
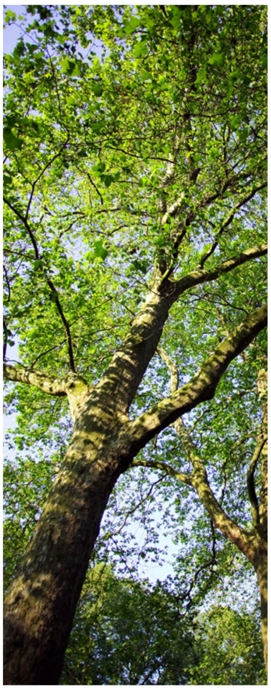


National Water and Wastewater Utility Manual

Institutional Strengthening of Future EU Financed Project Beneficiaries, Romania (FOPIP 2)

July 2010

Ministry of Environment and Forests

Mott MacDonald
In association with MVV Energie and CIMP

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Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
A	October 2008	FOPIP1 Team	FOPIP1 Team	FOPIP 1 Team; Mnistry of Environment	Final verision as approved by the Contracting Authority
B	June 2010	FOPIP 2 Team	Toma Stoia Geoff Lawn	R H Noakes	Draft (first) issue

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1. Introduction

This Manual documents the approaches, methods and experiences of the FOPIP-1 and FOPIP 2 projects. The first project which was carried out during the years 2006 to 2008 by a consortium led by Royal Haskoning from The Netherlands and with partners Louis Berger from France, and BDO Conti Audit from Romania. The second project was implemented in the period November 2007 to July 2010 by a consortium led by Mott MacDonald Ltd. (UK) with two other partners – MVV Energie AG (Germany) and CIMP (Romania).

Both projects were financed from EU funds (ISPA Measure 2003 RO 16 P PA 012 and ISPA Measure No: 2005 RO 16 P PA 001 -06), with the Ministry of Environment and Forests (formerly known as 'the Ministry of Environment and Sustainable Development' [MESD] and then 'the Ministry of Environment') as principal and beneficiary.

The Manual documents the experience and best practices which FOPIP1 and FOPIP 2 consultants had with 12 and respectively 21 regional operating companies in the water and wastewater sector from Romania. Some of FOPIP1 counties ((Sibiu-Medias, Gorj, Suceava, Caras-Severin, Vaslui, Giurgiu, Olt, Teleorman, Turda-Campia Turzii) continued to be provided assistance throughout FOPIP2 project.

The FOPIP 2 Consultant reviewed the entire Manual and revised the following sections:

- 1. Introduction
- 2. The Romanian water sector: performance, policies
  - 2.3.1. Regionalization of water and wastewater services
  - 2.3.3. Main advantages of regionalization
- 4. Benchmarking and key performance indicators
  - 4.1. Introduction
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  - E.15. Water and wastewater quality monitoring
  - E.25. FOPIP ROC performance.

The FOPIP 2 Consultant also added or **entirely** revised the following sections to the Manual:

- 8.Technical and operational management
  - 8.3.9. Apparent water losses
  - 8.3.15. Regulations on control of waste, misuse, and undue consumption

- 8.5.3. Performance indicators and LOS targets
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- Appendix B. Appendices to Chapters 4 & 5
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  - G.13. Guidelines on developing a communication plan
  - G.14. Guidelines on the analysis of end-to-end processes
  - G.15. Guidance on meter reading, billing and revenue collection.

1.1 Contributors to the Manual

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1.2 Why this manual?

The Romanian drinking water supply and wastewater sector is facing two major challenges:

- Improvement of technical, financial and commercial operations, in order to comply with European directives and sound economic principles. Huge investments together with effective and efficient operations and increased professionalism are main courses of action to achieve these objectives.
- A change of the institutional setup, particularly the shift from locally organized and managed services to regional operating companies. Scale of operations, legal setting as well as management mechanisms are thus due to change substantially.

In this process of change and development, there is a widespread need in the sector for having access to and sharing of information and experience.

The Manual is meant to provide the various stakeholders in the water sector with an overview of policies, best practices and approaches tested and proven to be potentially successful in a variety of Romanian water companies. The manual provides practical guidance on how to plan and implement desired changes and improvements. It covers a wide range of topics that are relevant for regionalising and developing water companies: policies, strategies but also tactical and operational aspects. It deals with institutional and legal setup, strategy development, organizational and human resource aspects, technical aspects, financial management and customer relations.

- The Manual is not meant to be comprehensive and covering all aspects of water supply and wastewater. It deals mainly with institutional and management issues, practices and approaches and not with e.g. in-depth engineering principles. Therefore, the reader will not find design guidelines for treatment plants or distribution systems.
- The manual is not an instruction book, prescribing in detail what to do and how to do it. It provides process steps, checklists, formats and examples, and therefore should be considered a guide rather than a book with standard solutions.
- The manual is not only meant for the 12 water companies that participated in FOPIP-1 or 21 counties that were included in FOPIP 2. All Romanian water companies and professionals may find guidance in this document.
- The manual is not intended to be final and finite but it should be approached as an ever-growing body of knowledge. More experience and good practice may bring further developments, updates and reviews.
- Four main target groups are likely the main readers and users of this manual:
  - (Top) managers and key professional staff of water companies and technical staff of IDA's.
  - Local politicians and administrators, for instance those involved in the IDA's, can gain a far better understanding of the water business, policies, the institutional setup and consequently their role.
  - Regulatory, policymaking and executive bodies like ANRSC, MIRA, MESD (and intermediate bodies), Apele Romane, etc. dealing with various aspects of water companies.
  - Professionals in the sector, including consultants, may benefit from the information, approaches and experiences for their own fields of interest and/or planning and implementation of similar projects.

1.3 Guidance to the reader

All the chapters can be read 'stand-alone', without the need to read preceding chapters. The structure of the manual is as follows:

- Chapter 2 provides background information on sector performance and policies, notably the regionalisation policies.
- The legal and institutional setup for regionalization in the water sector is described in Chapter 3.
- Chapter 4 deals with analyzing, monitoring and benchmarking the performance of water companies.
- Chapter 5 summarises key aspects of project preparation: master plans and feasibility studies.
- Strategy development and business planning are elaborated in Chapter 6. Experience with management information systems is also discussed here.

- Organization development and human resources management are presented in Chapter 7.
- Chapter 8 deals with the technical-operational management. Particularly asset management, leakage control, water quality monitoring, service levels and operation and maintenance guidelines are presented.
- Chapter 9 covers financial management. This includes accounting principles, financial planning, tariffs and cost control.
- Finally, Chapter 10 addresses areas of improvement regarding the relations with the ultimate users and beneficiaries of water supply and wastewater services: the customers.

Detailed information and instruments can be found in the appendices. As a general rule, manuals and larger documents are provided as soft copies, on a CD-ROM and may be downloaded from the website indicated by the Contracting Authority. Guidelines and examples are provided as hard copies, in the Appendices section corresponding to each of the chapters. All Appendices are listed in the Appendices Table of Contents.

1.4 Acknowledgment

The FOPIP 2 Consultant acknowledges the assistance provided to its team by all stakeholders.

2. The Romanian water sector: performance, policies

2.1 The water sector: key performance issues

After a period of more than four decades of centralised management, Romania has returned to the local autonomy principle through decentralisation, in this way transferring major and concrete responsibilities to the local public administration. This principle is reflected in the National Constitution. One of these specific responsibilities mentioned in the Law of the local public administration, No 215/2001 republished, refers to the obligation of local administrations to organise their operations efficiently and adequately in order to provide public services. According to this Law, local public administrations have the right to associate with the aim to develop efficient public services of common/regional interest.

Nevertheless, effective and efficient public services can only be achieved when supported by adequate investment programmes. However, only 32 major municipalities (of more than 100,000 inhabitants each) have benefited from capital investment programmes for rehabilitation of their water and wastewater infrastructure after 1990.

Also, only a small minority of the 276 towns in Romania (at the end of 2003) have benefited from these programmes. Around 230 considered small and medium-sized towns, have not been able to attract financing from either international financial institutions or private operators. Due to lack of funds, these towns have made very little investments over the past 15 years to maintain and develop their water and wastewater infrastructure. As a consequence, the condition and performance of their systems is very poor. Some of the major problems linked to water services in smaller agglomerations include:

- Inappropriate maintenance and operating services;
- High volume of unpaid water caused by network leakages and low level of payment collection from the consumers;
- Lack of investments for rehabilitation / extension of water / wastewater infrastructure;
- Lack of experienced staff for promoting, planning, management and implementation of large scale investments;
- Inefficient management of the operating, maintenance and personnel costs;
- Unclear role and responsibilities of institutions / authorities involved in management of public utilities;
- Inappropriate institutional framework.

In Romania, only 52% of the population is connected both to water and sewage services and more than 71% of the wastewater is untreated or insufficiently treated. Until recently water and wastewater services were mostly operated by (often small) municipal utilities resulting in inefficient operations carried out at a sub-optimal scale, without access to financial means and limited technical and managerial capability to further develop the level of services.

Now that Romania has become a member country of the EU, it must comply with the European Directive 98/83/EC on drinking water quality by 2015 and the Directive 91/271/EC on urban wastewater treatment by the end of 2018. For this reason, Romania intends for the period 2010 -2015 to make the necessary investments to comply with the European drinking water indicators for e.g. turbidity, ammonia, aluminium, pesticides, nitrates etc and for urban wastewater collection, treatment and discharge. Also by 2015 waste water collection and treatment is planned to be realized for a number of 263 agglomerations of more than 10,000 population equivalent (p.e.) and by 2018 in 2,346 agglomerations of between 2,000 and 10,000 p.e.

Having these ambitious objectives, the Ministry of Environment and Sustainable Development (MESD) has requested financial assistance from pre-accession programmes (PHARE, ISPA) to support local authorities in creating strong and viable regional operators in the water sector, to ensure an adequate implementation of internationally financed projects and efficient operation of the utilities constructed with European funds.

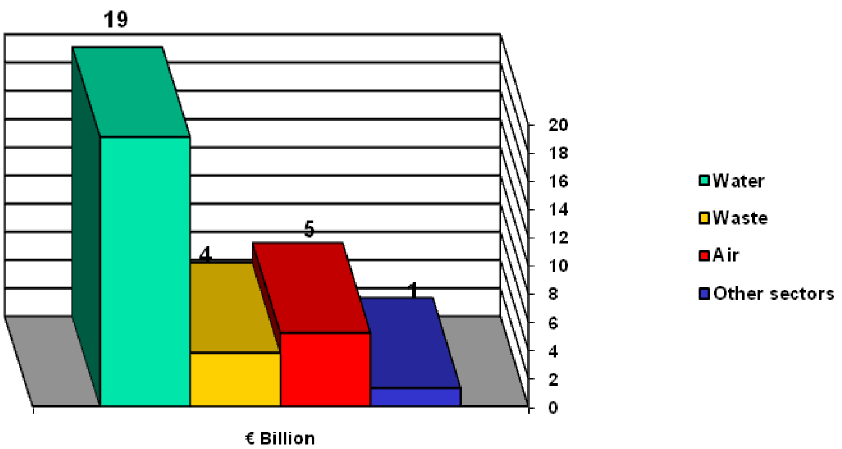
2.2 Relevant sector policies and strategies

The Sectoral Operational Programme for Environment (SOP ENV) prepared by the Ministry of Environment and Sustainable Development (MESD) as Managing Authority for the environmental sector and approved by the Romanian Government presents the strategic objectives and the context of financing of the infrastructure investments in the environmental sector.

The Sectoral Operational Programme for Environment (SOP ENV) is closely linked to the national objectives of the strategy laid down in the National Development Plan 2007-2013 (NDP) and National Strategic Reference Framework (NSRF), which takes into consideration the European Union's supporting objectives, principles and practices. It is designed to lay the foundation and be a catalyst for a more competitive economy, a better environment and more balanced regional development. The SOP is fully based on the goals and priorities of the European Union's environment and infrastructure policies and reflects Romania's international obligations as well as its specific national interests.

The investment needs for fulfilling all the objectives presented in SOP ENV are presented in Figure 2-1.

Figure 2.1: Investment needs as complied in SOP ENV



Source: FOPIP 1 Version of this Manual

For the period 2007-2013, Romania expects an EC contribution from Structural and Cohesion Funds of about Euro 4.5 billion for environmental investments, which is far below the estimated needs in the same period.

One of the specific objectives for SOP Environment is the improvement of quality and access to water and wastewater infrastructure, by providing water supply and wastewater services in line with EU practices and policies, in most urban areas by 2015 and by developing efficient regionalized water and wastewater management structures.

The Priority Axis 1 “Extension and modernization of water and wastewater systems” of SOP Environment sets as objectives the following elements:

- Provide adequate water and sewerage services, at accessible tariffs
- Provide adequate drinking water quality in all urban agglomerations
- Improve the quality of watercourses
- Improve the level of WWTP sludge management
- Create innovative and efficient water management structures.

Therefore the overall objective of the current development process is to create a solid and sustainable institutional and legal framework that provides for:

- A long term implementation structure for planned investments under SOP;
- Adequate management capability for operation of existing and future facilities.

According to Romania’s policy reflected in the SOP Environment the achievement of such objectives is realized through a process of regionalisation, meaning the implementation of an institutional framework within the Project area, suitable to combine the water supply and wastewater services related to the development areas in that region, within a common operating process. The regionalisation is a key element in improving the quality and cost efficiency of local water infrastructure and services in order to fulfil environmental targets, but also to assure sustainability of investments, of operations, of a long term water sector development strategy and of regional balanced growth.

2.3 Regionalisation of drinking water and wastewater services

There is a continuing need to ensure that all towns can invest to maintain and upgrade their infrastructure in order to have good services, able to meet EU standards. This requires adoption and implementation of adequately designed development policies, focused on meeting the real needs of the population, if services are to be affordable to everybody.

In line with this background, since 2001, Romanian authorities have designed programmes meant to support local authorities in order to:

- Access international financing in small and medium agglomerations with the purpose of rehabilitating and modernizing local water infrastructure and
- Promote self sustainable regional utilities by introducing principles of cost recovery and efficiency into their operations.

Regionalisation process

The regionalisation process consists of the concentration of the operation of the services provided to a group of municipalities within a geographical area defined with respect to a river basin and/or to administrative boundaries (e.g. municipalities, county).

The regionalisation of services aims to provide that 2,600 localities of more than 2,000 inhabitants meet 2018-performance targets established by the SOP, by concentrating the management of water and wastewater services in around 50 stronger operators, set up and developed by merging the existing local utilities into Regional Operating Companies (ROC).

Regionalisation of the water services, planned to overcome excessive sector fragmentation and to achieve economies of scale, is ongoing. Programmes are supported by pre-accession programmes (ISPA, PHARE and state budget) and include all 42 counties in Romania.

2.3.1 Regionalization of drinking water and wastewater services

A regional public water supply and wastewater system represents the entire technological, operational and managerial system resulted from the combination of two or more local drinking water supply and wastewater systems. The main objective in creating a regional drinking water supply and wastewater system and operator is to optimize the performance of the operations and quality of supplied services by using joint resources and facilities. It is recommended as a strategic guideline that the regional operation of water supply and wastewater services be performed in an area covering at least 100,000 population equivalents and as much urban agglomerations in a county or hydrographical basin as possible.

Therefore, the process of regionalisation consists in concentrating and integrating the services rendered by a group of administrative-territorial units. The new regional unit covers a certain geographical area delineated by a hydrographical basin and/or administrative boundaries.

The regionalisation of drinking water supply and wastewater systems and operators in general means consolidation and integration of notably:
- Technical and physical infrastructure
- O & M activities
- Financial and accounting systems and procedures
- Commercial systems and procedures (customer relations, billing and revenue collection)
- Human resources
- Management arrangements, systems and procedures
- Institutional and political decision making

2.3.2 The need for regionalisation

According to the EU Adhesion Treaty, Romania has obligations involving major investment in water supply and wastewater services in order to comply with EU environmental regulations and directives.

The creation of Regional Operating Companies (ROCs) and impliedly the delegation to ROCs of the drinking water and wastewater service management is an essential process to ensure within set terms the compliance with the “acquis communautaire” and also the development of the capacity to absorb EU structural funds and implement future investment projects.

As a direct consequence, the development of water and wastewater systems will play an important role in achieving those set objectives and in ensuring a 100% level of service coverage of good quality water (status), in compliance with the Water Framework Directive and other water related Directives.

Major investments are required, significantly exceeding the financial capability of most local authorities. Furthermore, a lack of specialized personnel and of expertise in preparing and implementing projects is felt at the level of small and medium communities that may slow the process of available investment fund absorption.

The association of several administrative-territorial units in order to jointly delegate the management of their drinking water and wastewater services will also respond to the need of balancing the level of development of the administrative-territorial units and is the application of the principle of solidarity as one of EU's fundamental values with positive effects on all consumers.

As a consequence, the solution proposed to settle these issues is the organization and operation of services at the regional level in order to ensure sustainable development and economies of scale. In order to cover a part of the measures required for EU standard compliance, Romania benefits from EU financing, i.e. from the Cohesion Funds. This financing is granted under the aforementioned SOP ENV programme.

2.3.3 Main advantages of regionalisation

In this context, the main advantages in operating water and wastewater services at the regional level are indicated below:

- The regional supply of utilities by integrated systems and more professional management is expected to result in time in the reduction of water loss, in the promotion of resource preservation, in minimum investment and in the protection of water sources;
- The strengthening of the capacity to prepare and implement investment projects as well as of the capacity to negotiate financing.
- Improvement of service quality, of customer relations and their perception on utility operators;
- Achievement of scale economies affecting the efficient operation of some cost categories: central invoicing and financial management, PIU at the central level, central management of laboratories, etc.
- Operation management by means of modern and efficient management instruments and the reduction of political involvement in the course of business.

In addition, regionalisation is a local legal requirement in Romania, since the introduction of Emergency Ordinance 13/2008.

2.3.4 Key institutional elements of regionalisation

The purpose of the process of regionalisation of water services, initiated by Romanian authorities and supported largely by pre-accession programmes (PHARE, ISPA), is to assist the local authorities in the creation of efficient regionalised water and wastewater service operators and in strengthening the capacity of local authorities to control effectively their activities.

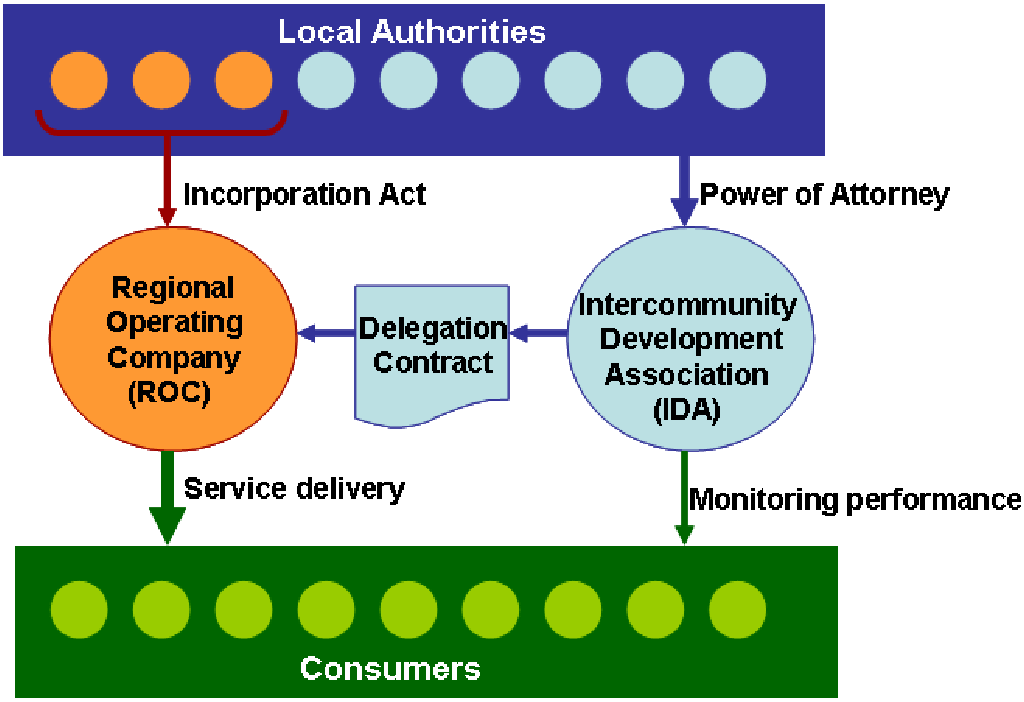
Regionalisation is achieved by three institutional elements (see figure 2-2):

- Intercommunity Development Association (IDA, Romanian equivalent is ADI)), which receives a power of attorney from its members to exercise in their name and on their behalf the prerogatives and responsibilities related to their water and wastewater service, as well as the rights to control ROC ;
- Regional Operating Company (ROC), a public equity commercial company, set by all or a part of the members of IDA, which is directly granted with the management delegation contract in observance to the "in-house" rules;
- The Contract of Delegation of Services' Management. The administrative-territorial units through their local public administration authorities (LA), which are all members of IDA, all or part shareholders of ROC, and also all of them delegate the management of their water and wastewater services to ROC by a single management delegation contract, via IDA.

The relationship between these institutions will be regulated in the Statute of IDA, the Incorporation Act of the ROC and the Management Delegation Contract.

The function in the process of Local Authorities is reflected by the participation to the creation of ROC's share capital, i.e. the approval of ROC's Incorporation Act and IDA's Constitutive Act / Statute whereby it is invested to exercise certain competencies, rights and obligations in the name and on the account of member administrative-territorial units.

Figure 2.2: Institutional framework for the regionalisation of water supply and wastewater services



Source: FOPIP 1 version of the Manual

Thus, the IDA will be the main interlocutor of the ROC as discussion and coordination entity and will represent the shared interests of its member municipalities / towns in what concerns water supply and wastewater, and mainly regarding:

- Common development strategy;
- Signing of the delegation contract
- Tariff policy
- Control of ROC operations and performance.

It is important that the IDA has also executive staff in order to adequately perform its duties and responsibilities. The role of the executive staff will particularly to ensure the day-to-day activity of the IDA in order to fulfill the tasks mentioned in the Statute.

The IDA should recruit or avail in another way of professional staff and expertise covering the following areas:

- General management and administrative issues;
- Technical;

- Finance;
- Legal.

The delegation of service management represents the base for operational and institutional organization of water and wastewater service management and is intended for:

- Ensuring a balanced relation between LA and ROC.
- Focussing the contract on the preparation, financing and execution of investment plans underlying the improvement of utility performance.
- Supervising key elements conducive to an efficient, dynamic and sustainable management in the water and wastewater sector, especially when it comes to:
  - Service delivery and service levels (LOS) to the participating communities
  - Management of fixed assets and of the financial system
  - Tariff adjustment system;
  - Reporting and control processes.

The Delegation Contract defines the specific obligations and rights of each stakeholder on the development of investment programmes and the achievement of performance levels of preset services. Therefore, ROC is responsible for the management, operation, maintenance, improvement, renewal and extension as the case may be of all fixed assets contemplated in the contract and the most significant risk assumed by the ROC is the non-payment of services rendered to customers as per the contractual provisions.

The ownership of public assets and the responsibility for the supply of adequate water and wastewater services at an affordable cost remain with the Local Authorities. The regionalisation requires groups of Local Authorities located in a specific region to coordinate efforts with a view to implement integrated service development programmes aiming to meet performance objectives established by the SOP, and to proceed with the territorial reorganization of the services by delegating the implementation of the regional development plans and the management of services to a ROC.

Fixed assets remain in the public property and must be taken back by the public owner (administrative territorial unit) on termination of the contract. The delegation contract is a long-term commitment. The tariff policy is aimed at full cost recovery and set by the ROC in compliance with applicable regulations set by the National Authority for Regulation of Community Services (ANRSC), under control and acceptance of the administrative territorial unit. Financing and commercial risks are undertaken by the ROC.

It is preferred that the regionalisation process be coordinated and mediated by the County Council considering its function and authority at the local level.

Furthermore, considering that the service regionalisation process requires a relatively long period of time both for the creation of ROC and for its consolidation, the active support of national / local authorities is absolutely necessary in order to complete this process in due time. To this extent, the adoption of a communication strategy ensuring the proper data exchange and the flow of the decision-making process involving several partners is required.

3. Institutional and legal aspects of regionalisation

3.1 General

This chapter describes the institutional and legal aspects of water supply and wastewater services, notably in view of the management, regionalisation and delegation of services.

First, the legal framework and the administrative arrangements for water supply and wastewater services is described (par. 3.1 – 3.6)

Thereafter, this chapter gives in paragraphs 3.7 – 3.10 practical format templates and step-by-step approaches in arriving at the key elements of the regionalised water and wastewater services, e.g.:
- Establishing the Intercommunal Development Association (IDA, Romanian: ADI)
- Establishing a regional operating company (ROC)
- Delegation of services contract (delegation contract).

Finally, this chapter discusses in general the performance indicators related to the delegation contract (par. 3.11).

3.2 Current legal framework

The Romanian legislation regulating the organization and implementation of water and wastewater utility services consists of the following relevant laws, and by-laws and ordinances.

3.2.1 Applicable laws
- Law no. 215/2001 of the local public administrations, republished, with subsequent amendments and completions;
- Law no. 213/1998 on the public property and its legal status, with subsequent amendments and completions;
- Law no. 273/2006 on local public finance, with subsequent amendments and completions;
- Law no. 51/2006 of local public services, with subsequent amendments and completions by OUG 13/2008 – general law;
- Law no. 241/2006 on water and wastewater utilities, with subsequent amendments and completions by OUG 13/2008 – special law;
- Law no. 31/1990 republished, with subsequent amendments and completions, regarding the commercial companies that is incident for the organization and functioning of the Regional Operator (ROC);
- Government's Ordinance no. 26/2000 regarding the associations and foundations, approved with amendments by Law no. 246/2005
- Government's Ordinance no. 198/2005 regarding the creation, supplying and using of MRD Fund for the local services' infrastructure development projects that benefit from EU grants, and approving the Norms for the creation, supply and use of MRD Funds.

3.2.2 Applicable by-laws
- Government's Decision no. 671/2007 regarding the approval of the Internal Regulations of ANRSC;
- Government's Decision no. 745/2007 for the approval of the Regulations regarding the granting of permits in the field of the local public services;

- ANRSC Order no. 65/2007 on the approval of the Methodology for the establishment, adjustment and modification of prices / tariffs to water supply and wastewater utility services
- ANRSC Order no. 88/2007 on the approval of the Framework Regulation of the water supply and wastewater utilities;
- ANRSC Order no.89/2007 for the approval of the Framework Specifications of the water supply and wastewater utilities
- ANRSC Order no. 90/2007 for the approval of the Framework Water Supply and Wastewater Service Contract;
- ANRSC Order no. 102/2007 for the approval of the Regulations regarding the ascertainment, notification and punishment for the inobservance of the regulations issued in the field of competency of A.N.R.S.C.

3.2.3 Definition and purpose of utility services

The Law no. 51/2006 defines the community utility services as the total of regulated actions and activities to ensure the satisfaction of utility needs and general public interest of local communities, including the water supply services, i.e. sewage and treatment of waste water.

Community utility services are / will be created, organized and supplied al the level of communes, towns, municipalities, counties, the Municipality of Bucharest and eventually, according to law, at the level of administrative and territorial sub-divisions of municipalities, under the subordination, coordination, supervision and responsibility of local public administration authorities.

The Water and Wastewater Utility Service, as defined by Law 241/2006, refers to the aggregate utility and general economic and social interest operations performed for the collection, treatment, transportation, storage and distribution of drinking or industrial water to all consumers within a locality and for the collection, transportation, treatment and disposal of waste water, rain water and surface water collected in its area respectively.

The water supply and wastewater public services, as local public services, are operated through a combination of buildings and lands, technical installations, functional equipment and specific facilities that form an integral part of the urban infrastructure of the localities, collectively called the public water supply and wastewater systems.

The water supply system is usually made of: collection elements, transmission lines, treatment plants, pumping stations, storage tanks, transport and distribution networks and connection up to the delineation point.

The water utility has the following main features:
- Abstraction of raw water from the surface or underground sources;
- Treatment of raw water;
- Transportation of drinking and/or industrial water;
- Storage of water;
- Distribution of drinking and/or industrial water;

The public wastewater system usually includes the following parts: wastewater connections from the delineation and collection point, sewage pipes, pumping stations, treatment plants, sewers for discharge towards the emissary, inlets for discharge into the emissary and dried sludge storage basins.

The wastewater utility addresses mainly:
- The collection, transport and discharge of waste water from consumers to treatment plants;
- The treatment of wastewater and its discharge in the emissary;
- The proper collection, discharge and treatment of waste from the rain water inlets and ensuring its functionality;
- Discharge, treatment and storage of sludge and similar waste derived from the activities mentioned above;
- Drainage and discharge of storm water and surface water from urban area.

3.2.4 Competent authorities

With regard to the regionalisation and the operations of the water operator, local authorities, IDA and A.N.R.S.C have main powers and responsibilities. Hereunder, the competences of these are described.

3.2.4.1 Local authorities

The competent authorities of the administrative-territorial units have the exclusive power that may also be exercised by Intercommunal Development Association (IDA) for water and wastewater under Law 51/2006 as recently amended, in the name and on behalf of associated administrative-territorial units, based on their power of attorney, in all aspects related to:
- The approval of local strategies on the set-up, organization, management and functioning of the water and wastewater utility companies;
- The approval of investment plans on the set-up, development, modernization and rehabilitation of the public service infrastructure;
- The approval of regulations and specifications of the service;
- Adoption of the approach to management and approval of documentation related to the organization and performance of management delegation procedures;
- Approval of service performance indicators.

In some cases, it is the counties and not the municipalities / towns or communes that hold exclusive power and responsibility on the water supply and wastewater services, in which case the county is the owner of the corresponding infrastructure. This situation results from the enforcement of Ordinance no. 69/1994, republished, on measures to reorganize autonomous regia on local interest.

3.2.4.2 A.N.R.S.C.

The local authorities are responsible for the organization and functioning of local public services, but there is a national relevant body at national level, which is A.N.R.S.C. (the National Regulating Authority for Local Public Services). A.N.R.S.C. has a set of prerogatives related to the services, namely in respect of:
- Granting of functioning permits to the operators, which are indispensable for them to be able to function, to be granted with management delegation contracts and to supply the service;
- Endorsement of the tariffs proposed by the operators, prior to their approval by the local authorities or IDA;
- Issuing of frame-regulations and specifications that are mandatory as a minima for the local authorities and IDA when they draw up and approve the local regulations and specifications of the service;
- Monitoring of the fulfilment of performance indicators (levels of services), the rules regarding the permits, the tariffs regulations.

It is important to notice that A.N.R.S.C., beside its regulatory role, has the prerogative to inflict penalties (including the withdrawal of the permit to the operator that leads to the termination of the delegation contract granted to such operator) to those operators that do not comply with the legal provisions and regulations monitored by A.N.R.S.C., and as well to the local public authorities for granting the management delegation contract without observance of the relevant legal provisions.

3.2.4.3 Other competent authorities

Further, it should be noted that apart from the above competent authorities, a number of other authorities directly or through their territorial authorities play to different extent a role in monitoring and supervision in the drinking water supply and wastewater sector. These are notably:

- Apele Romane (e.g. water abstraction and discharge permits and monitoring);
- Ministry of Environment and Forests (e.g. environmental permits);
- Ministry of Labour, Family and Social Protection (e.g. labour protection)
- Ministry of Health;
- Ministry of Public Finance (e.g. audits).

3.2.5 Public ownership

According to Law no 213/1998, the infrastructure related to the water and wastewater services (water supply and wastewater networks, treatment and ancillary plants, with the corresponding installations, buildings and land) belongs to the public domain. Both the existing infrastructure as at the date of the signing of the Delegation Contract and the assets afferent to the infrastructure, which result from the investments carried out during the performance of the Delegation Contract, are public assets belonging to the public ownership of the administrative-territorial units, to be taken over by their owner upon the termination of the Delegation Contract.

By the recent amendments to Law no. 51/2006, introduced by OUG no. 13/2008, it was provided that “the public services systems or their parts, created jointly by new investments programmes, performed within the intercommunity development association (IDA) having for scope of activity the local public services, belong to the public ownership of the member administrative-territorial units and are registered in their patrimony according to Law 213/1998 on the public ownership and its legal status with the subsequent amendments, on the grounds of the following criteria: (...) letter b) – the assets located in several administrative-territorial units and/or serving several administrative-territorial units shall belong to the public ownership of the county, if all the involved administrative-territorial units are in the same county and the county is member of the association” (article 10 paragraph (6) of Law no 51/2006 of the local public services, as amended by OUG no 13/208). Therefore all the assets created within EU financed programmes are public assets, and if they are located or serve several administrative-territorial units they are owned by the County, when this is member of IDA. In case when the county is not a member of IDA or the administrative-territorial units are situated in different counties, the letter c) of the same law article provides that the owner has to set by an express clause of the Delegation Contract.

3.2.6 Legal basis for delegated service management

The management of utility services addresses the organization, functioning and control for the supply / rendering of utility services under the conditions set by local public administration authorities.

The management of water and wastewater utilities may be organized in two ways at the discretion of local public authorities:

- Direct management by utilities (created or not as legal entities) organised under public law.
- Delegated management defined as an approach to management whereby local public authorities or IDA eventually assign to one or several operators the effective management of the service, i.e. the management and operation of water supply and wastewater networks based on a management delegation contract.

The approach to managing utility services is established by decision of deliberative authorities of the administrative-territorial units depending on the nature and status of the service, of the need to ensure the best price/quality ratio, of current and future interests of the administrative-territorial units as well as of the size and complexity of utility service infrastructure.

Further to recent amendments of Laws 51/2006 and 241/2006, through OUG no. 13/2008, an explicit legal basis was set for the institutional scheme proposed by SOP Environment, with regard to the delegated management. The new legal provisions of Law 51/2006 define the delegation of the management of a local public service as the action by which an administrative-territorial unit grants to one or several certified operators the management of a service or service's component activity whose responsibility belongs to such unit, as well as the concession of the related infrastructure; the delegation of the management of a local public service involves the right and the obligation for the operator to manage and operate the infrastructure related to the delegated service/activity. The delegation of the management may be done also by the IDAs having for scope of activity the local public services, in the name and on behalf of the member administrative-territorial units, on the grounds of a power of attorney granted by these.

3.2.6.1 Direct granting

The delegated management is performed by the means of a management delegation contract entered into between one or several administrative-territorial units (themselves or via IDA on the grounds of a power-of-attorney), as granting authority, and an operator, as grantee. The principle for granting such management delegation is the public tendering, with the observance of the relevant procedures. By exception, within the regionalisation process it was agreed with European Commission with the occasion of the negotiations for SOP Environment approval, and afterwards enacted by OUG 13/2008, that the management delegation contracts shall be directly granted to ROC by the administrative-territorial units, via IDA. For this direct granting to be allowed, in the respect of the principles of competition and transparency stated by the European and domestic legal frame, a set of rules has to be observed. According to the European Court of Justice (ECJ – Teckal and Coname case and following caseslaws), European tendering regulations may not be applied when the following conditions, called the "in-house" rules, are simultaneously observed:

- the public authority being the contracting authority, controls the concerned separate entity (operator) in the same way that it controls its own departments ("similar control" criterion) - this criterion was extended with the supplementary condition that the said entity keeps an integral public equity for all the period that the delegation contract is in force,
- the said entity (operator) carries out the essential part of its activities together with the controlling public authority or public authorities ("exclusive activity" criterion).

3.2.6.2 Direct granting: conditions

The new provisions of Laws 51/2006 and 241/2006, introduced by OUG 13/2008, are similar and form the legal basis in the Romanian legislation for the direct granting of the management delegation contract, as an exception to the competitive procedures, in the cases expressly provided by these articles and under the conditions stated by them, as a application of the “in-house” rules. According to these new legal provisions, by exception to the competitive procedures, the management delegation contract may be directly granted to the regional operators (ROCs) set up by the administrative-territorial units that are members of an IDA having as scope of activity local public services, with the cumulative compliance of the following conditions:

a. the administrative-territorial units members of an IDA for local public services, as shareholders of the regional operator, exercise via IDA a direct control and a dominant influence on the strategic decisions of regional operator related to the supplied service (the water and wastewater service in this case), similar to the control they exercise on their own structures in the situation of direct management;
b. the regional operator, as grantee, performs exclusively activities in the field of supply of the local public services (in this case the water and wastewater service, according to Law 241/2006), meant for satisfying the general public interest needs of the users on the competency area of the administrative-territorial units members of the association;
c. the registered capital of the regional operator is held in all by the administrative-territorial units members of the association; the participation of the private capital to the regional operator’s equity is prohibited.

The compliance of the presented institutional scheme with these in-house rules shall be elaborated further herein, within the analysis of institutional issues of the regionalisation process. Through this institutional mechanism ROC is subject to the joint control of the Local Authorities that exercise such control by the unique body, IDA, to which they give power of attorney and special rights.

3.3 IDA, ROC and Delegation Contract

3.3.1 IDA Constitutive act and Statute

Among other amendments made by Law no 286/2006 to Law no 215/2001 on Local Public Administration, was to define the modality of the local cooperation through legal entities named Intercommunity Development Associations.

According to Law 215/2001, the Intercommunity Development Associations (IDA) are cooperation structures having legal personality, organized under the private law (created following the provisions of the Government Ordinance no.26/2000 on associations and foundations), having a statute of public utility. Also, according to Law of the local public services, no 51/2006, as amended by the Government’s Emergency Ordinance no 13/2008, IDA for local public services are cooperation structures, set up as private law legal entities, having a statute of public utility recognized by law, meant to jointly exercise and carry out the prerogatives of local public administration authorities related to the supply of local public services. The member territorial-administrative units may grant power of attorney to IDA for local public services, under the terms of IDA’s statute and constitutive act, in order that IDA exercises in the name and on behalf of them, those prerogatives, rights and obligations related to the local public services that are mentioned by Law no 51/2006 and observing the conditions provided by this Law.

An IDA is set up by administrative-territorial units (municipalities and counties), according to Laws 215/2001, 51/2005, 241/2006 and Government Ordinance 26/2000, in order to jointly accomplish certain development projects of zonal or regional interest or jointly provide certain public services. These administrative-territorial units are the same as those that delegate the management of the water and wastewater service to a ROC.

IDA is the sole interlocutor for the ROC, as a unique body for debate and coordination, representing the common interests of its member municipalities regarding the water and wastewater service, especially with regard to:

- General strategy
- Investments
- Tariff policy

IDA exercises, in the name and for its member Municipalities, certain of their competences and prerogatives, rights and obligations, on the grounds of a power of attorney, which these members grant to the IDA through its statute.

The Statute of the IDA specifies in detail several key aspects, such as:

- the objectives of IDA, related to the development of water and wastewater services and related infrastructure;
- the extent and the conditions of the power of attorney granted to IDA by its member Municipalities to exercise in their name and on their behalf certain prerogatives related to the services, as well as the voting procedures;
- the conditions for adhesion to IDA;
- the restrictive conditions for withdrawal from IDA stipulating financial penalties including reimbursement of investment value;

Laws 51/2006 and 241/2006 have been recently amended by OUG no 13/2008 in order

- to clarify the legal status of IDA as private law entity, of public utility;
- to clearly provide the terms and conditions of the power of attorney granted to IDA by its member Municipalities;

The template constitutive act and statute of the Intercommunity Development Association is presented in Appendix A1.

3.3.2 ROC incorporation act

The ROC is a commercial company, owned by all or a part of the IDA member municipalities, to which the management of the water and wastewater service is delegated, through the Delegation Contract.

The regionalisation process, that provides the basis for the establishment of the ROC, represents an essential element towards achieving the ambitious investment objectives set for the renewal, extension, operation and maintenance of the country's water and wastewater sector assets in order to comply with the targets for water and wastewater set for 2015 and 2018. It initiates the development of an institutional and legal framework at regional level, suitable to replace the existing smaller operators and autonomous regias with a stronger and larger new single regional operator intended to be more effective in operating the services and in this way to acquire sufficient managerial and financial credibility to apply for and obtain EU Cohesion Fund financing.

Under the provisions in force of Law 31/1990 regarding the commercial companies and Law 215/2001 of the local public administration, such a common regional operator is set up as a commercial company having as shareholders administrative-territorial units that are simultaneously also IDA members.

The template of the Incorporation Act was designed in order to correlate the provision of the constitutive documents and prerogatives of the IDA with provisions of the delegation contract and with the aspects negotiate with European Union regarding the institutional set up for SOP Environment.

The template constitutive act for the ROC is presented in Appendix A2.

3.3.3 Model contract for delegation of services

The Delegation Contract for the water and wastewater service's management is a contract agreed between ROC on the one hand (as operator), and IDA in the name and on behalf of its member municipalities (these municipalities are, collectively, the granting authority). It is a unique contract for the entire area of the Project, corresponding to the territorial competency area of all the administrative-territorial units that delegate the management of the water and wastewater services to the ROC.

According to the new Law no 241/2006 on water supply and wastewater services, in case of delegated management for the service's functioning, the local public administration authorities transfer to the regional operator the tasks and the responsibilities regarding the public utilities services' supply, as well as the management and the operation of the related water supply and wastewater systems, on the grounds of a management delegation contract, approved by decision of the granting authority.

Delegation Contract

The Delegation Contract for the water and wastewater service's management is a contract agreed between ROC on the one hand (as operator), and IDA in the name and on behalf of its member municipalities.

According to the strategy approved by SOP Environment, the Delegation Contract is granted directly to the Regional Operator, by the application of the exception to the tendering rule, in compliance with Law 241/2006. The direct granting of the delegation contract is achieved in compliance with the EU "in-house" rules as an exception to the tendering procedures. The recent amendments to Laws 51 and 241 also include the provisions regarding the "in-house" rules in those laws (i.e. the new art. 311 of Law 51/2006 and art. 211 of Law 241/2006).

In the following paragraphs are presented the provision regarding the "in-house" considered in the design of the institutional framework.

According to the European Court of Justice (ECJ – Teckal and Coname case laws), European tendering regulations do not apply when the following conditions are simultaneously observed:

a. the administrative-territorial units exercise, via IDA, a direct common control over the ROC, similar to the control exercised over an own department, with a dominant influence on all the strategic and/or significant decisions of the ROC (the "similar control" criterion);
b. ROC carries out, exclusively, activities in order to provide water and wastewater services for those administrative-territorial units that delegated the management of such service to the ROC (the "exclusive activity" criterion);
c. the registered capital of the ROC is entirely owned by administrative-territorial units that are members of IDA, the participation of private capital being excluded.

3.3.3.1 The similar control criterion

The key lines of the direct management according to the requests of the similar control criterion are:

- it is carried on the grounds of terms of reference and services' regulation
- the appointment and repeal of the management of the operator
- the approval of the Internal Organization and Functioning Regulations (ROF) of the operator
- the approval of the annual budget of the operator.

The control over ROC is exercised jointly by several municipalities, via IDA, on the grounds of an institutional frame set by the ROC Incorporation Act (regarding the institutional control over ROC) and the Delegation Contract having as appendices the terms of reference and the service's regulations (regarding the control over the performance of the contractual obligations related to the water and wastewater service management).

The control over the ROC is exercised jointly by the participating municipalities, through the IDA.

In respect of such control, IDA:

- Receives by its Statute, a power of attorney from its member municipalities to exercise in their name and on their behalf, their competencies related to the water and wastewater service, provided in Laws 51/2006 and 241/2006. Such power of attorney shall be formalized especially in the signing of the Delegation Contract and the monitoring of its performance.

  IDA's power of attorney, for exercising in the name and on behalf of its members, their prerogatives regarding the water and wastewater service, is detailed in the Statute of the Association.
- Receives through the ROC Incorporation Act certain specific rights, in order to allow IDA to control the ROC. Such specific rights are:
  - The members of the Board of the ROC shall be appointed by the shareholders assembly among the persons proposed by the IDA, and shall be revoked only upon proposal of the IDA;
  - IDA agrees upon the Internal Organization and Functioning Regulations (that includes the organizational chart) of the ROC before its approval/ modification by the Board of the ROC.
  - The annual budget of the ROC shall be established in accordance with the Business Plan agreed by IDA
  - The ROC has to inform IDA regarding its activity so that IDA can perform its control attributes

3.3.3.2 The "exclusive activity" criterion

This condition is included in the Incorporation Act of the ROC regarding the scope of activity of the company, on one hand, and in the Delegation Contract regarding the delegated services that constitute the exclusive activity of the Operator, on the other hand.

The Delegation Contract also stipulates the possibility for the ROC to sub-delegate a part of the management of the delegated services, if needed for economical efficiency reasons, to a third party, but solely by a tendering procedure.

3.3.3.3 The public capital of the ROC

The Incorporation Act of the ROC stipulates the obligation undertaken by the shareholder municipalities that the registered capital of ROC is entirely public capital and shall remain entirely public for all the duration of the Delegation Contract.

The template of the Delegation Contract is presented in Appendix A3.

3.4 Steps and activities to establish the regional institutional framework

3.4.1 Preparation phase, opportunity study

The creation, organization, functioning and management of water supply and wastewater services are based on specialized (opportunity) studies that will analyze the following elements:

a. The needs of local communities;
b. The socio-economic characteristics, level and pattern of development of agglomerations;
c. The status of existing water supply and wastewater networks;
d. Local possibilities to finance the operation and functioning of the service, namely of creating or developing the associated public infrastructure;
e. The optimal cost/quality ratio for the service(s) supplied to consumers.

The optimal solution will be adopted after public debate of the study and consultation of end users. This opportunity study will be also the basis for the creation of ROC.

In the consideration of these aspects, the following preliminary actions need to be undertaken for the delegation of service management to the ROC:

Preliminary actions

1. The preparation by local authorities of an opportunity study on the set-up, organization, functioning and management of water supply and wastewater services , jointly via IDA; we also recommend (the legal frame has no provisions in this respect) that the performance indicators (levels of service) to be drafted at the same time;
2. Organization of a public debate on the set-up, organization, functioning and management of water supply and wastewater services, as well as on the proposed levels of service;
3. Adoption of local and county council decisions on the approval of
   a. the opportunity study related to the set-up, organization, functioning and management of water supply and wastewater services, jointly via IDA
   b. the performance indicators (levels of service)
4. Adoption of local and county council decisions on the selection of the approach to water supply and wastewater service management (based on the aforementioned study);
5. Public information in relation to decisions taken by local public administrative authorities.

3.4.2 Creation of the Intercommunity Development Association (IDA)

According to art.10 par.(3) of Law 51/2006 as amended by OUG 13/2008, “the intercommunity development associations having for scope of activity local public services are set up, function and are incorporated as legal entities according to Government’s Ordinance no. 26/2000 regarding the associations and foundations, approved with amendments by Law no. 246/2005.”

IDA is authorized to exercise specific powers, rights and obligations in the name and on the account of member administrative-territorial units to the sole purpose of water supply and wastewater services.

Therefore, considering the relevant provisions of OG 26/2000, of Law no. 51/2006 and the practice, the following steps must be performed to create an IDA:

1. The definition of administrative-territorial units that participate to the creation of IDA and of ROC respectively

2. The negotiation of final forms of the IDA's Constitutive Act and Statute;

In this respect, the futures associates need to decide upon the following significant issues:
- How an associate can acquire or lose membership
- Rights and obligations of associates
- Contribution to patrimony of each associate
- Structure of the management bodies
- Nominal composition of management bodies
- The decision-making process within the association.

3. The proof of IDA's name availability issued by the Ministry of Justice.
4. The approval of the association, and the final form of IDA's Constitutive Act and Statute by decisions of deliberative bodies of the member administrative-territorial units.
5. The signing of the IDA's Constitutive Act and Statute by the presidents of county councils and/or mayors of the associated administrative-territorial units before a public notary or attorney-at-law.
6. The payment of each LA's contribution to the patrimony of the association and the availability of IDA's headquarters.
7. The incorporation of the Association through registration in the Register of Associations and Foundations in the possession of the Record Office of the Court of territorial jurisdiction.

Any of the associate members may file based on a proxy a written application to register the association in the Register of Associations and Foundations held by the Record Office of the Court of jurisdiction.

The registration application will be accompanied by the following:
   a. The Constitutive Act, certified by a notary public or an attorney-at-law;
   b. The Statute, certified by a notary public or an attorney-at-law;
   c. Supporting documents attesting the registered office and initial patrimony;
   d. The proof of name availability issued by the Ministry of justice or the motivated grounds of the refusal to issue such a proof, as the case may stand.

Within 3 days from the submission of the registration application and of documents mentioned above, the judge designated by the president of the court will check the legal value of documents and will order by a written settlement the registration of IDA in the Register of Associations and Foundations.

IDA becomes a legal person from the moment it is registered in the Register of Associations and Foundations.

IDA must be also registered to the relevant tax authority for fiscal reasons.

3.4.3 Creation of regional operating company (ROC)

The starting point in creating the ROC is the decisions adopted by local and county councils on the approval of the opportunity study regarding the set-up, organization, operation and management of water supply and wastewater services.

The ROC may be created from existing operators in each region in one of the following ways:
- Through administrative reorganization of former autonomous regia (in practice the main existing regia in the county) of local or regional interest into a commercial company, followed by a capital increase through the contribution of all or a part of IDA's members;

- Through increase of an existing commercial company's capital (already held by one administrative-territorial unit - in practice the main existing company in the county) through the contribution of all or a part of IDA's members that become shareholders of ROC;
- Through the creation of a new company, with entirely public equity, having as shareholders solely local public authorities within the region of intended service supply, which are also IDA's members.

The following actions will be considered for the creation of the ROC:

1. The creation of a negotiation committee to establish the contribution of each LA to the capital of the ROC materialized in a negotiation report. This activity is optional, yet creates the conditions of a detailed analysis before the creation of ROC.
2. The joint decision on the form of the Deed of Incorporation of the newly-created/reorganized company.

The following main issues will be considered when getting the ROC's Deed of Incorporation in its final form:

   a. The ROC's object of business, with the indication of the field and main activity;
   b. Clauses on the management, administration, functioning and control over the ROC's property by statutory bodies, its control by shareholders, via IDA, as well as documents to which shareholders should have access to be informed and exercise control;
   c. The distribution of benefits and loss, in compliance with the provisions of MRD Norm and Delegation Contract ;
   d. The dissolution and liquidation of the company.

3. Adoption of decisions by the deliberative bodies of IDA's member administrative-territorial units that are future ROC's shareholders on the participation to the capital of the ROC, on the approval of the ROC's Deed of Incorporation, on the designation of a representative to sign this Deed as well as on the designation of a person to represent the LA's interests in the ROC's general assembly;
4. The signing of the ROC's Deed of Incorporation;
5. The registration of the ROC as per the law.
6. ROC creation follow-up actions.

After the ROC is created, the following should be considered:

   a. To ensure the transfer / employment of personnel in the newly created company;
   b. Procurement of authorizations / permits / licences for functioning (also by transfer form former operators if possible);
   c. Definition of the organizational chart of the new ROC, with the mandatory endorsement of IDA, for compliance with the "in-house" similar control criterion;
   d. Completion and approval of the Internal Organization and functioning Regulation of the ROC, with the mandatory endorsement of IDA, for compliance with the "in-house" similar control criterion;
   e. Elaboration of an action plan to strengthen the newly-created operator.

3.4.4 Delegation of water supply and wastewater service management

The following activities should be considered when delegating service management to ROC:

1. Conduct by local public authorities, or water and wastewater IDAs if such study was not made together with the opportunity study, of a specialized study to establish the performance indicators of the service supplied / rendered to end users;
2. Organization of a public debate to establish the performance indicators for delegated services if such study was not made together with the opportunity study;
3. Elaboration by IDA of the Regulation and Terms of reference for water and wastewater services;

4. Adoption of decisions by local public authorities on the approval of Regulation and Terms of reference for water and wastewater services, including the performance indicators of the service supplied / rendered to end users;
5. Adoption of decisions by local public authorities on the approval of the management delegation contract, as well as on the direct granting of the management delegation contract to the ROC;
6. Public information on the decisions adopted by LAs;
7. The signing of the delegation contract by the president of IDA in the name and on behalf of member administrative-territorial units, based on the power of attorney they had granted.

It is recommended in the process that negotiation be uniform and a single management delegation contract be signed by IDA authorized to this extent by involved administrative-territorial units' authorities, which contract will include special clauses and/or appendices for each administrative and territorial unit separately.

3.5 Performance indicators (Levels of Service)

According to art.8 of the Law no 241/2006 on the water and wastewater service "the service that is provided by the water and wastewater infrastructure must accomplish, at the users' levels, the performance indicators (levels of service) provided by the water and wastewater service's regulations".

The proposals for the performance indicators of the water and wastewater service that is supplied to the users, as they result from the speciality study drawn up on this purpose, shall be submitted to public debate prior to their approval by the authorities of the local public administration.

Art.16 of the same Law provides also that ANRSC drafts and approves, by order of its president, the methodology and the frame-procedure for setting, monitoring, measuring, comparing and analysing the performance indicators of the service.

However; we mention that no such frame-documents have been issued until present. ANRSC monitors the evolution of the service's performance indicators, in the purpose of dissemination to local authorities and operators of the best practices in this field. ANRSC shall develop an informational system allowing the creation of a database and the permanent comparison of each performance indicator with the level reached by the most efficient operator in the field. For implementing the monitoring and database activities the operators are obliged to supply ANRSC with all the requested information related to the service's performance indicators.

The management Delegation Contract must include the penalties to be inflicted to the operators in case of non observance by them of the service's performance indicators (art. 32 of Law no 241/2006).

In the application of this Law no 241/2006 were issued the Frame-Regulations for the water and wastewater service, which comprise specific provisions regarding the service's performance indicators. In this respect the Frame-Regulations define:

- the "general performance indicators", as parameters of the supply service for which there are set minimal levels of quality, monitored at the level of the operators;
- the "guaranteed performance indicators", as parameters of the supply service for which minimal levels of quality are set and for which penalties are stipulated in the service supply contracts, in case of non achievement of them.

Art.231 of the Frame-Regulations stipulates that the performance indicators set the conditions that must be observed by the operators in the supply of the water and wastewater service, and they ensure the conditions that must be accomplished by the water and wastewater services, considering:

- the continuity in terms of quantity and quality;
- the permanent adjustment to the users' requirements;
- the exclusion of any discrimination regarding the access to the water and wastewater service;
- the observance of the specific regulations in the field of water management and environment protection.

According to article 232, the water and wastewater service's performance indicators are specific for the following activities:

- connection of the users to the water and wastewater networks;
- contracting of the water and wastewater services;
- measuring, invoicing and collecting the counter value of the supplied services;
- the observance of the contractual provisions regarding the quality of the supplied services;
- maintenance of equitable relationship between the supplier and the user by the operational and objective solution of the problems, observing the rights and obligations of each party;
- settlement of the users' claims regarding the water and wastewater services;
- provision of other services related to the supply service (information, consulting etc.)

The Delegation Contracts to be signed between IDA and ROC will have, as separate annexes, the service's performance indicators for each administrative-territorial unit that delegates the management of its service to ROC.

In this respect, each deliberative authority shall approve the performance indicators to be observed within its territorial area, after coordination within IDA.

The target in the future is that IDA approves a consolidated set of performance indicators of the service, applicable for the entire delegation area.

4. Benchmarking and key performance indicators

4.1 Introduction

Benchmarking, using performance indicators, is a powerful and extremely useful technique that a company can use to help improve performance and maintain a competitive advantage. It is a performance comparison tool that can be used to encourage good practice throughout an organization in a measurable way. Use of benchmarking is potentially very important in Romania today as the Country, as part of the European Union, has a need to demonstrate improving performance, particularly in the water and wastewater sector.

This Chapter of the Manual, therefore, summarises the main "benchmarking" issues for the following two purposes:

- to provide the water and wastewater companies with an effective tool to monitor and improve their own performance;
- to provide the Ministry of Environment and Forests as the managing authority for implementing the SOP Environment, with an easy to apply instrument for collecting data from the sector operators in order to obtain a complete picture of the water and wastewater sector.

The role of benchmarking to increase a company's competitiveness is extensive. It not only helps companies assess their performance using their existing internal measures, but also can be used to compare a company's performance externally with other similar organisations. In the municipal service sector this comparison can be expanded to cover other national, or even international, service providers. Consequently, benchmarking can provide a particularly useful vehicle for developing databases for International Financing Institutions (IFI's).

Benchmarking principally is a process for identifying and learning good practices in other organisations. It was launched by XEROX in the 1980's and has been widely used since. Notably, the public water sector in the Netherlands uses this instrument to monitor individual company performance vis-à-vis others in the water sector and to improve in areas where others perform better. It is one of the most efficient tools available today to improve the performance of an organization. Benchmarking is closely linked to Total Quality Management (TQM).

Benchmarking and its associated performance measures can take several forms; firstly by focusing on either "internal" or "external" factors it can be used in two ways, namely:

- to monitor the company's performance through time; and
- to compare the company's performance with others in the industry, made possible by monitoring and publication of benchmarking results.

Secondly there are a number of approaches that can be adopted such as metric and process benchmarking; these can be undertaken either by a group of companies willing to share business information or independently by one company. Finally benchmarking can be used to determine strategic areas of opportunity and improvement since the information benchmarking provides, helps management to define more exact targets for its policies.

A prime requirement for benchmarking is the use of reliable data, if this is not achieved it will be a case of 'rubbish in – rubbish out'. Failure to use reliable data will inevitably lead to wastage of resources and be particularly demotivating to those involved in the process of improvement and will also misdirect investment programmes.

In using the results of benchmarking one should be aware that differences do not necessarily mean “better” or “worse” management practices. Different externalities as to starting position and the social, economical and geographical environment may lead to differences in benchmark figures that no management can avoid. Nevertheless, inter-company comparisons provide extremely useful overall management information.

The various forms that benchmarking takes, including definitions of metric and process benchmarking, are outlined in Section 4.3 and are based on the assumption that in the early stages of introducing benchmarking to Romanian water companies, metric benchmarking will be adopted. This approach is being taken since it is felt that a better understanding will be achieved if the approach that has already been used is adopted in the first instance. Benchmarking can be seen as an evolving process and therefore it can be expanded on once more experience in its use is gained.

Benchmarking is a continuous cyclical process of utility performance improvement – it is not a single event. In time, benchmarking can become part of the routine utility management functions.

These Benchmarking Guidelines have been developed for the ROCs and were implemented through a web-based system that was setup under the FOPIP I project and that is now managed by ARA. It was recommended that ARA should also have an audit role in terms of periodic data validation. In addition to participating ROCs and ARA, it was also recommended that Ministries and ANRSC should have access to benchmarking data but it was not intended that other reporting requirements would be replaced as a consequence of its implementation.

It is intended that the performance indicators selected in this document will be included for levels of Service (LOS) and Standards of Service (SOS) and could be stipulated in the Delegation Contracts between IDAs and ROCs.

To link into best practise for benchmarking reference should be made to the following ISO standards for management and assessment of drinking water and wastewater services:

- ISO 9000 series;
- ISO 14000 series;
- ISO 18000 series
- ISO 17000 series
- ISO 24510, 24511, 24512.

4.2 The use of benchmarking in Romania

In the Romanian water utility sector currently there is only limited experience in the use of benchmarking. During the past 10 years there have been two important projects, at a national level, were data has been gathered by the process of metric benchmarking. The first was developed during the MUDP II project and it covered 10 water utilities. The second was developed by the Romanian Water Association, ARA, and it covered 25 water utilities from the major Romanian cities. In addition a national system of benchmarking, for all utilities, was proposed as part of the Improvement of Management of Municipal Services project.

4.2.1 Experiences in MUDP II

During the MUDP I&II project the first analysis necessary for starting a benchmarking process was made. A limited number of indicators were chosen to reflect:

- Population coverage
- Water production and consumption
- Unaccounted for water
- Meter coverage
- Pipe network performance
- Cost and staffing
- Service quality
- Billing and collection
- Financial performance
- Capital investment

A metric benchmarking exercise for the fifth year of the project was completed for the ten utilities involved in the MUDP II programme. At the end of the Project (year 2000), the results of this exercise were introduced to all of the key stakeholders.

As a follow up to this process a decision was made by the national authorities to introduce and prepare performance indicators for the water sector in compliance with the relevant service regulations. However, the lack of experience of the utilities to record and report performance indicators, the large number of utilities (more than 250) and indicators (about 100) combined with the fact that there were no appropriate instruments for filling in and processing the information made the process impracticable.

4.2.2 Experience of the Romanian Water Association in benchmarking

In this context, ARA implemented a metric benchmarking survey in 2005, through the Romanian Water Training Centre. The methodology used was based on the International Water Association framework. During the process of data collection, the following steps were performed:

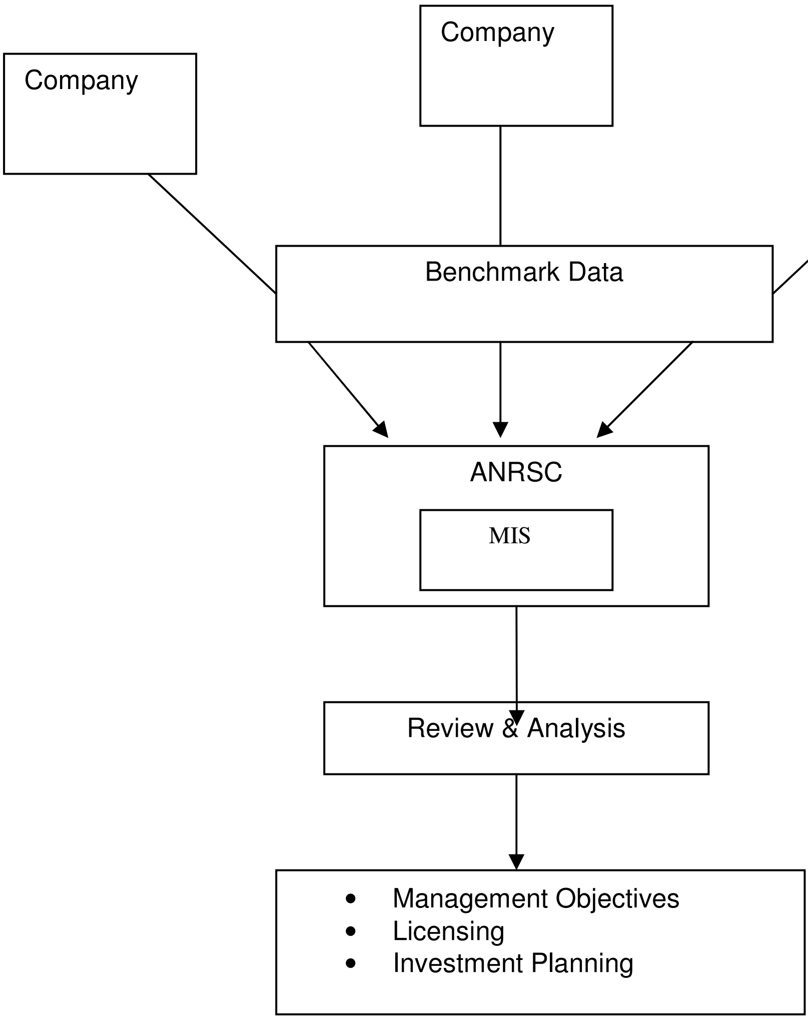
- Identification of water utilities to be included in the benchmarking process
- Preparation of an information tool and guideline
- Training of the future partners
- Preparing for and undertaking benchmarking visits
- Completion of the Excel forms
- Data validation.

The results of this metric benchmarking were introduced at the IWA CEO Forum that took place in Brasov, Romania in 2005. Unfortunately only a few of the utilities currently involved in FOPIP were part of the survey.

4.2.3 Improvement of management of municipal services project

As part of the PHARE project entitled "Support for the Development of Improved Management of Municipal Services", RO.01.05.01.01 in 2004 a computerised benchmarking system was developed and implemented within the ANRSC. The system is designed as a very capable SQL database structure and it processes and stores a lot of information relating to the whole utility sector. Note that it covers the whole sector not just water. Figure 4-1 outlines the concept on which this system is based.

Figure 4.1: Concept of ANRSC benchmarking system



It has to be said that although the system is operational it is not yet functioning as was originally intended since;

- The set of performance measures to be collected and monitored is too comprehensive requiring a huge amount of data to be gathered from each utility operator on a monthly basis.
- The of data being requested places a strain on the resources of the individual operators and as a consequence a large number them do not comply with requirement to submit data on a monthly basis.

Currently the data loaded consists mainly of static long term data, e.g. utility names and addresses; as a consequence there is little or no “operational” data available to report on.

4.3 Benchmarking methodology

4.3.1 Methods of benchmarking

Benchmarking methodology needs to be viewed from a number of perspectives to provide maximum benefit; these are:

- Traditional planning perspective
- Core skills perspective
- Customer perspective
- Business objectives perspective
- Business improvement perspective.

Planners, of whatever discipline, are resident in most organizations and will have the authority necessary to initiate introduction of benchmarking principles to the organisation. As such, planners have an important contribution to make in aligning benchmarking to the strategic issues.

Core skills are the abilities an organization has developed through its people, experience, available technology and culture in which it operates. It has been said many times that an organization is only as good as the people it employs. This is particular true when benchmarking is applied as the use of cross-functional working in problem solving and developing good practice will produce substantial benefits.

Delivering customer satisfaction has become increasingly important in recent years. It is now necessary in planning the development of a company (e.g. ROC) to take into account what standard of service customers expect, not only what the operator thinks is adequate or what the customer ought to have. These do not always align with other perspectives but are equally important to consider. The use of regular surveys of the opinions of customers on the level of services provided by ROCs is a useful way of understanding what customers consider to be the most important functions and localities / districts for improvement.

Long term benefit is derived from using benchmarking activities that relate to corporate or strategic objectives. In doing so it needs to identify the prime goals of the organization, what is required to achieve this in terms of process evaluation and resourcing, together with assessment of priorities in the short, medium and long term.

The business improvement perspective is purely an internal application of self improvement in areas of identified weakness. The identified areas of weakness become subjects for continuous improvement and benchmarking projects. Commitment to self- assessment and improvement can significantly improve profitability.

Benchmarking can take two basic forms:
1. Metric benchmarking

Metric benchmarking is a quantitative comparative assessment that enables water utilities to track their internal performance over time and to compare their operation against their past performance levels or that of other similar utilities, using Key Performance Indicators.

The ratios thus produced can be very reliable indicators of performance over time within the given utility when they are well defined, applied consistently and set in the proper context. Arising from this exercise the process can be extended to make comparisons with the same processes and practices of different organizations.
2. Process benchmarking

Process benchmarking requires the identification of specific work procedures in need of improvement. This is done by using a “process mapping” technique; such a technique involves a step by step analysis of the identified process and then identifying external examples of excellence in the process. This allows for standards to be set and steps taken to try and improve a company's performance.

Process benchmarking: the management analysis of a utility's own business processes and comparison with those of utilities with exemplary performance in those processes.

Process benchmarking is usually performed at a higher level than metric benchmarking and is less numbers intensive.

4.3.2 Process

One of the reasons why benchmarking has become so readily adopted in market economies is that the basic concepts and principles are easy to understand. However, it is important to follow a well proven format and develop a common benchmarking language and framework to suit the individual organization. This will ensure communication is understood, without unnecessary jargon and assist in the transfer of learning process.

One of the perceived problems with benchmarking is accessibility to partners with relevant experience. Within the water and wastewater sector in Romania this should not be a problem.

As benchmarking has developed into a recognised technique, a common methodology has evolved. This is based on the order in which things need to be done to achieve results. The Benchmarking process comprises a number of stepped stages that are subject to review and recycling as is best demonstrated in the model shown as Figure 4-2.

Figure 4.2: Benchmarking process model

The Planning Stage
1 Select the subject area
2 Define the process
3 Identify potential partners
4 Identify data sources and select appropriate collection method

The Analysis Stage
5 Analyse data and select partners
6 Determine the gap compared to the benchmark
7 Establish process differences
8 Target future performance

The Action Stage
9 Communicate to management and others
10 Adjust targets and develop improvement plan
11 Implement
12 Review progress and calibrate

REVIEW & RECYCLE

4.3.3 Planning stage

Step 1: Select the subject area

One of the most important considerations in benchmarking is to decide what area to focus on; an organization should not aim to benchmark everything in sight. It is likely that the Vision Statement of an organization will provide direction as will answers to the following questions:

- What are the main activities of our business?
- Which aspect of our business do we have to improve to gain market place advantage?
- What would make the most significant improvement to customer relations?
- Which single area of activity, if improved, would contribute most to the 'bottom line'?
- How will improvement in this area impact on other parts of the business?

It is likely that the areas selected are those that have the most significant impact on increasing income, optimising costs, optimising cash flow and improving customer service.

Step 2: Define the process

Having identified the area to benchmark the next step involves identifying and defining the process. A team will need to be assembled and to deliver maximum benefit it is recommended that its membership is cross-functional under an executive champion to ensure strategic direction is achieved. Then proceed through the four stages of process definition which are:

1. Define the boundaries
2. Agree what is happening between the first and last steps in the process
3. Agree a common working definition for the process
4. Map the process

Define the boundaries

The positional setting of boundaries is not important, what is important is that each team member understands and agrees to work within limits. Boundaries need to be reasonably set and not too ambitious in the first instance. They should enable the project to be completed in a reasonable period of time and deliver interim results to encourage the team. A number of fundamental questions need to be asked when defining boundaries which are:

- What is the output of the process?
- Who is the customer?
- What does the customer require?
- Is this what the process delivers?
- Where does the process start?
- Where does the process end?
- Who owns the process?

Agree what is happening between the first and last steps in the process

Involve people who are involved in all steps in the process as now defined. Establish exactly what happens, when and why. Only by doing this will the actual situation be established as quite often the reality of the situation is quite different from that laid out in training manuals or standing procedures.

Having identified each element of the process it is necessary to sort them into a sequence of events and produce an affinity diagram which can then be developed into a flow chart. The flow chart will identify decisions, delays, repetitions, critical paths and so on. The team then needs to agree the most important steps and assign measures for cost, quantity and time. Flow charting rapidly identifies where inefficiencies exist or activities are being carried out at an inappropriate point.

This is a good point to provide initial feedback on progress; because waste, errors and duplication should have been identified and can be removed from the process, so demonstrating efficiency improvements.

Agree a common working definition for the process

A clear description of the process objective needs to be defined, e.g. repair a burst water main within 24 hours. The description needs to be specific to avoid misunderstanding by third parties. If, on checking, the description is not fully understood it needs to be redefined.

Map the process

Flow charts are the working tools for describing processes and are of particular benefit to benchmarking. The same is true for process maps but with the added dimension of linking together benchmarked processes that show interrelationships and distances between what happens and where, in an organization. Process mapping readily lends itself to computer application.

Step 3: Identify potential partners

Process definition will highlight a number of areas where there are opportunities for improvement. In some cases solutions may be readily available within the existing organization, but to improve, it is sometimes necessary and often desirable to look for improvement outside. If it is necessary to go outside, a useful vehicle for identifying potential partners is to conduct a brainstorming exercise with the purpose to identify ‘better performing’ organizations. There is a need to make sure there is a mix of local and non-local organizations, other water and general utility providers as well as private sector companies whose service performance can be compared.

Organizations often consider themselves to be ‘unique’ in terms of their sphere of activity with the inherent limitation this imposes in generating new ideas. It is important to include creative and sometimes lateral thinking in the process of improvement; otherwise the full potential for improvement will be compromised.

Step 4: Data sources and collection

The objective of this step is to identify and plan where to find data on potential partners.

Within the water sector this can easily be realised through experience and knowledge gained during the MUDP and the networking available through ARA. However, in the broader sense there may be other criteria that need to be considered such as:

- Location – there may be a need to restrict comparative activity to a localised geographical area to reduce travel time and costs.
- Size – there may be benefit in selecting organizations of a comparable size to that of your own.
- Perceived organizational structure – if a radical change is sort, organizations with a culture similar to your own will need to be considered.
- Ease of access – approachability and responsiveness is a major consideration in selecting a partner.

Information on potential partners is available from a wide variety of sources, available both internally and externally. Typical data sources are given below:

Typical sources of data:

Internal	External
Internal library	National libraries
Corporate publications	Internet
Internal databases	External databases
Customer surveys	National surveys and statistics
Market research	Trade shows, journals
Personal networks	Suppliers, customers
Employees knowledge	Financial institutions
	Trade associations
	NGO's
	Media
	Universities and business schools
	Professional Institutions
	Seminars and conferences
	Utility associations
	ARA Web-based benchmarking

4.3.4 Analysis stage

Step 5: Analyse data and select partners

It is now necessary to analyse the collected data with the intention of drawing up a short list of potential partners. Having done this the team need to develop a short questionnaire to be used as a conversational aid with the potential partners. A number of points need to keep in mind:

1. The questionnaire needs to be concise and focused to inform and guide future discussion.
2. It needs to determine whether the target will be a suitable and responsive partner.
3. On questions about which you are able to reciprocate on should be asked.
4. Provide sufficient information to enable the target organization to assess if they are in a position to assist.
5. If the initial questionnaire confirms the suitability for proceeding further it may be necessary to follow up with a site visit for which a more detailed questionnaire will be required.

Step 6: Determine the size of the gap

In order to determine the nature and size of the gap it is necessary to compare measurements on the area being considered for improvement, between your own and that of the selected partner.

For example, it could be that in your organization the average length of customer debt is 90 days, whereas in the partnering organization it is only 45 days. Through discussion and comparison it will become apparent that although the partnering organization performs better in the overall process, there may well be component parts in which you perform better. This is important for two reasons: (i) it encourages the partners to participate through enabling them to improve their performance still further and (ii) to achieve the benchmark standard. It is necessary to compare the respective process maps to do this and reach the optimum performance.

The use of histograms, cause and effect analysis and Pareto analysis are particularly useful techniques that can be applied at this step (see Section 4.4).

Step 7: Establish process differences

Having confirmed the validity and magnitude of the gap it is now necessary to establish the reasons and practices behind this. Again, comparison and dialogue on the respective process maps will highlight where positive improvements can be achieved to deliver cost reductions, reduced timescales and improved customer service.

Culture and tradition in organizations have a significant influence on why people perform better and therefore questions will need to be directed to these areas on occasions, rather than the process itself. If cultural change is required hard facts will have to be faced as quite often there is insufficient commitment in an organization to effect the degree of change required to introduce or support the best practice.

Time and cost can also impact on the need for change, particularly when they are greater than planned or budgeted. Such factors should prompt a review of the situation with a possible redrawing of the project objectives and/or timetable.

Step 8: Target future performance

By now you will have a detailed understanding of the size and nature of the gap and what needs to be implemented to achieve effective and efficient process improvement. This needs to take into account resource, cultural and time considerations to enable realistic targets to be set for the organization. In considering time requirements it is prudent to make an allowance of up to 50% to cater for interruptions or disruptions to schedules.

Good project planning and management are essential at this point. Schedules need to clearly define targets and milestones to ease the process of communication. The project action plan should include full resource details such as who is to do what, when, how much it will cost and how long it will take. Without this level of detail and accountability, many benchmarking projects will fail.

4.3.5 Action stage

Step 9: Communication

Clear and convincing communication is essential for benchmarking projects. The objective being for recommendations to be understood by everyone and acceptance gained from those involved or affected by any changes.

A debriefing session should be held at the end of the second stage that will identify who will be involved in ensuring implementation is carried forward.

A team leader or improvement manager will be required to oversee and monitor activities. This does not have to be the most obvious person, particularly when benchmarking is new to an organization. What is important is that the team leader can gain organizational acceptance to new techniques over the longer term and produce initial success for benchmarking projects. Hence, it may be wise to identify a team leader for implementing who is different from the person who led the planning and analysis stages.

The composition of the team will also alter to reflect the change in emphasis. Planners and information specialists will tend to be replaced by people working daily in the process.

Communication needs to have a two way flow between the team and the organization. This will afford opportunities for comments and contributions from the broad spectrum and assist in acceptability in concept changes with those not directly involved with the project but affected by its consequences.

Step 10: Adjust targets and develop the improvement implementation plan

As feedback is received as a result of communication it will be necessary to review original targets for their suitability and accuracy. Adjustments to these should be made and incorporated in the final improvement project implementation plan. This should show the desired process state related to time together with the essential steps for achievement.

Milestones and objectives need to be stated in the plan that then needs to be rolled out to the organization. To maximise the benefit of improvement, the team leader will need to link personal objectives of team members to those of the process being improved. In turn the personal and process objectives need to be linked to those of the organization and to achieve this, the senior managers must be in tune with and supportive of the concepts.

Step 11: Implementation

As the name implies, implementation is the delivery of the improvement process and the step when the benefits are realised. Implementation may not always be easy as there is generally a human resistance to change and this needs to be managed carefully, but with authority. There are no magic secrets to successful implementation but attention to detail and follow through of actions in a timely way, are prime requirements. The team leader is responsible for monitoring progress against milestones and deliverables through regular review sessions with the implementation team. Regular communication of progress and success in achieving targets will ensure interest and commitment from the rest of the organization.

The team leader plays a vital role at this stage in liaising between project champion (the employee who is assigned responsibility to work with the benchmarking team and promote the benchmarking activities across departments) and process owner (head of department in which an activity is being benchmarked). It is the team leader’s role to keep the company management team informed of success and savings achieved through benchmarking to ensure commitment and support is maintained. With this achieved further improvement projects can be generated and funded.

Step 12: Review and recycle

Once the implementation plan has been followed through the entire team, including the project champion, should review progress against objectives. By this stage the process should have reached the level of performance that was targeted. The questions that should be addressed are:

- Is the process now the best it can be?
- If so, what actions are needed to maintain the situation?
- Who is responsible for these actions?

- It the process is not the best it can be, what are the contributing factors?
- Will this require a benchmarking team to evaluate?
- What has been learnt from the project?
- How should this be communicated to others, both internally and externally?
- With hindsight, where could change bring further improvement?

It is not unusual for organizations, once they have gained experience in implementing benchmarking, to develop their own methodology to suit their own requirements and culture. However, the overall philosophy and principles will remain the same, the objective being for benchmarking to lead to an overall improvement in the organizations performance and competitiveness.

4.3.6 Benefits

Benefits resulting from benchmarking not only impact on the performance of an organization but also on its customers' perception as well as its perspective in the market place. Table 4-1 summarises the benefits that can be realised through benchmarking and indicates how and when the benefits are delivered.

Table 4.1: Benefits to an organization realized through benchmarking

Benefit	How	When
Improved performance and profitability	Improving efficiency and effectiveness of processes, reduced costs associated with waste and duplication errors	Initially when processes are analysed; then continuously through the benchmarking life
Clarity of leadership	Discussion on what improvement would bring largest benefit	On starting the project
Clarity of management and enhanced communication	Focus on key processes directs management to where it is needed	In first three months
Saving or better utilisation of resources	Analysing processes and finding out exactly what is going on	In first three months
Increased efficiency of operations	Remove error, waste and duplication in processes	In first three months
Greater value creation or reduction of non-value adding activities	Questioning which activities in the process add value and eliminating those that do not	In first three months
Challenge current thinking	Learning from others mistakes saves time and speeds up the learning process. Gaining appreciation of new aspects in the organization	When networks are accessed or potential partners contacted – ongoing
External focus and tapping into other sectors	Through data search and collection/networking for information	Starts within first three months, becoming evident within 12
Reduces need for fire-fighting and improves quality of working life	Processes become more efficient and effective	Gradually from month 1 onwards
Beneficial impact on customers and suppliers	By taking their perspective and views into account as processes are improved	Gradually from the first month onwards
Opens doors to other organizations	The technique provides a purpose and common language	As external benchmarking progresses

4.4 Tools, techniques and procedures

There are a number of tools and techniques that are used in 'Total Quality Management' that are particularly applicable for use in benchmarking.

A number of these and their application and worked examples are included in Appendix B1 to this document. These are:

- Brainstorming
- Affinity diagrams
- Histogram
- Cause and effect analysis
- Flowcharting
- Pareto analysis

Use of these tools and techniques will provide an analytical and structured approach to problem identification and solution and ensure that priorities are tackled in a correct, rather than subjective, way.

In addition to the procedures described above relating to each stage of benchmarking, it is also important for ROCs to consider and adopt procedures when working with another ROC or with a group of ROCs (or other types of organisation). Procedures should be agreed between the participants, adopted and adhered to throughout a benchmarking exercise. In Appendix B2, a copy of a European Benchmarking Code of Conduct on such procedures is provided.

4.5 Benchmarking strategy developed under FOPIP I Technical Assistance

Use of performance indicators

It is important for Romanian water industry executives to demonstrate the operational service and efficiency improvements of their individual companies. The most appropriate method of demonstrating such improvements is the use of "Performance Indicators".

Performance Indicators are used to provide senior executives with an overview of the overall performance and development of the utility, essential performance related data and information being made available that focuses primarily upon:

- the prime business activities of the utility;
- the use of essential resources;
- the achievement of defined performance targets and improvement objectives

Water utilities efficiency, improvement and development is usually driven, at least initially, by the identification of solutions to specific operational problems which arise from the direct demands for services by customers and from actual failures and inadequacies of the operational infrastructure designed to provide those services. The design and usage of the performance measures necessary and employed in benchmarking provide the means by which a utility can examine and recognise potential areas of concern in a proactive manner when managing their operations.

The use of Performance Indicators is now an established part of the normal business activities of all modern water utilities, since they:

- provide essential information on key business parameters, e.g. cash flow and service development parameters

- form an essential part of the corporate management, control and monitoring activities of any water utility, providing essential performance data and information for use by all Executives and Senior Managers
- provide a simple but effective method of monitoring the overall performance of key departments and work sectors within an organization.
- can be used to demonstrate the continued improvements that have been achieved in developing the overall effectiveness of the Water Utility.
- form an integral part of the external reporting systems that are required to keep all stakeholders aware of the progress that is being made by the utility in achieving defined development objectives, financial and operational efficiency targets and agreed performance improvements
- provide the information that is to be used for evaluating the benefits achieved as a result of externally provided funds (e.g. Cohesion Funds, funds from EBRD and other IFIs).

An objective under the FOPIP I project was to introduce a complete benchmarking system for use within the FOPIP beneficiary companies. A simple Web-based benchmarking system has been developed that is designed to:

- Provide a range of measures suitable for both external and internal usage.
- Initially the number of measures will be limited.
- Initially the usage will be restricted to metric benchmarking.
- Be achievable and practical to measure
- Simple in both understanding and implementation.
- Contribute in a meaningful way to the overall performance development process of the utility concerned, rather than simply developing and using an unrepresentative set of measures.
- Develop the performance data collection and dissemination procedures.
- Develop the mechanisms to collect the required data, etc.
- Develop and agree timetables relating to data input and output reporting.

4.6 Proposed benchmarks

FOPIP I proposed operational, managerial, financial and "continuity" or "asset management" benchmarks. From a management perspective theses should not be considered in isolation as these benchmarks reflect important areas of water and wastewater services for improvement. These benchmarking guidelines have been prepared with simplicity in mind to enable the ROCs to gain confidence in the benchmarking process. More benchmarks can be added in time when more reliable data is available, particularly in the area of customer service.

Operational benchmarks

The operational benchmarks are meant to provide information on production and efficiency in both material and financial terms.

Difference between the water supplied to the distribution network less the quantity of water sold divided by the quantity of water supplied to the distribution system, expressed as a percentage. By using the parameter ‘water supplied into the distribution network’ it will enable like for like comparisons to be made for benchmarking purposes. Process water used for water production will vary depending on the treatment process and therefore will distort values if included in the NRW calculation.

Managerial benchmarks

The managerial benchmarks give an indication of scale of activity, effectiveness and efficiency of the organization.

Financial benchmarks

The financial benchmarks are based on diagnostic indicators derived from financial statements and represent the most basic indicators of financial health. They are based on standard ratio analysis of the financial statements obtained at each company. They demonstrate three categories of financial conditions, namely, *profitability, liquidity* and *solvency. These indicators are separate from any financial indicators that might be used in project analyses, investment decisions, or operating cost analyses.* The benchmarks have been chosen since they give a general idea of the company's financial health and indicate its ability to undertake and finance a project. Also, if the benchmarks are presented over several years, trends become apparent (for example, the days of receivables may have increased, indicating a worsening ability for the company to collect revenues and generate cash).

It should be noted that the selected benchmarks are appropriate for the current conditions faced by the companies in Romania. Few of the municipal companies, for example, currently have long term debt. This is due to both historical reasons (they previously were part of the local government and operated as budget organizations) and financial reasons (local private banks are reluctant to lend to the municipal sector). Therefore, some typical solvency indicators, while important, are currently not pertinent. Likewise, indicators such as the returns on equity are interesting only in the economic sense, since the shareholders of the companies are mainly public bodies and the shares are not listed on a public exchange.

Continuity and Asset Management Benchmarks

The continuity or asset management benchmarks were developed as an indication about the physical improvement or decline of the company's assets.

It is important that priority is allocated to asset management to ensure that investment is best directed and benchmarking can be used for this purpose. This can be done through reporting on the level of networks replacement and monitoring the level of maintenance activity, particularly with regard to water and waste water networks. To facilitate this is it is usual to establish discrete demand areas of between 3000 and 5000 connections, known as District Meter Areas (DMA's) and record data such as flows, pressures and levels of maintenance activity within the areas. Condition assessment and customer contact information can also be built up that can drive investment in an objective, rather than subjective manner.

Under the FOPIP II project, the proposed benchmarks were reviewed and discussed with the Ministry of Environment and ARA. The benchmarks that were approved as a result of this process are shown in the following table.

Table 4.2: FOPIP II Proposed Indicators and Definitions for Benchmarking

Ref. #	Indicator	Units of measurement	Definition	Formula
1	Coverage ratio - water	%	Population residing within the service areas that receives piped water supply services (excludes population supplied via public taps) (P1) expressed as a proportion of the total population residing within ROC agglomeration (P2).	= P1 / P2 x 100
2	Coverage ratio - wastewater	%	Proportion of population residing within the service areas that receives piped wastewater collection services (P3) expressed as a proportion of the total population residing within ROC agglomeration (P2).	= P3 / P2 x 100
3	Water production per capita served	l/cap/day	Volume of water delivered into the distribution network in a year (Qty), less volume of exported water (Qexp) / population with piped water supply services and divided by 365. Note: includes volume of purchased treated water, if any, but excludes technical water[1]	= (Qty – Qexp) / P1 / 365
4	Specific energy use	kWh/m³	Total electrical energy consumption per year (kWh) (ΣE) divided by volume of water billed per year (Qby). Note: special account needs to be taken if technical water is supplied.	= ΣE p/ Qby
5	NRW[2]	%	(Water delivered into network per year (Qpy) + Water imported per year (Qimpy) – Water exported per year (Qexpy) - water sold per year (Qby)) divided by (Water delivered into network per year (Qpy) + Water imported per year (Qimpy) – Water exported per year). Note: excludes water used during water production processes.	= (Qpy + Qimpy – Qexpy – Qby) / (Qpy + Qimpy – Qexpy) x 100
6	NRW/km/of water distribution pipelines per day	m³/km/day	(Water delivered into network per year (Qpy) + Water imported per year (Qimpy) – Water exported per year (Qexpy) – water sold per year (Qby)) divided by length of the water distribution network ((Lw[3]) at the start of the year) and divided by 365.	= (Qpy + Qimpy – Qexpy – Qby) / Lw / 365
7	Water network pipe breaks frequency	#/km/year	Total number of water distribution pipe breaks per year (#B) divided by the length of the water network ((Lw) at the start of the year)	= #B / Lw
8	Sewer and drain blockages frequency	#/km/year	Total number of sewerage and drainage pipe blockages per year (#sB) divided by the length of the sewer and drainage networks ((Ls[4]) at the start of the year)	= #sB / Ls
9	Proportion of water network pipes replaced annually	%/year	Length of new replacement and rehabilitated water pipelines per year (Lwr) divided by total network length ((Lw) at the start of the year)	= Lwr/ Lw x 100
10	Proportion of sewers and drains replaced annually	%/year	Length of new replacement and rehabilitated sewers and drains per year (Lsr) divided by total sewer and drain length (at the start of the year)	= Lsr/ Ls x 100

[1] Technical water = non potable water supplied by operator to industry, agriculture, etc.

[2] NRW = Non-revenue water

[3] Length of water distribution network (Lw) is defined as: sum of the lengths of transmission mains, distribution mains, service pipelines and connections up to property boundary of customers.

[4] Length of sewer and drainage network (Ls) is defined as: sum of the lengths of sewerage and surface drainage pipelines operated by the ROC and connections up to property boundary of customers.

Ref. #	Indicator	Units of measurement	Definition	Formula
11	Proportion of population connected to WWTP providing at least primary treatment	%	Population residing within the service areas connected to WWTP with screening, primary settlement and removal and safe disposal of sludge (P4) expressed as a proportion of the total population residing within ROC agglomeration (P2)	= P4 / P2 x 100
12	Proportion of population connected to WWTP providing at least secondary treatment	%	Population residing within the service areas sewer connected to WWTP with screening, primary settlement, biological treatment and removal and safe disposal of sludge (P5) expressed as a proportion of the total population residing within ROC agglomeration (P2)	= P5 / P2 x 100
13	Proportion of population connected to WWTP providing tertiary treatment	%	Population residing within the service areas sewer connected to WWTP with screening, primary settlement, biological treatment, tertiary treatment and removal and safe disposal of sludge (P6) expressed as a proportion of the total population residing within ROC agglomeration (P2)	= P6 / P2 x 100
14	Proportion of customers billed based on water meter readings	%	Number of customer contracts billed based on metered volume (Cm) divided by total number of customer contracts (Cc). Note: number of billed customers includes all categories of customers (apart from those, if any, supplied with technical water)	= Cm / Cc x 100
15	Volume of water billed based on water meter readings as proportion of total volume of water billed	%	Volume of water billed that is billed based on metered volume per year (Qbmy) divided by total volume of water billed per year ((Qby) billed volumes include all categories of customers – apart from those, if any, supplied with technical water)	= Qbmy / Qby x 100
16	Population served per utility staff	#population/#staff	Population connected to the water supply network divided by the number of employees (all personnel on utility payroll)	= #population / #staff
17	Water and wastewater staff costs as proportion of operating costs	%	Annual total payroll cost (Cs) divided by total annual water and wastewater operating cost (Cop)	= Cs / Cop x100
18	Energy cost as proportion of total operating cost	%	Annual total electricity cost (Ce) divided by total annual water and wastewater operating cost (Cop)	= Ce / Cop x 100
19	Specific water and wastewater operating cost	RON/m³ billed	Total annual water and wastewater operating cost divided by total annual volume of water sold	
20	Drinking water quality compliance	%	Number of samples of water from the distribution network analysed per year in conformity with standards for all parameters tested (#Sc) divided by the total number of such samples tested (#St)	= #Sc / #St x 100
21	Wastewater quality compliance	%	Number of samples of wastewater discharged to recipient water bodies analysed per year in conformity with standards for all parameters tested (#Scw) divided by the total number of such samples tested (#Stw)	= #Scw / #Stw x 100
22	Complaints about water supply and wastewater services	# complaints/year /’000 customer contracts	Number of complaints received per year (Com) divided by (number of customer contracts (Cc) / 1000)	= Com / (Cc / 1000)

Ref. #	Indicator	Units of measurement	Definition	Formula
23	Collection rate	%	Amount of revenue collected per month ((Rc) RON) divided by amount billed ((Rb) RON)	= Rc / Rb x 100
24	Working ratio	%	Total annual operating cost ((Cop) RON) divided by total annual billings ((B) RON)	= Cop / B x100
25	Current ratio	%	Value of current assets ((Ca) RON) divided by value of current liabilities ((Cl) RON)	= Ca / Cl x 100
26	Profit margin	%	Annual operating profit (before depreciation and concession fee) ((Op) RON) divided by annual revenue ((V) RON)	= Op / V x100
27	Average period to recover debts	Revenue days	Value of receivables ((R) RON) divided by value of annual revenue ((V) RON) / 365	= R / V / 365
28	Average period to pay suppliers	Operating cost days	Value of payables ((P) RON) divided by total annual operating cost ((Cop) RON) / 365	= P / Cop / 365
29	Debt ratio	Total liabilities / total assets	Total liabilities ((Tl) RON) divided by total assets ((Ta) RON)	= Tl / Ta

4.6.1 The proposed web-based benchmarking system

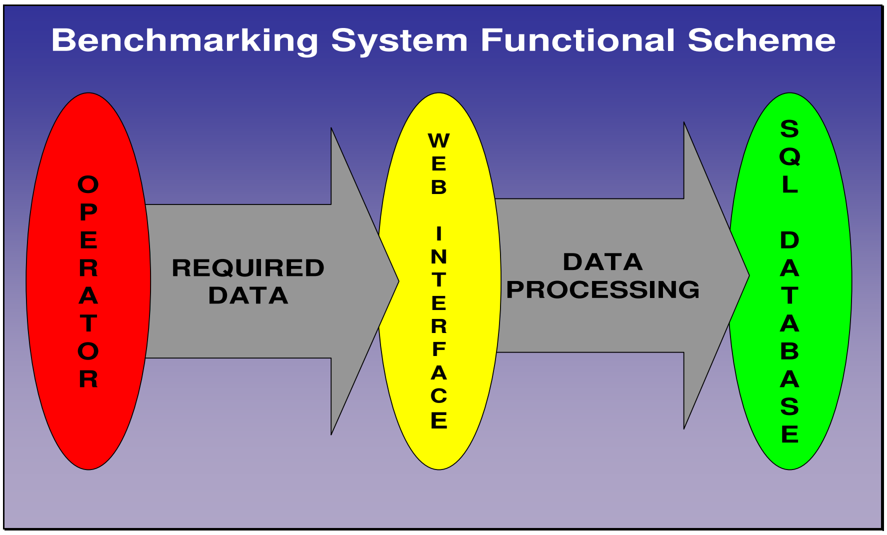
The benchmarking system is proposed to be a web-based information system. By such a system, participating water companies can submit their data to the 'central database', retrieve and review their performance indicators on-line. Also, this central database will enable analyses at a national level.

A web-based benchmarking system enables operators, sector agencies and beneficiaries to monitor and compare performance.

System functionality

The diagram below demonstrates the overall functionality of the proposed web-based system.

Figure 4.3: Benchmarking system functional scheme

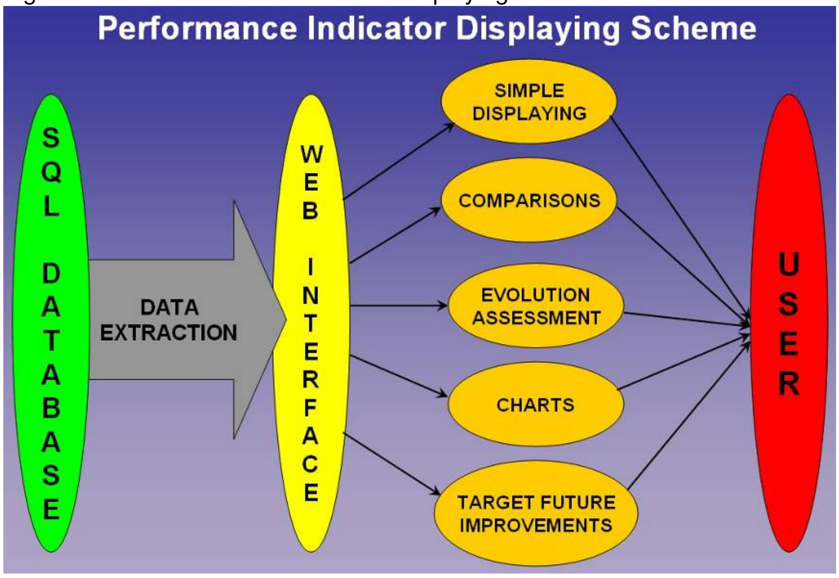


The proposed system will require the participating water utilities to submit in an agreed format and frequency (Quarterly?) prearranged financial and operational data. Whilst the actual form that the data will take is still the subject of discussion but initial thoughts visualize something in the following form:

The diagram below demonstrates the overall architecture of the proposed web-based system

The proposed architecture makes use of a single SQL Data Store that, via a web interface, provides detailed, summarised and graphical reporting of the agreed benchmarks.

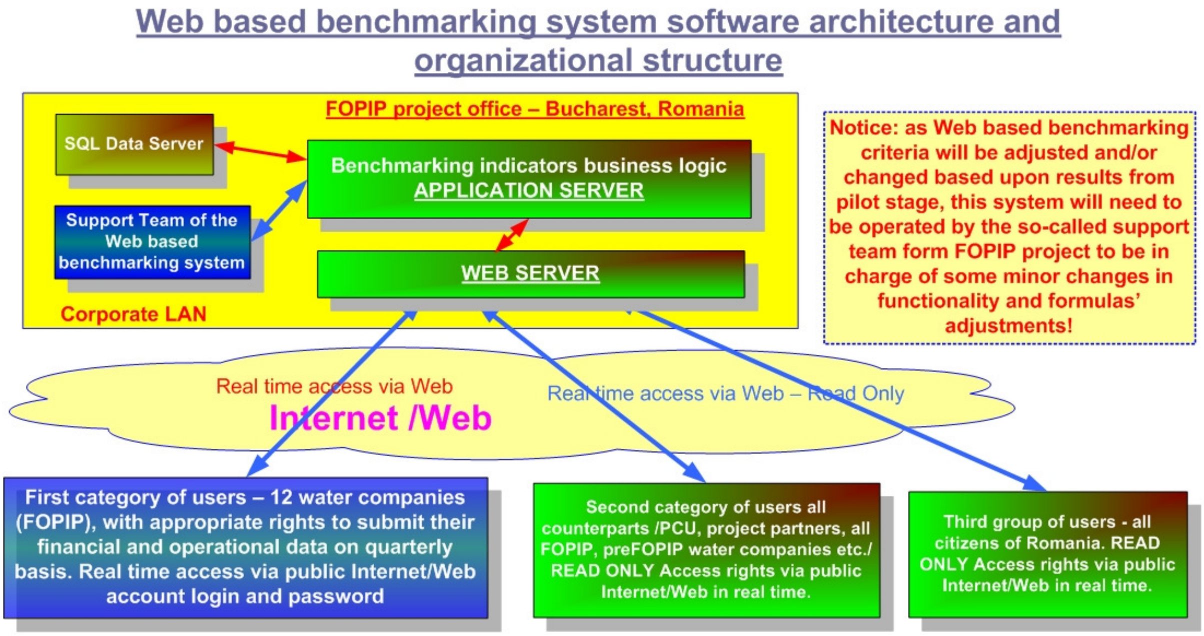
Figure 4.4: Performance Indicators displaying scheme



The overall system

The overall structure together with its availability to users is represented in Figure 4.5.

Figure 4.5: Web based benchmarking system software architecture



4.6.2 Conclusions

The benchmarking process has been designed to operate as a management tool for the ROCs, and to facilitate performance comparison for the ROCs, ARA, ANRSC and the ME. Data requested from the companies is intended to help establish the values of baseline indicators from the different companies to build a true and convincing picture of the sector's technical, operational and economic state of affairs and the degree to which it can serve the population. Thus it can be used to help drive and direct Government policies.

The Web-based benchmarking database was designed to evolve over time. The first set of operational benchmarks was intended to establish a baseline of current practices at the different companies. Later, other financial and technical benchmarks can be added.

It has to be recognized that the proposed “Performance Indicators” should be considered to be part of the normal business operations of the water companies and be used to:

- Measure performance improvements
- Assess and define future performance improvement targets.
- Measure the achievement of any deliverables that are to be included and defined in any Water Service Agreements or Concession Contracts.
- Facilitate the development of asset management planning which will play an important role in the future development of water utilities within Romania. This will involve the design and implementation of systems and practices intended to address shortcomings, inefficiencies, waste and unavoidable failures in managing the utilities assets and resources.
- Aid progress towards corporate and service objectives and performance targets. This process will draw on core data relating to the defined indicators these will have to be developed as local performance indicators for local corporate benefit.
- Define and determine the need for all corporate development objectives that are necessary to achieve the Company Vision, including the implementation of a full range of managerial, operational, financial, technical and customer related policies and practices;

At the time of writing this part of the Manual, the selection of performance indicators for benchmarking was under further review by ARA and the Web-based benchmarking system was under further development. In future it is anticipated that the FOPIP II ROCs could be permitted to participate in the national Web-based benchmarking system.

The National Benchmarking system for the regional water and wastewater companies should be evaluated periodically.

5. Guidelines for project preparation (EU/IFI/GOR)

5.1 Guidelines for project preparation (EU/IFI/GOR)

5.1.1 General

In order to assure an efficient project preparation and implementation process, the experience accumulated into the sector needs to be disseminated and a set of best practices needs to be prepared. In this respect, the Ministry of Environment and Sustainable Development (MESD) prepared 3 guidelines:

- Guidance on preparation of master plans;
- Guidance for feasibility studies;
- Guidance for cost-benefit analysis.

These three guidance documents are very important in providing the local stakeholders with lessons learned from the first wave of investment projects prepared for the Cohesion Funds.

In preparation documentation for investment projects, the requirements of Governmental Decision 28/2008 have to be considered. This document sets the standards for elaboration and approval of technical and economic documentation for investment projects.

In the following chapters, the content of the three guidelines is presented. The entire content of the documents is presented in Appendix B.

5.1.2 Guidance on preparation of Master Plans

A document was prepared by the Ministry of Environment and Sustainable Development under the Technical Assistance for Strengthening the Programming Capacity of the Ministry of Environment and Sustainable Development (EuropeAid/119086/D/SV/RO).

A Master Plan (MP) for water and wastewater projects is a strategic long-term planning tool to help meet future demand (usually 20 or more years) for water and wastewater.

A Master Plan typically includes:

1. A general description of the county/region subject to the Mater Plan;
2. Current institutional set-up;
3. The land use and projected land use for the planning period;
4. Existing environmental conditions;
5. The planning design criteria;
6. Description and inventory of existing water and wastewater systems;
7. Population projections, service area projections, present and planned land use, water demand projections, and future water quality demand;
8. Water supply quantity and quality projections and new source identification;
9. Improvements needed to meet future water demand; hydraulic modeling approaches to estimate long-term needs with documentation of each option;
10. Justification of selection of particular system improvement (based on needs, cost effectiveness, constructability, reliability, operation, maintenance, etc);
11. Recommended system improvements;

12. Projects prioritization according to agreed criteria;
13. Implementation schedule for the necessary projects;
14. Maps showing improvement components and service areas;
15. Documentation and description of costs of system improvements.

The MP should be re-evaluated and updated periodically (at least every five years) to keep up with e.g. changing system needs (population, socio-economics), external requirements and technologies.

This guide for preparing MP for water and wastewater project proposals that are candidates for financing/co-financing from the EU Cohesion Fund includes two sections:
- A comprehensive Index (Table of Contents) of the MP, and
- Scope and information to be included in each chapter of the MP.

The detailed guide on master plan preparation is presented in Appendix B3.

5.1.3 Guidance for Feasibility Study

A document was prepared by the Ministry of Environment and Sustainable Development under the Technical Assistance for Strengthening the Programming Capacity of the Ministry of Environment and Sustainable Development (EuropeAid/119086/D/SV/RO).

The document present a detailed table of contents for the technical feasibility study mentioning also the main areas that have to be covered in each chapter.

The document also presents the main volumes that need to be prepared as part of the documentation for the Cohesion Funds Application process. These volumes are:
- Volume I: Feasibility Study Report;
- Volume II: Annexes Feasibility Study;
- Volume III: Drawings;
- Volume IV: Financial and Economic Assessment – Cost Benefit Analysis (CBA);
- Volume V: Institutional Analysis;
- Volume VI: Environmental Impact Assessment (EIA);

The detailed guidance for feasibility study preparation is presented in Appendix B4.

5.1.4 Guidance for Cost Benefit Analysis

The document refers to Sectoral Guidelines for Water and Wastewater projects, and has been prepared in the general context of the water management projects included in the Action Plans between JASPERS and the beneficiary Member States. The intention was to close the gaps between the existing guidance and the specifics of the projects in the sector, with focus on the information and outputs required in the major project applications.

To that extent, while consistent with the general Cost Benefit Analyses (CBA) framework mentioned above, the document is based on the experience of project appraisal for the first round of water/wastewater projects applications assessed during 2007, and the early part of 2008. It reflects the intense discussion with MESD and its consultants on the practical details of CBA analysis, as well as the detailed guidance and clarifications received from DG Regio's geographical desk and evaluation unit.

CBA is an analytical tool which is used to estimate the socio-economic impact (in term of benefits and costs) related to the implementation of certain policy actions and/or projects. The impact must be assessed against predetermined objectives and the analysis is usually made from the point of view of the society as whole, intended as the sum of all individuals concerned. Typically, CBA analysis works with national boundaries so that the word "society" usually refers to the sum of the individuals in a nation state.

The objective of CBA is to identify and monetise (i.e. attach a monetary value to) all possible impacts of the action or project under scrutiny, in order to determine the related costs and benefits. In principle, all impacts should be assessed: financial, economic, social, environmental, etc. Traditionally, costs and benefits are evaluated by considering the difference between a scenario with the project and an alternative scenario without the project (the so called "incremental approach").

Then the results are aggregated to identify net benefits and to draw conclusions on whether the project is desirable and worth implementing. To that extent, the CBA could be used as a decision-making tool for assessing investment to be financed by public resources.

When submitting an application for funding under the CF and ERDF funds, information on the results of CBA is required only for Major Projects, which are defined as operations accomplishing a precise and indivisible task whose total costs is in excess of:
- EUR 25 million for environmental projects
- EUR 50 million for all other fields.

To that extent a full CBA (comprising both a Financial and an Economic Analysis along with a risk assessment) is compulsory only for Major Projects.

However, for smaller projects which are not subject to a preventive appraisal and approval by the European Commission, the relevant Managing Authority could decide to include a requirement for results of CBA to be assessed as part of the selection criteria. In those cases, the methodology described by these Guidelines, or a simplified version of it, will apply.

Details of the methodology to be followed for smaller projects will be discussed with each Management Authority and will be reflected in relevant calls for proposal and applicant's guides.

The proposed sequence for the CBA in the framework of project preparation, which is consistent with the recommendations of the European Commission, is the following[5]:
- Strategic approach and definition of objectives
- Identification and selection of the most suitable alternative (deriving from the master plan and the feasibility study)
- Financial Analysis
- Economic Analysis

[5] The concept of CBA here has been expanded from the traditional economic analysis to the wider concept used in the relevant EU regulations and related guidance documents.

- Risk and Sensitivity analysis
- Reporting conclusions

Most, if not all of the inputs for the definition of project objectives, the identification of alternatives and even the selection of the most suitable alternative will come from other parts of the project feasibility studies, and more specifically from the analysis of the project's technical, environmental and institutional feasibility. For these sections, what is expected in the CBA is a summary and a presentation of those findings in a rational and consistent way.

The detailed guidance for cost-benefit analysis is presented in Appendix B5.

6. Strategic development

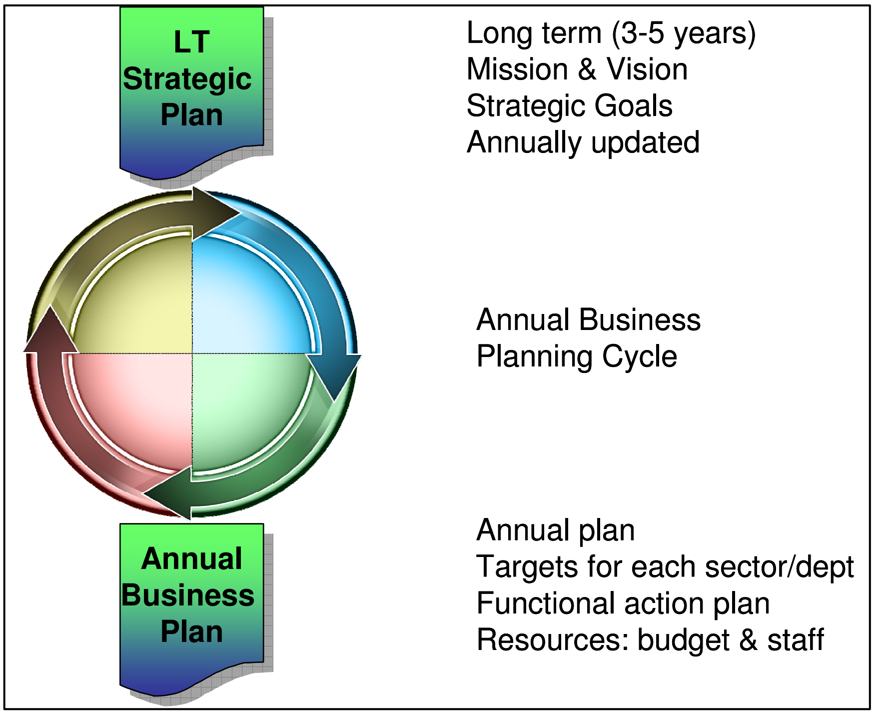
6.1 Strategic planning

Strategic planning in general is defined as follows:

- a continuous and systematic process, where people make decisions, about intended future outcomes, how outcomes are to be accomplished, and how result is measured and evaluated.

In Figure 6-1 the typical approach to strategic planning is represented: a long term strategic planning activity which is updated every year, combined with an annual business planning cycle resulting in a business plan with functional actions and resource planning. The annual cycle is also often called the Planning & Control cycle.

Figure 6.1: Typical approach to strategic planning



Through the strategic planning process the water utility can:

- Work together to create a common vision and mission for the utility;
- Develop goals and objectives to achieve this vision
- Identify strategies to close the gap between the goals and current performance in key areas of improvement;
- Develop action plans for translating strategies into concrete steps for improving operations.

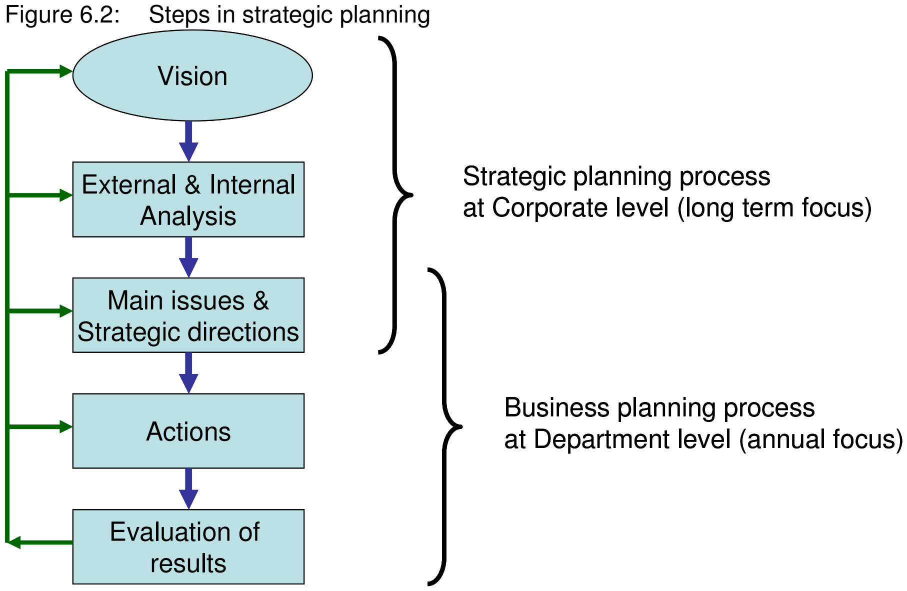
The elements of a strategic plan are listed in the table below.

Table 6.1: Elements of a strategic plan

Elements	Description
Vision	Statement of what the organization wants to be
Mission	The organizations purpose for existing
Values	The principles that motivate the organization and the way it operates
Goals	Long range desired status of performance areas
Strategic plan	A road map for accomplishing the vision
Strategic objectives	End states (results) that must be reached to accomplish each goal
Action Plans	Concrete steps (actions, often projects) to realize desired results
Monitoring and evaluation	Monitoring the performance through agreed criteria and measurement methods

The main steps in a strategic planning process are shown in Figure 6-2.

Figure 6.2: Steps in strategic planning

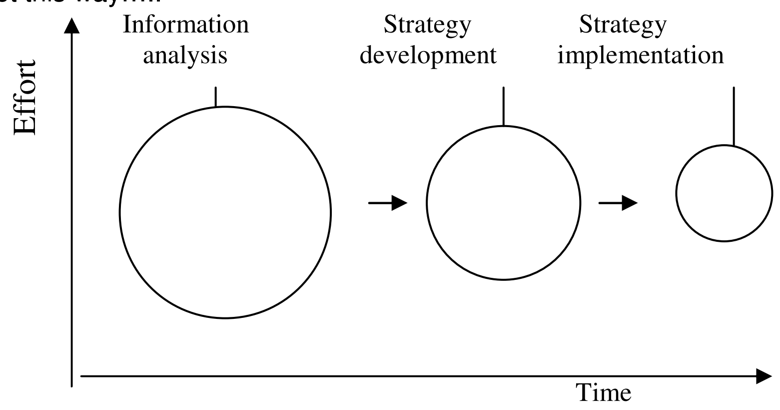


Too often, the resources allocation for a strategy process is not appropriate. So much effort goes into information analysis (external/internal analysis) that strategy development and implementation receive less overall effort. This inevitably results in less effective strategies and incomplete implementation.

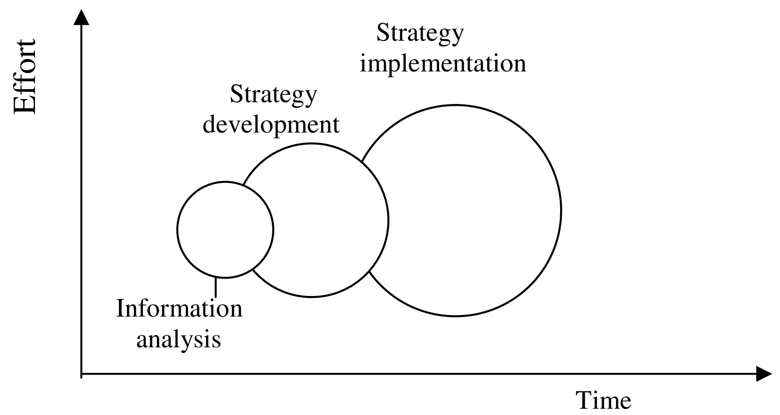
Increasing the level of effort devoted to strategy development and implementation, and merging the phases by emphasizing improvements that can be implemented without waiting for the completion of the entire process, offers a better chance of successful implementation. In Figure 6-3 this approach is represented.

Figure 6.3: : Recommended approach to strategic planning

Not this way…..



… but this is the recommended approach



6.2 Strategic planning elements

Strategic planning focuses on the long term and includes:

- Setting objectives, or defining what "success" should mean to the organization;
- Information analysis or reviewing the characteristics of the organization and the environment to link internal strengths and weaknesses to external opportunities and threats;
- Strategic choice or taking decisions on the direction of company and formulating strategic goals.

The strategic chances normally occur because:

1. The aspirations and requirements of the owners and/or managers have changed (or the individuals themselves have changed).
2. The environment has changed:
   a. Market opportunity has increased/decreased.
   b. Technology offers increased opportunities/threats.
   c. Economy has improved/declined or led to a modified distribution of wealth.
   d. The policy and/or legislative background has altered.

The present plan is failing to meet its perceived objectives because of competitive activity or poor performance.

Strategic analysis means measuring the organization's strengths and weaknesses and opportunities and threats presented by the environment. This can be done through a so called SWOT analysis.

SWOT

SWOT is an acronym for Strengths, Weaknesses, Opportunities and Threats.

The analysis is best carried out by the organization's own management in conjunction with external consultants. Management must be involved if it is to believe the output of the analysis and provide detailed knowledge of the organization.

Consultants provide the specialist analytical skills and an independent view to ensure management does not believe its own propaganda.

Strengths and weaknesses are internal characteristics of all organizations. The most common technique for identifying them is brainstorming by groups of 10 to 12 senior managers. Once the key factors have been subjectively identified, detailed objective analysis is required.

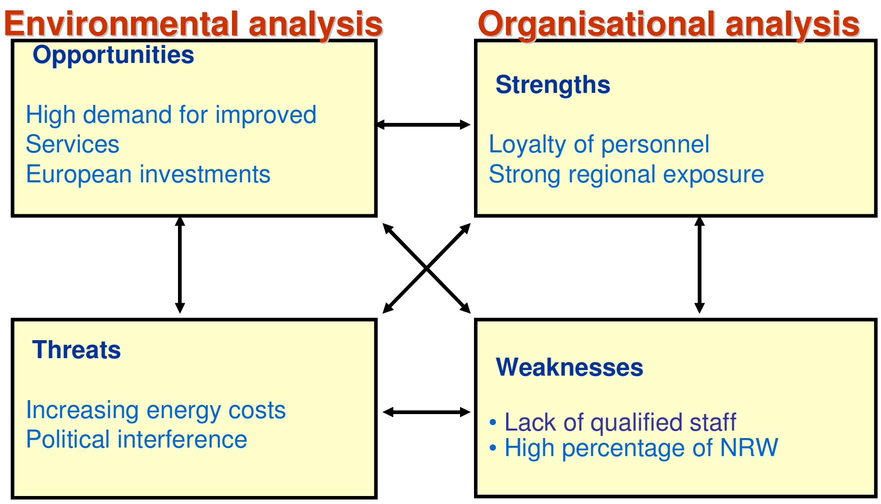
External circumstance is regarded as an opportunity or threat depending on the organization's ability to exploit it. A progressive company welcomes technological change; a conservative company, however, feels at risk from it.

The SWOT analysis must therefore be vigorously tested. Base potential analysis looks in detail at the internal parts of analysis using five main headings:
- **Existing resource:** what financial facilities are available; how adequate are the physical assets and labor force as a base for the future? How strong are existing products?
- **Experience:** how experienced is the organization at managing change; product development; operating in the markets?
- **Control:** how good are the information systems; does the organization adequately plan/budget; who makes the decisions?
- **Leadership:** how involved are the owners; what are their personal ambitions/objectives; what is the organization's preferred management style?
- **Ideas:** how active is the organization in research and development; how good are ideas encouraged/developed/promoted?

A different approach to carry out an internal analysis is that based on the five resources of an organization. These are:
- **Marketing resources**: what products and services does the organization provide? What are the tariffs and prices of these? What are the characteristics of the products/ services? What trend the sales have? How the customer relations are managed?
- **Operational resources**: how adequate are the physical assets and what is their current state? How the assets are operated and maintained? How physical processes are controlled and monitored?
- **Human resources**: Are the existing labor forces adequate as a base for the future? What the human resources efficiency is? Are the employees motivated and adequately rewarded? What relation exists between the staff and the senior management?

- **Informational resources**: how good the information systems are? Are data for decision-making reliable and timely available? Are the ERP, MIS and DSS adequately implemented? What hardware and software tools are available?
- **Financial resources**: are the necessary financial resources available for both operational and capital expenditures? What is the level of bad debts? Has the company a healthy cash flow? Is the business profitable and self-sustainable?

Figure 6.4: Model of SWOT analysis



From the SWOT analysis the following strategic directions can be derived:
- ***S-O strategy: Use the strengths to take advantage of the opportunities (Attack strategies)***
- ***S-T strategy: Use strengths to avoid threats (Counter attack strategies)***
- ***W-O strategies: take advantage of opportunities by overcoming weaknesses (Build capacity strategies)***
- ***W-T strategies: minimize weaknesses and avoid threats.(Defend strategies)***

More details about the SWOT methodology can be found in Appendix C1.

Preparation of a strategic plan alone will not make things happen. Chances of success are enhanced if:
- Management is committed to implementing the plan and their actions match their words.
- An appropriate organizational structure is established.
- The plan is communicated to all staff. Everybody doesn't need all details, but everyone needs to know the essence so that they can play their parts in its implementation.
- Management information reflects what is trying to be achieved.
- Progress is reviewed regularly.

6.3 Strategic planning in FOPIP water utilities

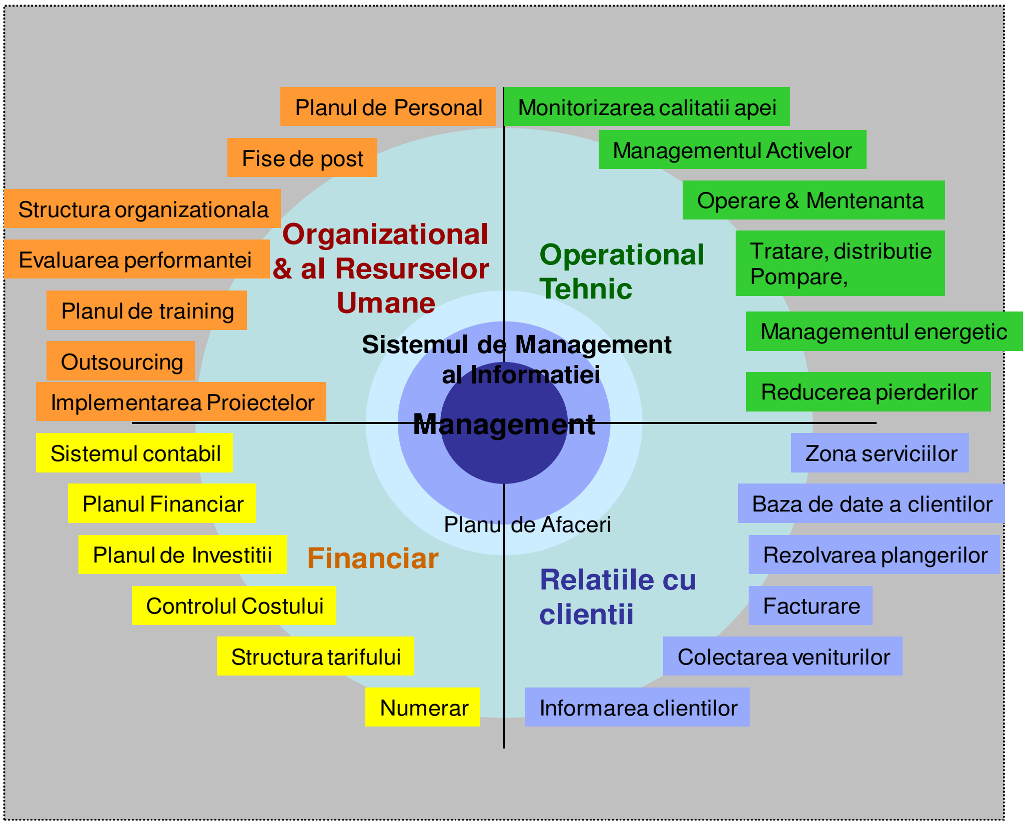
The water companies have four main business sectors:
- Operational and Technical Management
- Customer Relations
- Financial Management

- Organization and Human Resources.

These four sectors are integrated in overall management.

The four business sectors and a number of important aspects are depictured in Figure 6-5.

Figure 6.5: Business sectors and aspects



Each sector has internal issues, inter-sector issues (within the ROC) and issues with the external environment.

The internal, inter-sector and external issues were analyzed with the help of a general format. This format aims at defining the strategic actions.

Table 6.2: Format for strategic actions

	Internal (within certain sector)	Inter-sector (ROC)	External (external parties, environment)
Objectives			
Issues			

	Internal (within certain sector)	Inter-sector (ROC)	External (external parties, environment)
Actions			
Means/resources			

Below the strategic statements from some FOPIP companies are summarized.

Apavil S.A. Ramnicu Valcea

Regarding the organizational and human resources management the company identified as an internal objective defining the human resources strategy. The operator stated as a problem the lack of qualified personnel which could be solved by recruiting the necessary qualified staff and providing training programs to the employees through the means of an additional allocation of financial resources and a proper endowment.

In the technical/operational field, the objective is to make some investments for improving the quality, rehabilitation or replacements of the old systems for water supply and sewerage. This measure requires accessing external financing and a proper endowment.

Regarding the financial management the main objective is implementing an integrated accounting system which will allow complete access to the information for all the interested people.

In the customer relations field the company is interested in setting up a customer relations desk and improving the debt recovery system. Additionally, a properly working integrated customer database is required.

Apa Canal 2000 S.A. Pitesti

The operator in Pitesti is extending his area of operation at present but it cannot become a regional operator because the Intercommunity Development Association is not yet functional. The company has stated as objectives extending the operation area at regional level, continuing the investment program by accessing Cohesion Funds, complying with the European Framework Directives regarding the quality of water and wastewater. The solution proposed by the operator is ensuring compliances with the necessary conditions for accessing the Cohesion Fund.

The company is fully aware about the importance of the actions it has to adopt: finishing the Cohesion Fund application before 31.12.2008, transforming the company into a regional operator, signing the Delegation Contract for the water and wastewater services with IDA, developing the implementation capacity for international financing projects. Apa Canal 2000 Pitesti plans on setting up a specialized department for conceiving the application, a unit for contracting and monitoring the contract implementation, identifying and obtaining the necessary funds, cash flow forecasts and monitoring for the implementation period.

Apa Canal S.A. Galati

The main objectives of Apa Canal SA Galati are the implementation of an integrated informational system, improving the cash flow, asset management plan, setting up profit centres, implementation of a performance assessment system, customer relations improvement. The solutions identified by the company outline the projection, financing, acquisition and implementation of the information system, cashing the historical debts, setting up a specialized unit for realizing, monitoring and operating the asset management plan, more efficient production activities, conceiving a performance appraisal system, mass information means.

The following actions are considered necessary to be performed by the company: projecting by specialized personnel, acquisition of necessary equipment, system implementation and preparation, recruiting the necessary personnel, hiring debt collection companies, qualified personnel, improved solutions for the activities, developing informational campaigns and providing feed-back, transparency in the recruitment process. In order to take these actions the company needs financial, human, non-financial resources and technical equipment.

Apa Prod S.A. Deva

The company has set its objectives for the 4 types of management (human resources, financial, technical/operational, customer relations) as follows: creating a flexible organization structure, reducing losses from 59% to 45%, covering operational costs and establishing performance indicators for a most favorable functioning of the operator, increasing debt recovery percentage to 95%. The solutions for the first objective are: providing training for the employees, new methods for evaluation of personnel and providing training programs.

Regarding the technical management the company's solutions are realizing a Maintenance Plan and a network monitoring Plan by the technical team, as well as improving the work procedures. The actions to be taken are making up a fixed assets data base and a Maintenance Plan. For the financial management the solution is cost control; for the customer relations management awareness campaigns, one-stop shop and a call centre are determined as strategic actions.

Apa Canal Sibiu

The company Apa Canal Sibiu identified for the next years, objectives like: training HR specialists, finalizing the SAP implementation at financial – accounting department, increase the efficiency in customer relations, finalizing the assets management module, making the personnel loyal, covering the costs and obtaining a minimum 25% profit, water loss reduction, identifying potential sources of personnel, establishing an unique tariff, ensure the quality and safety of the water sources. The company plans to achieve these objectives by: trainings, improving the salary system, recruitment of qualified personnel, transformation of the dispatch into a call centre, increase the tariff, identify the losses, integrations of the new comers in the informatics system. The most important resources are financial and human resources.

Secom Drobeta Turnu Severin

The main objectives identified by the company were:

- establishing an efficient human resources management, including introduction of performance appraisal system and personnel planning;
- implementing an integrated information system;
- rehabilitation of water and sewerage networks, assets management and water loss reduction;
- improving communication between department;
- increase the profitability of the operations;
- regionalization;
- improving customer relations
- increase the level of investments.

The actions Secom has chosen in order to achieve these objectives are: acquisition of necessary endowment, implementing a system for recruitment of personnel, identify the level of training, hiring a consultant for technical assistance, periodically analyses, transparency of procedures, costs analyses, accessing EU funds. For all these, the company needs both human and financial resources.

SC Compania de Apa Targoviste Dambovita SA

The ROC indentified the following strategic objectives to implement the company's Mission::

- Sustainable development and increased flexibility through extending the operating area and diversify the services portfolio
- Optimizing operational costs in order to assure the high performance and the required level of services at minimal costs
- Prioritize the EU funded investments as to create a reliable water and wastewater infrastructure
- Identify an adequate HR strategy
- Continuous monitoring and maintenance of the water and wastewater systems
- Water supply at EU quality standards
- To gain an adequate profit margin to sustain the continuous development of the business, the reimbursement of the loans and to motivate people.

SC Aquavas SA, Vaslui

The ROC indentified the following strategic objectives

- Customer focus
- Non-discriminatory access to the water and wastewater services
- To assure the continuity of the delivered services
- Continuous increase of the quality of services
- To increase the professional skills of the employees
- Optimizing the institutional structure to increase the efficiency
- To hold on the investment process to bring the water systems to an European level
- Maintain the systems at a high operational level
- Reducing NRW at an economic level
- Pollution control and reduction
- Implementing an Integrated Management System (quality, environment and OHS)
- Implementing an integrated MIS
- Extending the coverage rate
- Implementing an adequate tariff policy

- Implementing a cost reduction and control policy
- Improving the cash collection rate
- To gain an adequate profit margin to sustain the continuous development of the business

SC Gospodarie Comunala SA, Covasna

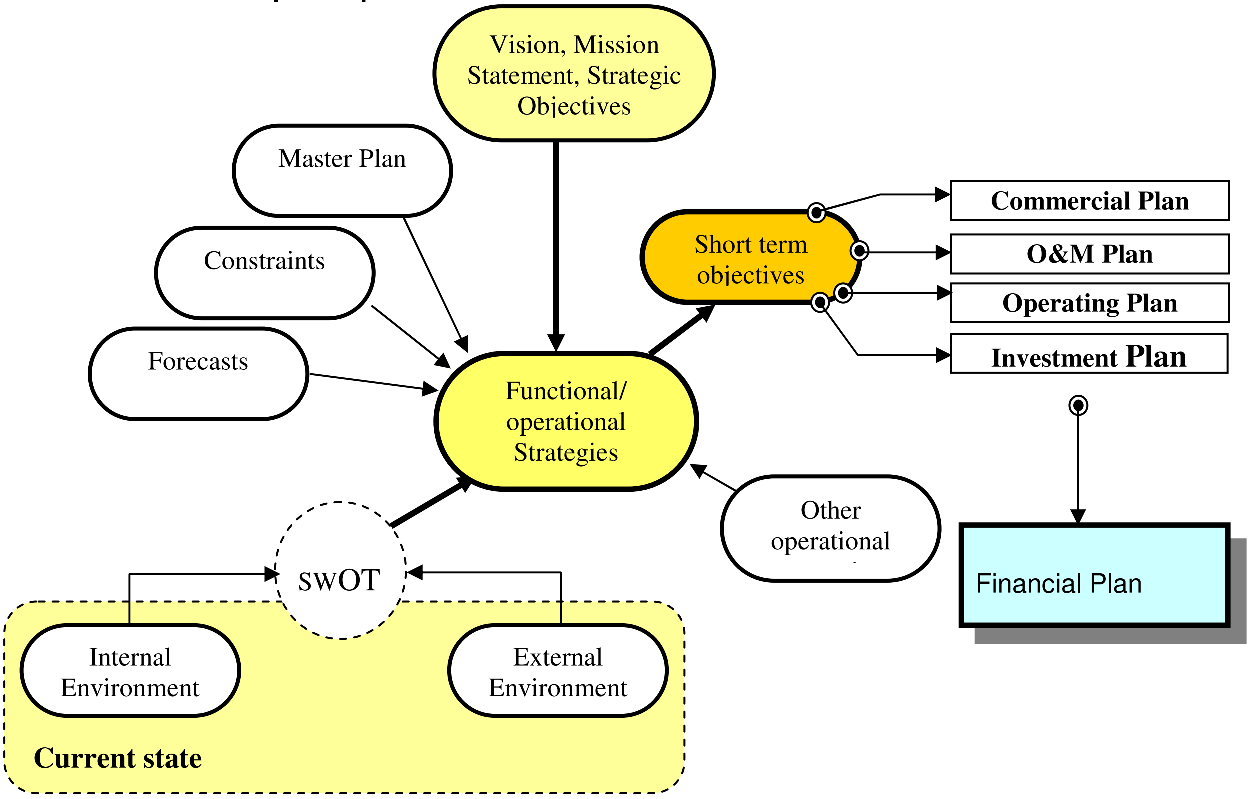
The main objectives identified by the company were:
- Maintain a customer needs assessment system and monitoring the level of customer satisfaction
- To assure and to maintain the institutional flexibility and responsiveness
- To pay an increased attention to gain an improved customer trust
- Increase the level of incomes through extensive and intensive market development and through an adequate pricing policy
- Implementing a cost management system to assure a high level of operating performances at a low level of resourcing
- Implementing a cash management system in order to have a necessary level of liquidity in the business
- Continuous improvement of HR by implementing a motivating system based on individual performances.

S.C. APA SERV Valea Jiului S.A. Petroşani
- Continuous water supply to all clients at national and European quality standards and at affordable tariffs.
- Waste water collection and treatment complying with national and European quality standards.
- Extending water and waste water networks in the Valea Jiului to catch new clients.
- Gain an optimal range of profit to allow continuous development of the business.
- To apply efficient management methods to reduce operating costs.
- Customer focus, increased transparency.
- Development of HR, training and periodical employees' performance assessment.

6.4 Business planning

Developing the Business Plan is a complex process assuming to go through some, well identified, planning steps. These planning stages follow the "red line" conducting from the current position to a future one desired by the managers/ owners of the business. The process is illustrated by the drawing below, catching the development of the Plan until obtaining its final results.

Business Plan development process

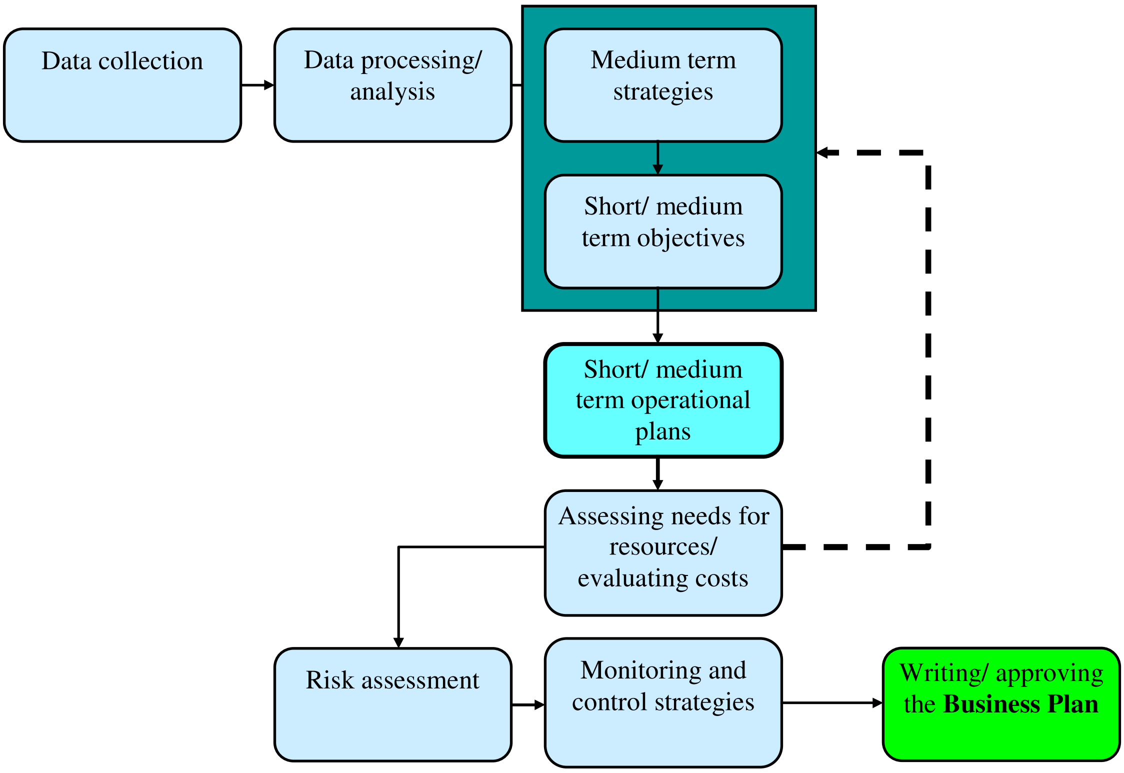


The main steps of the process are:

- defining the business; the reason the organization exist for. The Vision and the Mission statement agreed by the managers of the organization best express this.
- stating the long term targets the business wish to achieve in the future. These are described in the Strategic Objectives of the company
- analyzing the current state of the business. This include both the internal environment (strengths, weaknesses) and the external ones (opportunities, threats)
- making forecasts regarding the future evolution of the main environmental issues. These mainly describe the evolution of the market and the customers and the foreseeable level of sales.
- evaluating the constraints affecting the limits of possible strategic options. The restraints are due to a set of external factors such as: legal framework, loan agreements, delegation contract, etc.
- defining the short/ medium term objectives and functional/ operational strategies. This step also includes evaluating different scenarios and selecting the optimal ones.
- developing the short/ medium term plans to achieve the proposed objectives.
- evaluating the resources needed and produce the Financial Plan.
- identifying the risks jeopardizing the accomplishment of the Plan.
- approving the Plan

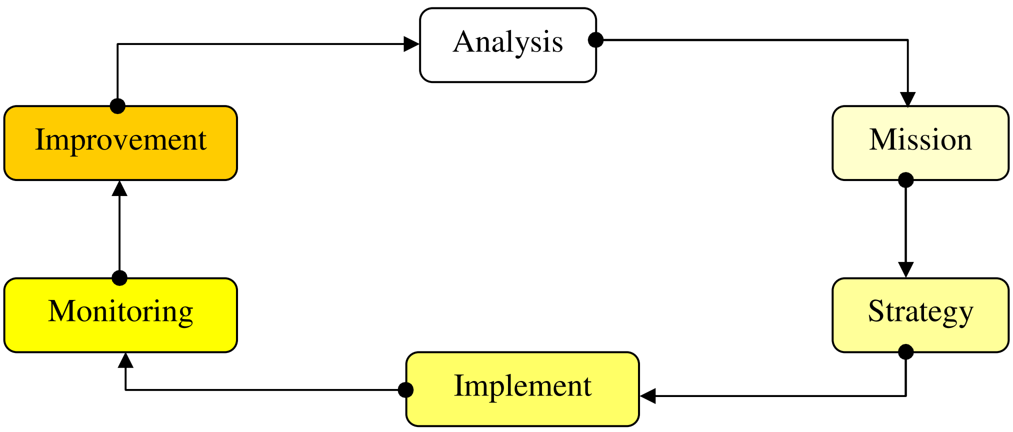
The flow of activities identified above is synthesized in the next flow-diagram:

In the annual business planning cycle the long term strategic goals are transformed into concrete targets



and action plans on how to achieve those targets. The preparation of a business plan is not a "one of event" it is an integral part of the effective management of a utility. It is an important part of the annual planning cycle. It is complementary to annual budgets and capital investment programming.

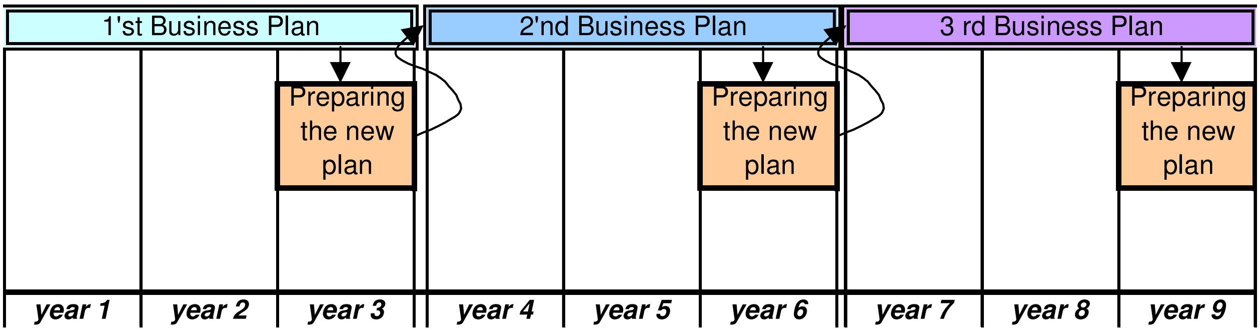
Managers are facing two overlapped planning cycles: a short term one including all the steps of the process and a longer one extended over a number of years. The first cycle includes the stages of developing the plan, to implement it and to improve it as a result of monitoring. This cycle is presented on the flow-chart below:



The short term Business Planning Cycle

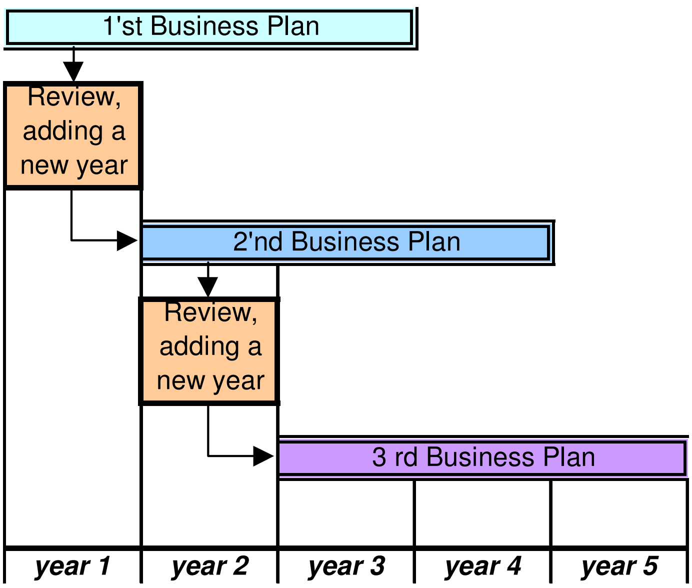
The long term planning cycle assures the business plan to be extended in time. It has two practical approaches:

- sequential planning. In this case a new business plan is worked out in the last year of the existing one and for a new period of 3 – 5 –10 years. This type of planning, for a three years framework, is shown in the drawing below:



Sequential Business Planning Cycle

- continuous planning. In this case the planning cycle is based on annual review of the existing Business Plan and extending it with a new period of one year. Allowing a better fitting to a changing environment, this planning approach is more flexible than the sequential one but it requires more planning effort. It is illustrated in the chart below:



Continuous Business Planning Cycle

Along the time, there were proposed different structures for the business plan in different national programs: MUDP 2, SAMTID, FOPIP 1, etc. A reviewed, detailed content of the Plan is presented in the Table 6-1, having the experience and lessons learned from these programs.

The sources of information are considered:

- Master Plan and Investment Plan (prepared for Cohesion Fund Application)
- Outcomes from a management workshop.

Table 6.3: Content of the business plan

	Business Plan Content
1	Executive summary
2	Introduction. General overview of the business Company overview Water branch in Romania
3	Strategic issues Vision Mission statement Strategic objectives
4	Present situation Internal environment Management system Marketing/ commercial activities O&M HR management IT systems Financial analysis External environment Macro environment, PEST analysis Micro environment SWOT analysis Constraints
5	Short/ medium term directions Operational/ functional strategies Short/ medium term objectives Short term plans Commercial (sales&marketing) plan O&M plan Investment plan Action plans:
6	Financial Plan
7	Risks
8	Annexes

6.4.1 Executive Summary

Whilst the Executive Summary appears as the first section of the plan it is, in fact, usually prepared last. The reason for this is that, as the name implies, the executive summary is a resume of the salient features of the plan. Obviously such a resume can only be completed when the plan itself is complete.

As previously stated the executive summary is a resume. By intent it should not be substantial since it is designed to draw an individual's attention to the fundamental features of the plan. A properly constructed executive summary will enable the reader / user to quickly relate to the plans main objectives and consequences. Therefore, in compiling the executive summary account needs to be taken of:

- the key objectives
- the key dates in achieving those objectives
- the financial implications of the plan
- how the plan is to be funded.

6.4.2 Strategic issues

This section of the plan identifies the strategic objectives of the utility. It is usual to start by defining the ROC's Vision and the Mission statement. These are simple and concise statements designed to convey the overall direction that the utility wishes to take. They are designed to be easily readable and understandable by all stakeholders ranging from employees to customers.

Some examples of a **Vision** applicable to the water utility are as follows:

> "*Our vision is entirely customer focused:* "*If customers had a choice, they would choose Thames Water.*"
>
> *By adopting this vision, we are putting customers at the heart of everything we do. It is a stretching and ambitious vision but it will keep us focused on delivering for customers 24 hours a day, every day of the year.*" (Thames Water, UK)

> *"We define ourselves as a drinking water and sewerage operator for an extended operation area and our objective is to achieve operational and financial performances which should recommend us as a competitive company on the EU water and sewerage services market."* (Aquaserv SA, RO)

Related to Vision, the **Mission** is a longer statement. It defines the fundamental purpose of an organization or an enterprise, basically describing why it exists. The following elements can be included in a mission statement:

- Purpose and values of the organization
- (products or services, market) or who are the organization's primary "clients" (stakeholders)
- What are the responsibilities of the organization towards these "clients"
- What are the main objectives supporting the company in accomplishing its mission

Some examples of a Mission statement applicable to a water utility are as follows:

"Our mission:

- *To provide the best in class water and sewerage service, which is profitable and sustainable and acts in the long-term interests of both our customers and the wider community. We will achieve this by:*
- *Working closely with our customers and stakeholders to understand better their needs and expectations.*
- *Planning and delivering services that anticipate those needs and expectations at a reasonable cost.*
- *Building credibility and trust with all stakeholders by saying what we will do and doing what we say.*
- *Developing the most capable, dedicated and technically advanced team in the management, maintenance and operation of a water and sewerage business.*

- *Embracing innovation and investing in the tools, resources and technology necessary to get the job done efficiently and safely.*
- *Educating and informing the public about the value of water.*
- *Improving financial performance by maximizing cash collection, a continued drive for operational efficiencies and completing capital projects on time and within budget."* (Thames Water, UK)

"Mission
- *Our priority is to meet the clients' demands and the success of our company depends on our services quality improvement and extension*
- *We are concerned with ensuring a high degree of professionalism to our employees for whom we are responsible, without any discrimination*
- *We aim at excellence and build the future of our company with regard to prosperity, continuity and development through a competitive management*
- *By integrating with the external environment, we are responsible for the conservation and protection of the environment for the benefit of the community" (Aquaserv SA, RO)*

In theory the determination of the strategic objectives is done in the manner of a cascade. Starting at the highest level of the mission statement this is then further analyzed to determine the strategic or corporate objectives. Again these objectives are high level statements of intent that are then further broken down into the goals of the organization. Goals are in effect elaborations of the corporate objectives they are designed to be more specific than the objectives in that they identify potential areas of improvement. Examples of strategic objectives and goals applicable to water utilities are demonstrated in the table below.

Table 6.4: Examples of strategic objectives and goals applicable to water utilities

Strategic / corporate objectives	strategic / corporate goals
Provide reliable water supplies in compliance with statutory standards	24 hour supply to all connected customers and compliance with WHO standards
Use the Utility's assets efficiently so that they deliver the best possible service.	To improve the reliability of water supply services at the least overall cost.
Provide timely information to the right people and communicate with customers	To provide an effective and efficient mechanism for dealing with both internal and external information requirements.
Provide for domestic and industrial demands for service.	To respond to demand so as not to restrict industrial or domestic development.
Develop long term comprehensive strategies and action them.	To achieve consistent integrated management of the Utility.
Achieve sustainable financial self sufficiency	To ensure the continuing operation of the Utility to satisfy the genuine demands of customers for water supply services. To meet the criteria necessary to attract potential investors.
Prioritize the Utility's actions to address areas of greatest need.	To achieve maximum impact on poor customer service.
Maximize the potential of the people employed by the Utility.	To increase the overall efficiency of the Utility.
Charge and bill correctly for services received.	Define and develop appropriate tariffs and accurate bills for all sectors of the community.
To realign the Utility as a customer focused business	Consult customers to determine their needs and views on the Utility's plans

Once strategic objectives and goals are determined the question has to be asked, "how are they to be achieved?" The answer is that they are translated into strategies; examples of the potential areas requiring strategy development are detailed in the table below.

It is also at this stage that the objectives and goals are prioritized:

Table 6.5: Example of objectives and goal

Strategy	Purpose
Corporate Development	To create a modern, efficient and effective Utility.
Business Information Systems	To maximize the use of modern technology in the effective operation and management of the Utility.
Human Resource Management	To maximize the use of staff resources in the effective operation and management of the Utility.
Training	To ensure that all staff is trained in the job requirements in accordance with best practices.
Financial Improvement	To create a self sustaining Utility capable of attracting both national and international investment.
Operational Improvement	To provide an acceptable level of service, in accordance with statutory standards, at least cost. And to improve efficiency and make the best possible use of manpower and physical assets.
Customer / Employee Relations	To increase both customer and employee awareness of the Utility's aims and objectives and thereby build a positive image of the Company.

6.4.3 Internal & external analysis

Before any organization can move forward it first needs to know the point at which it is currently situated. This can only be done by carrying out a diagnostic analysis of all aspects of the organization; Appendix C contains details of how a Diagnostic Analysis should be carried out. By completing such an exercise the utility should be able to identify its strengths and weaknesses and to thereby identify where and what action is necessary to move forward.

As a synthesis, the diagnostic analysis has to deal with the following main issues:

Internal environment – inside the company. This analysis will detect the strong and weak points of the ROC's structures, mechanisms, peoples, assets, processes and financial status. It includes:

- the management of the company and its five main resources:
- commercial/ marketing
- O&M
- human resources
- informational resources and
- finance

A detailed list of aspects to be taken into account is shown in the table below:

Management system	planning/ scheduling decision systems formal hierarchy permanence of the management team abilities of the managers organization chart management systems (ISO9001, 18000, 14000) management techniques
Commercial/ marketing	mix of marketing products and services tariffs PR sales historical trends metering billing collecting cash customer relations
O&M	Water/ wastewater infrastructure O&M activities process monitoring Level of service (LOS) Non Revenue Water (NRW) Energy management Asset management Operational KPI's
Human resource management	Present status of the HRM performance management efficiency of HR employer/ employees relations
IT	Hardware Software MIS, DSS SCADA, GIS, network modeling
Finance	Historical incomes Historical costs Cash management Debts Balance sheet Profit and loss account Financial KPI's

External environment – outside the company. In this case, the analysis will focus on the environment the company is working in and will emphasis the impact of the environment on the business the company is running. The main issues included in this analysis are:

- macro environment: political, economical, social and technical aspects (STEP) and
- micro environment including the analysis of the market, the clients and the suppliers of the ROC

The results of the diagnostic analysis will be processed by the means of a SWOT analysis. This will put face to face the internal and the external current context and will help to define the short/ medium term operational strategies.

6.4.4 Operational and functional strategies

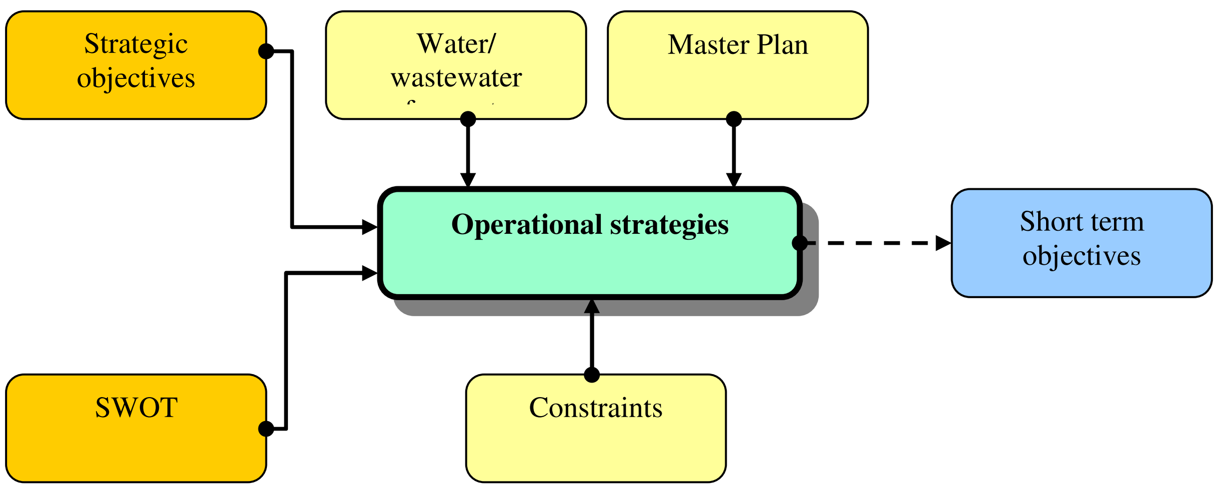
This section of the business plan is perhaps the most important since it is this section that breaks down the defined strategies and identifies what action is to be taken within the utility to achieve those strategies. The actual determination of strategies is covered in more detail in paragraph 3.2 where some of the specific strategic issues relating to water utilities are discussed.

In addition it is this section that converts the whole document from being merely a “wish list” into a meaningful and practical document. It does this by identifying the financial consequences of the actions proposed in the plan. It, therefore, identifies the cost of implementing the plan and thereby proves its affordability. It also identifies where the money is to come from, customers via tariffs, GoR and Municipal grants and contributions or borrowing. Perhaps most important to the customer it identifies the impact on the tariff over the life of the plan.

Development of these strategies is mainly based on the strategic objectives and the results of the SWOT analysis. That is the way from “Where we are” to “where we should be”. Other issues have to be taken into account are:

- Medium term (3 – 5 years) forecasts for drinking water demand and for flows and loads of domestic/ industrial wastewater
- Long term regional strategy and investment plan given by the water Master Plan of the targeted area
- External and internal constraints (legal, environmental, political, Delegation contract, etc.)

The process is illustrated in the drawing below:



Developing operational/ functional strategies

- *Taking the opportunity of the TA financed from EU funds, the ROC will develop its institutional and managerial capacity in order to stabilize its statute as a regional supplyer operating on an extended geographical area. (Management).*
- *The ROC will promote a commercial strategy targeting the territorial extension of its activity, capitalizing its oversized production capacities. (Commercial)*
- *The ROC will focus on planned and proactive maintenance methods in order to decrease accidental failures and the discomfort to its consumers. (Operational)*
- *The company will develope effective HR management systems enabling improvement of the employees' performance in order to increase the ROC's overall operational results. (HR management)*
- *To a better resource management, the ROC will develop and will implement adequate management accounting systems and will improve the bugetary control methodes. (Financial).*

Examples of short functional strategies:

6.4.5 Short term objectives

Based on the operational/ functional strategies, some very specific and clear objectives will be defined. These will help the managers of the ROC to know what exactly they have to do in the next few years to achieve the company's goals.

To achieve, monitor and control the short-term objectives, some specific requirements exist related to the wording of these objectives. These are best expressed by the SMART acronym, that is:

Specific – means clearly identifiable. If the objective is not formulated clearly enough, different interpretations of it will occur. Everybody will understand in a different way what really has to be done.

Measurable – how can we know if the target is achieved? If the objective has no a measurable result it is not possible to control it and to asses if it is realized.

Achievable – that is realistic. The objective has to be achievable in the given time-frame, with the given resources and in the existing context.

Relevant. As the final target is the ROC to be on the way of its strategic goals, the short-term objectives have to drive to these.

Time-bound – that is have a well-defined end-point in time.

Some examples of SMART-defined short-term objective are like that below:

> *"The operational department has to decrease the authorized, not billed water consumption with 1% until the end of the year 2009."*

> *"The ROC will decrease the specific standardized energy consumption used for pumping the water with 5% (related to base year 2008) until the end of year 2010."*

Taking into account the lessons learned in the past, it is recommended the number of defined short-term objectives to be a limited one. Too many objectives in a 3-year business plan will exhaust the available resources of the ROC and the goals fail to be achieved.

Examples of short term objectives:
- *Review and make improvements to the organizational structure of the ROC until the end of 2012 in order to adapt it to the requirements of regional water supply.*
- *Design and implement until the end of 2011 a competitive customer relationship management system as a tool to achieve the strategic objectives of the ROC.*
- *Develop and implement the Asset Management Plan until the end of 2012.*
- *Pull down the NRW to a level of 25% until the end of 2012.*
- *Develop and implement a performance based remuneration system until 30th June 2011.*

6.4.6 Action plans for main objectives achievement

This section of the report relates to the translation of specific strategies from what is to be done into how it is to be done. To be effective action plans have to conform to certain rules, namely:
- The tasks involved in achieving the given objective must be defined
- Each task (project) must have a responsible staff member and should have adequate resources to carry out the tasks (capacities, facilities, funding).
- Each task (project) should have a methodology (approach), phases and steps, and a completion date.
- The various tasks should be well coordinated.

> ***The business plan is a working document designed to translate the written word into action on the ground. It is this section of the plan that aids this process by clearly defining what is to be done, when and by whom.***

6.4.7 Specific Issues Relating to Water ROC's Business Plans

In developing a good Business Plan it is essential to identify the key elements of the business. In the Water Sector these are considered to be:
- Leakage control
- Operational management
- Investment planning
- Levels of service
- Customer service
- Public information
- Cost control
- Tariff management
- Environmental issues

In other parts of the manual the elements below are elaborated in more detail.

Leakage Control

Considerable scope exists in Romania to reduce leakage and ‘unaccounted for water’ through the introduction of active leakage control policies. Within the MUDP II towns the current level of leakage was assessed as varying between 27 and 43%. With the general absence of source metering and indifferent customer metering the figures have to be viewed subjectively. However, there is still considerable scope to reduce operational costs, improve water supply availability and improve revenue recovery through the introduction of active control policies.

Although the largest benefits are likely to be realized through focusing on the water distribution networks and customer usage, all potential losses of income from water loss should be defined, namely:

- Water treatment plant technological usage
- Major transportation mains losses
- Losses from service reservoirs
- Pumping station losses
- Water distribution losses
- Customer wastage

It is also necessary to establish data for comparative purposes, information such as, network lengths by material and age, number of interventions per year by type, source output and per capita consumption assessments are considered to be the minimum requirements.

An early evaluation of the above information will give a clear indication of where the Leakage Control Policy will be best targeted which needs to be defined in the Business Plan and targets set for the planning horizon of the Plan (3 years reviewed annually).

In defining the needs to implement the Policy it is necessary to specify the resource requirements in terms of manpower, equipment, materials and logistics. These then need to be costed to be offset against the savings identified.

An action plan then needs to be developed to clearly demonstrate responsibilities, time-scales, costs and anticipated delivered benefits.

With implementation, monitoring of performance needs to be undertaken at regular intervals.

Operational Management

To some extent operational management performance in Romania has been driven by the state of the assets being operated. With investment and the introduction of Western technology and techniques there is now scope to improve management in this area and in some cases move away from outdated norms.

One of the declared aims of a water utility will be to ensure a continuous supply of wholesome water to its customers and the collection and treatment of waste waters to meet designated discharge consents. These activities being achieved in the most cost effective way. This will require evaluation and monitoring of key activity areas such as:

- Water collection and treatment
- Water transmission and distribution
- Waste water collection and treatment
- Trade effluent control
- Repair and maintenance
- Operational strategies such as leakage control

- Manpower levels and utilization
- Service level requirements

It will be necessary to establish data for monitoring and comparative purposes; this could include, but not be limited to:

- Quantity and quality of water produced and distributed
- Quantity and standards to which waste water is treated
- Number of network repairs per annum
- Unit cost of an activity e.g. network repair, cost per m3 of water produced
- Number of employee's per activity
- Number of employee's per 1000m3 water supplied
- Number of employee's per km of water and waste water network.

Use of the above comparators, together with others that can be developed specifically to suit the individual needs of the Utility, will enable managers to focus on areas that are failing to perform or not performing as expected.

In defining Operational Management requirements it is necessary to specify the resource requirements in terms of manpower, equipment, materials and logistics. Costings can then be assigned to enable performance to be monitored against identified savings or additional costs.

An action plan needs to be developed to clearly demonstrate responsibilities, time-scales, costs and anticipated delivered benefits.

With implementation, monitoring of performance needs to be undertaken at regular intervals.

Investment Planning

The water industry is a long term industry with its prime product being delivered to its consumers via an infrastructure that is both costly to install and maintain. Whilst the water industry is not subject to the fads and fashions of other industries it is none the less subject to:

- Consumers' expectations. As the standard of living rises then so do people's expectations of what is an acceptable level of service.
- Technological changes. This includes both changes within the industry, e.g. computers, telemetry, new processes etc., and external, e.g. the introduction of water using appliances in both business and private homes.
- Growth in demand. Whilst both of the above items contribute to increases in demand there is also growth arising from increases in population and industrial / commercial development.
- Environmental concerns. Recent years has shown an increasing awareness by both the general public and politicians of the impact that certain industries can have on the environment. The water industry is one of those industries particularly in relation to the treatment and disposal of waste water.

Each of these issues can have a major impact on the water industry since failure to react to them can cause significant problems within the area that the utility operates. For example failure to respond to demand patterns could lead to major disruption in such areas as industrial / commercial development or even, in the extreme, impact on the health and well being of the local population.

However the water services infrastructure cannot be fundamentally changed overnight. In fact some major schemes, e.g. development of a major new water source, can be measured in terms of 10 years plus from the identification of potential need through to actual commissioning.

The actual identification of future requirements cannot, therefore, be left to chance. To be effective in this area the utility must be proactive in its approach to future needs rather than reactive as and when problems arise. To overcome this, the utility needs to have in place a system of investment planning. The function should be centralized within the utility and should be responsible for the creation, maintenance, update and reporting on the utility's capital investment programme.

The capital investment program is itself based on:
- needs arising from shortcomings or failures in the utilities operations.
- changes in operational / working practices.
- projected needs for the future

Each identified need will then be subjected to a feasibility study which will:
- confirm the need
- identify the best option for satisfying the need
- prioritize the need
- identify the likely cost

Once the feasibility has been completed and the course of action identified and approved then this can be entered, as a scheme, into the capital investment program. Since many of the schemes involved in the capital investment program are spread over a number of fiscal years the program itself will, like the business, plan be projected over from three to five years. Each year the effects of the capital investment must be reflected in the business plan. This will involve identifying the financial requirements of implementing the capital program and will broadly fall into two areas, namely:
- Funding requirements. Will the cost of the capital program be met from borrowing, consumer charges, GoR or municipal contributions?
- Revenue impact. What will the impact on expenditure be as a result of the capital program? The revenue effects of any scheme should have been identified, and used to determine viability, during the feasibility study.

Levels of Service

For any Water Utility it is essential that they can monitor their performance and measure the level of service they provide to their customers. Monitoring and reporting of pressures within the water distribution network is seen as the initial way that this can be achieved. By selecting a number of points throughout the distribution network (MUDP I and II specified a minimum of 15 points) the level of service in providing water supplies to customers can be easily demonstrated.

There are three stages to the exercise:
- Select pressure monitoring points, the criteria for selection should be the ability to manage the distribution network and to reflect clearly, pressure fluctuations. In the case of discontinuous supplies periods of no-supply should be clearly identifiable.
- Install pressure monitoring equipment.

- Record and report monitored pressures.

> ***The development of a level of service in this way is particularly useful. It clearly enables the Utility to better manage its distribution network and at the same time demonstrate improved availability of water supplies brought about through capital investment or other initiatives, such as the introduction of a leakage control strategy.***

Levels of service for monitoring and reporting can also be applied to other areas of activity such as:
- Water and waste water quality
- Water resource availability
- Supply interruptions
- Areas affected by flooding from the waste water network
- Performance in responding to customer complaints and billing queries

In defining levels of service it is necessary to specify for each, the resource requirement in terms of manpower, equipment, materials and logistics. These then need to be costed to be offset against identified savings, if any.

An action plan then needs to be developed to clearly demonstrate responsibilities, time-scales, costs and anticipated delivered benefits.

With implementation, monitored performance needs to be taken into account when updating the Business Plan.

Customer Service

Customer service provided by water utilities in Romania is generally reactive and there is a need to move away from this approach. This will be aided by the improvements brought about by investment programs and the introduction of new strategies. In doing so benefits will be realized and a clearer focus for the business provided.

There is a need for the customer service strategy to be objective and realistic. It is far better to under-promise and over-deliver than the other way around. To demonstrate a commitment to customer service a code of practice needs to be developed that covers such areas as:
- Quality and quantity of water supplies
- Waste water collection and treatment
- Responsibility for pipes
- Dealing with interruptions to water supplies including how customers will be advised in varying circumstances
- Dealing with customers enquiries and complaints, both by telephone and in writing
- Metering, Billing and payment services
- Utilities approach to environmental issues

In developing the code of practice and providing customer service to the prescribed level it is necessary to define organizational relationships and specify resource requirements in terms of manpower, equipment, materials and logistics. These then need to be costed to be offset against any savings identified. However it has to be recognized that there is usually a premium to be paid in providing enhanced levels of customer service.

An action plan then needs to be developed to clearly demonstrate responsibilities, time-scales, costs and anticipated delivered benefits.

An action plan then needs to be developed to clearly demonstrate responsibilities, time-scales, costs and anticipated delivered benefits.

With implementation, monitoring of performance against the defined code of practice needs to undertaken at regular intervals. Customer expectation also needs to be taken into account as this may change and could necessitate change in the code of practice.

Public Information

Relationships with the media and the provision of customer information about the Utilities activities are also important areas that need to be dealt with in a Business Plan. Clear statements on how this will be achieved and the approach for implementation need to be provided.

The areas that can be covered include:
- Establishment of links with the press, radio and TV at a local level and where necessary at a national level
- Regular briefing sessions with the media, to keep them advised on issues relating to the Utilities activities
- Proactive approach to media in dealing with emergency and operational problem situation
- Establishment of links with all interested parties in dealing with financial issues such as tariff increases and debt reduction policies
- Organization of interactive meetings with local administrations, residents associations, environmental bodies and the media on topical or politically sensitive issues
- Preparation of information of the activities of the Utility for general dissemination
- Development of educational information on the Utilities activities and introduction of awareness training for schoolchildren
- Establishment of public information and media relations department
- Establishment on selected sites of visitor centers and museums which can demonstrate the evolution of the water Utility
- Opening operational sites to the general public for open days

In defining the requirements for the provision of public information it is necessary to specify the resource requirement in terms of manpower, equipment, materials and logistics. These then need to be costed to be offset against identified savings, if any.

An action plan then needs to be developed to clearly demonstrate responsibilities, time-scales, costs and anticipated delivered benefits.

With implementation, monitored performance needs to be taken into account when updating the Business Plan. This can be obtained through feedback from the general public through periodic questionnaires.

Cost control

One of the fundamental aims of any water utility should be to provide consumers with the best possible service at least cost. Effective cost control is at the centre of achieving this aim. However, cost control must not be seen as a mechanism designed to prevent spending. In reality cost control in effect means making the best use of the financial resources available.

All too often cost control is seen as being the responsibility of the finance function. This approach fails to recognize that whilst finance is responsible for maintaining records of financial transactions by the time those transactions are recorded the commitment to spend has already occurred. Responsibility for true cost control, therefore, lies with those persons within the utility with the authority to requisition peoples, goods and services. All such persons should ask themselves the question, "what added value does this expense provide the utility?"

From a business planning point of view cost control is no different from any other aspect of running the utility. That is to say in addition to the day to day control on the ground can be added a strategic dimension to the control of costs. The most obvious of these is the formulation of budgets and budgetary control. A budget is a statement of intent for a specified area for a specified period expressed in financial terms. An important point about budgets is that they both contribute too and draw from the annual business planning process. They contribute to the plan in that they provide the basis of the financial data within the plan. They draw from the plan since proposals contained within the plan are translated into financial terms and included within the budget. The budget is in effect the detailed financial action plan for implementation of the business plan.

However, in addition the financial records should be capable of, in addition to monitoring, identifying potential areas suitable for cost control action. An analysis of costs will demonstrate those areas of operation absorbing the major elements of expense. Detailed investigation in these may result in the development of strategies / action plans aimed at cost reduction

Tariff Management

Utilities have to answer the following questions:
- How do we prepare a sales forecast?
- What information (estimates) do we need?
- From where and how do we get this information?
- On what assumptions are these estimates based?

The water and wastewater activity may be readily incorporated into a single-business activity. This approach leads to a simpler approach to forecasting. There are principally two variables which have to be estimated:
- the tariff
- the volume of consumption

For each of these components some the following information needs to be provided:
- for tariffs
  - estimated evolution of tariff levels;
  - policy regarding potential cross-subsidizing between population, industry and institutions;
- for volume of physical sales
  - estimation of the per capita consumption for the population. Links with the evolution of tariff and impact of metering;

– estimates for local industry and institutions development (or recession) and the impact over water consumption.

Factors influencing the physical sales
- macro economic conditions;
- demographic & social conditions;
- regulatory conditions;
- changing tastes;
- learning;

Controllable factors in sales forecasting:
- product costs;
- sourcing;
- promotion activities;
- customer service;

Uncontrollable factors in sales forecasting:
- state of the economy;
- inflation;
- purchasing power;
- interest rates;
- demographic development;

Environmental Policy

An Environmental Policy is an essential part of a Business Plan as it links together investment benefits, customer expectation, operational performance and the need to improve the environment. In view of the excessive problem areas that need to be addressed through an Environmental Policy a clear prioritization needs to be made to ensure a firm focus.

The areas that are most likely to be priority needs of an Environmental Policy are:
- Improvement in the quality of water supplied to customers, initially to meet Romanian standards and ultimately EU standards
- Providing a water supply 24 hours per day
- Reducing unnecessary water losses through technological processes, water networks and by customers
- Improving the quality of waste waters discharged into water courses to meet Romanian standards, this will involve improving the quality of trade effluent discharges into the waste water collection network
- Reducing energy consumption
- Elimination of working practices and materials in use that are considered hazardous to health
- It is necessary to establish data for comparative purposes such as water and waste water quality standards, energy usage by site a list of working practices and materials that need review.

An early evaluation of the above information will give a clear indication of priorities to be addressed which need to be defined in the Business Plan. Those that will be impacted upon by the Capital Investment Programme should be separately identified. Targets should be set for the planning horizon of the Business Plan (3 years, reviewed annually).

In defining the needs to implement the Policy it is necessary to specify the resource requirements in terms of manpower, equipment, materials and logistics. These then need to be costed to be offset against identified savings and environmental benefit.

An action plan then needs to be developed to clearly define responsibilities, time-scale, costs and anticipated delivered benefits.

6.4.8 Appendices

As previously stated the business plan is a working document, therefore, an important requirement is that it should be understandable and readable. This requirement can be lost if care is not exercised when drawing up the plan. The plan should not contain reams of data embedded in the main text. Facts and figures should be clearly presented in tabular form, however, in the case of large quantities of statistics these are best presented in summary form within the text and the detail included as an appendix.

The actual appendices will be dependent on each utilities own requirements and therefore may vary from utility to utility. However, a rule to be followed is that if the data is not central to the argument but rather supportive of it them that data is best located in an appendix.

6.5 Management Information System (MIS)

6.5.1 Definition, goals and structure of MIS

'MIS' is a planned system of collecting, processing, storing and disseminating data in the form of information needed to carry out the functions of management.

MIS has some differences with Enterprise Resource Planning (ERP) as ERP incorporates elements that are not necessarily focused on decision support.

For the purposes of this document we will use MIS and ERP as equivalent terms only specifically outlining subsystems part of ERP, which are not crucial for the management decision making process.

> ***A management information system (MIS) is a system or process that provides the information necessary to manage an organization effectively. MIS and the information it generates are generally considered essential components of prudent and reasonable business decisions.***

The importance of maintaining a consistent approach to the development, use, and review of MIS systems within the institution must be an ongoing concern of water companies' management. MIS should have a clearly defined framework of guidelines, policies or practices, standards, and procedures for the organization. These should be followed throughout the institution in the development, maintenance, and use of all MIS.

MIS is viewed and used at many levels by management. It should be supportive of the institution's longer term strategic goals and objectives. To the other extreme it is also those everyday financial accounting systems that are used to ensure basic control is maintained over financial recordkeeping activities.

Financial accounting systems and subsystems are just one type of institutional MIS. Financial accounting systems are an important functional element or part of the total MIS structure. However, they are more narrowly focused on the internal balancing of an institution's books to the general ledger and other financial accounting subsystems. For example, accrual adjustments, reconciling and correcting entries used to reconcile the financial systems to the general ledger are not always immediately entered into other MIS systems. Accordingly, although MIS and accounting reconcilement totals for related listings and activities should be similar, they may not necessarily balance.

An institution's MIS should be designed to achieve the following goals:

- ***Enhance communication among employees.***
- ***Deliver complex material throughout the institution.***
- ***Provide an objective system for recording and aggregating information.***
- ***Reduce expenses related to labour-intensive manual activities.***
- ***Support the organization's strategic goals and direction.***

Because MIS supplies decision makers with facts, it supports and enhances the overall decision making process. MIS also enhances job performance throughout an institution. At the most senior levels, it provides the data and information to help the board and management make strategic decisions. At other levels, MIS provides the means through which the institution's activities are monitored and information is distributed to management, employees, and customers.

Effective MIS should ensure the appropriate presentation formats and time frames required by operations and senior management are met. MIS can be maintained and developed by either manual or automated systems or a combination of both. It should always be sufficient to meet an institution's unique business goals and objectives. The effective deliveries of an institution's products and services are supported by the MIS. These systems should be accessible and useable at all appropriate levels of the organization.

MIS is a critical component of the institution's overall risk management strategy. MIS supports management's ability to perform such reviews. MIS should be used to recognize, monitor, measure, limit, and manage risks. Risk management involves four main elements:

- Policies or practices.
- Operational processes.
- Staff and management.
- Feedback devices.

Frequently, operational processes and feedback devices are intertwined and cannot easily be viewed separately. The most efficient and useable MIS should be both operational and informational. As such, management can use MIS to measure performance, manage resources, and help an institution comply with regulatory requirements. One example of this would be the managing and reporting of loans to insiders. MIS can also be used by management to provide feedback on the effectiveness of risk controls. Controls are developed to support the proper management of risk through the institution's policies or practices, operational processes, and the assignment of duties and responsibilities to staff and managers.

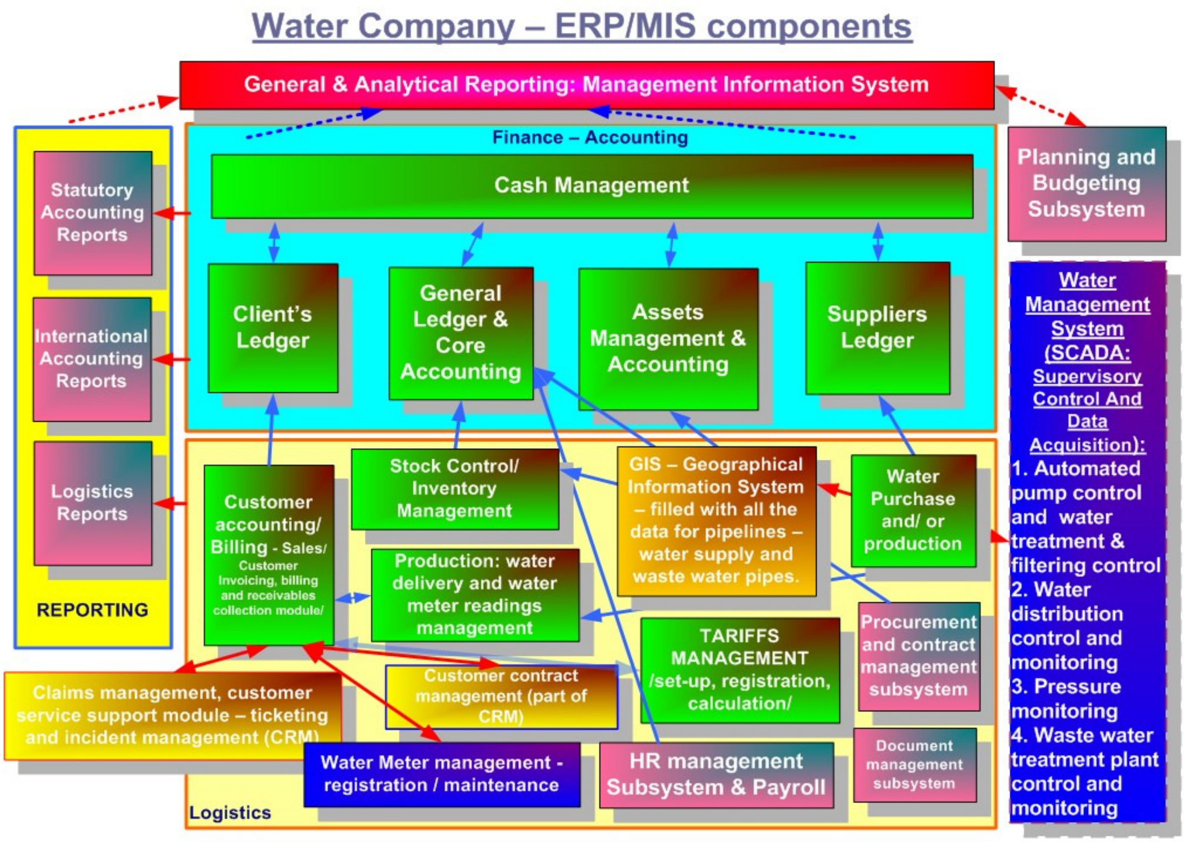
Technology advances have increased both the availability and volume of information management and the directors have available for both planning and decision making. Correspondingly, technology also increases the potential for inaccurate reporting and flawed decision making. Because data can be extracted from many financial and transaction systems, appropriate control procedures must be set up to ensure that information is correct and relevant. In addition, since MIS often originates from multiple equipment platforms including mainframes, minicomputers, and microcomputers, controls must ensure that systems on smaller computers have processing controls that are as well defined and as effective as those commonly found on the traditionally larger mainframe systems.

Water utilities must set up a framework of sound fundamental principles that identify risk, establish controls, and provide for effective MIS review and monitoring systems throughout the organization. Commonly, an organization may choose to establish and express these sound principles in writing. This manual fully endorses and supports placing these principles in writing to enhance effective communications throughout the institution. We would strongly suggest management to establish written MIS policies to formally communicate risk parameters and controls in this area.

Sound fundamental principles for MIS review include proper internal controls, operating procedures and safeguards, and audit coverage.

Monitoring water utility performance is based upon all the existing and (assumable) INTEGRATED components of ERP/MIS – enterprise resource planning & management information system as shown on the diagram below:

Figure 6.6: Water Company ERP/MIS components



For the adequate /verifiable/ performance indicators to be produced by a water utility all the components/subsystems above should be integrated and 100% utilized (used in everyday operations) by the company.

Most important and major components/subsystems to be identified:
- Financial accounting
- Customer accounting and billing/invoicing
- GIS – Geographical Information System with relevant (frequently updated) data concerning pipeline infrastructure water company operates
- CRM (Customer Relation Management) system /could contain also customer accounting & billing as integrated module/ + Call centre & customer claims management
- Automated Water Management and control system called also SCADA (Supervisory Control and data Acquisition) System – real time pump, valves etc. Control of the water flow and delivery
- Planning and budgeting
- HR & payroll

Other (supporting specific functions and/or in general usage) information systems:
- Document management / document flow control and processing
- Procurement and contract management
- Other supporting systems – which are part of ERP but not relevant to MIS as stated earlier (like hydraulic modelling, etc.)

As we have mentioned earlier in this chapter MIS is an application of people, technologies, and procedures. In addition to the mentioned above ERP subsystems for the purpose of water utilities we need to outline also people context: Human resources, staffing and organizational issues. This includes but not limited to in-house IT Departments staffing structure, staffing policies and promotion & remunerations of high-skilled IT professionals on the payroll of the water company.

Third important component of the water company MIS is the organizational context: IT procedures and Good Professional Practices in corporate IT governance. The widest spread and well known standard set of procedures in this area is ITIL: Information Technology Infrastructure Library.

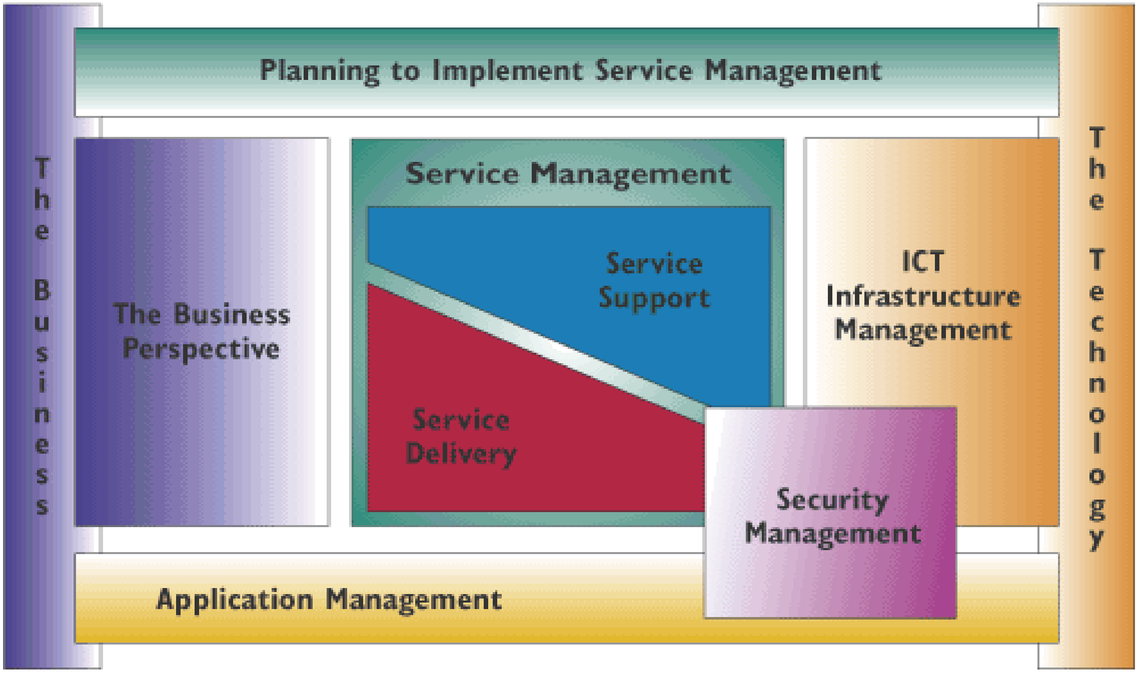
6.5.2 Information Technology Infrastructure Library (ITIL)

ITIL is the most widely accepted approach to IT service management in the world, ITIL provides a comprehensive and consistent set of best practices for IT service management, promoting a quality approach to achieving business effectiveness and efficiency in the use of information systems. ITIL is based on the collective experience of commercial and governmental practitioners worldwide. This has been distilled into one reliable, coherent approach, which is fast becoming a de facto standard used by some of the world's leading businesses.

ITIL was developed in the U.K. during the 1980's by the UK Central Computing and Telecommunication Agency, now British Office of Government Commerce (OGC). It was developed in conjunction with the British Standards Institute (BSI) and is currently overseen by the IT Service Management Forum (SMF), a non-profit organization. Oversight by the SMF has allowed ITIL to move from a "government-type" approach to more generally accepted industry set of Best Practices for IT services.

The concept of managing IT services for the improvement of business functions is not new; it predates ITIL. The idea of bringing the entire Service Management best practice together under one roof was, however, both radical and new.

Figure 6.7: Water Company ERP/MIS components - 2



In summary, ITIL is a customizable framework of IT processes used for delivering and supporting IT services. IT services are defined as one or many IT infrastructure components. This definition represents a business perspective and not necessarily an IT one. ITIL is built on a process-model view of controlling and managing operations. It addresses the structure and skill requirements for an IT organization by defining and presenting a comprehensive set of management processes and procedures. There are 11 ITIL processes comprising both IT Service Support and Service Delivery. They are:

IT Service Support:
- Service Desk (a function, not a process)
- Configuration Management
- Incident Management
- Problem Management
- Change Management
- Release Management

IT Service Delivery
- IT Service Management
- IT Financial Management
- Availability Management
- Capacity Management
- IT Service Continuity Management

Security Management is also considered vital but exists outside of the Service Support and Service Delivery processes.

IT Service Management is concerned with delivering and supporting IT services that are appropriate to the business requirements of the organization. ITIL provides a comprehensive, consistent and coherent set of best practices for IT Service Management processes, promoting a quality approach to achieving business effectiveness and efficiency in the use of information systems. ITIL Service Management processes are intended to be implemented so that they underpin but do not dictate the business processes of an organization.

The best-practice processes promoted with ITIL (Information Technology Infrastructure Library) both support and are supported by the British Standards Institution's Standard for IT Service Management (BS15000), and the ISO quality standard ISO9000.

6.5.3 IT service support

Configuration Management: Configuration Management covers the identification of all significant components within the IT Infrastructure and recording details of these components in the Configuration Management Database (CMDB). Importantly the Configuration Management system also records relationships between these components. It provides comprehensive information about all components in the infrastructure that enable all other processes to function more effectively and efficiently.

Change Management: Change Management covers the process of IT Change for all types of Change, from the Request for Change, to assessment, to scheduling, to implementing, and finally to the review. It is the Change Management process that produces approval (or otherwise), for any proposed Change.

Release Management: Release Management is very closely linked with Configuration Management and Change Management, and undertakes the planning, design, build, and testing of hardware and software to create a set of release components for a live environment. Activities cover the planning, preparation and scheduling of a release to Customers and locations.

Incident Management: The primary goal of the Incident Management process is to restore normal service as quickly as possible following loss of service, and to minimize the adverse impact on business operations, thus ensuring that the best possible levels of service quality and availability are maintained. An Incident is defined as any event which is not part of the standard operation of a service and which causes, or may cause, an interruption to, or a reduction in, the quality of that service.

Problem Management: The goal of Problem Management is to minimize the adverse impact of Incidents and Problems on the business that are caused by errors within the IT Infrastructure, and to prevent recurrence of Incidents related to these errors. In order to achieve this goal, Problem Management seeks to get to the root cause of Incidents and then initiate actions to improve or correct the situation. The Problem Management process has both reactive and proactive aspects. The reactive aspect is concerned with solving Problems in response to one or more Incidents. Proactive Problem Management is concerned with identifying and solving the underlying causes of Incident before they recur.

Service Desk: The Service Desk differs from the other main areas of Service Management in that it is not a process but is the central point of contact for Customers to report difficulties, complaints or questions. Additionally the Service Desk extends the range of services allowing business processes to be integrated into the Service Management infrastructure by providing an interface for other activities such as Customer Change requests, maintenance contracts, software licenses, Service Level Agreements and Configuration Management.

Many Call Centers and Help Desks naturally evolve into Service Desks to improve and extend overall service to the Customers and the business.

6.5.4 IT service delivery

Service Level Management: Service Level Management is the processes of planning, coordinating, drafting, agreeing, monitoring and reporting on Service Level Agreements (SLAs), and the ongoing reviewing of service achievements to ensure that the required and cost-justifiable service quality is maintained or where necessary improved. SLAs provide the basis for managing the relationship between the provider and the Customer.

Financial Management for IT Services: Financial Management is concerned with three main processes of Budgeting, IT Accounting and Charging. Budgeting is the process of predicting and controlling the spending of money within the enterprise and consists of a periodic negotiation cycle (usually annual) to set limits on budgets and the day-to-day monitoring of the current budgets. IT accounting is the set of processes that enable the IT organization fully to account for the way its money is spent - particularly the ability to identify costs by Customer, by service, by activity. Charging is the set of processes required to charge Customers for the services supplied to them. To achieve this requires sound Accounting, to a level of detail determined by the requirements of the analysis, billing and reporting processes.

Capacity Management: Capacity Management is the focal point for all IT performance and capacity issues. It is essential that Capacity Management has a close, two-way relationship with the business strategy and planning processes within an organization. The process needs to understand the long-term strategy of the business while providing information on the latest ideas, trends and technologies being developed by the suppliers of computing hardware and software.

IT Service Continuity Management: IT Service Continuity Management is responsible for taking risk reduction measures to reduce the chances of major disasters occurring and for the production of an IT recovery plan which interfaces into the overall business continuity plans. The IT recovery plans will need to be cost-effective and justified by the business.

Availability Management: Availability Management is concerned with the design, implementation, measurement and management of IT infrastructure availability to ensure the stated business requirements for availability are consistently met. Availability Management will consider all aspects of the IT infrastructure and supporting organization which may impact availability, including training, skills, policy, process, procedures and tools.

ITIL is a framework of IT Service Delivery and Support processes and must be customized and adapted to the organization itself. ITIL is a major component of IT Governance along with several complementary frameworks (COBIT, CMM, Six Sigma, etc) and management roles/responsibilities. Thus the implementation of ITIL also represents a significant IT Transformation effort for an organization.

More reasons for implementing frameworks and specifically ITIL.

- First, frameworks help bring about a level of consistency and the ability to measure performance.
- Secondly, there are increased regulatory pressures mandated by the Sarbanes-Oxley Act, Basel 2 and SAS-70. Additionally, there is the desire to bring more structure and rigor to IT, which has long been thought of as more of an art form rather than a science.
- Industry analysts such as Forrester have stated: “After 15 years, the IT Infrastructure Library (ITIL) is finally becoming the de facto standard methodology for internal IT service delivery processes. The final

breakthrough came in early 2005, when ITIL finally made the shift from describing service delivery processes—the 'what'—to helping organizations actually implement these processes and measure service quality –the 'how.' Widespread adoption of ITIL best practices by internal IT departments will follow through to 2008." ITIL focuses specifically on IT operations with the goal of improving the quality of IT service delivery and support.

Service Support measurements of this quality include:
- Faster incident resolution times allowing for reduced business impact;
- Proactive identification and resolution of problems thereby reducing the number of incidents;
- Consistent control and management of changes brought into the infrastructure, thereby reducing the number of change-related incidents and disruption to the business.

Service Delivery improvements include:
- Improving system availability;
- Agreeing and measuring service levels with the business users;
- Anticipating and planning for and the timely procurement of infrastructure capacity;
- Ensuring business continuity.

ITIL implementations require: Knowledge of the "pain points" of an organization; Strong understanding of the business requirements for IT Services, Good understanding of the organization's culture and its employees. Acquaintance with the ITIL processes

By understanding what processes should be implemented first along with their dependent processes, an organization can make the best use of its resources to ensure success for both ITIL and Outsourcing efforts.

6.5.5 Benefits of implementing ITIL

Direct benefits
- Increased alignment with the business understanding of an IT Service;
- Service Level Agreements which are aligned with Operational Level Agreements and Underpinning Contracts (agreements between disparate IT groups, including outsource providers);
- Faster incident resolution time while minimizing business impact;
- Proactive problem management;
- Identification of troublesome infrastructure components to improve system availability;
- Fewer incidents resulting from unmanaged change introduced into the infrastructure.

Indirect benefits
- Improved resource utilization
- Improved availability and reliability of business-critical IT services
- Justification of the cost of service quality
- Providing services that meet business, customer and user demands
- Improved IT services while reducing delivery costs.

6.5.6 EMSYS software

In July 2007 the tender procedure for implementing an integrated MIS in FOPIP Utilities was completed. Nine water companies committed themselves to implementing the integrated MIS software called EMSYS from Prodinf, the software company from Pitesti that won the tender.

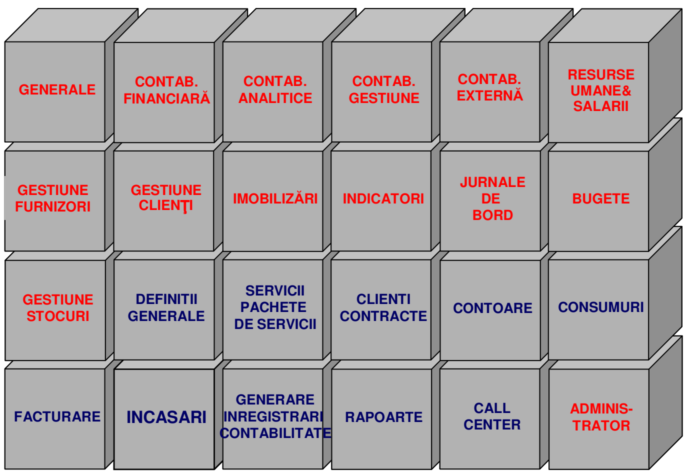
Brief description of Emsys

EMSYS is a so called Enterprise Management System. It is conceived as an integrated system at the functional level and not as a collection of interconnected import-export modules. EMSYS is a software application that processes data "in real time", in a local area network or over Internet/Intranet. This software was selected because it fully satisfied the Technical Specifications in the Tender Dossier for both Utilities and MIS functional requirements.

The application consists of 5 modules:

- **Utilities module** including: customer contract management, water meter management, services and tariffs registration, customer invoicing, billing and receivables collection, claims management;
- **Financial module** including: general accountancy, accounts Receivable, accounts payable, Cash Management and Treasury, Indicators, Dash Board and Budgeting, Analytical Accountancy and Cost Accounting, Payroll, Fixed assets, Inventory, General Ledger Consolidation;
- **Human Resources module** including: Time Management, Staff Management, and Recruitment and Selection Management, Management of Training and Development.
- **Sales module** including: customers' orders, delivery, invoicing, articles, services, price and discount lists;
- **Purchasing module** including: Purchase requests, Purchase orders, Reception of purchase orders and returns, Fiscal reception, prices, payment and trade conditions.

Figure 6.8: Structure of EMSYS



The application is based on open system architecture. It allows clients to use stored data for other purposes, and allows external links to other applications through easy and flexible interfaces. The available database structure and the internal report generator make easier ad-hoc queries and reports generation, database and/or operational interfacing with other systems.

The structural changes of a company, involving re-codification of accounts, partners, personnel, inventory goods, fixed assets etc, are simultaneously spread and replicated into the database, without any supplementary proceedings.

The EMSYS system is able to process information efficiently, in order to produce specific reports in any of the functional areas (Utilities, Financial Accounting – General Ledger, Inventory, Customers and Account Receivable, Suppliers and Account Payable, Payroll, Human Resources, Stocks, Fixed Assets, etc).

6.5.7 Implementation of EMSYS

Prodinf installed Emsys in September 2007, on dedicated hardware equipments, for both, database and application server. After the installation was completed, starting October 2007, data migration took place for financial, utilities and payroll module of the application. Prodinf performed configuration operations of the application, in order to provide the necessary functionalities for the beneficiary.

Typically the following activities are carried out during implementation

Accounting software (financial module of EMSYS) and cost accounting system:

- Migration of the general definitions: chart of accounts, classes, cost/profit centers, accountancy registers, general ledgers, partners, stocks, fixed assets, etc.
- Allocation of access rights for the users
- Configuration of all the processes regarding the accountancy of costs, in order to determine the tariff
- Migrating the analytic balances for the accounts developed on dynamic lists (542, 462.1, 426) and printing from EMSYS the Dynamic Analytical Balance sheet for these accounts.
- Data migration for all the fixed assets. The Fixed assets balance sheet was printed, as well as the depreciation balance sheet from EMSYS and checked with the existing situation.
- Migrating the balances for accounts available as per 30.09.2007, and printing the balance sheet, form EMSYS.
- Prepared for migration: Stocks records, Suppliers records
- Creation and configuration of the users' access rights.
- The companies have implemented a cost accounting system on profit centers. They keep records separately on each location. The Companies also prepare separate budgets for each of the profit centers and monitor the performances for each area.

Invoicing and collection software (Utilities module of EMSYS)

- Configuration of invoices, encashment, types and groups of clients, groups and schemes of services, zones, subzones and areas, cashiers, readers, contract responsible, documents and transactions, groups of services, etc.
- Migration of services and tariffs, based on zone, place, type of clients or packages
- Configuration of streets and reading sectors
- Configuration of types and dimensions for meters
- Migration of:
  - 50540 records for clients (for 2067 positions there were inconsistent data, so Apaserv has to solve this issue)
  - 55585 records for meters
  - 50049 records for branches.
- Establishing the form of the invoice (A4). EMSYS invoices were printed, as an example.

Human Resources and Payroll module

- Migration of data regarding the active personnel of Apaserv; some information appeared not available (addresses).
- Migrating the history for sick leaves calculation (January – august 2007) : 2389 records
- Data for holiday leaves calculation were prepared and prepared for migration;

- Configuring 3 different users with personnel rights, in order to respect the confidentiality of the salaries;
- Printing different reports regarding the payroll activities: there were no differences;
- Testing the salary calculation for September 2007: there were no differences.

Training

General administration: training for all the functionalities of the application was provided to the local IT employees. A training for Emsys administration was delivered to the local IT employee.

Utilities module: detailed training for all the functionalities of the module, and provided the User Manual.

Human Resources and Payroll module : detailed training and provided a user manual, with all the functionalities of the system. As a hands-on training, calculations were made of the salaries for October 2008.

Financial module: Users were trained regarding the chart of accounts, the ISPA activity, and the depreciation calculation. PRODINF performed additional training for the following functionalities:
- accounting registration
- invoices from suppliers
- operating receptions of articles
- operating consumptions of articles
- other functionalities.

6.5.8 Experiences with implementation

The implementation of EMSYS in 9 companies in parallel appears to be a very hard job for a relatively small software company like Prodinf. The originally planned implementation period of 6 to 8 months per company is far too short. It appears that considerable time needs to be spent in (re)defining the relevant business processes. In most cases the old data are not consistent or contain mistakes. Many staff of companies is not used to working with computers, or are used to working with old applications that were developed in house and are not easily left behind. Sometimes the commitment from the company is insufficient to make the transition from old to new software.

The expectation with the companies was that they get new modern software which is easier to operate, and which makes their life easier. In practice it appears to be an enormous job to make the transition. The big advantage of this operation is that during this long and cumbersome period the companies are getting their procedures and basic data in order because they have to rethink and redesign them.

The difficulty with IT companies supporting this process is that they often are short of project management capacity and professionalism. There is the risk of insufficient communication, management of expectations, reporting, training, ad hoc planning. Such performance is adversely impacting on the progress of such important projects.

6.5.9 MIS in FOPIP II project

In FOPIP II project it was a different approach for the MIS. The mission of the consultants was to review the current information systems, the MIS strategy and architecture, and to prepare the tender documents for the MIS acquisition. The consultant did not finance the MIS acquisition and he did not organize the tenders.

The SWOT analyses realized for the IT systems and infrastructure have discovered the existence of a heterogeneous IT environment in the targeted operators. In few places there are modern systems running, in other places some old styles software applications with few functionalities and in others almost nothing. Some problems have been identified with the amount of data and the backup capabilities.

Key points about the MIS that are covered by the tender documents:

- MIS sustains the informational infrastructure of the business processes and not the organizational functions;
- Many processes are using more than one function area, so it is essential to use an integrated system;
- In some cases when a MIS is implemented, there is a need for business reengineering;
- GIGO garbage in -> garbage out;
- MIS acquisition is an investment so Investment principles have to be applied, for example feasibility studies;
- Benefits have to be higher than costs;
- Implementation of a MIS is a project, so Project Management have to be applied;
- Implementation of a MIS is an organizational change, so Change Management procedure have to be applied;

The complete set of documents has been handed over to the operators, and during the training and workshop sessions they have been described in detail. A lot of effort have been spend to identify what can go wrong during such a tender and to take appropriate measures to mitigate the risks. This is a table with some identified threats:

Table 6.6: Threats and their mitigation

Risk	Answer
Different expectation between purchaser and contractor because of vague specifications	Very detailed Technical Specifications
Too much time consuming in data migration- the contractor did not know well enough the requirements	Good description by the Purchaser of the current IT structures and text file transfer
Not enough training	Training Duration and Programme are clearly stated

Also the documentation, testing, training and acceptance are defined in detail, and they are controlled through a set of key documents that the contractor will provide, and linked directly to the payment plan proposed.

As a deliverable of the project, the tender documents can be used with small changes by any operator in such a way to respond to their specific needs for systems, IT hardware infrastructure and communication, and also for outsourced software development.

The relation with the External Provider

When the tender is finalized and the winner is nominated, during the next years it is essential how the company will manage the business relation with the external provider. A summary of the best principles to be applied will be helpful for the future:

- For good results the beneficiary will monitor and conduct the project. A special team who has the required knowledge and qualification has to be established.
- The data gathered during the service monitoring will be used to control the contract.
- The supplier will not need the client strategy because he will have the temptation to do the easiest think.

- The IT strategy will define software, hardware and communication standards (they are included in the tender document), rules for system development, project management methodology.
- Other technologies will be considered to identify opportunities.
- Benefits and costs will be continuously monitored.
- Service level agreements will be defined and followed up.
- A group of representative users (GRU) will be identified and directly involved on the entire life cycle of the project. GRU is composed with people from all the business area. No technical background is required, but at least a basic IT culture is useful.

The service level agreement (SLA) is that part from the contract which lists all the services required after the complete implementation, and the minimum level of quality with these services have to work to respond to the business requirements.

The reasons the SLA is needed are:
- Assure a measurable, consistent and agreed level.
- Correlates the quality with costs
- Increase users productivity
- Simplify the relation with the supplier
- Reduce the frequency of unexpected events

In case that it become clear the problems will not be solved in due time, or because the specific nature of the problem a solution will not be provided, an escalation procedure has to be applied. The purpose is to minimize the impact and to prevent the negative effects to increase.

7. Organization development and human resources management

7.1 Introduction

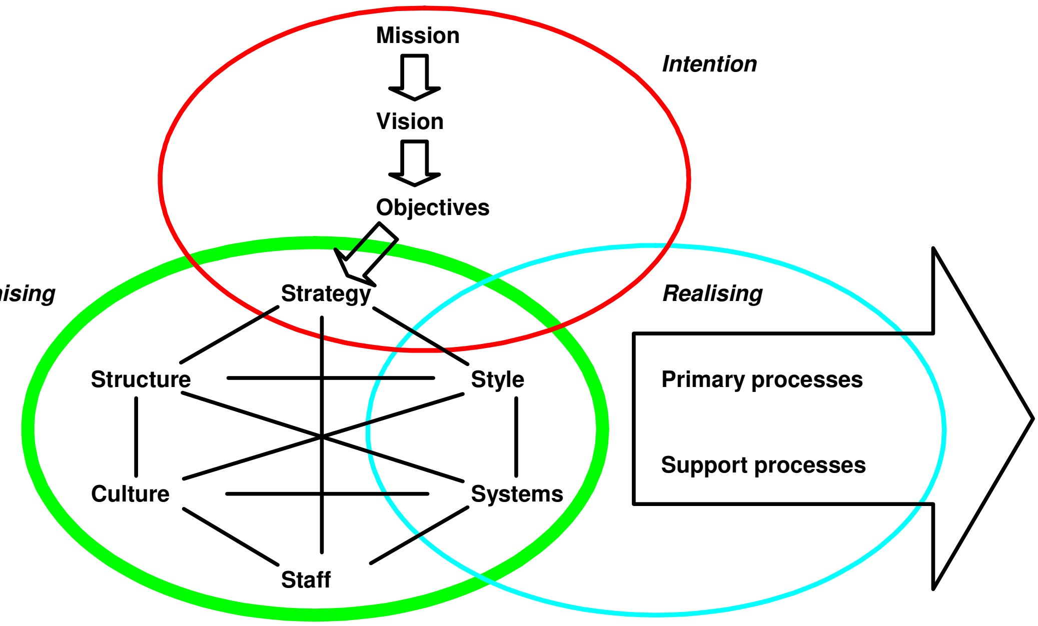
7.1.1 Scope

For the water enterprises participating in the FOPIP project, the field of Human Resources (HR) was not taken in its limited sense of ‘manpower’ or ‘staffing’, but in a broader sense and context. Manpower (staff) is indeed a core aspect, but there are more aspects that are important in organizing the HR input efficiently. Notably additional components of wider HR development and management are (i) improvement and optimisation of the organization structure, (ii) improvement and optimization of the internal systems and procedures, (iii) strategy definition, (iv) introduction of modern management tools and the (iv) development of the wider overall organization culture.. As a consequence, the HR support component was extended to and understood as a package of Human Resources and Organization Development (HR/OD).

7.1.2 Human resources management – why?

- Human resources easily make up 30 percent of the operating cost of a water company and more.
- Policies, technology, structures and finance are of course very important, but in the end it is the human factor that determines success.
- The water company’s financial and organizational standing has a direct impact on its employees.

Figure 7.1: Organizing HR aspects



7.1.3 What can be found in this chapter?

In order to guide the reader in this chapter on HR/OD, the following topics will be dealt with:

- A general description of the organizational and HR situation and needs of the water enterprises (par. 7.2).
- The overall HR/OD approach and interventions (par. 7.3).

- HR strategy analyses and development (par. 7.4).
- Organization design, notably the structure of the ROCs (par. 7.5).
- Staffing and personnel planning (par. 7.6).
- Task analyses, job design and job descriptions (par. 7.7).
- Performance appraisal (par. 7.8).
- Training needs analyses and training planning (par. 7.9).
- Career management and development (par. 7.10)
- Transferring and integration of staff in the ROC (par. 7.11).
- Outsourcing (par. 7.12).

7.1.4 Manuals and guidelines

Detailed and supporting information such as manuals and guidelines are provided as various appendices in section D (on attached CD) to this report. The following sections will mention these manuals and guidelines. These manuals and guidelines were used in the dissemination and promotion of the HR instruments and practices.

The actual implementation of the HR support programs and instruments enabled to assess the impact and acceptance (and actual implementation) in the water companies. These results were used, in turn, to adjust and fine-tune the manuals and guidelines.

7.2 General description of organizational and HR conditions

For a proper appreciation of the HR/OD fields of intervention and approach, a brief description of the main topics for HR and organization development of the water enterprises is presented below. It should be stated that the situation, context, needs and intensity of these topics may vary per enterprise. Also, some companies are more developed or faster developing than others. Yet, the description gives an overall picture regarding 'what is on' and what challenges there are with regard to HR/OD in the regionalizing water enterprises.

e. The water companies went through a process of regionalization with the majority of counties having completed regionalization recently. That means that more local operators have been or are brought under and managed by one regional entity and structure – the Regional Operating Company, ROC. The one-location operator concept and traditions are to be abandoned and replaced by a regional concept and arrangements. A regional headquarters will serve as management centre and umbrella for multiple location operations organized as cost centres. This requires a clear differentiation between (a) operating functions at local level and (b) management, expertise and support functions at regional level. The framework organization structure has therefore to be revised. In addition, organizational 'mindsets' have to be adjusted too.
f. The regional companies have to become financially viable entities and as such credible partners for the EU for the release and implementation of Cohesion Funds. Regionalization requires more advanced organizational arrangements This includes a set of HR instruments of the company, such as modern management structures, optimization of internal processes and results-oriented Performance Management Systems..
g. The ROC senior management will need to divert some efforts; they will be far more occupied by the interactions with other public stakeholders (ADI, local councils, various governmental agencies, general public etc.) and, at the same time, conduct direct management and control of the daily operations. Increasingly, the internal affairs need to be dealt with by middle management and specialists. Capacities, structures and systems for this have to be developed. This all will have

impact on human resources. Increases professionalism of management, increased empowerment and this all backed up by HR systems is called for.

h. Most if not all HR departments (in the ROCs) however showed a keen interest to improve and implement new and modern human resource management methods and tools. Specific trainings were provided and are now under implementation.
i. Some ROCs show poor financial results. Because of the dire financial state, modern performance based remuneration systems, so argued by the senior management of these ROCs, could not be introduced. However, there are non financial benefits and, an overhaul of the management and payment system will allow for some efficiency savings to be allocated as performance based remuneration. This strategy was well received and is under implementation, but will require extra efforts by all concerned if it is to work.

7.3 HR approach and interventions

7.3.1 Strategy of FOPIP regarding HR

For the development of the HR aspects in the relevant ROCs, the following approach, methods, tools have been used:

- **Approach FOPIP on HR/OD**
  - Capacity development of the HR function in the company.
  - Development and implementation of a set of prime HR instruments.
  - Development of HR strategy for the company.

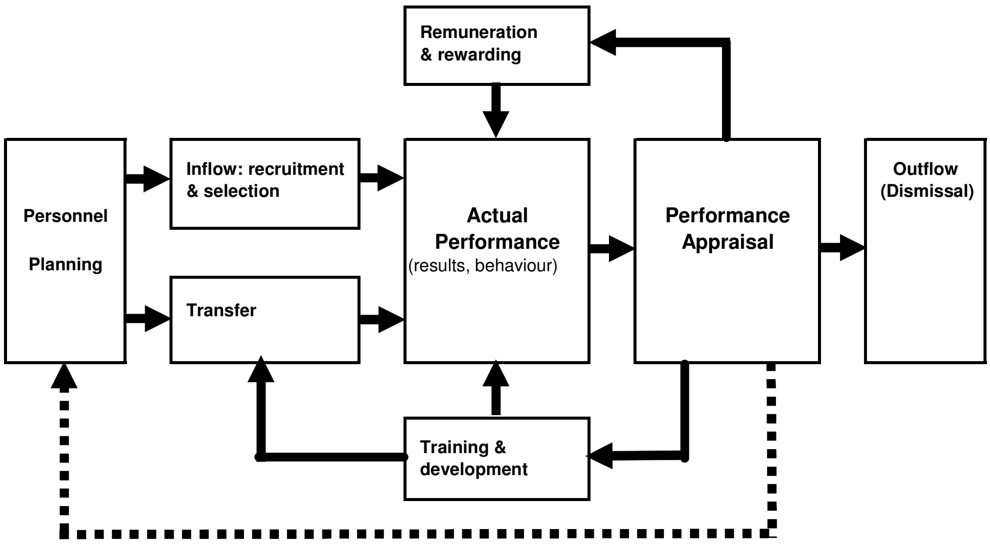
Capacity development has been implemented through the provision of training courses as well as on-the-spot training and coaching.

The basic HR activities and instruments for the water companies are notably:

- Performance appraisal system
- Reward and motivation system
- Training needs assessment and training plan
- Personnel planning
- Selection, recruitment and transfer

These activities and their interaction are depicted in Figure 7.2 HR Cycle . Job descriptions form a cornerstone in all these processes and activities.

Figure 7.2: HR cycle



It is in general difficult to develop a HR strategy in a not yet fully professional environment. In addition, strategy development needs to be practical and based on the actual situation, needs and challenges of the company.

Therefore, a practical and a hands-on approach was followed. FOPIP (I and II). The need, receptiveness and commitment of the ROCs for certain HR issues and instruments constituted the starting point for interventions. Due to the rotating nature of the HR activities (see Figure 7.2 HR cycle above), the choice for the initial area of intervention itself is not that critical, as long as it is a relevant need of the company and has commitment from the management. While developing and implementing a certain HR instrument for such areas of intervention, the capacity building for the HR function is also addressed. Also, as one instrument is being developed and implemented, the neighbouring aspects become more visible and the company may gradually assign priority to those areas too. Strategy development can only start once capacity development and implementation of instruments are reasonably advancing.

As a consequence of different priorities and 'entry points' in the various ROCs, the instruments developed and implemented differed slightly.

Because of the nature of intervention, FOPIP aimed to prepare the system for implementation and to provide guidance hereto, rather than executing a full-fledged TA to this end.

7.4 HR strategy analysis and development

7.4.1 Assessment

It was found that not all of the ROCs availed of an explicit HR strategy or similar document or alternatively, a firmly shared and explicit HR direction.

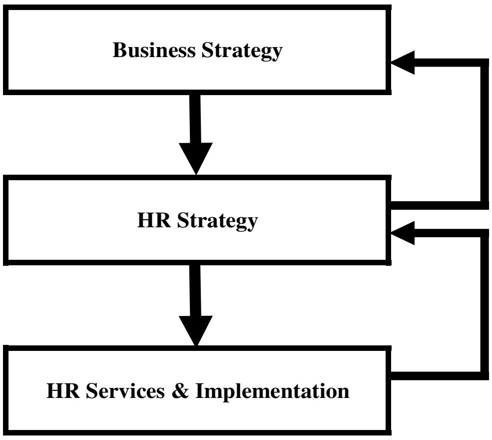
Strategy: a firm intention

Strategy is:

- A longer term plan or policy
- To guide decisions (so, provides a framework but leaves some flexibility)
- Aimed at certain outcomes (result-oriented).

The process of business planning and as a consecutive step, development of HR strategies in a most professional manner and according to latest techniques (Management by objectives, RACI, KAIZEN, etc) are not comprehensively used. In addition the HR functions were not or hardly contributing in a bottom-up process of strategy development for the company.

Figure 7.3: Simple strategy development



Reasons for this weak strategy development are mainly (i) the capacity of the HR function; (ii) insufficiently functioning of regular HR systems and (iii) because there is hardly a working mechanism in the water companies to channel and receive these inputs from lower management levels. As a consequence, strategy analysis and development for HR/OD topics became part of the HR/OD support to the companies.

7.4.2 Activities and results

FOPIP 1 conducted situation analyses and strategy development regarding organization and HR issues was addressed during the HR training courses delivered in May 2008. During this training, participants from the HR units in the various companies were requested to analyse their particular HR situation and environment and, based on this analyses, pinpoint key issues for a possible HR strategy and actions for their company.

During follow-up visits to the various companies, these draft HR strategies and actions were discussed and refined. Further, the issue of HR strategy development was addressed in a working session of the top management seminar in August 2008, with participation of both the General Directors and the HR managers of the respective water companies.

FOPIP 2 dedicated two comprehensive seminar series to this issue and modern techniques were introduced and promoted for utilization. Introduction of HR preparedness analysis tool and of modern management methods (Management by Objectives, RACI, Kaizen) was supported by dedicated local one-to-one support, aiming at increasing the HR involvement in the strategy development process.

7.4.3 Follow-up

Aligning of the HR strategy analyses and development with the more general business and strategy planning activities of the companies is still to be ventured and given shape. This needs to be addressed in meetings with general management.

In addition, support should be made available to the senior management of the ROCs, ensuring and assisting implementation and continuation of using these modern methods, until those have firmly grown into the organisational culture.

7.5 Organization design

7.5.1 Concept

A proper organization structure is an essential requirement for the regional operators, not only to have a framework and give shape to their actual operations but also as a requirement for the cohesion funds application. Regionalisation requires changes in the framework organization structure in accordance with the political and legal requirements in Romania. This requires technical assistance and support in the structuring of the organizational framework, which is included in the terms for the FOPIP 2 technical assistance. The Action Plans, designed and implemented for each ROC have earmarked efforts for organizational design and organizational optimization. The former local operators have been and are being organized in the ROCs as cost centers with dedicated lines of communication. Competencies and functions within the ROC have been brought under this new organizational structure, with a PIU assisting with the implementation of the upcoming projects under the cohesion funds.

The FOPIP 1 consultants have developed and promoted a regional framework structure for the ROCs. (Guideline Organization Chart Design. Romanian “Studiu privind structura organizationala propusa pentru operatorii regionali de apa“). See Appendix D1. The model is derived from the Mintzberg model of organizations with five main parts as this model provides a proper working concept showing the differentiation of operational activities and other processes/activities in the organization.

The main characteristics of this framework organization are (see also Fig. 7-4 below):

- A separation of operational functions on location and the steering functions and specialist support at regional level. The local operational functions consist notably of drinking water production, distribution, wastewater collection and treatment, customer interactions and revenue collection.
- The various local operations are clearly identifiable and designed to act as cost centre/profit centre in terms of an accounting system.
- A clearly recognisable technical development and specialist function at regional level, in the shape of a Technical Development directorate. This directorate is in charge of longer-term planning, design, engineering and specialist support.
- A financial management function at regional level, consisting of financial planning, accounting and control.
- A commercial function at regional level, dealing with contracts, revenue collection processes and customer relations.
- For the smaller ROCs, the financial function and the commercial function can be eventually be combined in an economic directorate.
- A number of specialist support functions at central level that deliver services for all local operational centres and other regional functions (e.g. legal, HR, PR, environmental monitoring, audit, procurement).

The FOPIP 2 consultants have developed and promoted mainly for the new Regional Operators which have just been set-up an organizational structure based on the business processes.

In the identification and structure of the business processes within the water and waste water Regional Operator the following aspects were taken into account:

- The Process Classification Framework elaborated by the American Productivity & Quality Centre (APQC);
- The Value Chain elaborated by Porter;
- Performance Excellence Criteria.

Within a Water and Waste Water Company were identified 13 major categories of main processes based of the "value chain" approach presented below:

1. Understand markets and customers
2. Develop vision and strategy
3. Design products and services
4. Market and sell
5. Produce and deliver for manufacturing
6. Produce and deliver for service oriented organization
7. Invoice and service customers
8. Develop and manage human resources
9. Manage information resources
10. 10 Manage financial and physical resources
11. Execute environmental management program
12. Manage external relationships
13. Manage improvement and change

Figure 7.4: Value Chain

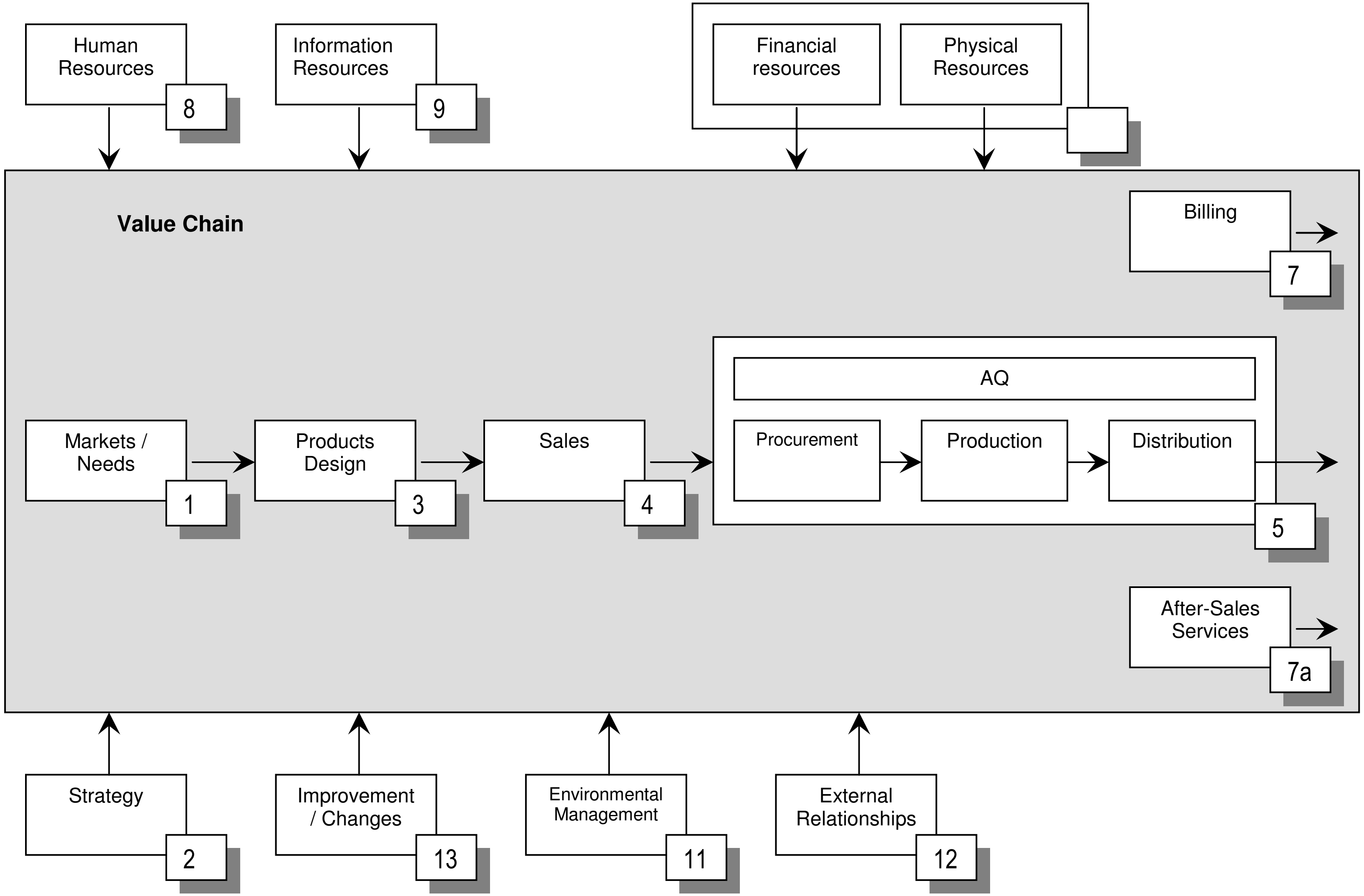
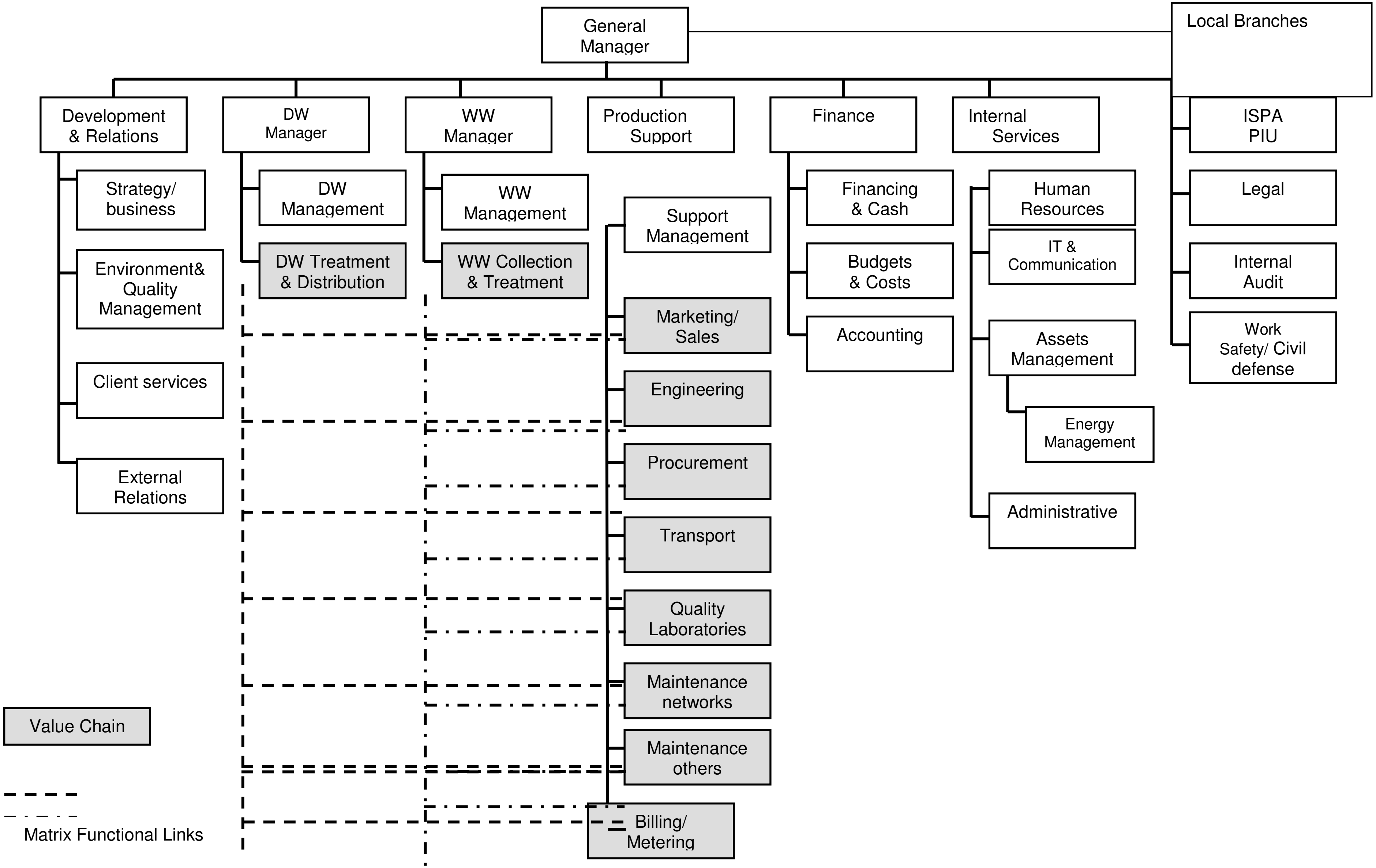


Figure 7.5: Proposed ROC Structure (FOPIP2)



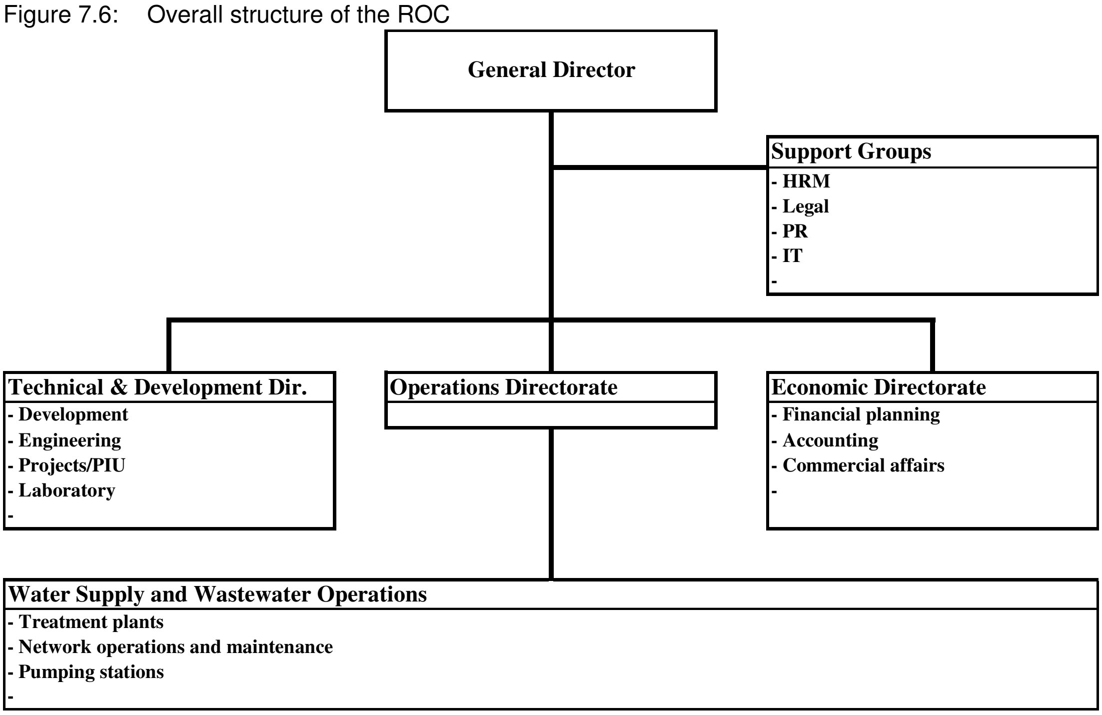
Based on this process approach, the proposed organisational structure was in some cases (Bacau, Covasna, Harghita) the foundation for the development of the structure for the company newly set up.

This structure helps the company to limit the double subordination as well as the possible "gaps" within the company's activities and responsibilities. As a main principle at the level of branches organised as cost centres or profit centres, the administrative subordination is with the branch Manager and the application of the company's methodologies and instruments is with the processes managers from the headquarter level; thus, double subordination boundaries are clearly defined within the Regional Operator.

In FOPIP 1, similar support was given to the water enterprises in developing the understanding of a regional concept and the related management mechanisms, review of the current organization chart and drafting of a new regional organization chart.

The proposed organizational chart in FOPIP 1 project was as follows:

Figure 7.6: Overall structure of the ROC



A main issue regarding the organization structure is the position of the Project Implementation Unit (PIU). Initially, there was a national tendency to situate this as a separate unit directly reporting to the general manager. This situation is often the case for the current ISPA PIUs.

As an outcome of various discussions and a dedicated national seminar on the functions and organizational location of the PIU (28-30 April 2009) in FOPIP 2 project, the PIU can either report directly to the General Director, or be integrated into the technical department.

Further, the vision and the steps of the regional operator to integrate the various local operators in a real regional working organization needs to be looked into and brought to a general accepted path of development for the medium-term. This gives an answer to the question how the regional operator will gradually evolve.

7.5.2 Assessment

7.5.3 FOPIP 1 Counties

Some companies appeared initially somewhat reluctant to develop and propose a new, regional organization structure. To a certain extent this was due to the non-familiarity of the top management with regionalisation and notably the needs and consequences with regard to the organization structure. Additionally, a new organization chart touches upon sometimes sensitive issues like power, influence and appointment of candidates for certain positions.

For most companies, notably abandoning the one-operator concept and separation of technical development versus operations appeared new lines of thinking.

In about half of the cases, the company was already gradually separating more clearly the commercial function (revenue collection, customer relations) from the more narrow financial and economic functions (financial analyses and planning, budgets, accounting, reporting).

Finally, a few companies regarded the organization structure as something to be sorted out only once the delegation contracts were signed. This delay might conveniently suggest that integration and regionalisation would not have organizational consequences.

7.5.4 FOPIP 2 Counties

Similar can be stated as for the FOPIP 1 counties, although the FOPIP 2 TA project commenced in October 2007. By this time, some counties were already well on their way in changing their organizational structure according to the latest regionalization requirements.

Most counties were pro-active; some have even hired extra TA, to effect the required changes rapidly. Some counties required more intense support from FOPIP 2 and with one exception, all FOPIP 2 counties are either efficiently restructured, or in the process of finalization of the restructuring efforts.

7.5.5 Activities and results

FOPIP 1 has put considerable effort to promote a general model for the regional structure of the water companies. This model is laid down in a manual. The model sketches main principles, a number of options but also allows freedom in adapting to the local circumstances. The regional model was disseminated and promoted during various occasions.

In all water companies, a number of discussion rounds were held to assess the regional situation, develop mutual understanding with regard to organizational consequences, promote the general model, make sketches for and fine-tune this with the (to become) regional operator.

During the course of time, most operators have revised their organization chart and tuned these with the general model as promoted by FOPIP 1. This has resulted in basically appropriate organization charts for the regional operators.

A number of the operators had yet to integrate local operators in a regional structure. It was observed that in those cases general little detailed information was available regarding these local operators, apart from informal reports. Also, some regional operators appeared hesitant to actively make steps on the path to integration.

In order to enable planning and preparing for integration of local operators, the ROC for Maramures (SC Vital) FOPIP has initiated and supported a field assessment of the local operator in Sighetu Marmatiei (the in terms of operations and staffing biggest newcomer). For this purpose, a team consisting of management and experts of SC Vital and FOPIP consultants conducted a field visit to Sighetu Marmatiei to gain first hand experience and impressions about the local situation. This assessment has resulted in defining a number of actions in technical, commercial and organizational fields that need to be undertaken prior to and during the integration process. A Water Company Assessment work list was prepared to guide assessment and data collection.

FOPIP 2 activities started with a comprehensive analysis of the ROCs structure and situation, based on a questionnaire delivered to all ROCs and main operators included within the assistance program. The information collected together with the Due Diligences' analysis provided the basis for a county-specific evaluation against SOP requirements and have been used for defining county-focused actions toward improvement of the organisational structure.

Support has been provided under FOPIP2 – via information and exercises during regional workshops or local assistance - aiming to the development of ROCs capabilities for analyzing and improving the business processes, as basis for the development and implementation of an efficient organisational structure.

Similarities with the cases under FOPIP1 have been also observed under FOPIP2:

- Some of the ROCs achieved an advanced stage of regionalisation and their organisational structure needed only fine adjustments, in order to
  - align their structure with business processes,
  - confirm/define cost and profit centres
  - enhance the HR department power as strategic partner and
  - ensure a proper positioning and composition of PIU within the organisation
- Other ROCs were at the beginning or in the middle of the regionalisation process, and they benefit of support also for structuring the data to be collected in order to make smoother the integration process and to re-design the structure as to sustain the regional operation
- A small number of counties within FOPIP2 TA had to establish a new ROC - in these cases the support provided has been oriented toward the implementation of an organizational structure based on the business processes.

The support within FOPIP 2 built on the experience of FOPIP 1 in two ways: transferring the experience gained to the new ROCs included in the assistance and continuing with those involved in FOPIP2. The examples from FOPIP 1 were the best argument for action and in the same time the consultants could do a fine-tuning of the interventions according to the sector specificities.

The pressure of High Performance requirements on the ROCs led to an important concern for all ROCs for optimised organisation structures. This concern was more obvious in FOPIP 2 than in FOPIP 1. The important conclusion is that the main driver for a "good organization structure" is the need to achieve the organizational performance indicators.

The added value brought in by the activities on organisation structures review is the effective involvement of the company in the process.

The consultants ensured guidance, an easy-to-apply methodology, opportunities to share experience and the process management to ensure finalisation. All these enabled top management and the key staff to understand the real problems, get the external view of the consultants (or other companies) and take ownership on decisions for change.

The key aspects of the activities provided for organisational reviews are:
- Comprehensive methodology for reviewing the organisation structure
- Workshops for sharing experience among ROCs and learning (developing competences)
- Practical tools for analysis and design (process analysis formats – specific for water sector, various organisational chart models with advantages and disadvantages, job design tools, workload analysis tools)
- Analysis sessions for identifications of appropriate solutions.
- Training of HR people to manage the process in order to ensure sustainability and the capability to apply the methodology after the project end.

FOPIP 2 experience highlighted in the organisation structure review process two key success factors:
- Stability of the top management – the top management initiating the review needs time to implement it; if they change the new management will come with a new vision and the process will start from the beginning again,
- Involvement of the HR personnel - the review of the organisation structure is a complex process interfering with other areas among which HRM is essential. Involvement of the HR specialists is essential in the analysis phase, design phase and will ensure sustainability - capacity to implement the changes. All these aspects were highlighted in the training provided.

7.5.6 Follow-up

After the implementation of the organization charts and integration of ‘new’ operators, the various ROCs have to review their organization charts and make the necessary adjustments.

FOPIP 2 consultants have assessed together with the management of the ROCs the existing structure and have presented their suggestions regarding possible solutions for improvement. Following this assistance new departments have been set up and others have been reinforced. FOPIP2 consultants emphasized that the management team of the ROCs must undertake this process yearly in order to review the organisational structure and implement the needs for change as identified during the performance management process.

Follow up was discussed with each ROC according to their stage of review and vary as shown below.
- ROCs – implementing the organisational review – a new organisation structure was designed and approved and have to be implemented the new roles and responsibilities. In other words it is about the transposition of the new structure at individual level – job descriptions, performance management - in some cases recruitment, redundancy, and training. This will result in implementing change and will touch several areas of the business, with a heavy impact on HRM.
- ROCs who will need adjustments due to various business environment changes (including management changes); in the review of the organisation structure there were measures proposed on immediate but also short and medium term, depending on investments, conditions for outsourcing, and others; the review has to be monitored and implemented.

7.5.7 Guidelines and manuals

7.5.7.1 Guideline Organization structure for ROCs. (Appendix D1)

This guideline presents a framework organization structure for a regional water company. It also shows for certain business areas options. One can use this framework as a basis for design of the organization structure of a particular water company.

7.5.7.2 Water Company Assessment – Work List (Appendix D2)

This Work List is meant to assist staff and consultants in assessing the main business processes of a water company and determine eventual crucial issues for integration. It assists in data collection by means of questions, tables and gives questions for semi-structured interviews.

7.5.7.3 Guidelines and manuals provided to FOPIP2 ROCs

The assistance of the consultant has been supported during FOPIP 2 by theoretical and methodological transfer. The methodologies and instruments have been transferred during national seminars or during one to one counselling sessions that have been delivered for each of the target group according to their specific development needs. During the national seminar the structured information and guidelines have been provided regarding the following areas:
- Institutional organisation
- List of the main processes within a Water Company
- HR Function audit

As mentioned before there were prepared for ROCs several tools and methodological support documents:
- Methodology for organisational review
- Principles for organisation review (optimisation)
- Process analysis tool (specific for water companies and examples)
- Typology of organisational charts
- Job analysis and workload analysis tools
- Training materials on organisation structure review.

7.6 Staffing levels and personnel planning

7.6.1 Assessment

There is a general impression that staffing levels in water companies in Romania are high and some companies are certainly overstaffed and/or staff is inefficiently managed . Indeed, personnel cost form a substantial part of the operating cost, easily 30% and more. Effective and efficient deployment of staff is therefore a main HR task.

Yet, without a more detailed look into the companies and their individual situation, it makes little sense to suggest or propose generic staffing measures or staffing levels/norms for all the companies. Given the pattern of regionalisation and need for professional expertise, in some cases companies look also overstaffed but are at the same time also under-qualified. Further, not all the companies had already regional ‘responsibility and control’; it was therefore difficult or even impossible to assess and intervene on staffing levels and qualification of personnel of ‘incoming new local operators’. Finally, in most cases the regionalisation included a ban on personnel reduction for one or two years. In that case, even with a sound analyses and good plan to reduce staff it would not be implemented soon. That would certainly not contribute to the credibility of the management. Arriving at a personnel plan that can steering the company and indeed is 'implementable' may take some time.

7.6.2 Staffing levels

Determining staffing levels: establishing and implementing the systems rather than prescribing the numbers of personnel.

FOPIP 1 has therefore chosen to develop the personnel strength analyses and planning system rather than straightforward recommending and (assist with) implementation of staffing measures.

A company's personnel plan is essential as it lays down what the company thinks (plans!) to look like in terms of staffing numbers and qualities in the medium-term (2 – 3 years ahead). A personnel plan should be drawn up by the HR department in co-operation with the respective managers of departments/units.

7.6.3 Personnel plan

A personnel plan is substantially more than a list of names and numbers of current staff and eventual vacancies.

With a personal plan you determine what you need, not what you have.

This meant more practically:

- Assist the companies to develop and enhance their capacity to critically analyse their current and future staffing levels. Task analyses, looking into the systems and procedures and job design in the company were major interventions.
- Facilitate comparison between the companies on a number of HR (staffing) indicators. These indicators point at the HR inputs for the main business processes. This HR benchmarking assist in revealing differences between the companies and invites for further investigation and analyses.
- Taking the organization structure and regionalisation process as point of departure to determine jobs, job requirements and personnel strength.
- Gradually arrive at personnel plans for the company, which can be used for steering.

7.6.4 Activities and results

As a basis for further analyses, HR indicators were produced for the 12 plus 1 FOPIP companies[6] and for the FOPIP 2 counties. Key HR data were collected and processed. The results were disseminated and presented to the companies through HR training courses and during the field visits to the companies.

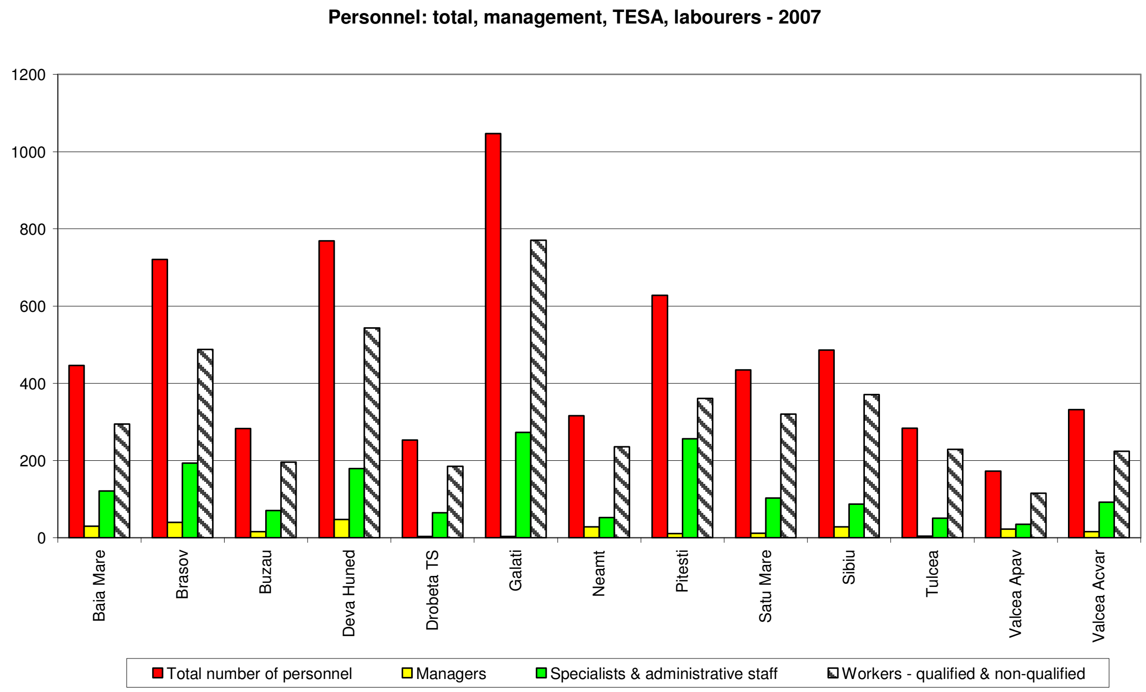
As example, two main indicators are shown below:

- Staffing details, see Figure 7.5 (composition of labourers, technical & administrative staff, management)
- Staff per 1000 contracts/connections[7] , see Figure 7.6.

6 For Valcea, the two existing water companies have to merge into one regional operator. Hence, here the data of Acvarim and Apavil were collected. This results in data for 13 companies.

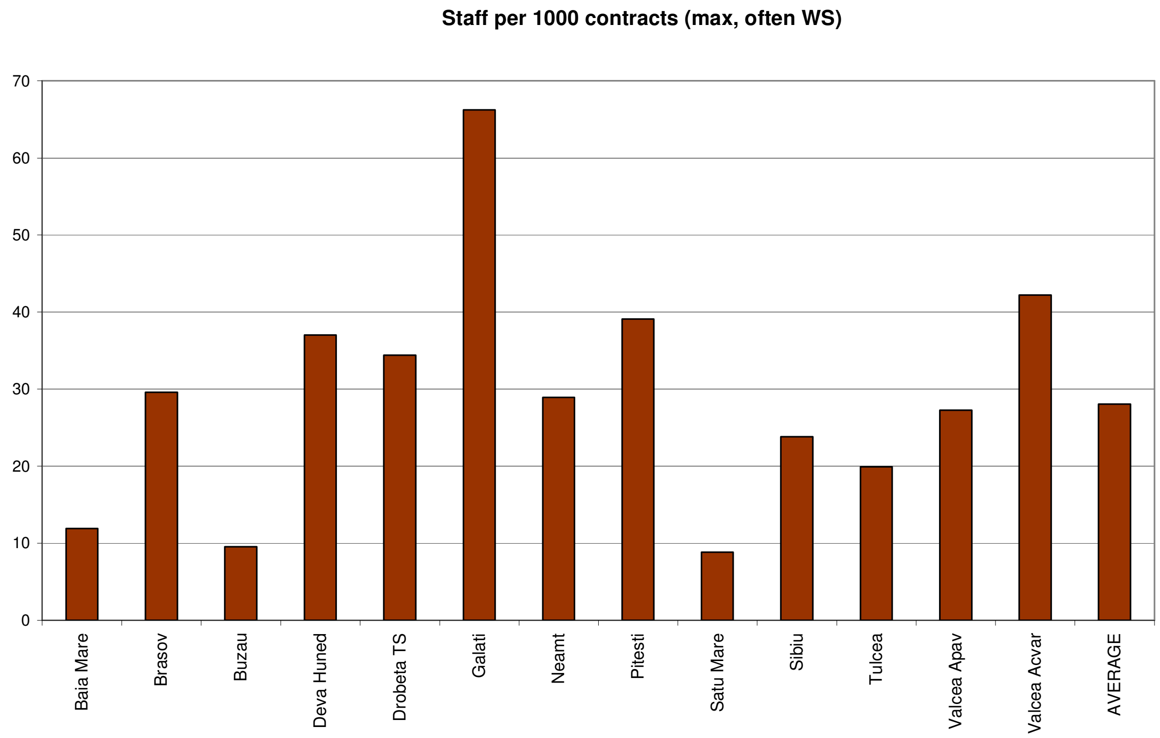
7 It should be noted that some companies have already nearly 100% individual households as unit of contract (e.g. Baia Mare,

Figure 7.7: Staffing details - FOPIP1



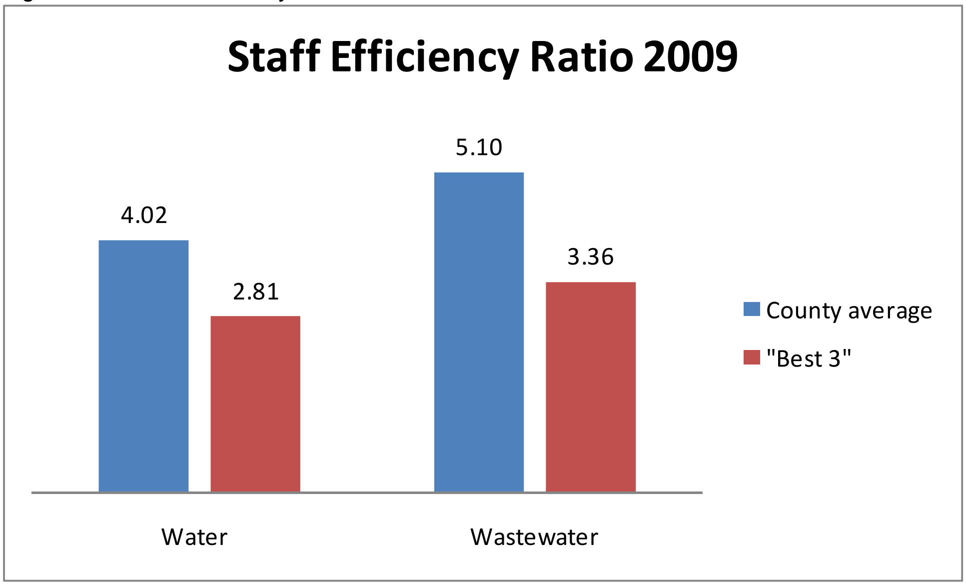
Buzau, Satu Mare). Others have still significant numbers of associations as unit of contract. This explains partially differences between the companies. Yet, still some differences remain striking and clearly point at manpower efficiency.

Figure 7.8: Staff per 100 contracts - FOPIP 1



The participating counties in the FOPIP 2 Technical Assistance show the following staff efficiency ratios:

Figure 7.9: Staff efficieny ratios - FOPIP 2



The indicator used by FOPIP2 TA is total staff / 1000 population served water and the same for wastewater.

The following aspects should be taken into account when discussing the figure shown:

- The figure shows FOPIP 2 participating counties;
- One regionalization imminent feature is the incorporation of small communities, villages, etc. This process has and is taking place and requires taking over of all rural staff in a first step, before efficiency improvement measures can be implemented. This process intervenes on a number of levels and shows and will show efficiency gains in the more advanced counties;
- In some cases, regionalization required merging of county and capital cities operators. This means that, initially, there are and will be duplication of departments and, as above, efficiency gains will materialize in time, when measures and interventions are executed.

Overall, the indicators of 4.02 for water and 5.1 for wastewater (staff per 1000 people served) show the potential for improvement. The best three counties 2.81 and 3.36 show the immediate potential for the (other) participating counties. The best three and all other counties are currently implementing measure and further improvement can be expected in the near future. Each individual ROC has its own tailor-made Action Plan, where individual targets for an increase in the staff efficiency co-efficient have been agreed.

7.6.5 Follow-up

- Integration of new local operators is a main trigger for personnel planning. The ROC should, based on the organization structure, desired functions and an assessment of staff numbers and qualifications, develop and maintain professional a personnel staff planning and recruitments plans. This personnel plan should indicate – with a time frame of approximately 2 – 3 years – the number and qualifications of the staff for the various organizational units that need to be trained, recruited, etc.
- Further, staff effectiveness and efficiency is to be critically examined and monitored for all functions. Task analyses are recommended for the various organizational functions. The HR indicators can assist in analyzing those. Companies may even develop more detailed and specific indicators for their own internal use and evaluate permanently.

7.6.6 Guidelines and manuals

7.6.6.1 Manual Personnel planning (Appendix D3).

This manual assists in a step-by-step approach the HR expert and management to conduct an analysis and arrive at a personnel plan. It also provides a background with a number of key elements and considerations for personnel planning.

The Manual was complemented with applications on analysing the staff needs using various tools

- Identification of natural leaves (using the staff records – including the applications)
- Staff needs analysis applied in the case of new process and sub-processes introduced and formalised
- Analysis of staff levels using sector indicators.

7.7 Task analyses, job design and job descriptions

7.7.1 Assessment

Most companies avail of job descriptions for the majority of the functions. Also, the HR departments have developed and are maintaining job descriptions. But, the job descriptions are often overly detailed.

In order ‘not to forget anything’, instructed by external agencies and to serve various purposes in many case too much was put in the job description. This has resulted in job descriptions of easily 4 pages and more. As a result, it is often difficult to distinguish major topics and tasks from minor ones. Consequently, job descriptions are too complex, confusing and in practice poorly functional/little used. They hardly assist the job holder in pointing out what is actually required from him or her.

7.7.2 Job description – recommendations

A job description should contain / abide by the following as a minimum:
- Title of the function
- Place in the organization
- Main purpose of the job (2 lines only)
- Main tasks, responsibilities, powers (approximately 5 – 7 main fields)
- Equipment, tools, working conditions
- Job requirements (knowledge, skills, experience, attitude).
- Maximum 2 pages.
- Available for the job holder and discussed between the job holder and supervisor.

In addition, critically evaluating and structuring the jobs through task analyses and job design was hardly practised in the water companies. Main reasons for this were (i) limited HR capacity as well as (ii) limited internal pressure to do so.

During national seminars and one to one counselling sessions for the management teams of the ROCS included in FOPIP 2 TA ,the job analysis and job description have been introduced as basic instrument that management has in the process of designing and implementing work processes . Therefore, managers have been encouraged to involve themselves along with HR representatives in the process of job design and job description. Management teams have been assisted in using a job analysis questionnaire. RACI methodology regarding segregation of responsibilities has been also introduced during the national or local seminar. As a result, job descriptions were reviewed and optimized. Clearer and more efficient communication and reporting lines (RACI, the “I” standing for Information) have been described.

7.7.3 Activities and results

Task analyses and preparation/revision/streamlining of job descriptions were initiated and taken up for two major purposes:
- Analysing personnel requirements for certain departments. Work processes were studied and analysed and, based on this, recommendations were made to improve effectiveness and efficiency. As part of it, some job re-design and revision of job descriptions took place.
- Preparations for performance appraisal. Proper job descriptions, pointing at the main tasks and responsibilities, are crucial in performance appraisal system. For selected departments, task analyses were conducted and job descriptions were streamlined.

The above mentioned activities were conducted in close co-operation with HR staff and line management of the selected departments (e.g. commercial department, network maintenance & repairs, HR department).

The institutional consultants within FOPIP2 TA provided on the job support to HR representatives and managers for job analysing and development of JD, with main focus on jobs within PIU and technical departments.

7.7.4 Results of task analyses – experience

FOPIP 1 results were as follows:

- Far better understanding and insight with line management regarding the core activities of the departments.
- Recommendations for improvement of effectiveness and efficiency: work processes, numbers of staff, management levels, work space arrangements and equipment.
- Better understanding of individual workers regarding the main tasks.
- Grievances and suggestions of staff come on the agenda; solutions can be sought for it, suggestions can be considered for implementation.
- Developed capacity with HR departments in conducting task analyses and preparing job descriptions.

A critical note with regard to job descriptions should be made here. It appears Romanian practice to include too much additional information in job descriptions for two main of reasons:

- Job descriptions are sometimes used in legal cases. In order to avoid eventual claims, companies include detailed information and instructions.
- External agencies, e.g. labour inspection, quality assurance, environmental inspections, demand details on safety, environmental and health practices to be included in the job descriptions.

This tradition and practice results in complex and unmanageable job descriptions that also easily become outdated. It would be far more recommendable to limit job descriptions to indeed the very key aspects (2 pages only) and refer where necessary to safety instructions, manuals, quality management systems etc. rather than including this information in the job description itself. Also, the demands from the external agencies should be challenged. Only where there is indeed a proper legal basis, these demands should be honoured.

The FOPIP 2 Consultants have conducted a pointed review of job descriptions and the analysis of job competencies and reporting lines, which revealed that the practice of including too much information was still in place, as well as the practice of charging only the HR representatives with the development of JD. Consequently, the provided support focused on agreeing a lighter structure for the JD and clear communication and reporting channels. Managers have been involved in the process and the HR department has been encouraged to coordinate and support with advice; further assistance were needed.

In the participating FOPIP 2 counties, there is now a clearer understanding of the role of the managers in the job description process. The rationale of the collaboration between HR department and the management of the ROC is understood in most of the companies included in FOPIP 2 TA. The concept of team work has been constantly clarified roles and responsibilities of the HR department and managers of the ROCs are segregated in most of the counties.

In FOPIP 2 we learned that job descriptions are an important concern of managers, HR specialists and staff because they are the basis of many HR and organisational processes.

The assistance focused on ensuring competences of staff for:

- Understanding what is the best structure of a job description avoiding frequent changes (sometimes generated by external recommendations);
- Understanding the meaning of the content and make it work for the HR;
- The consultant worked with the HR specialists - applying the principles in various cases and offered examples.

7.7.5 Follow-up

Companies should critically evaluate the quality of the job descriptions and improve these where deemed necessary.

The annual review of job descriptions should become a common practice for companies. The HR department and managers have to acquire the competence to use job descriptions effectively – that means reduce the administrative burden, identify exactly the need to review, write them concisely focusing on essentials.

7.7.6 Guidelines and manuals

7.7.6.1 Manual Job analyses and job descriptions (Appendix D4).

This document gives information on the relevance of task analyses, job design and job descriptions. It also provides a template for job analysis.

A Job Analysis Questionnaire has been provided to FOPIP2 ROCs and is also included in Appendix D.4.

A number of job descriptions models, procedures and guidelines as well as examples of relevant typical job descriptions for water companies have been provided - as a guide pack.

7.8 Performance appraisal systems

7.8.1 Assessment

Most ROCs do not use a comprehensive performance appraisal system (PAS). Existing PAS are mostly isolated activities, with little impact on other vital HR functions, such as training, remuneration, personnel planning).

After some discussions on HR management and associated instruments, all companies ROCs showed positive interest in PAS. Gradually, also the need to link PAS with other HR systems and measures was recognised by the ROCs and, with a varying degree, modern HR structures are being introduced. (Clearly most ROCs are being pre-occupied by and with the regionalization and incorporation efforts, but the PAS is a priority item in the Action Plans, amongst others, and will be implemented once the regionalization efforts have been completed.

7.8.2 Performance appraisal system – Main features

The main features of the performance appraisal system are as follows:
- Full support and commitment from top management
- Establish a proper and transparent procedure
- Start with a pilot; only thereafter scaling up. It will take time to implement it in full scale.
- Prepare/have good job descriptions for each job. These are
- Determine performance criteria for each job
- Determine general performance criteria for all employees
- Prepare, train and coach management in conducting performance appraisal
- Conduct performance appraisal
- Conduct feedback interview with employee (results, conclusions, recommended actions)

- Analyse results of departments, units and define actions
- Communicate, communicate and communicate with employees and management.

7.8.3 Activities and results

7.8.3.1 FOPIP 1

The water company of Neamt showed the first keen interest in jointly developing and implementing a performance appraisal system. It was therefore decided to implement a PAS in Neamt as a pilot and later on, based on the Neamt experience, disseminate PAS to other companies.

The pilot in Neamt was implemented during 2007 and evaluated early 2008. A number of experiences and lessons learned are briefly reported here:

- The PAS has resulted in far better insight and understanding of the activities of the organization units. Reviewing job descriptions and task analyses played a main role in this. Job holders as well as direct supervisors appreciated this exercise as it created much clarity about what is expected. Also, during the task analyses and reviewing of job descriptions plus discussion of the performance the relationships between job holders and supervisors was reported to have improved.
- Determining the criteria for performance evaluation is a serious job. The number of task related criteria should be between 5 – 7 items. The number of general criteria (applicable for all staff) should not exceed 3.
- Implementation of PAS is time consuming for both HR and management and should therefore not be taken lightly. However, once the system is properly functioning the organization gets far more grip on performance of staff and required performance improved measures.
- Implementation should follow a top-down pattern, in order to set the proper examples.

7.8.3.2 FOPIP 2

A number of FOPIP 2 counties have shown a keen interest in the introduction of a PAS and succeeded to take over the PAS development and implementation methodology. These are not only the most advanced ROCs, but also those that are establishing new institutions from scratch. The ROCs in between those two (most advanced and “new comers”) have been and are, to an extent, occupied with completion of regionalization. But, once regionalisation is completed, the experience of FOPIP 2 shows that these counties indeed embark of reform and are keen to introduce a PAS.

The pilot in HIDROPRAHOVA has effectively started in January 2010, with technical jobs for branches as target group. ACET Suceava, CUP DUNAREA Braila and AQUAVAS Vaslui completed the PAS development stage and are planning for the pilot implementation in the second semester of 2010.

CUP (Vrancea) has implemented the PAS within a target group that includes 17 jobs across the organization. First evaluation session is planned to take place during T3 2010. SC Compania de Apa (Olt) has introduced PAS for the members of PIU. 1st evaluation session id planed during T3 2010. ECOAQUA (Calarasi) has implemented PAS within the Commercial department. Evaluation sessions are planed during T2 2010

A positive aspect noticed during FOPIP 2 was the increasing interest of top management to use the Performance appraisal system more as a management tool to enhance overall organisational performance and to make decisions relevant to staff.

FOPIP 2 succeeded to provide customized assistance to each ROC according to their stage of using appraisal as well as interest and involvement of the top management, managers and hr department. The activities included

- Assessment of the current situation and effectiveness of the appraisal system (including questionnaires and criteria for assessment)
- Planning for HR department to manage the appraisal system review
- On the job training to design, review the appraisal system
- Assist consultation process with managers and key staff
- Analysis of comparative systems for an principles based decision
- Assistance for design of appraisal forms and procedures
- Share of experience among ROCs – which was highly appreciated by the participants.

7.8.4 Follow-up

Virtually all ROCs are interested in implementing a PAS. Further guidance is to be given through e.g. training (HR training) and assistance with initial implementation in the companies. A thorough analysis of the pilot stage should provide the basis for a favourable decision regarding the generalisation of PAS implementation.

The appraisal is a cycle process which in effective organisations is and has to be a continuous improvement process.

The FOPIP 2 consultants have agreed with the HR departments the next steps in the cycle as well as what means the continuous improvements.

The main aspect ensured by consultants was the capability of the HR departments to continue the process.

More opportunities to learn one from others experiences are highly appreciated by ROCs HR departments and top management.

7.8.5 Guidelines and manuals

7.8.5.1 Manual Performance Appraisal System. Appendix D5.

This manual describes the key features of a performance appraisal system. It assists the HR departments and management in implementing a performance appraisal system.

During the national seminars delivered under the FOPIP2 TA the following guidelines and instructions have been transferred to ROCs management teams, and will also be included in Appendix D.5:

- Performance appraisal guidelines for managers – describe the main features and principles of PAS and provide recommendations on organising and conducting the PA interview
- The Manager Preparation Form for PA.

During one to one concealing sessions the consultant has assisted the members of the management team to develop KPI for each job position included in the target group

FOPIP 2 has provided to ROCs practical tools for PAS elaboration and review including

- Overall process planning for PAS elaboration and review
- Guide how to customize a PAS to own needs

- Step by step approach to elaboration and review with participation of key stakeholders
- Methodology for consultation of staff./ managers including the assessment of satisfaction of staff
- Methodology for implementation\
- Procedures for appraisal
- Training kit for appraisal.

7.9 Staff training

7.9.1 Assessment

Most ROCs employ, to a varying degree, a functioning training cycle management system. Institutionalised and therefore periodic trainings needs analysis, however, had to be introduced and is implemented by the participating FOPIP 2 ROCs. It was noted that management – notably middle and lower levels - appears to have a rather passive attitude concerning trainings and would participate in trainings only when courses were offered. Most training events concerned job health and safety. This training is often prescribed by law or part of certification of workers.

A number of ROCs co-finance trainings and education of their staff as part of the collective labour agreement. These trainings were often of educative nature and are based on the specific employee's wish rather than job-oriented training based on a training needs assessment or in view of career development and in the joint interest of employee and company.

Some other ROCs are well-aware of certain training needs, but are unable to define or implement proper training measures.

A small number of ROCS maintained proper documentation of the training activities. This is then usually part of the quality management system.

7.9.2 Active training system – recommendations

The interventions of FOPIP 2 are detailed in the specific Action Plans. As a first step, a seminar was dedicated to raise awareness amongst senior management and modern management methods were being proposed. Part of those is performance appraisal and performance related remuneration, which in turn requires dedicated job descriptions and target setting (and appraisal). For this, staff needs certain qualifications and, as in any modern organization, requires constant review, retraining, additional qualifications, etc. this is appraised by a periodic trainings need analysis (TNA) and a responding trainings plan. This TNA and trainings planning are not one-off measures but imminent features of modern management systems.

The following methodology has been introduced:

- Performance appraisals
- Conduct systematic training needs assessment
- Training planning (strategic training plan 2- 3 years; yearly training plan, with a budget)
- Implementation (organizing, facilitating)
- Co-financing and stimulating training requests from employees
- Reporting and documentation of training activities
- Training results evaluation.

7.9.3 Activities and results

Comprehensive TNAs were conducted in (most of) the FOPIP 2 ROCs, where senior staff was invited to fill in questionnaires after the end of dedicated workshops. These were analysed and returned to the ROCs for further action and implementation, which has been provided on a one-to-one consulting basis. HR Professionals and managers were also assisted in performing TNA for PIU members, finalized with dedicated training plans.

7.9.4 Follow-up

- Further assistance in the introduction of TNA should be provided to the less advanced ROCs. This should preferably be linked to other HR instruments.
- At a national level, it is advisable to collect information and provide assistance in dissemination information about suitable training agencies and possibilities. ARA may play a role in collecting and dissemination of this kind of information.

7.9.5 Guidelines and manuals

7.9.5.1 Manual Training needs analysis and training planning (Appendix D6).

This manual can be used for training needs analyses and training planning. It describes different types of training interventions and provides a structured way to conduct training needs assessments and arriving at a training plan.

A TNA questionnaire for managers has been transferred to ROCs under FOPIP 2, together with a check-list for the development of a training program and models for training evaluation, and it has been included in this appendix (Appendix D.6)

The manuals and guidelines in the training area provided and transferred to HR departments during FOPIP2 covered TNA training planning evaluation of training.

The assistance focused on qualitative aspects - in order to make training more effective in these days when training budgets were cut and the workload is more and more demanding on key staff.

A comprehensive guide for Training procedure was prepared and introduced in a training course

A competency framework for managers as well as a guide for management development

Guidelines for software HR records including competencies (qualifications) linked with performance appraisal and training.

7.10 Career management and development

7.10.1 Concept

Career development (CD) process comprise of two overlapping purpose and interests:

- For the employee it means: development of the capacities, with the aim of increased job satisfaction and an increase in the career prospectus.
- For the ROC it means increase the level of qualified and motivated work force and most importantly, keep qualified staff.

Career Development implies responsibilities for both the water company and the employee.

The company can offer opportunities, but the employee has to appreciate and make use of those.

CD in a water utility is, as a concept, slightly more complex than it is in other commercial companies. This is because of the defined functional nature of a water utility, where innovation is introduced externally and the internal structures and HR have clearly defined roles and responsibilities. A water utility must, at any time, provide its services and this its the primary aim of the water utility. Innovations from "within", of technical nature, of institutional, managerial or financial nature are perhaps less prominent than are external reform, advice and assistance.

This is why water utilities should utilize and make room for innovations to the maximum extent possible and offer career development prospectus to those who actively work towards enhancing their career.

CD does not require a separate set of instruments. CD can be implemented with a common set of modern HR instruments and giving due attention to the career issues and perspectives.

To give shape to career management the key recommendations for the water company are stated below.

7.10.2 Main recommendations for the ROCs to implement attractive career development prospectus

1. Implement a good Performance Appraisal system, including feedback interviews.
2. Have good and current job descriptions available and accessible for your employees. These job descriptions are indispensable as those define job requirements and are thus the basis for further career development.
3. Have good personnel management plans. Personnel management and recruitment plans provide clarity as to the number and qualities of staff and potential career development for the immediate future.
4. Introduction of performance related remuneration.
5. Active and stimulating role of direct supervisors. Supervisors should facilitate development of their employees. Proper appraisal, spotting development opportunities and demanding implementation of newly trained skills and knowledge are crucial.
6. Conducting of TNA and operation of a professional trainings implementation plan. Make regular training needs assessments and participating in trainings is part of the performance appraisal.
7. Have a clear succession plan and well defined career paths
8. Have a professional, capable and active HR function.

7.10.3 Activities and results

The activities and support of FOPIP focused on the various instruments that contribute to career management.

The management TNA questionnaire was applied for the management team of all the ROCS subject to FOPIP 2 TA. Results were concluded in a Management Development Plan that is monitored by the HR Department. In addition to this following to specific assistance offered for HR Department a frame work for a training and development data base was developed together with the members of HR department and management team. Members of the HR Department have been trained and encouraged to update constantly the content of the data base.

7.10.4 Guidelines and manuals

7.10.4.1 Guideline Career Development (Appendix D8)

During FOPIP 1 it was prepared a guide for Career Development including: best practices, strategic factors; analysing the labour need and the demand, integration with the recruitment, performance appraisal, rewarding and training, the career management process and policy.

7.11 Transferring and integrating staff in the ROC

7.11.1 Assessment

As part of the regionalization processes, staff of 'incoming' operators is to become staff of the ROC. This transfer and integration of staff in the ROC has two distinct aspects:

- Job security and labour contracts
- Integration in the work force.

7.11.2 Job security and labour contracts

Job security and the contractual aspects of transfer and integration of staff in the ROC appeared hardly a crucial issue in the whole regionalisation process. This was somewhat a surprise for Consultants.

> ***Job security and labour contracts appeared for most companies not a stumbling block in integration.***

The transfer and integration issue on this topic was simplified as result of the following aspects:

- The integration of local operators was usually done on the condition of transfer of existing staff to the new operator. In some cases, the transfer also guarantees no lay-offs during a period of one year.
- Often, the local operators and particularly the smaller ones have experienced difficulties in covering the operational cost. In order to cut costs some local operators show low staffing and low salary levels. Further, it has resulted in departure of qualified staff with little inflow of young new recruits. The remaining – often ageing – staff therefore perceives the integration as a change to combat deterioration and see it as an improvement of their personal situation rather than a threat.
- Transfer of staff and entering into a new collective and individual labour contract is not unusual in Romania; Matters of pensions and social insurance are more state-organised. Therefore, it makes little difference for which organization one works.

Consequently and somehow surprisingly, the integration of staff under the ROCs is and has been less complicated than originally anticipated.

7.11.3 Integration in the work force

Integration of the work force appears far more an issue for the ROCs and HR management:

- The staff to be transferred may not have the necessary qualifications. Often, the 'incoming' operators' poor financial performance has not stimulated attracting and developing the right personnel. Knowledge and skills of staff may be obsolete. In some cases the incoming operator managed to keep 'its best staff' and transferred it to the ROC; in other cases 'good staff' has remained in the local council's administration.
- Staff of the incoming operators have worked under different HR systems or – in some cases – in virtual absence of HR systems. That requires a substantial effort in upgrading of the ROC's HR function.

7.11.3.1 Integration of work force – main concerns

- Qualification of staff
- Implementation of HR systems for all participating operators
- Culture and mindsets.

7.11.4 Follow up

With regard to HR, efforts for the ROC have to be focused on:

- Developing and integrating HR systems for all the operators
- Personnel planning, in order to make best use of human resources available within the whole operator. This includes eventual transfers from one local operator to another or between regional functions and operators.
- When possible, determine reasonable 'entry level qualifications' for staff of 'incoming operators'. These qualifications may assist the ROC to receive reasonably qualified staff from the incoming operator.
- Dealing with eventual cultural differences (e.g. management style and communication) between the various operators
- ROCs should be pro-active and provide advice and support to the "incoming" operator on a variety of HR topics (job descriptions, training, personnel planning, and recruitments). The ROC may consider seconding expert staff to the newcomer to prepare for and smooth the transfer.

7.11.5 ROCs HR activities in integration

- Integrating and implementation of HR systems and practices
- Personnel planning
- Pro-active support and advice, even before actual integration.

7.12 Outsourcing

7.12.1 Assessment

Outsourcing is seen as disposing and transferring activities of the company to private sector agencies. Outsourcing is considered to offer possibilities to improve effectiveness and efficiency of the water companies because the water company should focus on its core and value adding activities.

Under the FOPIP 2 technical assistance, comprehensive guidance was provided regarding outsourcing potential. The core services must be provided by the ROC, because of the "essential part of the services" criterion of the in-house rules. The outsourcing potential depends on a number of factors and on the specific situation of a ROC. These could be:

- Geographic considerations, for example if a ROC has an abundance of water sources;
- Political situation of a ROC, if, for example, politicians wish a comprehensive or a slim water services provider;
- The market situation, are there alternatives in the region;

- Financial considerations, can a ROC afford to pay an external services provider;
- Regulatory considerations, how can service delivery be ensured?

Outsourcing

Outsourcing may help water companies to focus on its core and value adding activities.

The extent to which ROCs consider outsourcing differs. On the one hand, SC Apa Canal 2000 (Pitesti) has outsourced its network maintenance and repair activities nearly completely to private sector contractors. Only a small repair team for urgencies is still on the payroll of the company. It has also outsourced its transport activities nearly completely.

However, further practical steps in studying possibilities or implementing it meets often a number of constraints:
- A certain reluctance to give up direct control of activities in the company. As a consequence, often only non-core and not critical activities are considered (e.g. security, gardening, and maintenance of buildings, etc.).
- Limited information on effectiveness and efficiency of the water company's activities. Management information and management quality is yet to be fully developed. That makes proper assessment of the potential gains of outsourcing difficult.
- Resistance with regard to the idea of reducing staff numbers.
- Non-availability (or perception of this) of qualified external contractors. It appears that apart from the obvious services like security, there is insufficient market information about potential providers of services. Also, providers may be sought outside the known environment of the water companies (e.g. nationally rather than locally).
- Water companies are missing the managerial capacity to conduct a proper analysis of outsourcing possibilities (cost of activities, benefits, management arrangements).

7.12.2 Activities and results

Staffing levels, manpower efficiency and eventual possibilities for outsourcing were discussed with a couple of water companies.

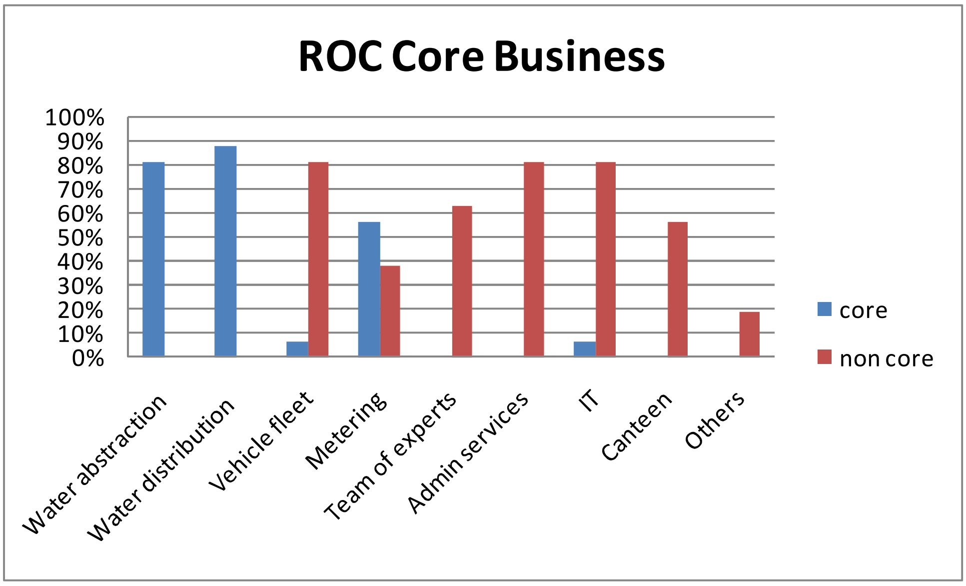
A manual describing background, considerations and possibilities for outsourcing was developed. This manual can be used for feasibility studies on outsourcing with individual companies.

Under FOPIP 2 a comprehensive outsourcing methodology was introduced and executed. The findings are as shown below.

In a first step, the core business had to be defined, since the core business cannot be outsourced; the study only concerns the water supply side (wastewater was not included into the methodology).

The sectors discussed with the ROCs were selected not on a comprehensive basis, but on a selective basis, to highlight and demonstrate potential. The sectors were:
- Water abstraction (and treatment);
- Waster distribution (and supply);
- Meter reading (including billing and collection);

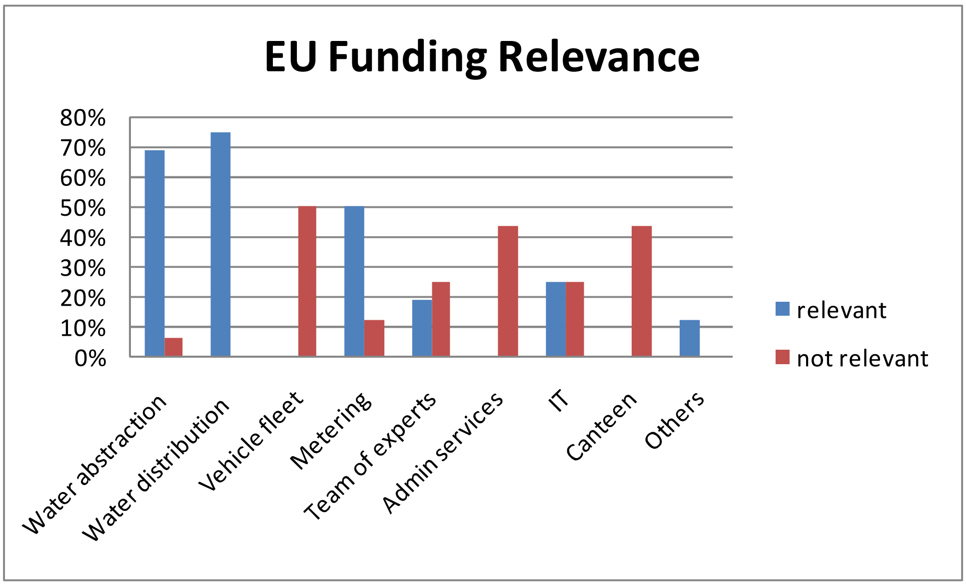
- Vehicle Fleet management, maintenance;
- Team of Experts (highly qualified engineers that are needed but not all the time, the idea was that these highly qualified experts could provide the services to more than one ROC and possibly offer consulting abroad);
- Certain administrative services (such as secretarial work, etc);
- IT services;
- Canteen and
- Others.



The graph shows that most ROCs see the water core business as water abstraction and distribution and directly related services such as metering are seen as core business. This demonstrates that the ROCs have a good understanding of the core business and where outsourcing can take place in line with the in-house requirements.

It is interesting to see the split on the metering side, nearly 40% of the ROCs do not see metering as a core business. It also shows that the vehicle fleet, IT and canteen business are not seen as essential, but almost all ROCs have these functions (apart from a few exceptions regarding IT).

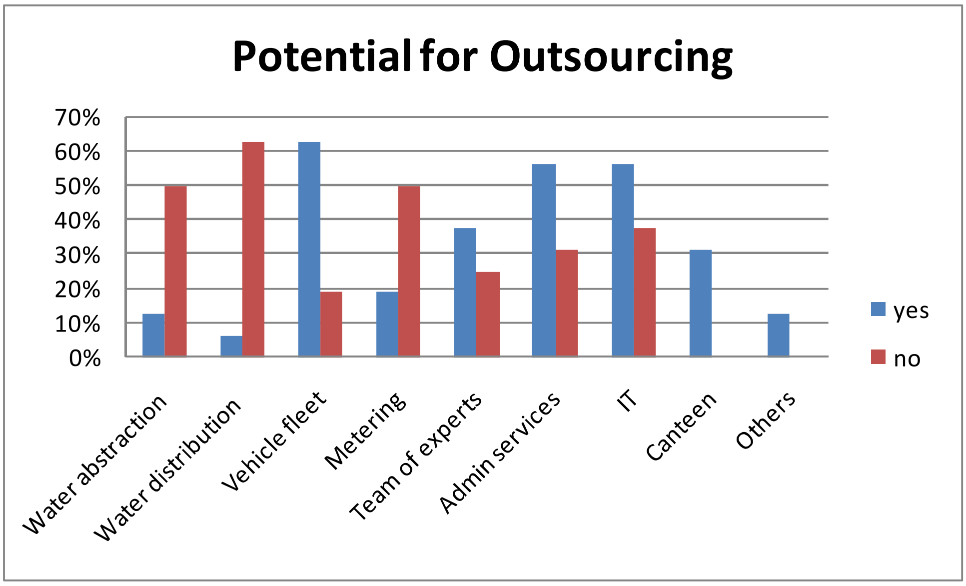
The next graph shows if and to which extent the ROCs believe that EU funding is relevant to the sectors.



Again, the ROCs have quite rightly decided that the water abstraction and distribution side is relevant and have (graph above) therefore decided that those be core business. Counter to the graph on the core business, metering is seen as being relevant to EU funding.

The final graph shows the concrete potential for outsourcing, as seen by the ROCs.

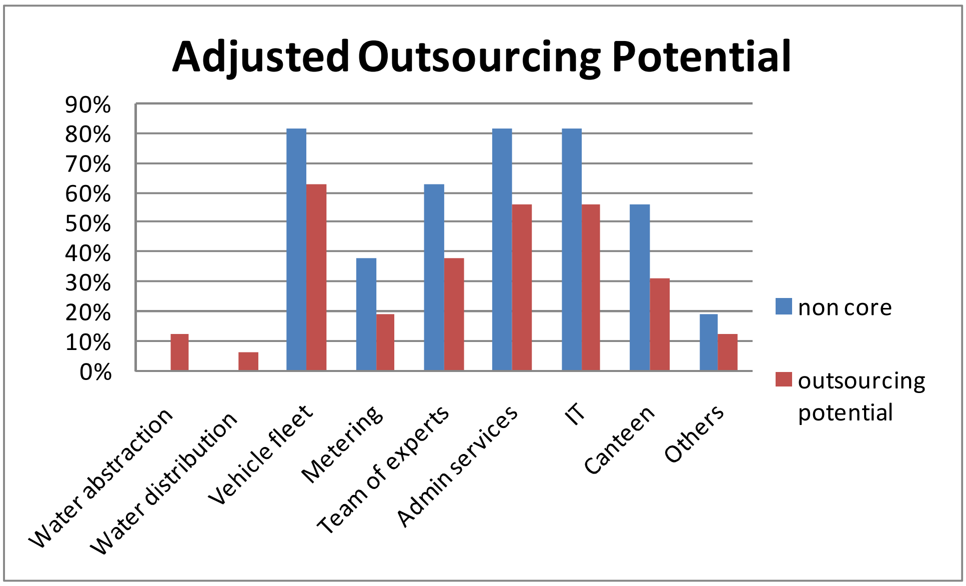
Figure 7.10: Potential for Outsourcing - ROCs' perspective



The trend is that core business and / or business relevant for EU funding should be kept under the ROC. This is a correct outcome, as these sectors (core) must be assumed by the ROC and can therefore not be subjected to any outsourcing considerations.

The non core sectors, whilst the ROCs see quite clearly that these may not be a core service, only half the ROCs consider outsourcing as a service delivery option.

Figure 7.11: Adjusted outsourcing potential



This graph shows that the ROCs opinion and willingness to consider outsourcing as a service delivery alternative increases with the view of a specific sector being a non-core activity of a ROC. This concerns mainly IT and, somewhat surprisingly the vehicle fleet management and maintenance to a larger extent as does IT and the canteen business.

7.12.3 Follow-up

With interested individual companies, feasibility studies may be implemented.

7.12.4 Guidelines and manuals

7.12.4.1 Manual Outsourcing (Appendix D7)

This manual presents a background on outsourcing (e.g. reasons and considerations), a process with different steps in the outsourcing study and contracting process and a listing of possibilities for outsourcing. Management can use this manual to get a better and broader understanding about the key aspects for outsourcing.

Under FOPIP 2 an Outsourcing set of instructions has been developed and transferred to ROCs management teams (Appendix D.7))

ROCs will be in the next years in the situation to decide on outsourcing of specific activities for which it was not made a decision, In addition to the guide provided and the training when competences were built there are examples of analysis which are easy to be followed.

The guide prepared for outsourcing is a very practical tool to be applied in varied situations

Examples resulted in the workshops (delivered in October 2009) as well as on the job training in some ROCs are additional guides for applying the methodology in an effective manner.

8. Technical and operational management

8.1 Introduction

This Chapter of the Manual presents information on a selection of major topics relevant for to the management of the technical and operational functions of Romanian water companies that have participated in the FOPIP projects – and other organisations involved in the development of the municipal water and wastewater sectors in Romania. The main topics included in this Chapter include:

- Asset management (Sub-section 8.2)
- Approaches for reduction and control of NRW (Sub-section 8.3)
- Water quality monitoring (Sub-section 8.4)
- Levels of Service and Standards of Service (Sub-section 8.5).
- Operation and maintenance (Sub-section 8.6).
- Energy management (Sub-section 8.7).

Further information guides, examples of previous experience and several outline strategies on relating to these topics can be found in a series of appendices.

8.2 Asset management

8.2.1 Introduction

Drinking water and wastewater utilities need to make investments to:

- upgrade ageing and deteriorated mechanical and electrical equipment, vehicles, and infrastructure, including underground pipelines, treatment, laboratories, storage facilities, workshops, buildings, etc.
- meet new regulatory requirements
- serve a growing population
- improve security.

Many utilities have not been generating enough revenues from user charges and other local sources to cover their full cost of service. As a result, utilities have deferred maintenance and postponed needed capital improvements.

To address these problems and help ensure that utilities can manage their needs cost-effectively, comprehensive asset management is needed.

ROCs have an imposing and valuable portfolio of assets, mainly underground in the form of water pipelines and sewers, which urgently require considerable investment both for expansion of the service area and for maintenance and replacement of existing assets. The management of this infrastructure is by any standard big business. The future challenge calls for changes in managing the water and wastewater assets by adopting a more "businesslike" approach where customers' needs are considered and agreed Standards of Service are achieved on a sustainable basis in the long-term.

ROCs are faced with the substantial challenges of having to simultaneously:

- Manage the expansion of water supply and wastewater systems to increase the coverage rate of these services
- Provide for the urgent rehabilitation and replacement of the ageing assets

- Upgrade of their facilities to comply with the current and future drinking water and effluent standards contained in the Water and Wastewater Directives.

If these challenges are to be taken up and met within a reasonable timeframe, the municipal enterprises need adopt modern management methods and procedures that will break the vicious cycle of lack of funding and deteriorating operational effectiveness. Without such changes, the present unacceptable service levels will decline further and customers will start to withhold payment for the services, and the image of ROCs will decline further. The unacceptable situation of a total collapse of the water supply function could result in the not too distant future which would endanger the public health of the population.

To avoid further deterioration, funds must be secured and allocated to not only increase coverage, but also to rehabilitate the assets that are in a state of emergency. Costs for implementing improvements of the facilities would be on top of the rehabilitation costs. More accurate and detailed assessment of the state of repair and performance of the facilities is required to achieve effective forward planning and to justify investment priorities.

Asset management and long-term forward planning are essential for efficient maintenance and effective development of the water and wastewater infrastructure.

Comprehensive asset management involves the systematic collection of data and the application of analytical tools such as life-cycle cost analysis and risk assessment.

Asset management is a continuous process that guides the acquisition, use, and disposal of infrastructure assets to optimize service delivery and minimize costs over the asset's entire life.

8.2.2 Why 'asset management'?

Knowing the condition of assets, and knowing where to prioritize rehabilitation and replacement spending helps utilities preserve assets, maintain reliable service, and understand long-term financial needs.

Asset management contributes to rational capital investment and asset improvement plans that will be supported by the public, elected officials and regulatory bodies.

Asset management is a way to target the points in the system where spending is crucial to manage risks associated with potential asset failures – thereby optimizing spending needed to keep the system working reliably and customers satisfied.

Data collected, analyzed and shared through an asset management approach can be used by the ROC to:
- make better informed decisions on maintaining, rehabilitating, and replacing assets giving the potential to make operations and maintenance more efficient
- to communicate more clearly with their ADI, other external control bodies and the public, giving the potential to strengthen the justifications for changes to O&M management methods, investment plans and tariff adjustments

There are many positive benefits of asset management. Systems that fully embrace asset management principles may achieve many or all of these benefits. However, systems may achieve some of these benefits just by starting asset management. The benefits of asset management include, but are not limited to, the following:

- better operational decisions
- improved emergency responses
- greater ability to plan and pay for future repairs and replacements
- increased knowledge of the location of the assets
- increased knowledge of what assets are critical to the utility and which ones are not critical
- more efficient operation
- better communication with ADI, other control bodies and customers
- tariff rates based on sound operational information
- increased acceptance of tariff rates
- capital improvement projects that meet the true needs of the system.

Using asset management concepts, utilities and other organizations responsible for managing capital infrastructure can minimize the total cost of designing, acquiring, operating, maintaining, replacing, and disposing of capital assets over their useful lives, while achieving desired service levels.

Collecting, sharing, and analyzing data on capital assets allows ROCs to make more informed decisions about how best to manage the assets. In particular, utilities use the information they collect to allocate their maintenance resources more effectively and to make better decisions about whether to rehabilitate or replace aging assets.

These improvements help utility managers reduce duplication of effort and improve the allocation of staff time and other resources.

8.2.3 Main challenges in asset management

The main challenges for asset management include:

- gathering and integrating complete and accurate data will require significant resources to determine the physical and operational condition of current assets and the need for future investment
- managing the information efficiently can be difficult when existing data are incomplete and inaccurate, the data comes from several localities, multiple departments and presently might be maintained using different and incompatible systems e.g. software programs
- successful implementation requires cultural change, departments long accustomed to working independently must be willing to coordinate and share information
- utilities may find that their efforts to focus on long-term planning conflict with their short-term priorities.

The above mentioned challenges can be expressed as asset management tasks that should be undertaken by ROCs:

- Collecting and organizing detailed information on assets. Collecting basic information about capital assets helps the ROC's O&M personnel to identify and understand more comprehensively their infrastructure and to make informed decisions about the assets. Information on an organization's existing assets generally should include:
  - descriptive information about the assets, including their purpose (duty requirements), age, size, construction materials, location, and installation date;
  - an assessment of the assets' physical and operational condition, along with key information on operating, maintenance, and repair history, and the assets' expected and remaining useful life;
  - information on the assets' value, including historical cost, depreciated value, and replacement cost.

- Analyzing data to set priorities and make better decisions about assets. Under asset management, managers apply analytical techniques to identify significant patterns or trends in the data they have collected on capital assets; help assess risks and set priorities; and optimize decisions on maintenance, repair, and replacement of the assets. For example:
  - Life-cycle cost analysis. Managers analyze life-cycle costs to decide which assets to buy, considering total costs over an asset's life, not just the initial purchase price. Thus, when evaluating investment alternatives, managers also consider differences in installation cost, operating efficiency, frequency of maintenance and repairs, and other factors to get whole-life picture of asset costs.
  - Risk/criticality assessment. Managers use risk assessment to determine how critical the assets are to their operations, considering both the likelihood that an asset will fail and the consequences—in terms of costs and impact on the organization's desired level of service—if the asset does fail. Based on this analysis, managers set priorities and target their resources accordingly.
- Integrating data and decision making across the organization. Managers ensure that the information collected within an organization is consistent and organized so that it is accessible to the people who need it. Among other things, the organization's databases should be fully integrated; for instance, financial and engineering data should be compatible, and each asset needs to have a unique identifier that is used throughout the organization. Regarding decision making, all appropriate units within an organization should participate in key decisions to help ensure that all relevant information gets considered and to encourage managers to take an organization-wide view when setting goals and priorities.
- Linking strategy for addressing infrastructure needs to service goals, operating budgets, and capital improvement plans. An organization's goals for its desired level of service—in terms of product quality standards, frequency of service disruptions, customer response time, or other measures—are major considerations in the organization's strategy for managing its assets. As managers identify and rank their infrastructure needs, they determine the types and amount of investments needed to meet the service goals. Decisions on asset maintenance, rehabilitation, and replacement are, in turn, linked to the organization's short- and long-term financial needs and are reflected in the operating budget and capital improvement plan, as appropriate.

Implementing the basic elements of asset management is an iterative process that individual organizations may begin at different points. Within the water industry, for example, some utilities may start out by identifying their infrastructure needs, while other utilities may take their first step by setting goals for the level of service they want to provide. The interrelationship between the elements of asset management can alter an organization's strategy for managing its assets. For example, once an organization has completed a risk assessment, it may scale back its efforts to compile a complete, detailed inventory of assets to focus initially on those assets that are associated with the main risks e.g. systems or equipment where failure would (a) create risk of death or injury to the public or ROC personnel (b) seriously and adversely impact the operator's ability to maintain services to customers, (c) result in high repair or replacement costs (d) etc.

8.2.4 Current Situation

In ISPA - FOPIP towns, asset information is held in several locations, both with the Operator and the asset owners, the individual Municipalities and the County Council. The information is also distributed in several departments within the same institution. For example:

- Finance
  - an asset inventory is used for the valuation of assets and for depreciation calculations for the annual accounts
- Operations

- water databases used to hold “water pumped” and pump data
- wastewater databases and map base, holds maintenance and repair event data
- mechanical and electrical planned maintenance system
- pipe work repair and capital works database
- municipalities and county council
- engineering services record drawings and digital maps
- pipeline record drawings.

The datasets are not complete and there is little compatibility between the systems. Not all of the data is held electronically.

For most of the ROCs, the current maintenance procedures are only applied to keep the main components of the system (water supply or wastewater) functioning. There are no planned and sometimes not even clear maintenance procedures, only servicing rules being set in place.

Asset management is not a common practice, as such routine maintenance plans, renewal strategies and capital works programs are not developed and used in most of the ROCs.

More details on the ROCs existing asset data bases in the light of the need for the restructuring process are presented in Appendix E1.

8.2.5 Requirements

Asset Management requires utilities to collect complete and accurate data; therefore, the utility should assess:

- condition of their existing data
- ability to coordinate existing data across departments
- need to upgrade technology
- ability to sustain complete and accurate data

The first step in the process is asset identification. Asset identification is the process of identifying and numbering the primary components in the system. Assets can be grouped by type, functional characteristics, location, etc.

Once the components are assigned unique identifiers, the utility can link information systems and aggregate data for financial, economic, technical and management use.

Identification begins with architectural or engineering maps and as-built construction or repair records, which may exist in paper or electronic format. Information from these records should be transferred to a database, such as a spreadsheet, relational database, or asset management software program. Each component record includes fields for relevant information.

By ownership status, the Delegation Contract for FOPIP / ISPA – General Provisions section identifies three types of assets: Own Assets, Return Assets, Take-Back Assets (see text box below).

The second step in the process is compiling an asset inventory – i.e. a database containing information about:

- age, condition, and location of the assets
- asset size and/or capacity

- valuation data (e.g., original and replacement cost)
- installation date and expected service life
- maintenance and performance history (e.g. frequency and date of repairs, rate of replacement, rate of extension, no. of complaints and time of response, etc.);
- construction materials and recommended maintenance practices.

Provisions in the Template Delegation Contract on type of assets:
Provisions in the FOPIP / ISPA Delegation Contract – General Provisions, on the type of assets

- **Own Assets** are mainly, and without limitation, made up of certain buildings used as offices or accommodation which, due to their location or arrangement, are not essential to the continuing provision of Granted Services on termination of the Delegation Contract and, if the case arises, of non-specialised motor vehicles, office equipment and furniture and non-specialised software (Art. 14.2)

- **Return Assets** consist in the assets of the Granting Authority, which are afferent and necessary for providing the Services, which exist and are granted to the Concessionaire or which shall be built and shall be granted to the Concessionaire for the duration of the Delegation Contract (Art. 7.1).
  Return Assets include the assets within the Concession Area, either existing, or to be built or incorporated later to the public domain. (Art.7.2):
  - the lands granted / purchased by the Concessionaire, belonging to the public domain and supporting the buildings and the installations/networks afferent to the drinkable water supply and wastewater public services and other lands which are strictly necessary for the operation of equipments and works
  - the equipments and works granted to the Concessionaire or built and financed by the Concessionaire for the production and supply of drinkable water (boreholes and draw-off-points, transmission pipelines, treatment plants, reservoirs, pumping stations and distribution systems, flow measurement and metering equipment, and all other associated devices and installations) and for wastewater collection and treatment (collection systems, pumping stations, pump mains, treatment plants and discharge constructions, flow measuring devices, and all other associated devices and installations)
  - the public buildings used as workshops, laboratories, offices, warehouses or accommodation, which are part of the Granted Services to the Concessionaire.

  Return Assets can be *Renewable* and *Non-Renewable*.

Optional Take-Back Assets are fixed assets, real estate and movables, purchased or built by the Concessionaire for the sole purpose of providing the Granted Services, except for assets mentioned in Art.7.1.2

The introduction of an effective asset management for the water and wastewater systems will require the following:

- Development of an asset inventory that will hold relevant asset data including; size of units, design capacity, throughput and also condition and performance assessments.
- Development of asset valuations that will be compatible with the requirements of the Financial Accounting systems.
- Development of asset condition and performance grading criteria.
- The making of condition and performance assessments of the operational assets. It is important that the system operators and managers, who know and understand the history of the operational systems, will play the major part in this process.
- Development of asset “Criticality” criteria, which will be used to identify the importance of the individual asset to the operation of the Operator.
- Development and monitoring of Operational Performance Indicators [OPI`s] and to understand the reasons and factors affecting performance.

- Development of investment strategies that can be used the identify investment needed.

Data collection is a continuous process and utilities need to remain consistent in gathering data and updating their central asset inventory as they repair, replace, add or de-commission infrastructure. Regular updating ensures that the information remains useful over time.

8.2.6 Key elements of asset management

- Level of service
  - a basic level of service can be defined as reliable services, delivered at a minimum cost, consistent with applicable environmental and health regulations
- Performance goals
  - and related performance measurements, i.e. specific measures designed to assess whether level of service objectives are being met
- Asset identification and valuation
  - process of identifying and assigning unique identifiers to the primary components in the system
  - once the components are assigned, the date can be aggregated and linked for financial, economic, technical and management use
  - identification begins with architectural or engineering maps and construction or repair records; information is then further transferred to a database (spreadsheet, relational database, or asset management software programme)
- Condition and performance assessment
  - above ground assets (wellfields, reservoirs, pumping stations, etc) - using dedicated Asset Condition Grading Templates
  - underground assets (transmission mains, distribution mains and the sewerage systems) - subjective assessment based on the analysis of the repair and capital repair information held in the operational repair databases. The opportunity should also be taken to make condition assessments when network repairs are carried out
- Information system
  - designed as to include some or all of:
    - up-to-date system maps
    - data related to capacity assessment studies, inspections
    - inventory of assets, including age, capacity, major construction materials, historical cost, condition and performance
    - information related to identified structural and non-structural defects, including type of defect, severity, location, and date of discovery
    - records of routine preventive operation and maintenance activities, including type of activity, location, date, and labour, material, and equipment costs
    - inventory of maintenance facilities and equipment, including replacement parts
    - results of inspections and tests for new or rehabilitated system components
    - schedules and budgets for routine operations and maintenance activities and planned rehabilitation and replacement projects
- Rehabilitation and replacement planning
  - goal - to find the point in the asset's life cycle where the cost of replacement is balanced against the accelerating cost to maintain it with a declining level of service
- Maintenance analysis and planning

  - goal - to improve system performance and preserve asset condition as long as possible;
  - effective planning = target maintenance activities to meet the goal and minimize costly emergencies
    - Criticality criteria should be developed in order to identify the importance of the individual asset to the operation of a ROC
    - OPI’s should be developed and monitored to understand the reasons and factors effecting the performance
    - Maintenance, rehabilitation and replacement should be based on Criticality criteria, condition assessment and OPI’s
- Financial management
  - financial forecasting over a long term period, annually updated
  - annual estimate of the cost to maintain the system
  - support data :
    - asset identification and valuation
    - condition and performance assessment
    - performance monitoring
    - current and future capacity assessments.
- Continuous improvement
  - periodic review of systems against performance measures to identify any shortfalls
  - performance measures can be related to level of service goals, condition maintenance goals, or asset management system goals.

These elements should be implemented by everyone in the organization, involving management, financial, engineering, administration, and field staff.

8.2.7 Asset Management Process

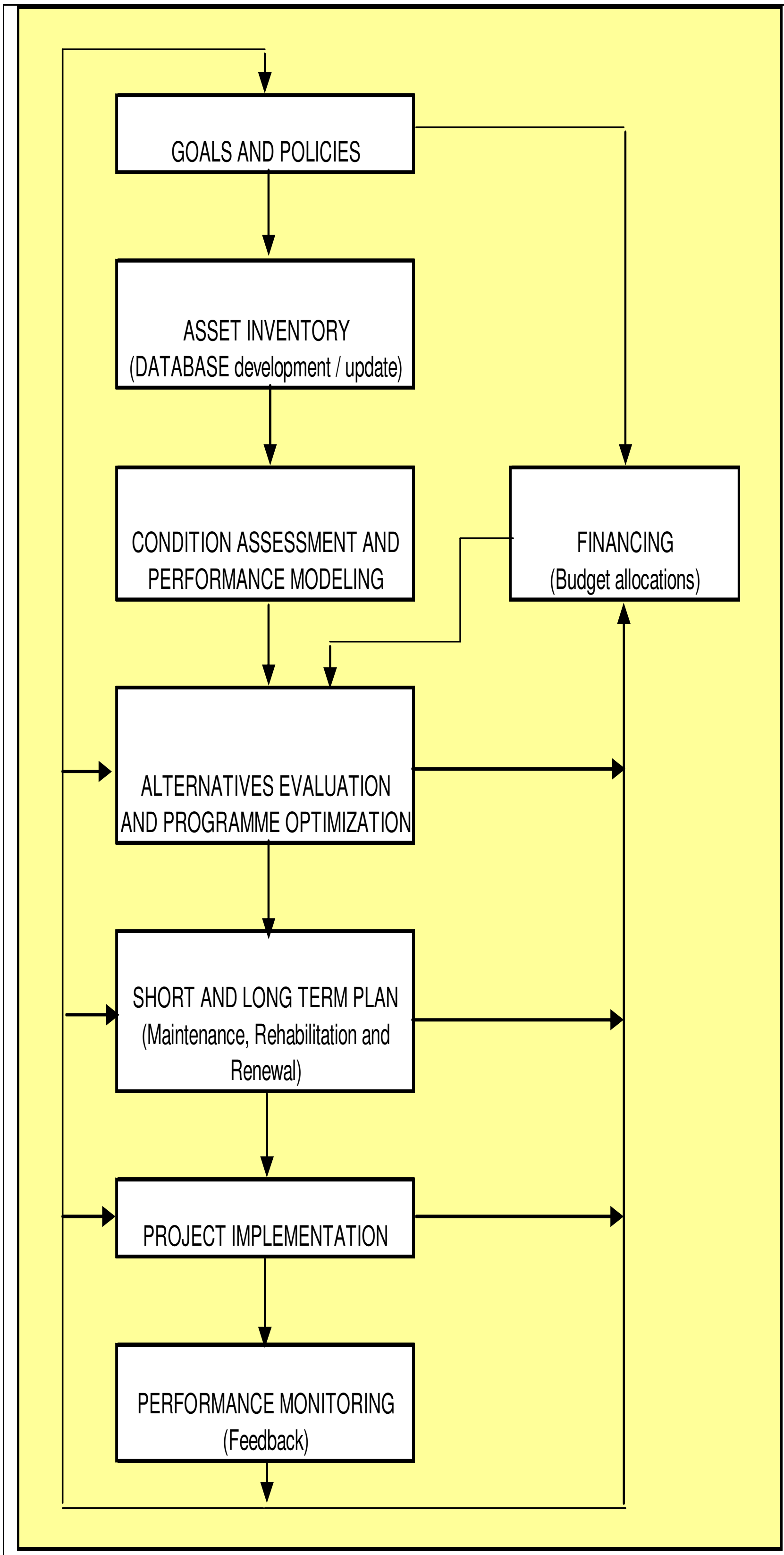
Asset Management’s primary function is to enable a utility to manage its infrastructure assets. This requires an accurate understanding of what assets the utility has, their condition, their relative importance to the reliable provision of services, risks in the event of asset functional failure, and replacement value. It also requires an understanding of what business practices associated with asset management can be continuously improved, what the priorities and risks are, what improvements need to be made to optimize the use and extend the life of the assets, and how to fund the assets’ maintenance, refurbishment, and replacement most effectively.

The asset management process includes periodic audits of all process elements to achieve at least the following five objectives:
- meet utility-wide goals
- reduce and anticipate asset-related costs
- meet required service levels
- conduct asset-related procedures as planned, and
- update and improve asset plans properly.

Steps and key issues for a generic asset management process are shown in Figure 8-1.

Figure 8.1: Key steps and issues in a generic Assets Management Process

A GENERIC ASSET MANAGEMENT PROCESS	
Steps	**Key issues**



- What are our goals and policies?
- What is included in the asset database? How is the database organized?
- What is data accuracy and validity?
- What is the value of the assets? What are their specific functions? What services do they provide? What type of service is each asset providing / contributing to provide?
- What data is missing / needs to be actualized / needs to be reorganized?
- How is data organized? - Type of support, storage, collection and distribution methods; How often is it updated?
- What resources are available? What is the budget level? What is the projected level of future funding?
- What is the current and historical status and performance of assets? What are the estimates (condition and performance) for the future?
- How can we maintain, preserve or improve our assets to ensure the maximum useful life while providing acceptable service levels?
- What investment options may be identified by asset category? What are the associated costs and benefits of these options?
- What option or combination of options is the optimal one?
- What are the consequences of not properly maintaining the assets?
- How can the information on the impact of the condition and performance of assets be communicated to the end user?
- How can we best manage our assets for ensuring the least inconvenience to the end user when repairing and replacing the assets?

	• How do we monitor the impact of implementation? How do we adjust the decision making framework when and if necessary?

8.2.8 Interfaces

To the extent possible, the operator should use specialized asset management software or extend its information system with an asset management component for managing its assets.

The asset management component (software) should include the asset inventory and should integrate the condition, criticality and performance of assets.

The software used for asset management should calculate the remaining useful life and costs for repair and replacement of each component (by locality, process, zone, basin, date of installation / commissioning, dates (past and predicted) of repairs, replacements, etc.). When used in conjunction with the financial analysis system, the asset management software should provide a consistent methodology for evaluating assets and for prioritizing repair and/or replacement projects.

Any asset database developed for asset management should be able to transfer data to and from the other systems of a ROC that are also to be developed e.g.:
- MIS
- asset inventories / databases / GIS
- finance - accounting system
- network models for planning work on water and sewer systems
- customer systems.

All databases must be compatible or have satisfactory interface arrangements.

8.2.9 Asset Management Plan

An Asset Management Plan (AMP) is a structured approach to minimise the life-cycle cost of assets while improving required service levels and sustaining the condition of the water supply and wastewater assets. It is a performance based business approach to improving service levels and can help ROCs to achieve several important objectives including:
- targeting investment effectively and efficiently
- improving service reliability
- regulatory compliance
- increased productivity and competitiveness
- more meaningful financial planning and reporting
- “visibility” for buried assets
- ability to justify investment -requirements to ADI, other control bodies and funding agencies.

Asset management is a planning process that enables the ROCs to get the best value from each of the assets whilst ensuring adequate financial resources to rehabilitate and replace the assets when necessary.

The AMP is a document that summarizes the operator’s approaches to the management of its assets.

Utilities should prepare an Asset Management Plan prior to any other asset management related activity.

The document must be flexible and should contain an explanation of how the system is operating each component, not the actual data obtained from each component.

The actual data should be in a format that can be easily updated (e.g. computer data base, asset management software, etc.), and the results of analysis performed (summary of condition grading, criticality assessment, remaining useful life, maintenance, rehabilitation and renewal needs, implementation plan, etc.) can be included in annexes as background and support documents for further analysis.

The Asset Management Plan:

- should be able to explain how the operator is going to manage its asset in the long-term
- does not need to be lengthy and should be written in such a way that all departments within the operator can make use of it (the goal is to make it easy to understand and useable by the employees of the operator)
- should be periodically reviewed (annually) to determine if the overall methodology has changed and, if so, the document should be revised; if not, the document can be left in its current status until the next review.

The database that is used in asset management should be updated continually to take account of changes (e.g. as breaks are repaired, failure data on respective assets should be updated, new assets should be added, decommissioning of old assets should be recorded, etc.). This type of updating should not require the overall AMP document to be revised.

A proposed structure / outline for the AMP is presented in Appendix E2.

An AMP is not complete without an implementation plan. The implementation plan should include details of the activities presented in AMP, with deadlines, responsibilities and associated costs.

A model of AMP implementation plan is presented in Appendix E3.

AMP together with the other plans and strategies developed by ROC are to be correlated to each other and should be reflected in company's Business Plan. The implementation plans of each of these plans and strategies are the key elements based on which the ROC will prepare its Business Plan.

A detailed discussion on the impact on asset management plans of future investments proposed to cover environmental issues, customer service standards and changes in overall performance levels is presented in Appendix E4.

8.2.10 Asset Inventory (Asset Database) – Data fields

A comprehensive asset inventory [database] of all of the operational assets needs to be developed. This database can be populated with data from any existing operational asset databases being used by the county council and municipalities and the water supply service department and the wastewater facilities department.

Asset data not already held will need to be identified and added individually. Any missing data will need to be collected and, as it becomes available, entered in to the asset database.

A key question is “How much information is needed for an appropriate asset management?”

There is no standard answer. Each utility must determine its information needs based on a variety of factors such as asset management goals, performance measures selected, regulatory requirements, and collection system size, complexity, and condition.

Under these circumstances, begin with an evaluation and documentation of existing information systems. For each data stream, questions to answer include:

- how much data is collected?
- how is it collected and managed?
- how frequently is the information collected?
- how thorough are the records?
- is the data available to other information systems and/or other users?

The Delegation Contract has clear provisions with regard to the asset data that should be included in the asset inventory, as presented in the box below.

Provisions in the Template Delegation Contract on Assets Inventory

Provisions in the FOPIP / ISPA Delegation Contract – Common Part, on the Management of Fixed Assets (Art.29)

The Concessionaire manages the whole of the assets of the Concession in detail, fixed asset by fixed asset, through the Register of Fixed Assets, which includes:

a) descriptive and technical information necessary for the identification of each fixed asset;
b) physical and technical details of all installed water and wastewater equipment, including structures, buildings, mechanical and electrical equipment, and details of lengths, diameters and materials of pipes for water transport, supply, distribution or wastewater collection, stating their make, design capacity and date of installation;
c) accounting information related to each Return Asset, namely depreciation, provisions and expenses for Reinforcements (Rehabilitation), Replacement, Planned Maintenance and Modernisation Works.

The fixed asset management tool is computerized and allows the generation of total amounts at each level, in particular by groups and sub-groups, by booking code and by grouping of Urban Areas.

Several approaches may be necessary to complete the list of assets, among which are:

- examining of plans, engineering drawings
- interviews with current and former operating and management staff, with residents (in small communities)
- visual observations of above-ground or visible assets (e.g., hydrants, pumps, manholes, treatment works)
- estimates on buried assets using above ground assets as a guide (e.g., using manholes to estimate locations, size, and type of pipe between the manholes).

Once the list of assets is developed descriptive information about each asset including type, code, accounting code, age, size, construction materials, location, and installation date is included in the inventory.

For example, the location of an asset should be described in such detail as to allow the following assessment: "If a pipe on street X is replaced what other assets associated with that pipe will also have to be replaced?" "If a component of the treatment plant is replaced what other assets might be impacted?"

Most utilities have asset inventories containing:
- asset descriptive and technical information
- physical and technical data
- accounting information - depreciation, provisions and expenses

The information that is missing in general from ROC asset inventories is:
- asset condition
- asset criticality
- history of maintenance and repairs
- remaining useful life
- asset valuation (actual value and replacement cost)

The methods for generating the data that is currently missing from ROCs asset inventories are presented further in this section.

Condition Assessment

It is critical that utilities have a clear knowledge of the condition of their assets and how they are performing.

The condition of an asset describes its structural integrity and safety. Condition assessment is a consideration of the soundness of an asset in terms of failure liability.

There are many ways to assess the condition of the assets depending on the capability and resources of the system.

The simplest approach for asset condition assessment is ranking, using some criteria and developed internally by the operator.

For example, for each asset is assigned a grade of 1 to 5, from very good condition to unserviceable. This approach uses the best information available and does not require ROCs to gather additional data in order to rate the assets.

The need for routine or minor maintenance should not affect the basic condition of an asset. Condition grades should be assigned to assets ignoring their performance.

A higher level approach, or the next step after the initial ratings of the assets, is based on the data on asset condition gathered through more sophisticated means – e.g. leak detection technology for assessment of the condition of water pipes.

Sometimes the only suitable way to assess an asset is to compare its performance (maintenance and repair history) to its expected life.

The utility should determine what type of grading system works best for its system. A model for the condition grading and a Condition Grading Template for a water and wastewater system are presented in Appendix E5.

ROCs are strongly advised to develop Condition Grading Templates for each individual group of assets and include them in the Asset Management Plan as Annexes.

Condition assessment of above ground assets

A condition survey of all the above ground assets, including buildings, well fields, reservoirs, pumping stations and the water and wastewater treatment plants, equipment, workshops, transport, etc. needs to be made and the conclusions entered into the asset database. The operations staff responsible for operating or maintaining the assets will be responsible for making these asset condition assessments.

Condition assessment of underground assets

With regard to underground assets it is very difficult to monitor deterioration and implement timely maintenance and renewal. The collection of operational data in a systematic recording system will however allow its capture as an attribute in the database. A picture of the networks performance can then be established. It is important that the system operators and managers, who know and understand the history of the operational systems, play the major part in this process.

As the pipelines cannot be seen, a subjective assessment of the condition of the underground assets needs to be made and the conclusions entered into the asset management database. These underground assets include the transmission mains, distribution mains and the sewerage system. ROC O&M staff will make these subjective assessments of the underground assets, as they are the people responsible for the operation or maintenance of the assets. In this work they can be guided and supported by the provision of a spatial analysis of the repair and capital repair information held in the operational repair databases. If the repair events can be shown on the plans for the specific pipelines and sewers, then the subjective assessments can be supported and justified. Being able to see which pipes that have had numerous repairs, will also remind the operational staff and make Managers aware of the more defective mains.

Criticality

Not all assets are equally important to the system's operation - some assets are highly critical and others are not critical at all. Furthermore, critical assets are completely system specific. Certain assets or types of assets may be critical in one location but not critical in another.

In order to identify the critical assets in the system ROCs should look at the likelihood that a given asset is going to fail. The data necessary for identifying the critical assets is: asset age, condition assessment, failure history and knowledge on how that type of asset is likely to fail.

An asset is much more likely to fail if it is old, has a long history of failure, has a known failure record and has a poor condition rating.

An asset is less likely to fail if it is new, highly reliable, has little to or history of failure and has a good to excellent condition rating.

Assessing the criticality in a water and wastewater system means analyzing for each asset or group of assets:

- what happens if the asset fails
- what are the chances of the asset failing
- if this asset fails, how much of the community is affected
- if this asset fails, how much would it cost to repair it
- if this asset fails, how many other assets could potentially be damaged
- if this asset fails, are there environmental and public health consequences.

Criticality analysis has several important functions among which allowing a ROC to manage its risk and help determining how to better allocate the rehabilitation and renewal funds.

In determining criticality there are two are important dimensions:

- how likely the asset is to fail (probability)
- the consequence if the asset does fail (consequence).

1. Probability of failure can be assessed based on asset age, condition assessment, failure history, historical knowledge, experiences with that type of asset in general and knowledge regarding how that type of asset is likely to fail. Failure rating can be a simple rating on a scale (from 1 to 5 for e.g.) or may be more complex if necessary data is available.
2. Consequences of failure, or cost of failure represents the cost of repair, social cost, repair/replacement costs related to collateral damages, legal costs, environmental costs and any other associated costs or asset losses.

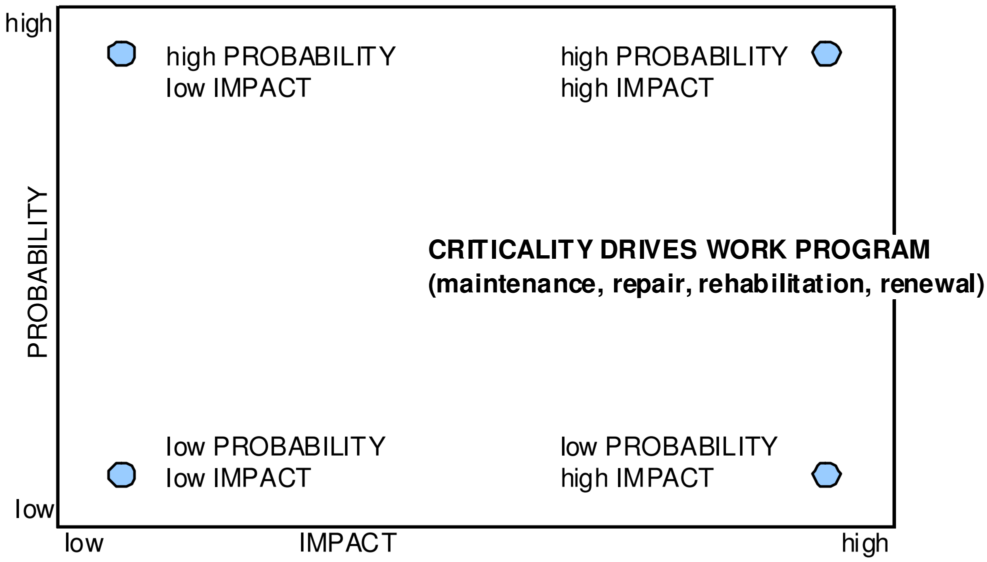
The consequence of failure can be high if any of these costs are significant or if there are several of these costs that will occur with a failure.

Assessing criticality requires an examination of the likelihood of failure and the consequence of failure (see figure 6-6). The assets that have the greatest likelihood of failure and the greatest consequences associated with the failure will be the assets that are the most critical.

In order to make a sound investment prioritization, each ROC will have to assess the criticality of the assets in its system, and assign to each asset a Criticality Index (CI).

The CI developed should be further used to quantify the importance of the individual asset to the operation of the ROC. The importance of the asset should be directly proportional to its Criticality Index.

Figure 8.2: Criticality assessment



A model for the calculation of Criticality Index and a Criticality Assessment Template for water and wastewater system are presented in Appendix E6.

ROCs are strongly advised to develop Criticality Assessment Templates for each individual group of assets and include them in the Asset Management Plan as Annexes.

All the descriptive information presented above in this section should be included in the asset inventory.

If all ROCs have asset inventories that include information on the type of assets, technical data, location, technical lifespan, only a few of them have and currently use in practice the information on the history of maintenance and repairing operations, asset condition, performance, or replacement value.

Asset condition, performance and criticality are extremely important information that needs to be included in the asset inventory. All management decisions regarding maintenance, rehabilitation and renewal are made based on these aspects.

Not knowing the current condition and performance level of an asset may lead to its premature failure, which leaves the utility with only one option: to replace the asset (generally the most expensive option). Not knowing the criticality of assets in the system may preclude the utility from making informed decisions on selection of priorities for maintenance, rehabilitation and renewal operations.

Not knowing the replacement value of the assets in the system may lead to costly and inefficient plans for rehabilitation and renewal of the system.

Maintenance and repair history

Alongside with descriptive information about assets (age, size, construction materials, location, installation date, etc) key information on operating, maintenance, and repair history needs to be included in the asset inventory.

For example, in the case of a pipe break the failure incident can be recorded in the asset inventory by registering the following information:

- location of the break
- type of break
- type of pipe
- type of repair
- condition of pipe (external and if cut out, internal)
- length of time from report of leak to response to scene
- length of time to repair the pipe
- materials used
- difficulties encountered.

Maintenance and repair history would allow analysis of system's past performance as a basis for the forecast of future performance. In the example above, the failure incidents recorded in the asset inventory would allow analysis such as:

- number of breaks (bursts, incidents) per pipe
- number of breaks (burst, incidents) per type of pipe
- time of response
- time of intervention.

Some ROCs have this type of information readily available, in general spread in different departments and sometimes only on paper. They should introduce this information in the asset inventory and try to complete a history of maintenance and repair activities for at least three years.

The ROCs that do not have such information available should start keeping records on failure and repair history and include it in the asset inventory.

Remaining useful life

The useful life of an asset is in most of the cases different than the technical lifespan. There are many factors that affect the useful life of a given asset, and make it different (generally shorter) than the technical lifespan.

Factors such as poor installation, low quality materials, poor maintenance, and corrosive environment will shorten an asset's useful life, while factors such as proper installation, high quality materials, proper maintenance procedures, non-corrosive environment, etc. will lengthen an asset's useful life bring it to / close to the technical lifespan.

Technical lifespan for equipment and works according to the Catalogue regarding the categories and the normal functioning lifespan of the fixed assets, approved by the Government Decision no. 2139/2004 is presented in Appendix E7.

ROCs should know their system better than any projection or norms and should asses the useful life of its own assets based on the local context and the particular conditions of the utility.

For example, a water distribution system operator may know that a ductile iron pipe in the system has a risk of freezing during winter (e.g. due to inadequate depth of cover) and that this could significantly lower the technical lifespan of the respective pipe.

Useful life can be assessed based on system characteristics, past experience, existing and future conditions, operation and maintenance history, and other similar factors.

For calculating the Remaining Useful Life (RUL), the operator can take into consideration one of the following methods:

- Based on technical lifespan - in this case Remaining Useful Life can be calculated with formula:

$$RUL = \text{Technical lifespan} - \text{Age}$$

This method is only recommended when information on the asset's failure history and condition are not available, because the asset failure mode is not linear with age.

- Based on default and experience values - in this case Remaining Useful Life can be calculated with formula:

$$RUL = \text{Adjusted useful life} - \text{Age}$$

where 'Adjusted useful life is an estimation based on experience.'

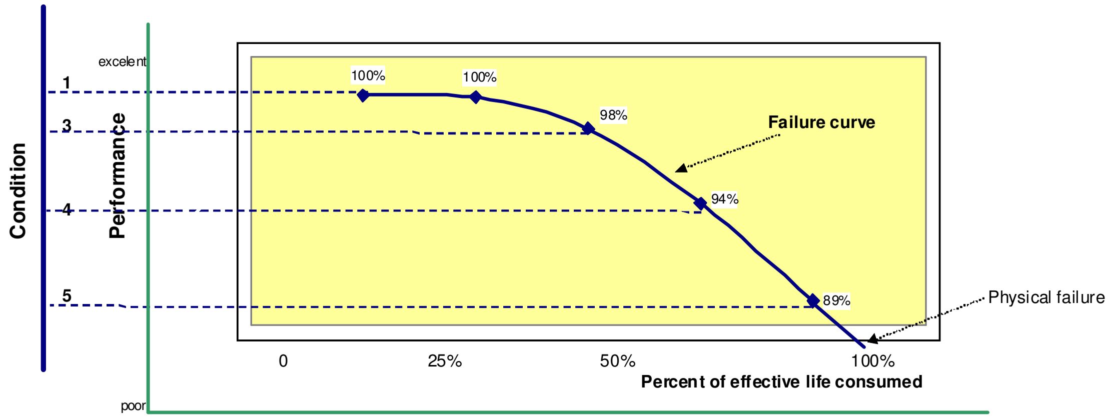
As a starting point, in the absence of any better information, the ROC can use default values based on historical information and practice that will be further refined and corrected as more information in available.

The method is more precise than the first one.

- Based on condition and failure curve

Most of the assets have a failure curve as the one presented in Figure 8-3. This shows that the failure mode is not a linear one, but is in relation with asset condition. For assets in very good condition, the useful life is equal or close to the technical lifespan. For assets in bad condition, the useful life is lower than the technical lifespan.

Figure 8.3: Asset condition and useful life



In this case, the Remaining Useful Life can be calculated with formula:

RUL = (Technical lifespan – Age) x [1 – ((C – 1)/ C)n x 2]

where:

C = Condition Grade

n = Maximum value for Condition Grade

This method is recommended because it takes into consideration the condition of the asset, and because the failure curve associated with the formula is very close to the real one.

There are some other more sophisticated methods for calculating the remaining useful life based on detailed historical information and in-depth analysis of asset failure modes. These methods are very complicated, require extensive historical information and specialized software tools for analysis.

Asset valuation

Several financial valuation approaches are commonly used today to assess the value of water and wastewater assets. These include acquisition cost, current value, book value, current value less repair costs and replacement value. The most common approaches used for asset valuation are:

- current value = purchase cost (with or without depreciation, depending on the type of asset) + maintenance and repairing costs
- replacement value = the cost of replacing the existing assets with modern equivalent assets; e.g., if the system has asbestos cement pipe that need to be replaced with PVC pipe, the replacement value is the cost associated with PVC.

Although the assessment of the current value of an asset is relatively simple as long as proper maintenance and repairing history with associated costs is available, obtaining the costs for asset replacement is not as easy.

Most of the ROCs are currently using the current value for asset valuation, but they will need to develop and use cost estimates for the replacement value of operational assets.

The cost information describes above (current value and replacement cost) can be successfully used for system optimization and investment programme modelling.

Provisions in the Template Delegation Contract on Amortization

Provisions in the FOPIP / ISPA Delegation Contract – General Provisions, on Amortization and Provisions (Art.43, Art. 44)

Own Assets and **Take-Back Assets** are subject to *Depreciation*. Depreciation, defined in accordance with the tax legislation, is applied to the purchase value of an asset and is spread over the whole period of its accounting lifespan.

Return Assets are subject to the provisions for:

- *Obsolescence*, aimed at allowing for the replacement of capital invested by the Concessionaire on behalf of the Granting Authority. They only apply to the first introduction of a new asset, excluding those purchased as a replacement for assets initially granted; The annual accrual shall be equal to the original asset purchase value divided either by the number of years remaining until the normal expiry of the Delegation Contract, or by 10 years if the remaining number of years is less than 10 years.
- *Replacement*, that applies to every renewable Return Asset. They are constituted by anticipation for the replacement of the Return Assets. When the asset is replaced, the purchase value of the asset is recorded as asset in the balance sheet, and the accumulated provision as liabilities in the balance sheet liability account representing the Granting Authority's part of the fixed Return Assets.

Non-renewable Return Assets are subject to depreciation on their technical lifespan and do not affect the Profit and Loss Account.

Renewable Return Assets are subject to depreciation on their technical lifespan and to a replacement provision accounted recorded as an expense in the Profit and Loss Account.

8.2.11 Asset Inventory (Asset Database) - Architecture

All information related to assets should be organized in a database, the asset inventory. The information should be organized by service area and detailed further by process, sub-process to the level of individual assets or, further, to asset components.

An example of asset inventory architecture for a water system is provided below, with examples for each level of decomposition within the service area.

Table 8.1: Assets Inventory Architecture example

Service area	Process	Sub-processes	Assets
Water treatment and resources	Wellfield	Wellfield works	Wells
			Pumps
			Pipes
		Aeration	…………
		Chemical treatment	………….

For each service area the assets should be organized by groups, as shown in the example below.

Table 8.2: Example of Group of Assets

Service area	Groups of Assets
Water treatment and resources	Raw water reservoirs
	Raw water pumping stations
	Raw water aqueducts
	Water Treatment Plant
	Sludge pipelines
Water supply and distribution	Strategic mains (trunk)
	Distribution reservoirs
	Distribution stations
	District Meter Area (non-strategic mains)
Sewage	Sewage treatment assets
	Sewer
	Drainage area assets
	Sewage pumping station assets

Individual codes should be assigned to service areas, processes, sub-processes and assets. In doing so, the information in the asset inventory can be further accessed at service area level, process or sub-process level, group of assets level and asset level.

Asset inventory information should be managed by computer to ensure its availability for analysis and decision-making.

Well-designed spreadsheet databases may be adequate to start with and collected data can be imported subsequently into more sophisticated asset management software.

For most utilities, information is most efficiently managed by use of asset management software programmes that help organize the data, perform many standard analyses, and facilitates planning, scheduling, and budgeting. These programmes range in cost and complexity from affordable, simple applications to complex, expensive solutions.

A number of commercial applications are modular, so that basic systems can be enhanced and expanded over time. It is best to start with the most basic system appropriate to the utility’s information needs, and add complexity over time.

This approach helps control up-front hardware and software costs and makes it easier for staff to master new systems, thereby reducing the margin for error during transition.

An asset inventory model that allows for an efficient and effective management of assets is presented in Appendix E8.

8.2.12 Operational Performance Indicators

ROCs should develop and monitor OPIs to help raise awareness of changes in the performance of the systems / services and to help understand the factors and reasons for changes in performance.

The set of indicators used for asset management should be extensive enough to provide information on operations performance, service provision efficiency and cost efficiency, should be based on easily available and reliable data and should not be to broad, to complicate in order to allow an efficient monitoring and a sound support to the decision making process.

The set of asset management performance indicators proposed to ROCs for the first asset management exercise is presented below. In time, ROCs can expand the set of performance indicators and adjust it to the changing environment of their systems. The performance indicators are grouped in two categories, operations PIs and planning efficiency PIs, and are applicable for both water and wastewater systems.

Operations PIs:

- Failure Incidents Rate
  - number of repairs per km of water network (per year)
  - number of sewer blockages per km of sewer network (per year)
- Non Revenue Water
  - percentage of water supplied into the distribution network not invoiced to customers
- System Renewal / Repair Rate
  - percentage network replaced

Planning efficiency PIs:

- Unplanned interruptions rate
  - number of unplanned interruptions / total no. of interruptions per year
  - number of beneficiaries affected by unplanned interruptions / total no. of beneficiaries (per year)
- Operating and Maintenance Rate
  - planned operating and maintenance cost / operating and maintenance cost
  - operating and maintenance cost / total costs.

Monitoring of the values of operational performance indicators will help ROCs to determine from time to time the magnitude of gaps between the required Standard of Service (SOS) and the actual Level of Service (SOS) that is being achieved by the ROC.

Monitoring of the value of operational performance indicators will also help operators to understand the reasons and factors affecting the performance of the system.

8.2.13 Maintenance, Rehabilitation and Renewal Planning

Adequate planning for operating and maintenance, rehabilitation and renewal of assets helps ROCs to address and prepare for both anticipated and unexpected problems.

There are four basic options for dealing with the assets over time:

- operate and maintain the existing assets
- repair the assets as they fail
- rehabilitate the assets
- replace the assets.

Each of these options has its own costs and considerations. Asset management planning helps determining the optimal way to allocate the money between each of these categories, while maintaining the desired LOS.

These options are connected to each other. Choosing to allocate more funds to one of them impacts how funds can be allocated to the others, choosing to allocate more time to one of them impacts the time frame in which the others are done.

For example, choosing to spend more on operating and maintaining assets will decrease the need to repair the asset and will increase the amount of time until the asset is replaced.

Operation and maintenance

O&M functions relate to the day-to-day running of assets. Operational procedures can be Standard Procedures (most common, typically used during day-to-day operations) and Emergency Procedures (used in emergency conditions).

Maintenance procedures can be classified as corrective maintenance (used by field technicians for the repair of assets) and preventive maintenance (developed to prevent breakdown and prolong asset life).

O&M procedures are generally standardized and formalized in order to increases efficiency and decreases intervention costs.

It is most advantageous for a ROC to spend a relatively high portion of its operation and maintenance budget on critical assets (i.e. those assets that are likely to fail and have significant consequences if they fail) because if these assets fail, they could have large, adverse impacts on the reliability of services and total O&M costs.

Repair the assets

ROCs need to consider how long they will keep an asset in service prior to replacement of the asset. If more resources (personnel and money) are spent on repair, there will be a decreased need for replacement.

In developing a repairing plan, ROCs must determine the optimal approach to repairing versus replacing assets. The utility will need to assess what is the optimal cost: to repair the asset (including material and personnel costs) or to replace the asset.

Rehabilitate the assets

Rehabilitation in water and wastewater systems brings the assets back to a useable condition without actually replacing them. In many cases, it may be cheaper to rehabilitate the asset rather than replace it; it may extend the lifespan of the asset considerably and may reduce other impacts related to asset replacement

Replace the assets

The assets that can no longer be kept in service through maintenance or repair or those that are no longer capable of meeting the LOS (economically or technically) need to be replaced.

Asset replacements can either be part of a replacement schedule or a capital improvement plan.

The replacement schedule includes those assets (or items) that are routinely replaced, using the water or wastewater system revenues or reserve funds.

The capital improvement plan includes assets (or items) that are major expenditures that generally require outside funding for at least a portion of the project.

Maintenance, rehabilitation & replacement should be based on criticality criteria, condition assessment and operational performance indicators.

Planning methods:

There are two planning methods that should be used by ROCs in planning their maintenance, rehabilitation and replacement activities:

- life-cycle cost analysis
- asset prioritization.

These methods are presented in further detail in this section.

Life-cycle Cost Analysis

Life-cycle costs analysis is the tool that helps evaluating investment alternatives. Life-cycle costing means evaluating the total cost with an asset over its useful life, including acquisition cost, installation cost, operating maintenance and repair costs, replacement and disposal costs.

Life-cycle cost analysis is the basis for investment decisions, i.e. for identifying which assets need regular maintenance and repairs, rehabilitation or to be replaced. The information needed for life-cycle cost analysis is contained in the asset inventory.

The main criteria for differentiating between the assets that need only regular maintenance, repairs, rehabilitation or replacement is asset condition.

For assets in very good condition or with minor defects (condition grade = 1 or 2) only routine maintenance or repair is needed.

For assets that require significant level of maintenance (condition grade = 3), between 10% and 20% of their technical capabilities being damaged, are two options, among which the most cost efficient one should be selected:

- asset can be repaired and maintained with acceptable costs over its remaining useful life (total cost of rehabilitation, repairs and maintenance over the remaining useful life is lower than the replacement cost) – in this case, the asset is included in the Rehabilitation Plan
- asset cannot be repaired and maintained with acceptable costs over its remaining useful life (total cost of rehabilitation, repairs and maintenance over the remaining useful life is higher than the replacement cost) – in this case, the asset needs to be replaced (is included in Capital Investment Plan)

The assets that require significant renewal or upgrade (condition grade = 4), with 20% to 40% of their technical capabilities being damaged, are included either in the Rehabilitation Plan or Capital Investment Plan using the same criteria as for the assets with condition grade = 3, the difference being that assets in condition grade 4 will have a higher priority rank in the prioritization list.

The assets that are unserviceable (condition grade = 5), meaning that over 50% of asset requires replacement, are usually included in the Capital Investments Plan.

The above criteria for differentiating between the assets that need only regular maintenance, repairs, rehabilitation or replacement are summarized in table 8.3.

The rehabilitation costs for this type of analysis can be estimated accurately enough using the formula:

$$\textit{Rehabilitation cost} = (\textit{Percent of life consumed})^N \ x \ \textit{Replacement Cost}$$

where:

N = 4 for architectural passive assets (pipes, concrete structures, buildings, etc.)

N= 3 for dynamic assets (electrical and mechanical equipment, etc)

N = 2 for other assets

Planning the maintenance, rehabilitation and replacement of assets also includes estimating the costs associated with respective plans.

Table 8.3: Life cycle cost and investment decisions

Asset	Condition	MAINTENANCE	REPAIR	REHABILITATION	REPLACE
A	1 (very good)				
B	2				
C	3			IF Replacement Cost > Rehabilitation Cost + Repairs and Maintenance Cost x Remaining Useful Life	IF Replacement Cost = < Rehabilitation Cost + Repairs and Maintenance Cost x Remaining Useful Life
D	4			IF Replacement Cost > Rehabilitation Cost + Repairs and Maintenance Cost x Remaining Useful Life	IF Replacement Cost = < Rehabilitation Cost + Repairs and Maintenance Cost x Remaining Useful Life
E	5 (unserviceable)				

If all cost information related to an asset (historical costs for all maintenance and repair activities, rehabilitation cost, replacement cost) is included in asset inventory the rehabilitation and capital investment plans (assets to be included in each of the plans and associated costs) can be easily generated, analyzed and decided upon.

Asset prioritization

Prioritization means ranking the assets in the system and deciding how the ROC's resources will be allocated based on this ranking.

Prioritization means analyzing:
- how important is the asset to the provision of the service at the established level (criticality index)
- how well the asset is performing its function (condition)
- how soon will the asset needs to be replaced (remaining useful life)
- are there other assets that can perform the same function (redundancies)?
- cost efficiency in asset operation and maintenance (replacement costs vs. estimated operation and maintenance costs for the remaining useful life).

Asset management planning helps to establish the priority of assets and helps to determine when the assets should be rehabilitated and replaced so as to maintain the desired level of service and cost efficiency.

As a general guide, higher priority should be given to assets that:
- are **critical** to the provision of services
- that are in **poor condition** have a **shorter remaining useful life** (they need to be replaced sooner)
- that have **less redundancy** (because the system cannot to operate without them)
- that are **not cost efficient** (because in the long-term over their remaining useful life the operating and maintaining cost could be higher than the replacement cost).

Ideally, the asset management plan should be the basis for the financial needs forecast and for the development of rehabilitation and replacement schedules in accordance with the various priorities of the systems.

8.3 Approaches for Reduction and Control of NRW

8.3.1 Introduction

The guidelines in this part of the Manual deal with non-revenue water (NRW) management and include information on:
- Real (physical) water losses i.e. leakage from the water supply systems
- Apparent (non-physical or commercial) water losses
- Water balance and assessment of water losses
- Network condition assessment
- NRW reduction strategy.

Leakage of water from water networks is wasteful but inevitable. It is expensive due to additional operating costs and can be dangerous due to risk of contamination of supplied water and disturbances to pipelines and other infrastructure. Its control reflects the professionalism of the owners on the ROC and the ROC management team towards the management of the water distribution system. Leakage must be reduced to an economically viable minimum. Leakage can occur from reservoirs, transmission mains and, most commonly, distribution systems and service connections.

Leakage control is an essential component of distribution system management.

Although there is an economic optimum level of leakage from water distribution systems most networks in Romania have leakage levels well in excess of these values with NRW values often in excess of 50%. Economic levels will only be achieved with investment and implementation of an effective strategy and associated actions.

These guidelines include sections on how to define a water balance and carrying out a losses assessment in line with current International Water Association (IWA) Leakage Taskforce recommendations and how computer models can assist in the NRW process. A methodology is defined also that enables water network rehabilitation needs to be prioritised. The appendices provide information on NRW activities that have been carried out in Romania.

The guidelines also reflect the current requirements of the Romanian water sector, provide information to support ongoing improvements, and initially were developed in consultation with the Romanian Water Association (ARA).

8.3.2 Real water losses (leakage)

There are several factors that affect leakage from distribution systems and these can be summarised as follows:

Pressure

Increases in pressure of only a few metres (<0.5 barr) can contribute to significant increases in system losses and burst frequencies. Higher pressures will also generally make leaks occur earlier than they otherwise would have done. Conversely a lowering of system pressure will cause a water loss reduction.

Pressure surging through switching a pump on or off, or operating a valve too rapidly, can cause system design pressures to be exceeded, resulting in bursts. Pressure cycling through pump-sets oscillating about duty points, or poorly maintained pressure reducing valves, can cause pipe fatigue and bursts. This is particularly relevant to plastic pipe systems.

Soil movement

Among the causes of soil movement are changes in moisture content, particularly in clays, changes in temperature, frost heave and subsidence. Movement of the soil may cause a pipeline to break, joints to move, or result in local stress concentrations within the pipes or fittings that eventually lead to failures.

Pipe deterioration

The most serious problem is the internal or external corrosion of metal pipes and fittings.

Internal corrosion is generally more severe in soft water areas. Over time, nodules build up on the pipe wall. The nodules, which also lead into internal encrustation, cause a pitting of the internal surface that can eventually lead to holes developing or a longitudinal or transverse fracture occurring.

External corrosion can arise from a variety of causes including differential aeration, bimetallic corrosion, variations in concentrations of dissolved salts in the soil, microbiological action and from contaminated ground in brown field sites. The consequences of external corrosion are similar to those of internal corrosion. Corrosion of concrete or asbestos cement pipes can be caused by soils or waters containing high levels of sulphates.

Poor quality of materials and workmanship

Leakage under this heading affects both Utility and customer pipes and fittings. It is important that appropriate standards are specified for materials and installation is properly supervised, including trench preparation. All pipes should be tested before commissioning to highlight any defects. It is also important that all materials are handled with care and stored appropriately. Training and re-training should be provided for ROC staff and contractors carrying out network repairs to help ensure good practice and procedures are adopted.

Soil characteristics

An important factor which affects the running time of individual leaks is the permeability of the soil in which pipes are laid. In some soils, water from an underground leak may show on the surface fairly quickly whereas similar leaks in soils such as chalk can run indefinitely without showing.

Traffic loading

The effects of vibration and heavy traffic loading in certain areas can have a significant impact on the levels of leakage. Where pipes are installed in heavily trafficked areas care should be taken in selecting the most appropriate pipe material and in trench reinstatement.

Stray electrical currents

Stray electrical currents can cause corrosion to unprotected metal pipes and highlights the importance of providing protection in such cases. This is particularly relevant in Romania were stray electrical currents in the vicinity of tramways have proved to have an adverse affect on unprotected steel pipelines.

8.3.3 Real losses (leakage) - methods of control

There are several methods of leakage control, some involve leakage location and the remaining method, pressure control can be considered supplementary to each of the other methods. Each method requires a different level of staff and equipment involvement so consequently each method will have different capital and operating costs. However, each method will maintain leakage at different levels.

Leakage in the distribution network can be broadly considered as arising from:
- Visible leaks
- Invisible leaks.

The main methods for controlling visible and invisible leakage from the distribution system are described below.

Pressure control

Leakage reduction by pressure control is probably the simplest and most immediate way of reducing visible and invisible leakage within a system as detection of leaks is not involved. There are a number of ways of reducing pressure such as:

Valving or zoning

This is probably the simplest and cheapest way of reducing pressures but does have limitations in its use. It basically involves closing or throttling valves within the system which has the effect of reducing the carrying capacity within a network or placing a zone on a lower pressure supply. This method is contrary to normal system operation in Romania where systems are normally operated open, to provide the maximum flexibility in operation. Care has to be taken in sizing the zones to ensure that, fire fighting and system recharging needs following a large burst main, are adequately catered for.

Reducing pumping heads

This technique has limited application but well worth considering where demand in an area has reduced, through heavy industry demise and reduced per capita consumption, as has been experienced in Romania. Benefits will be realised through reduced energy costs at pumping stations, due to lower heads and flows, as well as reduced network leakage losses. To achieve the full benefits of energy cost reductions, pumping equipment will need to be resized or pump impellors modified. If funding is not available for this leakage reduction benefits can be realised through throttling pumping station delivery outlet valves.

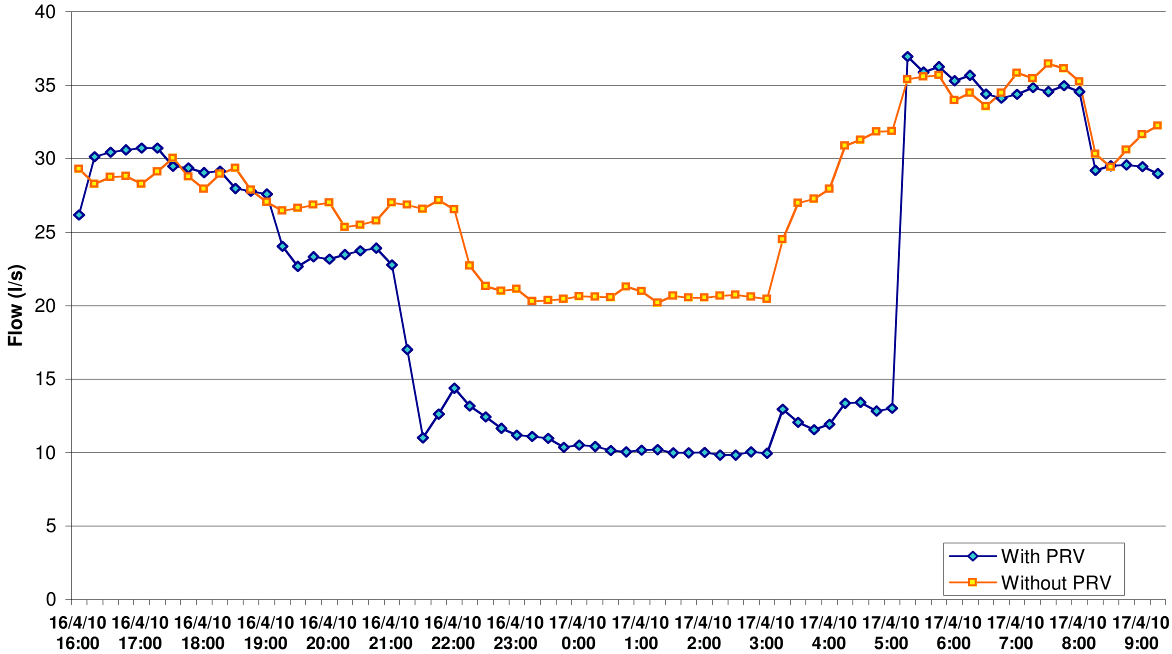
Pressure reducing valves (PRV)

The use of pressure reducing valves is the most common way of lowering pressures in distribution networks and thereby reducing leakage levels. Various types are available; those that produce a constant differential pressure from inlet to outlet, those that deliver a constant downstream pressure and those that can produce a variable downstream pressure that enable night-time pressures to be lowered.

Although PRVs are versatile they can be sensitive in operation and prone to failure due to air-locking. For this reason they should be regularly inspected and maintained and installed with a bypass facility.

An example of the potential impact of a PRV on the pattern of flow into part of a distribution sub-zone is shown in the figure below.

Figure 8.4: Graph showing example of flow into a sub-district with PRV and with no PRV



Passive Control

This requires the least effort on the part of the Operator but generally results in the highest levels of leakage. No efforts are made to detect or measure leakage and leakage repairs are on carried out as a result of:

- Water showing on the surface and reported by members of the public;
- Poor pressure;
- Loss of supply;
- Noise in plumbing systems.

Leak location may still be required though to pinpoint leakage using sounding techniques.

Passive leakage control is only likely to be cost effective where source water is plentiful, cheap in terms of production costs and leakages show readily on the surface. It does not align with environmental considerations to protect resources and could generate adverse public opinion against the Operator.

Walking the pipe routes

During dry weather, water from leaks is often visible on the ground surface. Such leaks are sometimes reported by members of the public to the water utility. However, experience indicates that inspections carried out by utility personnel can help identify many more visible leaks.

Therefore, it is recommended that a routine procedure should be established by the ROCs whereby field inspections for visible leaks are carried out at intervals along all water transmission and distribution pipeline routes.

The main advantages of walking the pipeline routes to search for signs of leaks include:

- Low cost (no need for equipment)
- Can accelerate the rate at which a ROC can find and eliminate water losses
- Easy to record and report
- Questions to residents can help to speed up finding visible leaks
- Frequency of inspections can be adjusted easily to focus on districts with history of leak repairs
- Unknown / unauthorised connections are sometimes found
- Other potential issues with water and wastewater systems can be identified during visible leak inspections e.g. missing covers, damage to valve chambers, damage to sewer manholes, subsidence as indication of sewer infiltration, etc.

Identifying visible signs of leakage on the ground surface does not necessarily mean that a leak is located immediately below the observed escape of water – one of the detection methods described below might be needed to find the leak.

Routine or regular sounding

This method of leakage control involved the systematic surveying of water networks using sounding techniques. Use is made acoustic listening equipment to sound on fittings such as valves, hydrants and stop taps to detect the sound of escaping water. Since the introduction of Leak Noise Correlators (LNC's) into the water sector, these have also been used in survey mode to supplement the method. Typically networks are sounded once or twice a year, depending on available manpower resources.

A refinement of this method involved dividing the network into a number of sub-areas and recording the number of leakage related repairs within each sub-area. Sounding is then prioritised and directed based on repair rates to enable more effective use to be made of manpower and equipment.

This method of leakage control costs less than those involving metering but not deliver the same levels of benefit in terms of leakage reduction. Regular sounding will probably be of most benefit in areas where the value of saving water is fairly low and soil conditions contribute to water from larger leakages showing readily on the surface. In this way only the smaller leaks need to be located by sounding techniques.

District Metering

As this name implies, meters, or a combination of meters, are used to measure water consumption in a specific area of a water network. Meters need to have an integrating capability and be able to be connected to data loggers. It is recommended if meters are not of the full bore type, such as mag-flow meters, a bypass arrangement should be installed.

A District Meter Area (DMA) should ideally consist of between 2000 and 5000 properties (an apartment would count as one property). All inflows to and outflows from a DMA must be capable of being measured. The number of meters should be minimised for cost considerations and in this respect boundaries should be established using closed valves. All valves used for this purpose should be clearly marked. It may also be necessary if dead ends are generated to install hydrants for flushing purposes, either side of the closed valve.

Each DMA needs to be allocated a unique identifier and the following information collected:

- Total number of properties;
- Number of metered and non-metered properties;

- Non-domestic users and patterns of water usage;
- Average daily consumption;
- Minimum night-line flows;
- Total length of mains.

If a suitable data base is established additional information can also be collected on a DMA basis, such as network repairs, water quality information and customer complaints. This is particularly useful for Asset Management planning purposes.

Once DMA's have been established it is necessary to establish norms for activating leakage activity. The preferred method is to thoroughly inspect the whole district using sounding techniques and quickly repair all leaks. This should establish average flows and minimum night-lines. These may need to be adjusted for seasonal demand but will be the basic triggers for activating leakage location. Once set up in this way, data from DMA meters should be accessed weekly initially. In districts that prove to be stable this frequency can subsequently be reduced. For comparative purposes, minimum night-lines can be translated into litres/property/hour. It is recommended that all DMA's are fully inspected at least every two years to ensure that the norms and trigger levels are still relevant.

Monitoring distribution flow enables leakage activities to be best directed

Work trials undertaken in the UK demonstrated that District Metering could be justified as a method of leakage control in the majority of systems.

The figure below illustrates the way in which night flow logs can be used to set an intervention level (the flow at which leak detection will be initiated in the DMA), and the exit level (the flow at which leak detection will be stopped), and to monitor progress of leak detection activities on reduction of leakage until it reaches the exit level.

Figure 8.5: Graph showing target and activity levels for atypical DMA

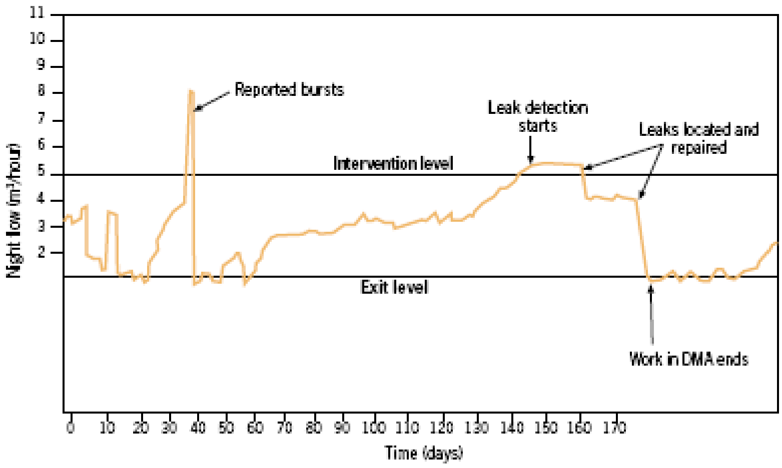
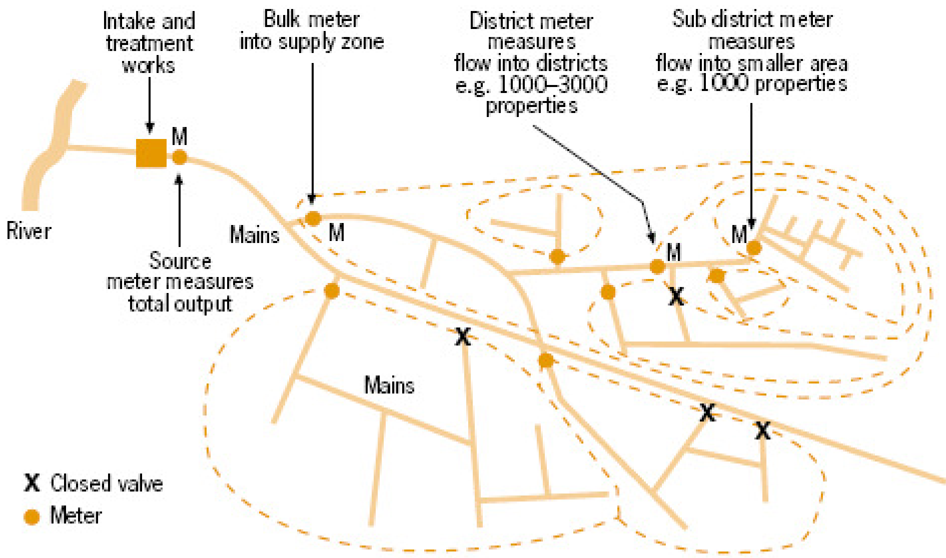


Figure 8.6: Plan of DMAs and NRW measurement



Waste Metering (also known as sub-division metering)

Waste metering is a leakage method that isolates sections of the distribution network through shutting valves such that and area is fed through a single feed.

A waste district would typically contain between 1000 and 3000 properties in an urban area. In a rural area the size of the district area is likely to be dictated by the network configuration. Ideally a waste district should be capable of being supplied for a 24 hour period to enable information to be obtained for peak, average and night time flows. It also has the advantage of minimising the amount of night time work required at premium rates for leakage location teams. However it needs to be recognised that flow rates can be distorted under waste district set-ups as normal flow patterns are altered and operating pressures are generally lower. Additionally the setting up of waste district can give rise to poor pressure complaints and cause temporary discolouration of the water supply.

Meters for waste metering can be either permanently fixed installations on a bypass or mobile units that are connected to the network through a hydrant/valve/hydrant arrangement. Whichever arrangement is selected, through careful selection of a meter location, it is possible to use one meter to cover waste districts.

As with DMA's a unique identifier needs to be allocated to each waste district and the following information collected:

- Total number of properties;
- Number of metered and non-metered properties;
- Non-domestic users and patterns of water usage;
- Average daily consumption;
- Minimum night-line flows.

Additionally it will be necessary to check valves that will be used for step testing purposes (this procedure is described below) and produce plans for each district that indicate the following:

- The size, layout and location of all mains;
- Meter installation;
- All valves, including boundary valves that isolate the District, circulating valves that are closed to achieve uni-directional flow in mains and the valves to be operated in the step testing. Each valve should be given a unique number and its direction of operation indicated;
- Commercial users.

Once waste districts have been established it is necessary to establish norms. As with DMA's the preferred method is to thoroughly inspect the whole district using sounding techniques and quickly repair all leaks and this will establish minimum night-lines. Again these may need to be adjusted for seasonal demand but will be the basic trigger for activating leakage location. Where commercial users have a night time usage they should be isolated whilst establishing the minimum night-line flow or alternatively their meters read and the night line compensated accordingly.

Monitoring of waste districts should be carried out on a 3 to 6 monthly basis depending on manpower availability. Triggers for activating leakage location will be when the established norms for minimum night-line flows are exceeded. This can then be followed up by step testing the Waste District. This practice is described below.

Step testing

The principle of the technique is to systematically reduce the size of the District by closing valves on each main in turn and noting the change in flow rate on the meter. A disproportionately large drop in flow rate indicates the probability of a leak in the section isolated.

There are two methods of carrying out step tests. The traditional method is to progressively close valves, working back towards the meter, and then reopening the valves when the test is completed. This method is less popular nowadays due to supply interruptions and the risk of causing discoloured water. A more recent approach, helped by developments in metering and data logger technology, is to use a series of short steps, isolating sections of the waste district for a short time only. This technique requires a remote meter reading device with a transmitting facility (either radio or mobile phone) located at the meter. Flow rates are transmitted to operators who can immediately see the results of valve closures and can more speedily see the effect and thereby reduce the period that valves need to be closed.

With the advances in data logger technology, step testing can also be applied in DMA's with certain configurations.

The main disadvantages of step testing, in the UK at least, are cost and regulatory. Step tests require night time working at premium time rates with associated recuperation time requirements. There is the need to forewarn customers of planned supply interruptions and this is time consuming and expensive. There is also the risk that step testing may cause bursts on week mains and discoloured supplies.

Combined district and waste metering

This method of leakage control consists of a combination of the previous two methods. District meters are used to monitor large areas, typically 2000 to 5000 properties, and when increases in flow rates are detected, waste meters located downstream are used to more precisely locate the location of the leak. By suitable selection and sizing of meters, both waste and District Meter Areas can coincide.

The figures below show typical arrangements for step tests, and for district and waste meter areas.

Figure 8.7: Plan of a typical step-test area (Reproduced from WAA/WRC Report 26)

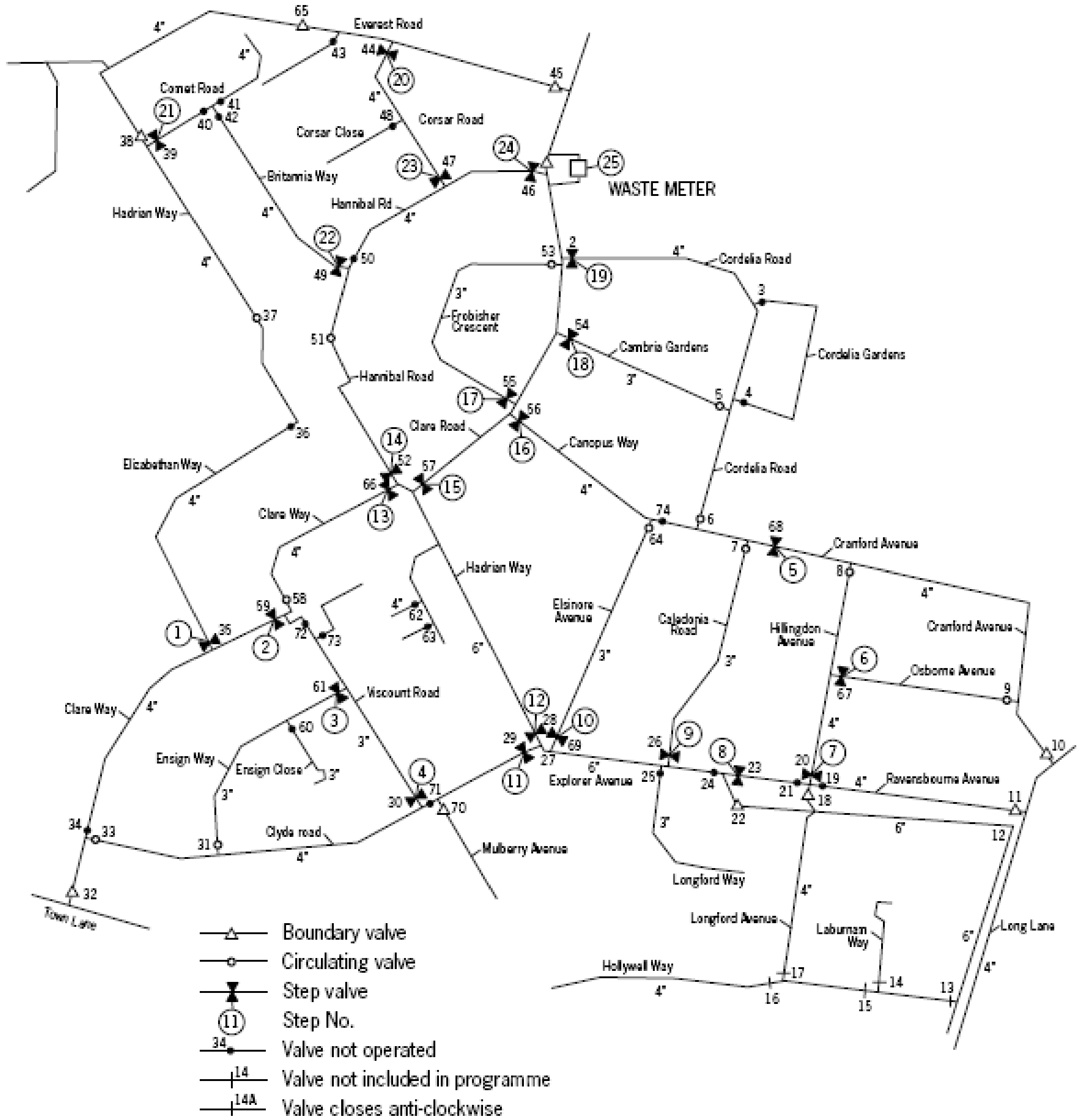
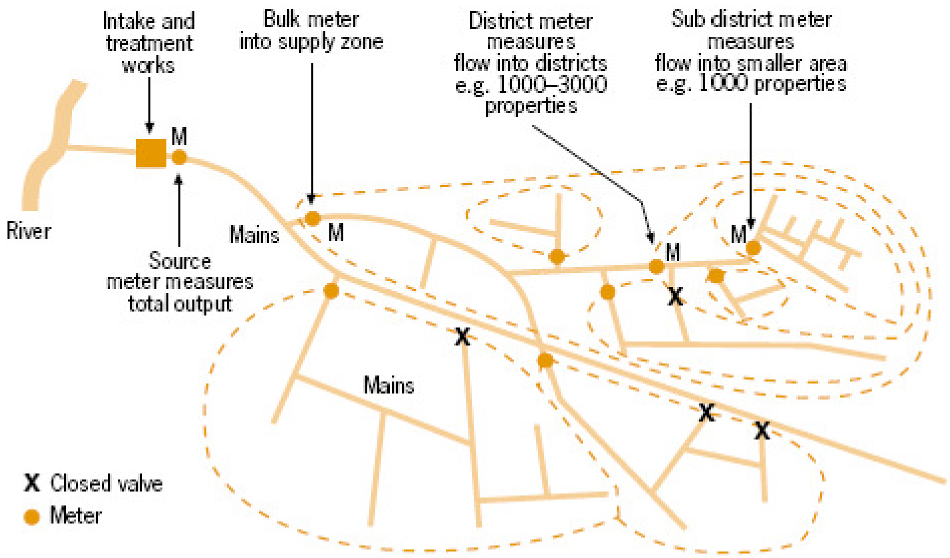


Figure 8.8: Plan showing District and Waste Meter Area hierarchy



8.3.4 Real losses (leakage) from reservoirs

Leakage from reservoirs can be minimised by good system operation supported by regular inspection of overflows, drainage systems and structural condition.

Routine monitoring and regular system inspection should be carried out for all components in water networks.

Other than regular inspection, it is unlikely that location of leakage from reservoirs will be cost effective as the methods available are either expensive or involve disruption of water supplies to customers. Other methods of location include:

- Drop testing with the reservoir totally isolated, this involves measuring drop in water level over a time period;
- Use of tracer dyes;
- Visual inspection of full reservoirs using divers to check for physical defects;
- Visual inspection of drained reservoirs when taken out of service;
- Injection of compressed air into under-drains with a few centimetres of water covering the reservoir floor;
- Excavation of reservoir embankments.

8.3.5 Real losses (leakage) from transmission mains

With some notable exceptions, transmission mains tend to be laid to a better standard than distribution systems and failures tend to be eruptive when they occur. However good metering, supported by regular inspection, will minimise associated leakage.

Other than eruptive bursts, location of leakage on transmission mains is problematic and can be expensive. Location methods include:

- Metering, including small bore by-pass metering and insertion metering;
- Gas tracer techniques;
- Over-flying thermal imaging.

8.3.6 Benefits of active leakage control

There are a number of benefits associated with a water utility adopting an active approach to leakage management. These can be summarised as follows:

Benefits of active leak control
- It minimises leakage and hence reduces the loss of income to the ROC;
- It results in an overall reduction in water demand;
- It reduces operating costs through savings made on energy and chemical usage;
- Work is planned and the need for emergency responses are reduced;
- Dangerous leakage is minimised e.g. freezing water on highways;
- Customer perception of the ROC is improved;
- Capital expenditure on new treatment works, reservoirs and mains could be deferred or reduced;
- Reduced risk of contamination from groundwater and wastewater;
- Sewer infiltration is reduced.

An active leakage management approach should also target private pipework through encouraging customers to repair defective plumbing systems speedily.

8.3.7 Location of leaks

There are several ways in which a leak may be located, none is infallible and most rely on leaking water making a noise. In all cases operator skill is required in determining the most appropriate leakage location method to adopt and apply.

Proper skills are essential!

Operator skills are necessary to maximize the benefits of the equipment and techniques used in leakage detection.

A comparison of leakage detection equipment is given in the next section.

Direct sounding

The most common way of determining the position of a water leak is by direct sounding. Sounding is done by attaching a sound amplification device to a water-fitting in order to pinpoint the location of greatest noise. There are two ways in which this can be applied. Firstly, by sounding all valves, hydrants and selected stop taps in an area and secondly by sounding all fittings. Field trials have shown that the second method, although a lengthier process, invariably proves more cost effective than the first. By valve and stop tap isolation, and the skill of the operator in recognising leak noise intensity, it is possible to hone in on leakages.

Surface sounding

Surface sounding consists of using microphones to measure the sound intensity of escaping water on the ground, directly over the line of the main. The point of maximum sound intensity will indicate the probable position of a leak. It is often successful in urban areas with hard metalled surfaces but has limited use on soft surfaces such as verges or where excavations have been made and backfill has been imported.

Leak noise correlation

The leak noise correlator is a leak locating device that uses a cross-correlation technique that measures the time interval it takes for a leak noise to reach microphones connected to two points on a water main or service pipe. The correlator then pinpoints to potential leakage position. Its advantage is that it is unaffected by extraneous background noises. For accurate location it is necessary to know pipe runs and material. This equipment is particularly useful in urban areas where there are a large number of access points such as valves, hydrants and stop taps. In rural areas, where such fittings are less frequent, it is necessary to drill down to the pipe and use metal bars to link to the microphones.

Gas injection

Gas injection and tracing techniques are used less frequently, since the previously mentioned methods of location are successful in most cases. Its use is also specialised and is generally carried out by a specialist contractor. The main application is for locating leaks that are difficult to find, particularly on non-metallic trunk mains and mains that operate at low pressures. The most common tracer gases used are sulphur hexafluoride (SF_6) and industrial hydrogen (95% nitrogen and 5% hydrogen). Hydrogen tracing has an advantage over sulphur hexafluoride tracing in its speed of tracing. Hydrogen diffuses through ground quicker and obviates the need for boring holes to enable the gas to reach the surface. The process involves injecting the gas into a pipe through a fitting, such as a fixed jumper hydrant, and an operator tracing the line of the pipe with a sensor.

Use of helium gas is also being used by some operators to help detect invisible leaks.

Other techniques

There are other techniques that have been tried in the water industry with varying degrees of success. These are usually applied to leaks that are difficult to locate and the techniques are expensive. They include ground penetrating radar, thermal imaging and in-pipe acoustic technology.

Ground penetrating radar identifies changes in electrical and magnetic properties in the ground. It is a well established technique for locating underground apparatus and has now been adapted for leakage location purposes. Its ability to detect differences in the density and water content of soils around pipelines enables it to identify leakage from mains. Thermal imaging can be used in much the same way to detect the effects of ground temperature changes brought about by water leakage. Both methods generally use an aircraft mounted camera and are particularly useful over-flying rural watermains.

In-pipe acoustic technology is now becoming an alternative to correlation in leakage location, particularly on larger diameter watermains. Proprietary systems such as ‘Sahara’ and the ‘smart ball’ have been developed using this technology. ‘Sahara’, developed by the WR in the UK, uses a microphone cable inserted into a pressurised main through an access tapping point. The cable is calibrated to measure the distance from the entry point to the leakage point that is detected by the microphone. The equipment is suitable for all pipe materials and successful detection has been achieved on survey lengths of up to 200 metres. The ‘smart ball’ is a free-swimming foam ball with an instrumented aluminium core capable of detecting and transmitting leakage noise. Like 'Sahara', the 'smart-ball' is inserted into the pipeline through an access tapping point.

8.3.8 Detection equipment

There is a wide variety of equipment available from international suppliers to support leakage location activities. A summary of the type, applications and limitations is given in the following:

Table 8.4: Summary of Leakage Equipment Type

Equipment type	Comments/application	Limitations
'Basic' listening stick.	Rudimentary sounding of pipework fittings.	Some smaller leaks may go undetected. It requires the operator to have a good ear to recognise leakage noise.
'Electronic' listening stick.	General sounding of pipework fittings. Better that 'Basic' listening stick due to sound amplification. It is sometimes used to confirm the best position of a leak sound after correlation.	Few limitations and generally a useful part of an operators leakage tool kit. Not as sensitive as the ground microphone.
Ground microphone.	More sensitive than 'electronic' listening stick. Generally used to confirm best position of a leak sound after correlation. Powerful enough to locate sounds through metalled road surfaces. Can be used for general sounding with a probe screwed into the microphone.	More cumbersome to use that the listening stick.
Ground microphone with sound frequency filters.	As sensitive as the ground microphone with the added advantage of having filters that can remove unwanted sounds. Generally used to confirm best position of a leak sound after correlation. Powerful enough to locate sounds through metalled road surfaces. Can be used for general sounding with a probe screwed into the microphone.	More cumbersome to use than the listening stick.
Acoustic detection loggers.	Detects and stores sounds within the distribution network within preset times. Usually between 0200 and 0400 hrs when demand is at its minimum. Loggers are set-up and downloaded on a PC. Leak sounds are identified by the range of sounds identified by the logger. Useful in areas where normal detection activities cannot be carried out.	Does not locate actual leakage position.
Step-test unit.	Mobile Advanced Step Tester (MAST) system. Used for remote monitoring of flows whilst carrying out step-tests within distribution networks. Allows almost instant results of valve closures leading to minimum disruption to customers. Leak location is carried out on site rather than having to wait for downloading of loggers back in the office. Can also be used for remote monitoring of pressure at sensitive points when setting up DMA's.	Valve closures required that will cause supply interruptions and possibly discolouration problems. Consequently this method is usually carried out at night to minimise disruption.
Leak noise correlators.	Used for general surveying of lengths of mains for leak noise followed by more accurate leak location. Various models available from easy to use menu driven machines to PC controlled machines for more difficult jobs. Sensitive enough for even quiet leak sounds and capable of surveying long lengths of main. PC based correlators are capable of interrogating flow	Very accurate when all data inputs can be guaranteed. Incorrect data input relation to pipe material, length, and velocity will lead to erroneous results. A reasonable degree of operator training is required together with skill and experience.

Equipment type	Comments/application	Limitations
	and pressure data loggers and can be loaded with graphics to display distribution network records.	
'Flexi trace'.	Enables non-metallic pipework to be traced by the insertion of a flexible wire into the pipe. A signal is induced into the wire that enables it to be traced using a cable avoidance tool.	The trace wire has to be installed inside the pipe giving rise to contamination potential. Trace wires will not pass sharp or T bends.
Pipe and cable locating/avoiding tools.	Used for locating pipes and cables.	Cannot trace non-metallic pipes unless 'flexi' wire is inserted. Limited distance tracing of having flexible rubber jointing systems.
Other pipe tracing equipment	A 'vibrating' sound can be induced in the pipe to be traced through equipment attached to a hydrant. The pipe is traced by listening on the surface for the sound being transmitted into the pipe.	There could be complaints about noise in the pipes when equipment is being used. Additionally there are concerns that vibration could damage pipes.

8.3.9 Apparent water losses

Apparent losses are sometimes described as 'non-physical' losses or 'commercial' losses. The term 'apparent losses' is used by the IWA and also has been adopted for use in this manual. The main difference between 'real losses' and 'apparent losses' is that 'real losses' represents water produced by the operator that goes to waste whereas 'apparent losses' represents water that is used by consumers (customers or non-customers) but is not accounted for.

The main components of apparent water losses are described briefly in the following paragraphs.

Unauthorised consumption

Unauthorized consumption is always difficult to assess but can represent a large component of NRW.

Various techniques are available to help identify potential causes of unauthorized consumption from unrecorded connections, illegal connections, tampered meters, etc.

ROC staff should carry out field checks in areas where buildings with no recorded water connection exist alongside distribution pipeline routes. The aim is to identify if any of these properties are likely to use water and if so, what sources are in use.

Modern, up to date base maps (e.g. satellite imagery such as Google Earth) can be used to help identify the location of individual buildings within the ROC service area at some localities within the ROC agglomeration. If the layout of the distribution network is superimposed on the base maps then buildings without a recorded connection can be identified. Such checks carried out by ROC personnel will help to identify potential unrecorded connections or illegal connections. Thereafter, the ROC can take action to install meters, register such connections, and to generate additional income.

Metering inaccuracies

Meter inaccuracies can be assessed by checking meters for correct size, age and type criteria. This in turn will drive a metering policy programme.

The sizing of meters using the Romanian standards in force in the past resulted in some ROCs with over-size customer meters – in some cases at the same size as the connection pipes. Due to changes in the charging system, tariff increase, etc., customers have reduced their undue water consumption and waste, and overall domestic water consumption has fallen substantially.

The preparation, implementation and proper monitoring of a customer metering policy are essential parts of a programme of active control of apparent losses (and of an income improvement programme) for the ROC.

A technical policy for customer metering should be prepared with joint contributions and commitments from concerned departments of the ROC and should cover topics relevant to the whole cycle of technical and operational activities relating to customer metering including for example:

- Main technical and operational functions relating to customer metering
- Management and organisational arrangements with clear allocation of responsibilities
- Procedures and schedules for technical surveys of customer meters and their installations where meter information is lacking and at intervals to check for changes and / or interference
- Requirements for analysis of meter survey data and reporting of survey findings
- Main guidance on selection of meter types, technical specifications and sizing
- Frequency of replacement of customer meters by size, type and class
- Arrangements for routine calibration of meters with special emphasis on meters of customers using large volumes of water
- Programmes for meters repairs and new meters installation
- Method for monitoring and analysing performance of meters
- Training for ROC personnel on matters relating to metering
- Expected benefits and method for monitoring the effectiveness and efficiency of the metering strategy
- Action plan including objectives on future proportion of authorised consumption that will be metered, new meter installations, repairs and calibrations, frequency of replacements,
- Annex with summarised information for each locality of the ROC on existing meters (types, manufacturer, sizes, age, etc.)

Requirements for meter reading equipment / software and data handling / processing are dealt with by the ROCs' customer billing departments.

Data handling errors

Data handling is not a technical function but is mentioned here because the associated errors form a potentially important part of NRW. The level of data handling errors can be identified by auditing processes where deficiencies should be addressed through procedural review and employee training where necessary.

Data handling errors can occur at several stages in processing bills and recording overall billed water consumption. These include errors relating to:

- Reading the meter
- Transfer of readings into billing system
- Re-basing meter reading when meters are replaced

Benefits of active control of apparent losses

- Proportion of water produced that is 'sold' can be increased
- Loss of income to the ROC can be reduced;

- More accurate estimation of the volume of apparent losses is possible;
- More accurate measurement of NRW;
- Customer perception of the ROC is improved.

8.3.10 Water balance

Measuring Non-Revenue Water

The current method used in Romania, and most other countries in the world, is to express Non-Revenue Water (NRW) as a percentage of system input. This uses the simple formula:

[(Volume of water supplied into the distribution network – Volume of water invoiced to all customers)/Volume of water supplied into the distribution network] x 100

There will be seasonal variations in the calculation but what is important is that the input periods and billing periods coincide.

The accuracy of calculated NRW values is only as good as the accuracy and reliability of the information used. The deficiency of some source and customer meters will lead to estimates being used and this can produce erroneous results. This is highlighted in Appendix E10 which indicates recent years' NRW performances for ISPA - FOPIP ROC's.

Use of the NRW performance indicator expressed as a percentage of water produced and delivered into the distribution system has some limitations. For example it does not:
- indicate whether looses are mainly real or apparent
- take network characteristics into account (pressure, density of connections, etc.)
- does not work well if the supply is not continuous.

These weaknesses are relevant when the indicator is used for comparing the performance of utilities. However, it remains a useful indicator for a utility to consistently monitor and report internally changes in NRW over time.

Water Balance

The current method for calculation of NRW as a percentage is satisfactory for present needs and accuracy of measurement will improve with improvements in metering, but with time there is a need to define water networks in terms of system performance. A methodology for this has been developed by a special Task Force set up by the International Water Association (IWA) and builds on the work done to date in formulating and guiding leakage reduction strategies. The starting point for the methodology is to establish a water balance as indicated in the following table

Table 8.5: The water balance table – a starting point for assessing NRW

Authorised Consumption	Billed Authorised Consumption	Billed Metered Consumption	Revenue Water
		Billed Un-metered Consumption	
	Unbilled Authorised Consumption	Un-billed Metered Consumption	
		Un-billed Un-metered Consumption	

System Input Volume	Water Losses	Apparent Losses	Unauthorised Consumption	Non-Revenue Water
			Metering Inaccuracies and data Handling Errors	
		Real Losses	Leakage on Transmission and/or Distribution Mains	
			Leakage and overflows at Utility Storage Facilities	
			Leakage on Service Connections up to Point of Customer Metering	

A water balance is a framework for defining water losses and its use can help to show more clearly:

- where data is lacking
- the relative magnitude of the components of water losses
- where improvements are needed.

The water balance is based on actual measurements, or estimates, using the best and most reliable information available. Once the volume of NRW is established it is necessary to break it down into apparent losses and real losses as indicated in Table 8.2. Further Performance Indicators, as outlined below, can also be developed that can be linked to asset performance criteria to guide network rehabilitation needs.

An accurate water balance requires a good assessment of the component parts, preferably through quantitative measurements.

Unbilled authorised consumption

This part of NRW is water physically delivered to authorized customers but not charged for. As a consequence, this volume not reflected in system output.

Un-billed metered consumption consists of water supplied to customers through a meter but who are not charged for water used. This is by agreement with the water utility and can include some public buildings, fountains in parks and churches.

Un-billed un-metered consumption consists of water used by the water utility itself for flushing purposes, water for fire fighting and water used for street cleaning. Installing meters for many of these uses is not viable and hence the volumes can only be estimated. For street cleaning and other uses involving road tankers, meters should be installed at the tanker loading points.

The proportion of water sold that is metered in an important performance indicator for the ROCs. A high proportion of metered volume sold will help towards improving the accuracy of NRW calculations. A low proportion indicates a higher degree of uncertainty on the calculated NRW value.

Therefore, unless the cost of producing water for distribution is very low (e.g. gravity supply from an abundant, high quality source) then the ROC should ensure that the highest affordable proportion of authorised consumption is metered accurately.

Real losses

Real losses as described in previous sections have two components, those that are unavoidable and those that are potentially recoverable through cost effective leakage control activities. The unavoidable real losses represent leakage for which the cost of efforts to reduce it would exceed the savings to be gained i.e. an uneconomic level of effort would be required.

The latter, avoidable losses and their reduction are affected by:

- Speed and quality of repairs;
- Pressure management;
- Infrastructure management;
- Active leakage control.

8.3.11 Losses Assessment

Infrastructure Leakage Index

The most recent real loss indicator as developed by the IWA is the Infrastructure Leakage Index (ILI). This is a measure, in purely technical terms, of how a water network is managed for the control of real losses at its current operating pressure. It is the ratio of Current Annual real Losses (CARL) to Unavoidable Annual Real Losses (UARL):

ILI = CARL/UARL

To determine CARL and UARL and subsequently the ILI it is necessary to have the following system data:

- Q_B Billed authorised consumption
- Q_{NB} Unbilled authorised consumption
- Q_L Volume of water losses (m3/yr) $Q_{RL} + Q_{AL}$
- Q_{RL} Real losses (m3/yr)
- Q_{AL} Apparent losses (m3/yr)
- Q_{SIV} System inflow Volume (m3/yr)
- Q_R Registered flow (m3/yr) $Q_B + Q_{NB}$
- C_n Number of connections
- L_n Total network length (km)
- L_c Total length of connections (km)
- P_m Average network pressure (metres head)
- Q_S Supplied flow (m3/yr) $Q_R + Q_{AL}$
- T Time water supplied during day (hours/day)

The representation for CARL is:

$$CARL = Q_{RL}/C_n \text{ (m3/year/connection)}$$

The representation for UARL is:

$$UARL = [(A \times L_n) + (B \times C_n) + (C \times L_c)]P_m \qquad \text{(litres/day)}$$

For the calculation of ILI, CARL and UARL have to be converted into compatible units, namely **litres per day per connection**.

A, B and C are constants that have been derived from the results of an international survey of water networks. A = 18, B = 0.8 and C = 25. In cases where water is not provided for 24 hours the UARL is reduced proportionately to the hours supplied.

For comparative purposes ILI has been compared for a number of countries that have participated in the IWA information sharing scheme. This information is detailed in the following table:

Table 8.6: The number of countries that have participated in the IWA information sharing scheme

Country	Number of participating utilities	Range of ILI	Mean ILI
North America/Canada	20	0.8 – 12.0	4.9
UK	22	1.4 – 6.5	2.58
Australia	27	1.0 – 13.2	3.0
South Africa	27	0.7 – 10.8	6.3
Thailand	14	46.0 – 543.0	
Kosovo	7	3.3 – 23.0	
Austria	27	0.3 – 6.6	
Croatia, Bosnia and Herzegovina	13	1.5 – 17.0	
The Netherlands	4	0.3 -0.6	
Italy		3.0 – 12.0	
Romania	29	0.9 – 57.7	25.0
20 unspecified countries	27	0.8 – 10.8	4.4

The detail of ILI's for Romanian utilities is given in Appendix E6. Inter-country comparison of ILI is not particularly beneficial as local conditions will vary considerably. It is also influenced by pipe dimensions and network pressure. Oversized networks operating at low pressure will generate a large ILI.

Network leakage per kilometre (LKM)

It is also necessary to consider the technical condition of the network in terms of leakage per km length of a network. This is given by the following formula:

$LKN = Q_{RL}/L_n$ (m3/year/connection)

Economic Leakage Index (ELI)

The most important need for an operator is to assess the economic value of acceptable water losses. This is done by relating the Economical Index (EI) to the Losses Index (LI) through the following relationship:

ELI = EI x LI

EI is assigned a value based on the network system configuration as follows:

1.5 – water in the system receives two-stage treatment and is pumped into the network at a minimum pressure of 50 metres.

1.0 – water in the system receives two-stage treatment but gravitates into the network or only requires disinfection but is pumped into the system.

0.5 – water in the system only requires disinfection and gravitates into the network.

LI is given by the following Formula:

LI = LKN/3600

For using the ELI the following classification can be used:

ELI > 3.5 A network where the water losses cause significant economic operating losses and where the operator should focus on leakage reduction.

ELI ≥ 2.5 to ≤3.5 A network where water losses do not cause significant economic operating costs.

ELI < 2.5 A network where water loss levels are acceptable and where further investment in water loss reduction would be not be economic.

Example calculations for NRW, LKN, ILI and ELI are given in Appendix E11 and a summary of results for water networks in Romania is given in Appendix E12.

8.3.12 Methodology for assessing network condition

Using the performance indices relating to leakage defined in previous sections, it is possible to create a methodology that will help to assess network performance and hence to prioritise network rehabilitation needs.

This methodology links water loss indicators to asset condition thereby driving network rehabilitation programmes in an objective way.

The performance indicators to be used are:
- Non-Revenue water (NRW)
- Leakage per kilometre of network (LKN)
- Infrastructure Leakage Index (ILI)
- Economic Leakage Index (ELI)

Based on the assessed values of the performance indicators the water network can be condition categorised based from very good to unacceptable. Five categories are recommended for comparative purposes. These are:

Category 1 – C1 - (very good) - Optimum condition of the relevant indicator. No special measures are necessary to improve this indicator.

Category 2 – C2 - (good) - Low level of risk of the relevant indicator. No special measures are needed to improve this indicator.

Category 3 – C3 - (average) – Average value of the relevant indicator. No measures needed to effect improvement other than planning to cater for a potential deterioration.

Category 4 – C4 - (critical) – Critical value of the relevant indicator. This is a trigger to implement corrective action to bring about improvement.

Category 5 – C5 - (unacceptable) – Unacceptable condition requiring immediate action to improve performance of the relevant indicator; an indication that action should have been taken retrospectively.

A range of values is applied to each category for the performance indicators and these are detailed in the table below. The values are based on international assessments. However, to define a higher degree of priority need, due to years of underinvestment, it may be considered necessary to reassign the ranges.

Table 8.7: Range of values applied to each category for the performance indicators

Category	NRW (%)		LKN (m3/yr/conn.)		ILI		ELI	
	from	to	from	to	from	to	from	to
C1	0	10	0	10000	0	10	0	1
C2	10	20	10000	20000	10	20	1	2.5
C3	20	30	20000	30000	20	30	2.5	3.0
C4	30	40	30000	40000	30	40	3.0	3.5
C5	40	40+	40000	40000+	40	40+	3.5	3.5+

8.3.13 Use of computer models

As a result of a National Leakage Initiative undertaken in the UK in the 1990's, one of the identified needs was to develop a methodology for leakage management that could be modelled by computer. The methodology so developed became known as BABE – Burst and Background Estimates.

BABE modelling is not a precise science; it relies on a number of estimates and assumptions. Some of the estimates and assumptions are specific to individual water operators, some are default values based on industry averages and others are based on an engineer's judgement.

The objective of BABE modelling is to assess the components of leakage in a supply zone and then to compare that estimate with the level of leakage derived from either the water balance or from nightline data, or preferably both.

The first BABE computer model was developed in 1994 and a user group set up to compare results from different operators of UK water companies. Since that time the techniques have been applied internationally which has led to the development and expansion of other models. Some are single page spreadsheets, whilst others comprise several sheets for each supply zone. They can also be linked to demand forecast models to develop least cost demand strategies and run 'what – if?' scenarios.

BABE makes an assessment of real losses using three components:

- Background losses – These are losses that individually quite small, but collectively can contribute a significant amount to real losses. They generally run undetected for considerable periods of time;
- Reported bursts – Bursts and leaks that come to the attention of the operator quickly through being reported and not through active leakage detection. Alternatively they can be identified through customer complaints such as poor pressure.
- Unreported bursts – These generally have a higher flow rate than background losses, but do not readily show on the surface. They are detected as a result of Active Leakage Control (ALC).

There are number of low cost or free software packages that can be obtained from the internet to assist Utilities in developing a water balance and assessing BABE. Some useful sites are:

- LeaksSuite – www.leakssuite.com

- Aqualibre – www.wrp.co.za
- WB-Easy calc – www.liemberger.cc

Numerous more are available by using internet search engines or the IWA Conference web-sites. The latter is also useful in providing specialist experience of available packages.

8.3.14 Strategy for NRW Reduction and Control

General

A strategy for NRW reduction and control needs to address several important topics including:
- The overall management of activities relating to NRW reduction and control
- Organizational arrangement relating to management of NRW work at the ROC headquarters and across the localities of the ROC
- Preparation, adoption and implementation of a written strategy on NRW reduction and control
- Establishing ROC-wide understanding of the strategy.

Management aspects

The IWA classification of NRW clearly indicates various technical, commercial and administrative aspects of revenue and non-revenue water. As such, skills in these areas need to be integrated in a workable way to achieve effective management of the NRW activity. The key steps to establish a proper organizational and managerial set-up for NRW are detailed below.

For the objectives of a NRW strategy to be realized it is required to have:

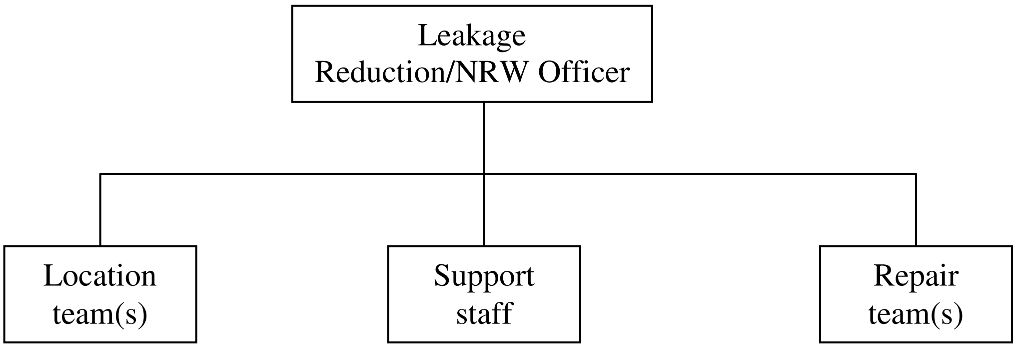
-Management commitment

-Staff with the right skills and knowledge

Organizational aspects for NRW management

The management team will have overall responsibility for NRW management but in order to provide a focus for the activity it needs a channelled organizational structure. There are many models that can be adopted but the following is considered the most appropriate for the needs of the Romanian water sector with a Leakage Reduction/NRW Officer heading a small department that reports to the Technical Director. The specialist department can be drawn from existing departments within the water utility as the skill requirements will vary. However the base skills will already exist within existing utilities, supplemented with training, but will benefit from being given a common focus.

Figure 8.9: Scheme for leakage reduction team organization



The main purposes of the NRW department are to reduce NRW in line with set targets, monitor and report on performance and keep abreast of developments in the leakage reduction field. To achieve this it will require:

- Co-ordination between the various disciplines in the water utility that impact on NRW activities, e.g. water production, distribution, commercial, customer service;
- Co-ordination with external organizations, e.g. local authorities, county councils, police, mass media;
- Knowledge of network operation;
- Skills in leakage location techniques;
- Data collection skills with the ability to monitor performance from an operational and budgetary point of view and provide timely reports on progress;
- Skills in carrying out network repairs;
- Have access to the management team to enable conflicts of interest (such as differing departmental priorities) to be resolved when they occur.

The suggested job profile for the Leakage Reduction/NRW Officer is as followed:

- Have experience to understand both the technical and commercial components of NRW and develop an appropriate NRW strategy;
- Have qualifications to support his important role in the organization;
- Be a good communicator;
- Be computer literate and have experience of data collection techniques and reporting
- Be a good time manager.

The responsibilities of the subordinate sections would be:

- Location team(s) – Establishment of DMA's, network inspection, location of leaks;
- Support staff – Monitoring of performance, collection and processing of information, liaison with commercial and administration departments, production of reports, system administration;
- Repair team(s) – Network maintenance, repairs of identified leaks.

A written strategy for NRW reduction and control

Management of the water utility should prepare, adopt and implement a cost-effective strategy for NRW reduction and control.

The preparation of a strategy document is recommended because, apart from the ROC's internal needs, the ROC needs also to demonstrate to IDA that, after establishment as a Regional Operator, the company respects its obligations to organize and manage effectively the reduction and control of NRW across all branches of the ROC and has set out an effective strategy to achieve this within a reasonable time period.

In Appendix E 9 (Outline of the Strategy for Reduction of Leakage and Unaccounted for Water – NRW) is given information and guidance for preparation of a strategy. The purpose of the strategy is to help the ROC to plan, justify and scheduled actions needed to reduce the amount of NRW including identification of problems which can lead to water loss from the system.

The strategy outline includes provision for a description of the current problems of ROC, the future objectives for reducing NRW, proposed approach and methodologies to improve procedures and practices for measuring losses, identifying how and where losses occur and remedying them.

It is important that selected techniques for NRW reduction are based on actual results and / or accurate assumptions and that the selected actions are adequately resourced in terms of manpower, equipment and materials. The ROC needs to be realistic in what targets it sets as over-optimistic plans are likely fail due to inadequate resourcing.

A ROC-wide understanding of the NRW reduction and control strategy

The management team and experts in the water utility need to have a proper understanding regarding the objectives of NRW management/reduction and the general approach to be followed. Managers should see NRW management as part and parcel of good operating practise, understand the main characteristics and give a commitment to its required activities, including the making available of resources.

To achieve this, awareness and training measures may be required e.g. workshops and meetings to determine NRW strategy of the water utility as well as periodic review of NRW activities to measure performance against targets. This should be supported by reporting.

8.3.15 Regulations on control of waste, misuse, and undue consumption

The focus of this part of the manual has been on the efforts that need to be made by the ROCs to reduce and control NRW within the distribution networks and by so doing achieve greater efficiency in the provision of water services to the ROC's customers.

Customers can also contribute towards improving the efficiency of water services by taking care to avoid or unnecessary consumption of water.

In some European countries e.g. the UK specific regulations oblige users of water supplied via the public distribution networks, to prevent contamination, waste, misuse, undue consumption and erroneous measurement of water supplied by a water utility.

Under the FOPIP II project a model regulation has been prepared to assist the relevant Romanian and European authorities towards development rules and guidelines to reduce inefficient and hazardous use of water supplied by water utilities via public distribution networks. The model regulation and associated schedules have been based upon the UK Water Supply (Water Fittings[8]) Regulations 1999.

The principal provisions of the UK water regulations (and the proposed model regulations) include the following:

- Water fittings must not be installed, connected, arranged or used in such a manner that they are likely to cause waste, misuse, undue consumption or contamination, or erroneous measurement, of the water supplied.
- Fittings must be of an appropriate quality or standard, and be suitable for the circumstances in which they are used; and they must be installed, connected or disconnected in a workmanlike manner.
- A person who proposes to install certain water fittings must notify the water undertaker, and must not commence installation without the undertaker's consent. The undertaker may withhold consent or grant it on certain conditions. This requirement does not apply to some fittings which are installed by a contractor who is approved by the undertaker or certified by an organization specified by the Regulator.
- Where an approved contractor installs, alters, connects or disconnects a water fitting, he must provide a certificate that it complies with the Regulations.
- A fine as prescribed on a standard scale can be imposed for contravening the Regulations.
- Water undertakers and local authorities are empowered to enter premises to carry out inspections, measurements and tests for the purposes of the Regulations.
- The water undertaker is obliged to enforce the requirements of the Regulations, this duty is enforceable by the Regulatory body.
- The Regulatory body must consult the water undertakers and organizations representing water users before giving an approval for the purpose of the Regulations, and to publish approvals.
- Disputes arising under the Regulations between a water undertaker and a person who has installed or proposes to install a water fitting must be referred to arbitration.

If Romanian regulations on prevention of contamination, waste, misuse, and undue consumption is in future brought into force in Romania, they would have impacts not only on customers of the ROCs but also could have impacts on the ROCs themselves; the ROCs would be obliged to comply with the relevant provisions of the regulations and will have a role in the proper enforcement of the regulations.

8.4 Water, Wastewater and Sludge Quality Monitoring

8.4.1 Introduction

> ***Monitoring the quality of water, wastewater and sludge from the water and wastewater treatment plants is crucial for ensuring the health of the population and for environmental protection.***

The purpose of this section of the Manual is to provide guidance for ROCs with regard to:

- water quality monitoring for raw and potable water for the consumers

[8] Fitting means any component of an internal piped water system and any installation held by end users that are connected to a public water supply system, including pipes, coatings, connecting elements, appliance connections, and any other device installed between an external water distribution network, downstream of the last component of the water service connection on public domain (e.g. a water meter where the water supply is metered) and all points of draw-off.

- wastewater quality monitoring of collected and treated wastewater as discharged into the recipient water bodies
- monitoring the quality of sludge generated by water treatment plants and by wastewater treatment plants
- laboratory practices relating to water quality monitoring.

The Government of Romania is presently developing policies on the management of sludge produced by water and wastewater treatment plants.

It is very important for the ROCs to prepare their own strategy for monitoring the quality of water, wastewater and the sludge generated by the water and wastewater treatment plants. Based on the strategy, ROCs should elaborate and implement action plans for the water, wastewater and sludge quality monitoring.

In the water, wastewater and sludge quality monitoring procedures, the main issues to be addressed are:
- demands and obligations related to the water and wastewater quality monitoring
- establishing the monitoring points
- monitoring frequency.

In the water and wastewater quality monitoring processes, a very important role is played by the ROC's laboratory of physical-chemical and biological analyses where some investigations are performed according to the methods indicated by the legislation for water, wastewater and sludge.

8.4.2 Water Quality Monitoring

8.4.2.1 ROC's demands and liabilities on monitoring the water quality

As per the legislation in force (i.e. the Water Quality Framework 458/2002, completed and amended by the Law 311/2004, GD 974/2004, etc), the water service suppliers are legally bound to monitor the quality parameters of the potable water supplied to the consumers.

To make sure that the quality of the water supplied to the consumers is within the limits of the specified parameters for potable water, the ROC must establish and maintain water quality monitoring arrangements throughout the entire water supply system, starting with the catchment area and ending with points on the connections to consumers.

According to the type of water supply system (see Figures 8.10 & 8.11), the main water quality monitoring points should be the:
- catchment area
- raw water transport main (from the catchment area to the water treatment plant)
- water treatment plant (WTP) or chlorination plant
- potable water transmission main (from the WTP to the potable water tanks, if the case)
- potable water storage reservoirs tanks
- potable water distribution networks.

Pursuant to the GD 974/2004, the ROC together with the Public Health Department has to set water quality monitoring points throughout the distribution network according to its length and urban population density.

8.4.2.2 Other Institutions and Control Bodies involved in water quality monitoring

Besides the authorized testing laboratories of the ROC, related activities are carried out by other institutions such as:

- Ministry of Public Health, through:
  - The Public Health Department (P.H.D.)
- Ministry of Environment and Forests, through:
  - National Environmental Protection Agency (NEPA);
  - Regional Environmental Protection Agency (REPA)
- National Authority “Romanian Waters Association”, through:
  - The territorial waters units: Arges – Vedea, Buzau – Ialomita, Dobrogea – Litoral, Prut, Siret, Olt, Jiu, Banat, Mures, Crisuri si Somes – Tisa
- A.N.R.S.C – the Regulatory body;
- others.

All the above mentioned institutions are authorized to monitor the water quality, to issue water quality bulletins, to apply penalties to the ROC in case of non-compliance and to help resolve any problems that occur.

In case of major non-compliance, the National Regulatory Authority for Municipal Services (ANRSC) may withdraw the operating licence of the ROC.

8.4.2.3 Legislation

The legal framework relevant to water quality monitoring comprises a set of laws and governmental decisions, such as:

- the law on water quality - 458/2002 completed and modified by Law 311/2004
- the law 241/2006 on the Public Service of Water and Wastewater supply
- the ordinance no 88/2007
- GD no 974/2004
- GD no 856/2002
- others.

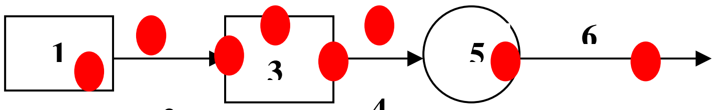
8.4.2.4 Setting the water quality monitoring points

Water quality shall be monitored at pre-selected points along the entire water supply system, from the source to the connections to consumers.

Changes in the raw water quality parameters may influence negatively the treatment process and may generate increased consumption of chemicals.

Simplified examples of water supply system designs are illustrated in Figures 8.10 & 8.11.

Figure 8.10: Water supply system design and the water quality monitoring points - Water supply system provided with potable water tanks

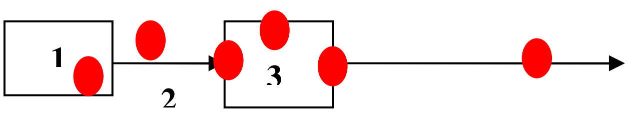


Gravitational flow to the town distribution networks

1. Catchment:
   - surface catchment: river, natural lake, basin etc.
   - underground catchment: wells, well field, drainage
2. Raw water transmission mains
3. Raw water treatment plant or chlorination plant
4. Potable water transport
5. Potable water storage reservoir
6. Distribution network

Water quality monitoring points.

Figure 8.11: Water supply system design and the water quality monitoring points - b. Water supply system without storage reservoir



Pumping to the town distribution networks

1. Catchment:
   - surface catchment: river, natural lake, basin, etc
   - underground catchment: well, well field, drainage
2. Raw water transport
3. Raw water treatment plant or chlorination plant / reservoirs
4. Distribution network

Water quality monitoring points.

With regard to the water supply system, the ROC shall establish the number of the water quality monitoring points for the elements 1, 2, 3, 4 and 5 (see Figure 8.10) in order to be able to identify in due time any negative changes in the values of quality parameters and to eliminate or to find solutions for the resolution of problems that might occur.

Therefore, quality monitoring points should be established at: the source (for the raw water), along the raw water main (especially when we refer to long pipelines in which raw water quality changes might occur), at the entrance of the WTP (in order to identify if the quality parameters values of the raw water are changed compared to the parameters registered at the source point), throughout the treatment process (if need be) and at the exit point from the WTP reservoir.

If the system is provided with a reservoir downstream of the WTP then the monitoring points should be established along the potable water main (if the length is considerable) and at the exit point of the reservoir.

Monitoring points shall be established by the ROC within the water distribution network, in cooperation with the Public Health Department (PHD) in the town area, according to the length of the network and the urban population density.

8.4.2.5 Frequency of monitoring the raw/potable water quality

The frequency of monitoring the potable water quality at the monitoring points set throughout the distribution network in the towns/localities should be established based on the in-house programme of the ROC and in cooperation with the PHD.

Apart from the monitoring timetable, the water quality should be measured at times and locations determined by the ROC to ensure that the quality of the water distributed to consumers is in compliance with the prescribed potable water quality standards.

Also, the assessment of water quality within the distribution network shall be made if there are any complaints and (mandatory requirement) after any intervention that causes interruption to the water supply (e.g. after repair of or replacement of a pipe or fitting, mains flushing, etc.).

The frequency of monitoring the water supply system (source, raw water main transport, WTP, etc) will be established by the ROC in order to generate continuous information on the values of the monitored water quality parameters.

8.4.2.6 WTP sludge management

According to the GD 856/2002, the sludge produced by the water treatment is not classified as a dangerous waste.

Normally, at the WTP, the sediments may be produced as a result of the treatment process by:
- grit traps
- clarifiers
- filters
- reservoirs.

Usually, if the plant is connected to the sewerage system, these sediments could be discharged into the sewer network for treatment at the WWTP. If the WTP is not provided with a connection to the sewerage system, the sludge should be deposited on drying beds, within the WTP, analysed by the ROC based on the quality criterion relating to disposal options and related requirements of a disposal contractor:
- agriculture or Forests
- incineration (if locally facilitated)
- vegetal layer for ecologisation

- landfill.

8.4.2.7 WTP testing laboratories

In the water quality monitoring process from source to the customers' taps, a very important role is played by the testing laboratories.

The generic name "testing laboratories" is according to the ISO/CEI 172025:2005 standard, but the name currently used is "analysis laboratory". Also the phrase "testing bulletin" is currently replaced by "analysis bulletin".

To monitor the raw and potable water quality, the ROC needs to have two laboratories: one for physical / chemical analysis and another one for microbiological analysis.

Both types of laboratories need to be adequately equipped according to:
- the analytical methods for each standard parameter indicated by the legislation on monitoring water quality
- the monitoring frequency imposed by the legislation and the competent authorities.

Laboratory equipment should be provided with:
- sampling, sample conservation and transportation
- adequate space and the its correct allocation for the required functions
- access paths and the ways set for the entry/exit samples, especially for the microbiological analysis laboratories
- satisfactory working conditions (temperature control, air quality, white rooms, etc)
- adequate equipment and the necessary chemicals for each assessed parameter
- personnel (number, professional qualifications and experience so as to be able to perform the assigned tasks).

Monitoring the quality of the sludge generated by the WTP can be performed either in one of the units of the WTP laboratories, in the central section of the ROC laboratory or in a laboratory of the WWTP equipped for the sludge assessment.

In the absence of its own laboratories or the possibility to analyse some of the parameters, a ROC can contract an external authorized or accredited laboratory for the assessment of the respective parameters.

8.4.3 Wastewater Quality Monitoring

8.4.3.1 Requirements / liabilities of the ROC on wastewater quality monitoring

By law (NTPA 001 and 002), the ROC is required to treat the wastewater received into the sewerage system to the specified standards. The quality of discharges into a recipient water body after the waste treatment plant shall comply with the limits set by NTPA 001.

For drainage systems designed for the collection of surface water to be discharged into the recipient water body with no treatment, the discharging points shall be identified and monitored by the ROC because there is the possibility of some buildings have been connected over time to the drains. In this case, the quality parameters of the discharged pluvial waters will not reach the limits provided by NTPA 001.

Along the sewerage network, the quality of collected wastewater shall be compared with the standards set by NTPA 002.

Monitoring wastewater as described above involves establishing monitoring points and a monitoring programme.

8.4.3.2 Other institutions or Control Bodies involved in the water quality monitoring

Besides the wastewater quality monitoring procedures performed by the ROC in their own testing laboratories, related activities are carried out by others including:

- Ministry of Public Health, through:
  - The Public Health Department (PHD)
- Ministry of Environment and Forests, through:
  - The National Environmental Protection Agency (NAEP)
  - The Regional Environmental Protection Agency (R.E.P.A
- National Agency, Romanian Waters, through:
  - The Territorial Waters Agencies: Arges – Vedea, Buzau – Ialomita, Dobrogea – Litoral, Prut, Siret, Olt, Jiu, Banat, Mures, Crisuri si Somes – Tisa
- National Regulatory Authority for Municipal Services (ANRSC)
- Others.

All these institutions are qualified to monitor waste water quality, to issue analysis bulletins and to apply penalties to ROCs in case of non-conformity, and to generate solutions to problems that occur.

In case of non-conformity with the legislation in force, the ANRSC may withdraw the licence of the ROC.

8.4.3.3 Legislation

The legal framework on the assessment of the water quality comprises a range of laws and governmental decisions, such as:

- NTPA 002/2002 – on the procedure of evacuation the waste waters into the sewerage networks of the municipalities and directly into the wastewater treatment plants.
- NTPA 001/2002 –setting the limits on charging with pollutions for the urban industrial wastewater at the evacuation in the natural hydro-graphic sources.
- NTPA 011/2002 –technical regulations on collecting, treatment and evacuation of the urban waste waters;
- Ordinance no 88/2007
- GD 352/2005 – amendment and completion of the GD 188/2002;
- Others.

8.4.3.4 Sewerage network monitoring points for wastewater

Generally speaking, quality monitoring can be carried out in the connection manholes of the economic/industrial agents – the potential polluters. The monitoring frequency is set up by the ROC and the economic agent based on a contract for industrial wastewater collection and charging.

If need it, the ROC may establish also other control points, along to the sewerage network, e.g.: at manholes on the drainage system and wastewater pumping stations if any, etc.

For the sewerage network, the quality parameters of the wastewater shall be compared with the limits established by NTPA 002.

Therefore, the ROC shall stipulate in the contract for the wastewater discharge, contract signed with the economic agents from where the industrial wastewater is discharged into the sewerage network, the limit values of quality parameters, at least equal with the maximum values according to the NTPA 002.

8.4.3.5 Surface water discharged from sewerage networks into the recipient

If the sewerage system was designed with the pluvial networks, the discharging points into the recipient water body should be monitored by the ROC because there is the possibility that in time, some buildings have been illegally connected to this network.

In this case, the ROC should identify these points and find out solutions to collect into the sewerage network, the wastewater that presently is discharged from these buildings into surface water drains.

8.4.3.6 Waste treatment plant monitoring points for wastewater

As a minimum, wastewater quality monitoring points at the treatment plant shall be set at the entrance and exit of the WWTPs.

At the entrance in the WWTPs, the wastewater quality should comply with the limits set by NTPA 002, and at the exit point, with limits of NTPA 001.

If at the exit point some parameter values are exceeding the limit, then the ROC shall set monitoring points inside the WWTP, along the technological flow, in order to identify possible problems in the wastewater system and to remedy them.

8.4.3.7 Monitoring points for treated wastewater into the recipient water body

After the wastewater treatment process, wastewater is discharged into the nearest recipient water body which corresponds from the point of view of the discharge rate.

If the discharging point is situated near the wastewater treatment plant, the monitoring process can be carried out inside of it, in the last inspection chamber. If the distance between the WWTP and the point of discharging into the emissary is great, then the ROC shall take samples at the discharge point.

8.4.3.8 Frequency of monitoring the wastewater quality

- in the connection chambers of the economic/industrial agents, according to the discharging timetable and at any other time considered necessary by the ROC
- periodically along the sewerage network at monitoring points established by the ROC and at any other time as considered necessary by the ROC
- at the WWTP:
  - at the entrance: constantly
  - at the exit: regularly and according to the permits for discharging the treated wastewater into the recipient water body
  - wastewater treatment process: at points and at times considered necessary by the ROC to monitor the effectiveness of the treatment processes.

8.4.3.9 Management of the sludge from the WWTP

The sludge generated by the wastewater treatment process is collected and deposited on drying beds. The dewatering, drying and compressing process of the sludge differs from one WWTP to another and according the other variables such as weather conditions.

The following sludge evacuation options could be considered:
- storage (not regarded as a long-term sustainable solution)
- landfill at solid waste disposal sites of the municipality
- in agriculture and Forests as a compost (fertilizer)
- incineration
- landfill stabilization
- others.

In order to use the sludge in agriculture or Forests it is necessary to determine the sludge composition according to the requirements of the MO 344/2004 regarding the use of sludge from WWTPs to agriculture.

It is important to do soil sampling, pedologic and agrochemical studies to determine if the ground identified is suitable or not to receive sludge from the WWTP.

The ROC shall elaborate a strategy to use the sludge from the WWTP, according to the local conditions. This strategy will be produced by the ROC or in coordination with consultants from different ongoing TA projects or other future projects: ISPA Projects for the elaboration of the Feasibility Study and finance application, other projects, etc.

8.4.3.10 The testing laboratories of the WWTP

The testing laboratories are very important to monitor the quality of the wastewater and sludge produced by the WWTP.

In order to monitor the wastewater quality and the sludge generated by the WWTP, it is necessary for the ROC to be provided with a laboratory for physical / chemical analysis. The minimum equipment of the laboratory serving each WWTP should be according to the current analysis needed to monitor the quality of the wastewater at the entrance into the WWTP, the exit from the WWTP, and within the treatment plant for a good management of the treatment processes.

For more complicated analysis or with a reduced frequency such as the determination of the sludge quality, the ROC may use its own laboratory or can make an agreement with an authorized and/or accredited external laboratory, according to the requirements of the competent authorities or according to their own requirements.

The central laboratory and/or the laboratories serving the WWTP need to be equipped according to:
- the analytical methods for each standard parameter stipulated by the law on quality monitoring (NTPA 001, NTPA 002, OM 344/2004)
- the monitoring frequency imposed by the legislation and the competent authorities.

The laboratories should be provided with:
- sampling, sample conservation and transportation equipment
- adequate space and the its correct allocation to the required functions

- satisfactory working conditions (temperature, air quality, white rooms, etc)
- adequate equipment and the necessary chemicals for each assessed parameter
- personnel (number, professional background, experience, etc. so as to be able to perform the assigned tasks).

8.4.4 Laboratory Practices

8.4.4.1 Introduction to Laboratory Practices

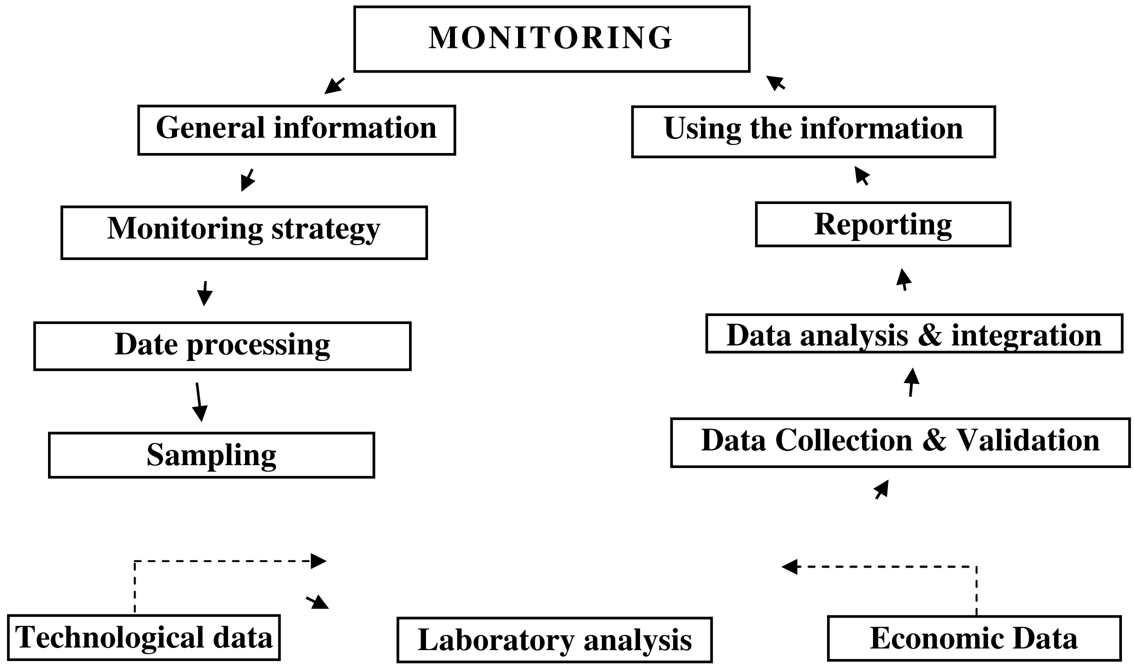
Taking into consideration the importance of laboratories in the quality monitoring process of water, wastewater and sludge, some guidance is offered on:
- good laboratory practices, ensuring the management quality
- the need to implement the general requirements with regard to competence (ISO/CEI 17025:2005 standard)
- data processing and interpreting.

Guidance for the ROC on the following topics also is included:
- general recommendations on quality management
- recommendations on the ROC's responsibility.

Regarding assuring the quality of the data, it is necessary to obtain data and precise and accurate information on which performance of the system and technical upgrading should be based. Quality assurance and quality control of analytical data (QA / QC), through structured programmes and measures implemented in a systematic way, are integral parts of monitoring the quality of water and wastewater and, thereby, the performance of the water and wastewater infrastructure systems.

The cycle of monitoring activity for quality assurance (QA) and quality control (QC) is presented in the Figure 8.12 below.

Figure 8.12: Water quality monitoring QA and QC activity cycle



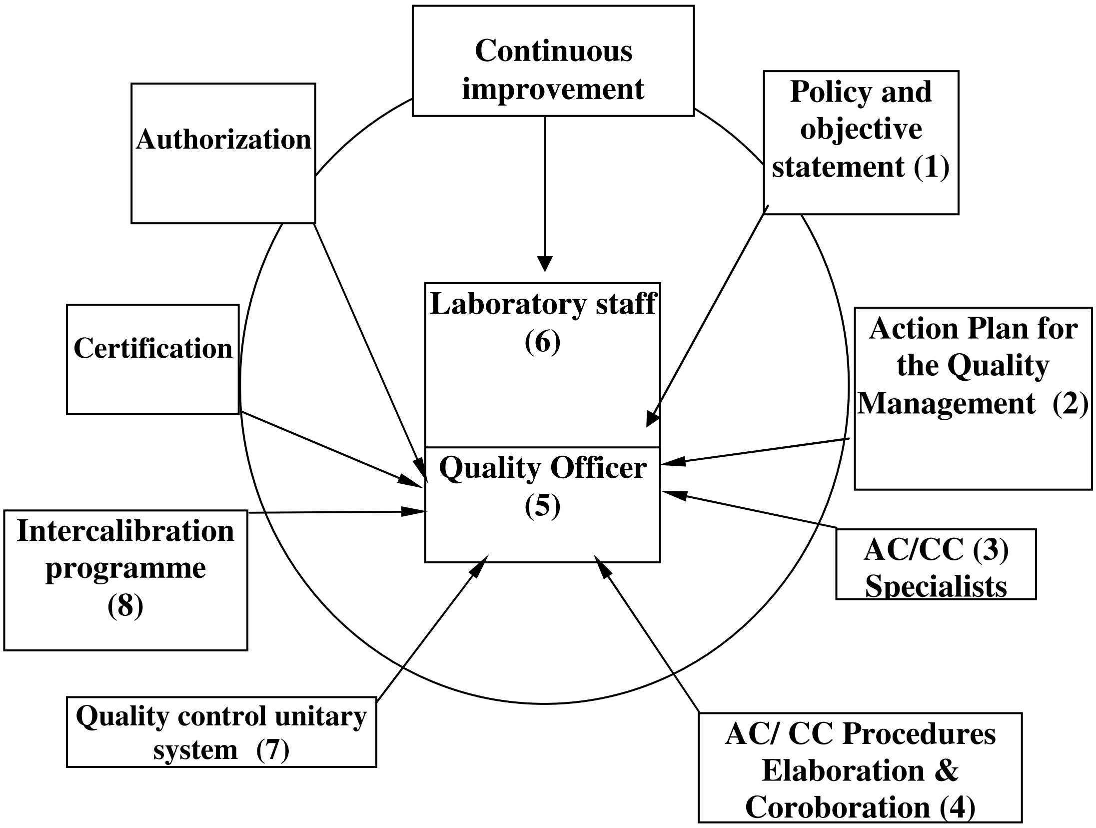
In a laboratory, the quality of the service depends on the accuracy and reliability of results in terms of compounds, valuable and trusted results. It is very important to build a quality assurance system as a cyclic process based on the concept as shown in the Figure 8.13,i.e.:

- Planning – Performing – Verifying – Acting

or

- Planning – Implementation – Evaluation – Improvement.

Figure 8.13: The QA / QC cycle building system



The system is built on the model: Planning – Performing – Verify – Action or Planning – Implementing – Evaluation – Improvement.

It is preferable that the quality assurance system of the laboratory should be integrated in the quality management system of the company and based on the quality and environment management standard or on the three standards: Quality Management (ISO 9001), Environmental Management (ISO 14001), Occupational security and health management (ISO 18001).

Because there is confusion between the **certification** and **accreditation** of a laboratory, a clarification is needed:

> **Certification** represents a written statement of a third party (Authorized Certification Body) on the compliance with the specific requirements of the product, process or service. For the ROC, certification represents evidence of implementation and functioning of a management system, a quality management system, an environmental management system, a health administration and occupational safety or an integrated management system.
>
> The implementation and certification of a quality management system or of an integrated management system in a laboratory can only make sure that it complies with the standard requirements. The management system mentioned above should be implemented and then

certified at the overall organization level as a measure of good management functions within the ROC.

Accreditation of a laboratory certifies the laboratory proficiency, the compliance with the specific standards (standards of method). The formal recognition is made by an accreditation organisation. The standard for the laboratory accreditation is *SR EN ISO/CEI 17025:2005 – General requirements for the competence of the tasting.*

For the accreditation according to the ISO/CEI 17025:2005 standard, it is important to establish the laboratory competence, measurements or calibrations. This standard has two major components:
- management requirements and
- technical requirements.

The management requirements are meeting the ISO 9001:2008 standard principles and are presented in the relevant/adequate language for the operations in laboratory. The evaluation is made by teams made of technical experts and evaluators capable to evaluate the compliance with the management requirements.

Technical requirements focus on technical competence of the personnel and on the technical resources necessary to produce data and accurate results for the testing methods.

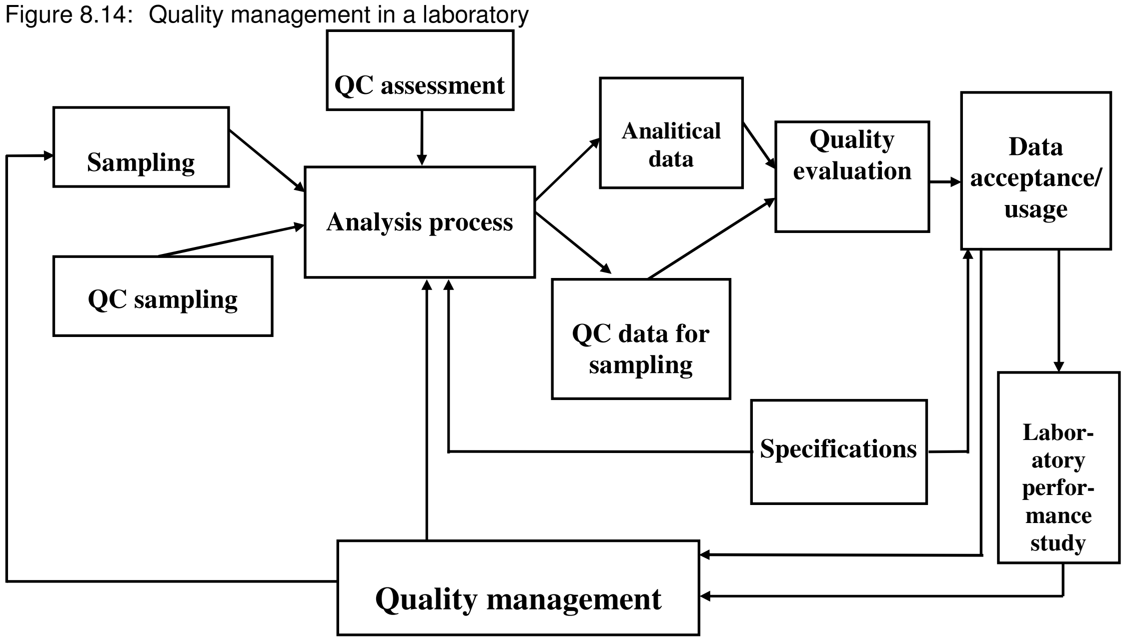
ISO 9001:2008 is a generic standard for the quality management system that can be applied to any organisation, no matter of type, product or service achieved. The same criteria are applied for the ISO 14001 si ISO 18001 standards. The standards are applicable to laboratories and the focus would be to establish the compliance of the laboratories with the requirements for a quality management system, for an environmental management or security and occupational safety or for the integrated management system.

With regard to the quality assurance, it is essential to appoint a person in charge with the data validity. The quality analysis in the laboratory represents an integrated part of the quality management process and involves two components:
- specific procedures to ensure the quality in terms of techniques and execution stages
- provisions regarding the professional competences of the personnel (legislation on quality; experience on practical activity).

The objectives of the QA system are:
- to establish the strategies and the quality control protocol
- to control the data accuracy
- to promote the guidelines for the best practice in laboratory
- to provide the clients and data users all the documentation needed on data quality
- to implement an audit mechanism of the laboratory operations
- to promote the quality control programme – QC – to apply the laboratory practices as in Figure 8.14

The quality standards cover a large area and are the outcomes of a long practice in quality management. These are the best means to create a framework for the quality system management and application.

Figure 8.14: Quality management in a laboratory



The quality system includes the organizational structures, the responsibilities and the needed resources to implement the quality management system.

8.4.4.2 Errors and the cause of errors

Some possible causes of errors in the laboratory are:

- system errors: devices, chemicals, calibration, sampling, calculation
- other errors: power failure, utilities, non-compliant environment, the wrong sample processing, lack of professionalism.

Sources of quality information/errors falsification:

- Issues related to the monitoring structure:
  - inadequate spatial structure in terms of sampling points and their linked density
  - the frequency of sampling is too low
  - not a proper selection of the investigation sections (water intake, water tanks, distribution networks) or indicators.
- Methodological problems:
  - the lack of sampling procedures containing provisions on possible contamination sources and their avoidance for sampling conservation and transportation
  - lack of sampling standard procedures and the analysis for some investigation areas or chemicals
  - lack of performance characteristics for laboratories and units
  - lack of ac procedures
  - non-compliant reference materials.

In order to avoid such errors, there are some internal and external audits or calibration / inter-calibration activities related to the national standard laboratory.

Calibration involves mainly the following two stages:

- initial calibration with pure samples, not treated and if possible, bought with the instrumental analysis procedure
- a final calibration for shape and intermediary operations.

Validation of results represents the adoption of some verification and control procedures on the status of analysis in terms of instruments calibration.

The first objective (and the first phase of validation) is to monitor the tests to see the level of compliance with the national and international standards, by comparisons.

The laboratory is responsible in terms of assessing and verifying the QA requirements set in the monitoring programme, with a focus on:
- verifying the characteristics of samples and the data collection procedure in the field
- ensuring that the samples were registered and delivered according to the monitoring procedure.

The operation and efficacy of the AC system in the laboratory is verified through a well organized inter-calibration programme. This verification is a continuous process applied for each sampling procedure and assessment, and involves also periodical tests, measurements and an analysis programme. The certification and accreditation of the laboratories certifies positive results.

8.4.4.3 Laboratory accreditation

Accreditation is the recognition at the highest level of the laboratory procedures and their applicability. In Romania, the only Conformity Evaluation Body internationally recognized is RENAR. A laboratory can obtain the accreditation from any internationally recognized accreditation body. It is expected that the final accreditation price might be higher, at least due to the translation and interpreter services during the audits.

The reports issued by the accredited laboratories based on the international regulations are essential to certify that a laboratory id accredited. The laboratory accreditation is a procedure certifying that an analysis laboratory has the necessary competence to perform the analysis or the type of analysis needed for the accreditation.

The accredited laboratory shall be fully equipped and operated by qualified personnel and needs to have in place well defined working procedures.

The laboratory accreditation is a voluntary action but is important because of the possibility to:
- obtain the recognition of analysis, samples, measurements and the verifications for the water/waste water/ treated waste water/ sludge in order to get a conformity certificate
- defend ROC assertion of non-compliant industrial discharges to sewers (based on ROC laboratory analyses) in the event of challenge from the alleged polluter
- achieve, based on a tariff, analysis, verifications and measurements for other beneficiaries who are not provided with accredited labs – in this case, the laboratory may easily become a profit unit
- increase the economic efficiency of the laboratory within the company by the contribution made to the turnover (see point above).

Therefore, for a laboratory to be accredited it is necessary to mention the place held in the current accreditation programmes and to answer to an auto-evaluation questionnaire. The accreditation body of the required laboratory organizes a system audit for the laboratory concerning the general performance. This audit is performed by a team with an organizational expert and one or more technical experts under a confidential regime and sets the status on the technical organization and competence also for the available human resource of the laboratory.

Based on the registered audit results, the accreditation might be or not offered to the analysis laboratory.

By authorization, the accreditation body confirms that there is a very developed and maintained quality system in place, at the laboratory level, and that the laboratory provides an acceptable level of technical competence for performance of tests, analyses and sampling required for accreditation.

The accreditation does not reduce the responsibilities of the laboratory. The accreditation certificate represents a serious and favourable assessment of the technical competence of the laboratory but there is no guarantee that the accreditation body will permanently grant such accreditation.

Considerations regarding the competence and integrity shall be clearly described in the laboratory's procedures because these elements are fundamental for satisfactory analysis and maintaining the required standards and reliability of analytical results.

8.4.4.4 Data processing and interpreting

This phase is very important and represents conditions needed to obtain the best conclusions as a result of evaluation the water and wastewater but also to improve the efficiency of the laboratory.

The processing – interpreting phase begins with the simple registration of the analysis results and ends by producing monthly and annual reports.

In all this stages it is very important to avoid possible deficiencies (see the table below) that might influence some information or reporting values.

Issues related to data transmission and processing	QA/QC Issues
◆With regard to the documentation (guides, procedures, forms, bulletins) containing inappropriate information, unclear formulation or unsatisfactory correlation with objectives ◆Late submission or non-submission of documents to the laboratories ◆Lack of data processing methods needed to obtain significant values.	◆With regard to a non-sufficient motivation and implication at the managerial and staff level of the laboratories and at the operational personnel level ◆The lack of QA/QC procedures during the sampling phase and the quality indicators analysis ◆Lack of internal audit programme ◆Lack of procedures for the statistical evaluation of the errors.

8.4.4.5 Recommendations

General recommendations on quality management of laboratories

First of all, are the requirements for a **functional quality management system** in the laboratory as well as for team-work and coordination between the:

- personnel in charge of the laboratory analyses and unit management
- different sub-units of the execution personnel of the same laboratory
- sub-units above mentioned and the person in charge with quality management
- person in charge of quality management and the groups of experts from the upper-level quality management structures.

Among the most frequently applied QA methods in the environmental monitoring process we can mention:

- QA Guides and procedures manuals specific for different stages of the sampling cycle
- systematic structuring and application of the QC procedures
- testing and inter-calibration programmes
- accreditation systems.

The **quality management** shall consider the dynamic elements and shall allow for adequate approaches. When discussing the quality requirements with the data users and the stage of choosing the analytic system, the following elements should be taken into consideration:

- correct sampling according to special sampling procedures
- sampling and assessment time related to the stability of samples and different assessed elements
- time between sampling and daily reporting
- frequency of sampling and the total number of assessed samples
- volume of samples
- sampling conservation
- automated measurements techniques, in situ determinations
- sample transportation systems
- accuracy of the assessment method
- execution cost of analysis
- trust level
- sensitivity of the method
- potential interferences
- pre-treatment techniques and sample solubilisation
- current equipment, the adjusting and extension to the quality requirements imposed by the data user.

Special care should be given to: errors, source of errors, size of error, avoiding methods and uncertainty of measurement etc.

Special care should be given to the measurement transability, a process in which the calibration, the intermediary verification for maintaining trust in the calibration status and in the reference materials, transportation, safe depositing and utilisation of samples and reference materials and in order to prevent the contamination and deterioration of materials and to protect the integrity of results.

Recommendation on the Operator's role

The ROC should take action to protect the health of the population by adequate quality monitoring of water supplied, of wastewater and also of sludge generated by the WTP and WWTP if the intention is to use it in agriculture, Forests and as stabilisation material or landfill. Requirements include:

- adequate equipment and qualified personnel
- implementing the quality management system at the laboratory level
- the implementation of the environment management system and of the safety and occupational health; safety protection against fire
- setting up a programme, section, sampling frequency and analysis according to the system capacity
- calibration and validation with sanitary or inspection bodies
- checks on water potability and stability.

> ***Taking into account the current development trend on the monitoring activity of the water and wastewater systems, the role of the laboratories will become crucial and the ROC needs to pay attention to this matter.***

Taking into account the current trend of developing the monitoring activity of the water and wastewater systems, the role played by the laboratories in monitoring the water quality on specific sections of the system or on the entire system is increasing in providing data and information. Coordinating this data with the technological data or taking into account the quantitative and economic issues, it is possible to get a picture on the status of the systems and of the current trends, at specific points in time.

Recommendation on the laboratory organisation

The restructuring process of the new ROC as one regional entity formed of local operators highlights the fact that the ROC should reorganize the laboratories taken over from the local operators in order to meet the local or county requirements. Therefore, it is advisable for the ROC to make complex and systematic analyses for each laboratory in terms of:

- technical
- managerial
- economic-financial.

Each laboratory analysis should contain the following:

- quality parameters to be monitored
- monitoring frequency (for each parameter)
- the locations where the control is needed / the controlled parameters
- locating the labs according to the control needs (staff, distance, transport etc.)
- equipments/ mobile testing kits (if allowed)
- the current status of the labs (location, status of location, equipment, personnel number, qualification, experience, etc.)
- cost/benefit report (the approach of a treatment in terms of profit/loss centre).

Based on the analysis, the ROC will be able to set some alternatives in order to define the activities of the labs. This definition of the activity of the labs will comprise the number, the structure and the functions of the laboratory. The additional activities will be evaluated and compared to each other based on a set of criteria established according to the monitoring, economic - financial requirements. Some possible options are listed below:

- maintaining the number of existing laboratories, functioning and improving the current activities
- increasing the number of existing laboratories with the necessary equipment
- reducing the number of existing laboratories and equipping the remaining ones
- building a central, modern laboratory for water and wastewater, fully equipped and maintaining the current ones but keeping only the basic types of tests
- building one or more mobile auto-labs
- maintaining a central laboratory and increasing the number of equipments/ mobile kits
- outsourcing some of the tests (generally the tests with a low frequency).

According to the results of the analysis and based on the set of criteria established according to the monitoring necessities correlated with the economic-financial analysis, it is most probable that the ROC will define one or more viable options for specific conditions.

It is advisable that the accreditation process of the laboratory/ laboratories be made after alternative approaches have been examined in order to minimize the costs. It is also advisable for the laboratory staff to become acquainted with ISO 17025:2005 standards and with the step-by-step implementation of requirements without additional costs (procedures, methodology, forms etc). It is recommended to proceed this way because some groups might respond to the requirements and it is better to take the decision of choosing one of the options according to availability, qualification and implication for the personnel in the laboratory.

Annex E17 – *Guide for the implementation of SR EN ISO 17025:2005 requirements and the laboratory accreditation* describes the main steps and the documentation needed for the implementation of the ISO 17025 requirements and the laboratory accreditation by RENAR. As mentioned above, a modern laboratory, with qualified personnel and provided with modern equipment can become a profit centre for the ROC.

Considering that some parameters require a reduced monitoring frequency but at the same time need more sophisticated equipment, the ROC should consider cooperation with neighbouring ROCs for analyses of such parameters. Therefore, one ROC could analyse a set of parameters (e.g. PCB) and another ROC could analyse another group of parameters (e.g. AOX, PAH). Thus, the equipment costs can be reduced and the ROCs may outsource the services to each other.

8.4.5 Water, Wastewater and Sludge Quality Monitoring Strategies

For a systematic approach to the improvement of the ROC monitoring functions for water, wastewater and sludge quality, it is recommended that each ROC should prepare strategy documents e.g.:
- water quality monitoring strategy
- wastewater quality monitoring strategy (including industrial discharges to sewers and sludge disposal).

The purpose of these strategies is to help the ROCs ensure coherence of the information used in the company's various departments and branches on how the ROC management team plans to improve the water and wastewater quality monitoring functions in the light of (a) regionalization across the localities of the ROC under new company management structures (b) new or rehabilitated treatment plants for water and wastewater (c) changes in the main requirements and specifications for water and wastewater quality monitoring.

The strategies can serve the ROC as internal guides with actions plans to achieve improvements in monitoring the quality of water and wastewater.

General outlines for the elaboration of these strategies are given in:
- Annex E18 – Outline for a water quality monitoring strategy
- Annex E19 – Outline for a wastewater quality monitoring strategy.

During the assistance provided to the ROCs under FOPIP 2, such strategies were produced by almost all of the ROCs. It is anticipated that the strategies will need to be revised periodically to reflect changes and developments.

The main themes of the water and wastewater quality strategies should be introduced in the ROC Business Plan to demonstrate the continuous concern of the ROC regarding the water and wastewater quality monitoring, appropriate facilities, staffing levels, training, and adequate budget allocations.

8.4.6 Environmental Impact Assessment

Environmental impact assessment (EIA) is a topic of particular importance for operators of water and wastewater systems.

Impact assessment of all environmental components, but also on landscape, human settlements, architectural and historical monuments, should be carried out both for the following phases:
- realization / construction of water and wastewater systems
- operation of water and wastewater systems and particularly for water treatment plants and wastewater treatment plants.

If not properly managed, the impacts during the construction and operation of an investment can cause significant damage to the environment and can have very serious consequences for one or more environmental factors.

Information is provided in Appendix E20 of this manual on the following EIA topics:
- a general introduction on the purpose of the guide, the FOPIP 2 Consultant's approach to preparing the guide, and aspects of environmental risks and the associated responsibilities of the ROC and ROC personnel
- guidance on EIA procedures – to comply with the latest changes in legislation made during 2009 – for the release of an Environmental Agreement necessary when building or extending wastewater and drinking water infrastructure works
- guidance applicable to the construction phase of works for water treatment or wastewater treatment plants
- guidance applicable during operation of water treatment plants (WTP) and wastewater treatment plants (WWTP)
- risk management.

By the new Government Decision no. 445/2009, two annexes of the EIA Directive (85/337/EEC) are provided:
- Annex 1**;** a list of projects subject to environmental impact assessment and (mandatory)
- Annex 2**;** a list of projects for which the need for an environmental impact assessment has to be established.

Information has to be provided in the Technical Memoir, as required under the above regulation (GD 445/2009), by the owner (i.e. the ROC) of such projects or activities on at least the following:
- description and characteristics of the proposed site

- description and characteristics of projects and activities to be performed: size, technology and proposed materials and the use of natural resources
- description of specific activities for the project period
- brief description of potential environmental impact of the project, including where appropriate, the protected natural areas of interest.

If the project becomes part of Annex 1 (that is subject to mandatory environmental impact assessment), the owner of the activities must provide the following information:

1. Description of the project, including:
    a. description of the physical characteristics of the entire project and the requirements of planning and land use during construction and operational phases
    b. description of the main characteristics of production processes, such as the nature and quantity of used materials
    c. estimates, by type and quantity, of expected waste and emissions (water pollution, air and soil, noise, vibration, light, heat, radiation, etc..) arising from the operation of the proposed project.
2. Summary of the main project alternatives studied by the holder and the main reasons for the final choice, taking into account the environmental effects.
3. Description of the environmental issues likely to be affected significantly by the proposed project, especially the population, fauna, flora, soil, water, air, climatic factors, material assets, including architectural and archaeological heritage, landscape and interconnections between factors above.
4. Description[9] of possible significant effects of the proposed project on the environment resulting from:
    a. existence of the project
    b. use of natural resources
    c. emissions of pollutants, noise and other sources of discomfort and waste and a description of the holder of the forecasting methods used in environmental impact assessment.
5. Description of the measures envisaged to prevent, reduce and where possible offset any significant adverse environmental effects.
6. A non-technical summary of the information provided in the previous paragraphs.
7. Indication of the difficulties (technical deficiencies or lack of know-how) encountered by the project owner to present requested information.

Both the request for approval of a project development and the decision of the competent authority should be brought to public knowledge by the competent authority and the holder, by public notice or by posting it on its website.

Details of the procedure on environmental impact assessment, under the laws in force in the second half of 2009 are presented in the guidelines on procedures for Environmental Impact Assessment as presented in Appendix E20.

9 The description should cover the direct and indirect, secondary, cumulative, short-, medium- and long-term, permanent and temporary, positive and negative aspects of the project on the environment.

8.5 Levels of Service (LOS) and Standards of Service (SOS)

8.5.1 Introduction

Chapter 4 deals with improving the performance of the ROCs in key areas of their activity using benchmarking principles. The focus is on the managerial, operational, financial and 'continuity' or 'asset management' areas. Training was provided to the FOPIP I ROCs through Regional workshops and a Working Group was established to review and agree the PIs, and their structure, that would be most useful in developing LOS and SOS. The Working Group comprised representatives from the then MESD, MIRA, and ARA.

Data was collected from the FOPIP I ROCs to assess the LOS provided and targets were set for future SOS. These LOS and SOS were intended for inclusion in the Delegation Contracts concluded between the IDAs and their ROCs.

During FOPIP II, a generally similar approach was adopted involving the provision of training for the FOPIP II operators and working with the operators to help with compilation of data and calculation of the values of performance indicators. Values of the performance indicators were prepared for years 2007, 2008 and 2009.

Information and training was also provided on the potential use of the Web-based benchmarking system that was established during the FOPIP I project in cooperation with the Romanian Water Association (RWA or ARA).

A FOPIP II benchmarking strategy, approved by the Ministry of Environment, was prepared in July 2009. The strategy took account of the work done on benchmarking under FOPIP I and included certain adjustments to the selection of benchmarks as discussed in subsequent sections of this Chapter.

8.5.2 Definitions

The following definitions have been applied:

> ***Definitions and interpretation of LOS and SOS vary from country to country. The definitions below apply to this document.***

Benchmarking – Benchmarking is a process for identifying and learning from good practices in other organisations. It involves a process of monitoring performance an organization relative to other organisations and having access to how performance is achieved;

Performance Indicators (PIs) – Measurements of actual performance in key activity areas of an organization - the calculated values of PIs depend very much on use of clearly understood definitions for each PI and the quality of the input data;

Levels of Service – The quality of services actually provided by an organisation *(Note: this definition is the reverse of the FOPIP I definition)*;

Standards of Service – The required quality of services required on an organisation (*Note: this definition is the reverse of the FOPIP I definition)*.

It is important to make an accurate assessment of current performance and set challenging, but realistic, targets for future improvement. It is important to make an accurate assessment of current performance and set challenging, but realistic, targets for future improvement.

8.5.3 Performance indicators and LOS targets

In the table below the benchmarking indicators from Chapter 4 are supplemented with a LOS target. proposed by the FOPIP I project. The time period for achievement of the LOS target (i.e. a SOS) is not specified in the table and it is assumed that the target values represent a general profile of acceptable performance.

Table 8.8: Performance indicators

Indicator	Description	LOS target
Operational indicators		
1. Water and Wastewater Quality Compliance.	Number of selected final water production and waste water effluent samples per year that comply with the respective quality standards. Expressed as a percentage of the total number of samples taken in the year. The parameters used for water quality should be: Turbidity Iron Manganese Ammonia Chlorine Nitrate Coliforms E Coli The parameters used for wastewater quality should be: Suspended solids BOD5 COD Ammonia	100% compliance
2. Water Consumption: litres/person/day.	Total annual quantity of water sold (invoiced) to customers/ population supplied, expressed in litres per person per day.	115 l/p/d
3. Non-Revenue Water (NRW). (Water produced/day (or year) - Water invoiced/day (or year))/ Water produced/day (or year).	Difference between the water supplied to the distribution network less the quantity of water sold divided by the quantity of water supplied to the distribution system, expressed as a percentage. By using the parameter 'water supplied into the distribution network' it will enable like for like comparisons to be made for benchmarking purposes. Process water used for water production will vary depending on the treatment process and therefore will distort values if included in the NRW calculation.	35%
Managerial indicators		
1. Population Coverage.	Percentage of the population connected to the water supply and the waste water network.	95% for water, 90% for wastewater
2. Percentage Metered Customers.	Percentage of customers that are actually charged by meter. Not being metered, meaning having to pay bills that are based on assumptions or averages and this may lead to high customer dissatisfaction.	100%

Indicator	Description	LOS target
3. Population Served per Employee	An indicator of manpower efficiency. It considers the population connected to the water supply network divided by the number of employees providing water and wastewater services (including support staff).	500 persons per employee
Financial indicators		
1. Gross Profit Margin: (Gross sales minus direct charges and expenses)/total sales.	Indicates how well the firm covers operating costs with sales before allowing for other costs (including finance, taxes, and extraordinary costs). A negative % indicates that sales do not cover current operating costs. A comparison can be made with net profit margin, which is net profit/total sales.	> 25%
2. Current Ratio: Accounts receivable/accounts payable.	Indicates the ability to pay current liabilities based on the amount of current assets. A ratio > 1 is normally a minimum.	>1
3. Days Receivables: Receivables/(annual sales/365).	This ratio indicates how many income days are necessary to turn a sale into cash. A small ratio (<30) indicates a liquid enterprise.	70 days
4. Days Payables: Payables/(operating costs/365).	This ratio indicates how long an enterprise typically takes (in operating cost days) to pay its creditors for materials, etc. Allowances for depreciation are not included in operating costs. A large ratio (> 90) indicates that the company may be behind in payments or enjoys easy credit terms with suppliers.	< 90 days
5. Total debt/total assets	Measures the percentage of total funds provided by creditors. Debt is defined to include both current liabilities and long term debt. This indicator gives an idea of the company's financial structure. 20% is normal: no company exists without (commercial, banking, fiscal) debt. 50% is a maximum. If the company has long term debt, a second indicator, the debt payment coverage ratio can be used to indicate the ability of the company to service the long term debt. It is defined: free cash (net income + depreciation +/- changes in working capital/debt payments (principal + interest payments).	<50%
Asset management indicators		
1. Percentage of networks yearly replaced.	The amount of the network replaced each year expressed as a % of the total length of the network. Relevant for both water and wastewater systems.	5% per year
2. Number of leakage related repairs to water network and blockages or collapses cleared to wastewater network.	Number of leakage related repairs to water network or sewer blockages cleared or collapses repaired on the sewerage system per kilometre of respective length. Expressed as No. per km. of network per year	5 repairs per year

During the Action Plan preparation phase of the FOPIP II project, a procedure for estimating target values for a selection key PIs (KPIs) over a 5-year time period was discussed with the ROCs. The base-year was 2007 and the projections extended to year 2012. Not all ROCs were willing to include target values for PIs in their Action Plans but technical KPI target values were included by the majority of ROCs.

The KPIs assessed during the FOPIP II Due Diligence phase and proposed for setting targets in the Action Plans were as shown in the tables below.

Table 8.9: FOPIP II KPIs (2007)

a. KPIs for Technical and Operational Performance:

Key Performance Indicator	Unit	FOPIP2 Counties Average
Population Coverage		
Water Supply	*%*	75
Wastewater	*%*	60
Water Consumption	*l/cap/day*	86
Non Revenue Water (NRW)	*%*	37
Repairs & Blockages		
Water Supply Pipe Repairs	*Nr/km/year*	2.7
Sewerage Blockages Removed	*Nr/km/year*	5.4
Network Replacement		
Water Supply	*%/year*	0.0
Sewerage	*%/year*	0.0
Water Meter Coverage	*%*	86
Population Served per Employee		
Water Supply	*Nr*	320
Wastewater	*Nr*	809

b. KPIs for Commercial and Financial Performance:

Key Performance Indicator	Unit	FOPIP2 Counties Average
Commercial performance		
Collection ratio	*%*	**90%**
Days Receivables	***days***	**104**
Average daily invoice collections	*RON '000*	49
Active connections per employee	***Nr***	**83**
Costs per Customer	*RON*	640
Incomes per Customer	*RON*	814
Invoice collected per Customer	*RON*	761
Water supplied per Employee	*000 m^3/y*	16.7
Treated wastewater per Employee	*000 m^3/y*	16.8
Financial performance		
Operational ratio	*Rate*	0.8
Availability ratio	*Rate*	0.8
Current Ratio	***Rate***	**3.0**
Acid test	*Rate*	1.6
Gross Profit Margin	*%*	**17%**
Days Payable	***days***	**81**
Sales / Own capital	*Nr*	7.1
Total Debts/Total Assets	*%*	**50%**
Unit cost of water sold	***RON/m^3***	**2.1**

The KPI tables for each Due Diligence Reports included values for the above indicators specific to the operator and also the average value of the KPIs calculated for all the FOPIP II operators from which data could be obtained. By this method, it was possible to present performance for each operator relative to peer companies. The average 2007 values of the KPIs are shown in the tables above. The above tables are included to illustrate how the topics of performance monitoring and use of indicators were introduced initially to the FOPIP II operators. The process of inputting data and of calculating PI values was not fully developed during the first half of 2008, and the average values of PIs should be regarded as indicative rather than precise.

Appendix E 25 provides the data for FOPIP I ROC performance - mainly based on the year 2007 and the first half year of 2008. Financial information for 2006 was also included where deemed useful.

The Appendix E 25 also includes:
- PIs used during the FOPIP II project with definitions and method of measurement
- performance data input sheets and PI output tables (from a spreadsheet provide to the FOPIP II operators)
- data on the data on FOPIP II ROC performance for years 2007, 2008 and 2009.

8.5.4 Areas for future LOS and SOS application

A number of additional performance indicators have been proposed for use in future by the ROCs. These include:

Supply interruptions – This indicator should show the number of properties connected to the ROC networks that experience interruptions to their water supply of greater than 3hours, 6 hours, 12 hours and 24 hours where the interruption was not planned and where no advance warning was given to customers. Incidents of supply interruptions should be excluded if they were caused by third parties or as a result of planned work and warning had been given to customers. ROCs should maintain records of properties affected by supply interruptions.

Restrictions on water use – This indicator shows the proportion (%) of population connected to the water network that has been the subject to water restrictions. Restrictions can be divided into the following categories:
- Voluntary reductions, encouraged by a publicity campaign;
- Hosepipe restrictions;
- Drought Orders restricting no-essential use of water
- Drought Orders imposing standpipe usage or rota cuts.

ROCs would be required to report the proportion of population affected by the above water usage restrictions.

Flooding from sewers – This indicator examines system performance in terms of internal sewage flooding of properties due to overloaded sewers or temporary problems. The later could involve blockages or pumping station failures. ROCs would be required to maintain registers of the number of properties so affected.

Billing contacts – This indicator shows the total number of personal, written and telephone billing contacts received and the number dealt with in 5, 10, 20 and more than 20 days. A billing contact is any enquiry regarding a bill, e.g. an account query, change of address etc but is not classed as a complaint. This will require accurate recording and processing of contacts for reporting purposes.

Written complaints – This indicator shows the total number of written complaints and the number dealt with in 5, 10, 20 and more than 20 working days. A written complaint is any letter or email that draws attention to any service provided or action taken by the ROC or its representatives which falls short of the expectation of the correspondent. This will require accurate recording and processing of written complaints that are received.

Bills for metered customers – This indicator shows the percentage of metered customers that receive a bill based on an actual meter reading. Estimated reading can be a cause for dispute and cause dissatisfaction with customers. Currently meter reading is generally undertaken on a monthly basis but in the future this is expected to reduce in the drive to increase ROC efficiency and reduce manpower numbers. New technology is also able to assist in this area through the use of 'intelligent' meters. Ultimately the intention should be to move towards a level where customer meters are actually read at least once per year.

Ease of telephone contact – This indicator identifies the ease with which customers can make telephone contact with their ROC. To facilitate this LOS it is necessary to establish customer contact centres and monitor all calls received to the centres to enable reporting to be made. The indicator could measure:

- Total calls received;
- Total calls answered;
- Calls answered within three time bands – within 15 seconds, 15 – 30 seconds and over 30 seconds;
- All lines busy and customers not able to make contact.

8.5.5 Performance Targets for the Future

Unifying performance measurement across the ROC:

The performance indicators for the main towns should be considered as the standard for the ROC and using benchmarking techniques opportunities for improvement in all localities within the ROC should be explored. Data for some localities with the ROCs are still questionable at this point in time. The FOPIP II ROCs have started to reach agreement with their IDA on a timescale for acquiring reliable performance data for each locality within their ROC; some have already made strong progress with this task.

Some ROCs have reported initial obstacles to assessing performance at some localities due to lack of sufficient data e.g. on assets, incomplete records and recording procedures, on the volumes of the services actually provided, and on costs incurred. Over time these short comings will be corrected and more reliable measurement of performance will be achievable.

It is recommended that the ROCs should continue to share experience on how they have standardised the recording of assets, and performance parameters and should set, in cooperation with the ADI, realistic programmes for improving the quality of performance data.

ROC personnel responsible for managing water and wastewater services at each locality should become able to prepare performance data and to monitor changes in performance of the services delivered at the locality.

Setting Performance Targets:

Medium- and long-term KPI target values of the whole ROC (i.e. consolidated KPI values for all the towns and localities in the ROC) should be set for achievement by important dates (nominally 2013, 2018 and

2033) in meeting EU Aquis requirements. The target dates and KPI targets should be agreed between the IDA and the ROC and should be stated in the ROC's Business Plans.

Within the ROC, performance targets for intermediate years using a wider range of performance indicators should be used to help the ROC management team to monitor progress towards achievement of the KPI targets. Performance targets for each locality should be set. The reported PI values will contribute towards the assessment of the overall ROC performance.

LOS reporting:

LOS reporting needs to be a dynamic process. This means that management information needs to be prepared for the selected performance indicators on a monthly basis within each ROC. Formal reporting should be made on an annual basis or at time intervals required by the IDA and stated in the delegation contract.

The format and procedures for collection and reporting of performance data to the ROC headquarters should be harmonised with those of the main towns and action plans should be developed to define how this will be achieved.

8.6 Guidelines for improved operation and maintenance

8.6.1 Introduction

This section of the Manual is designed to provide guidance for Regional Operators on ways to improve operational and maintenance (O&M) practices for provision of water and wastewater services in Romania. Support to the operators on improving the effectiveness and efficiency of such services is an essential component of the overall broader aspects of a Financial and Operational Performance Improvement Programme (FOPIP).

The main O&M operational activities of the ROCs discussed in this section include:

- water resources and abstraction
- water treatment
- water distribution
- wastewater collection
- wastewater treatment
- O&M management systems
- maintenance of equipment
- O&M cost optimisation
- integration of O&M strategies and contributions to the ROC's business plan.

In addition, a section is included on integration of O&M activities and their related strategies and implementation plans.

For each activity a review of current performance and practices or issues has been undertaken and a strategy for improvement outlined. For the following topics an outline strategy document is included in the Appendices to this part of the Manual.

- maintenance of equipment
- O&M management systems
- O&M cost optimisation.

Certain topics have warranted a more detailed examination and therefore have been expanded in other sections of the Manual. Where this is the case, the appropriate cross-references are given. These topics include:

- asset management (Section 8.2)
- non-revenue water (Section 8.3)
- water and wastewater quality monitoring (Section 8.4)
- standards of service and levels of service (Section 8.5)
- energy management (Section 8.7).

8.6.2 Water resources

8.6.2.1 Existing situation

There are a wide variety of water resources in Romania; these include rivers, lakes and groundwater sites. Licences for abstraction of water from the sites are issued by Apele Romane. Surface water sites are prone to transient pollution with no bank-side storage provided and protection zones to groundwater sites have generally deteriorated due to lack of maintenance. There is currently a general lack of metering at abstraction sites which has resulted in license quantities being negotiated.

With the decline in industrial demand and reductions in per capita consumptions, water availability is generally adequate but there are a number of specific exceptions in rural areas where deficiencies result in discontinuous supplies. This is either due to insufficient production capacity or inadequate financial resources to fund pumping operations. Limited resource inspection is carried out by ROC staff.

8.6.2.2 Strategy for improvement

Increasing use of fertilisers and pesticides, together with an increasing ability to detect and monitor for pollutants requires a stricter approach to water sources protection. This requires observation of extraction limits and prevention of pollution through a complex water resource management system that includes continuous water quality monitoring and the implementation of protection measures.

> ***With a reduction in demand for water as a result of industrial decline and reduced customer usage, water resources are generally adequate.***

As a minimum, protection of surface sources must include preventing the discharge of pollutants, particularly non-biodegradable ones, sufficient flow for diluting concentration and minimum flows to achieve self-purification capacity.

Ground waters must be protected by a set of measures preventing pollution penetration the abstraction aquifer. A sufficiently large sanitation area, designed specifically for each water source, needs to be secured to prevent:

- Entry by persons not engaged in its operation;
- Use of any fertilizer or other chemicals;
- Irrigation;
- Access by livestock;
- Erection of any structures or installations not directly related to the utilisation of the source;
- Mining for construction materials;
- Storage of materials etc.

The size of the protection area by the design for each source should be guided by the following general assumptions:

- Water must travel through the ground for a minimum of 20 days from the protection area perimeter to the well;
- The minimum distance between the well and its perimeter is 50 metres upstream and 20 metres downstream;
- When water is extracted from depths greater than 50 metres, the above distances can be reduced by 10 metres;
- For surface water sources, the restricted zone must be 200 metres upstream and 100 metres downstream.

The restricted zone is the is the territory surrounding the exclusion area that ensures the protection of water sources against bacterial contamination and chemical pollution as a result of the respective areas utilisation. Demarcation poles, or more ideally secure fencing, should mark the perimeter of the area. Building may only be erected with the permission of Sanitary Authorities and the use of fertilizers and pesticides should be prohibited if the land is used for agriculture.

The protection of ground waters must also be assured outside of the immediate protection area as pollutants, large distances from well or borehole may contaminate the water.

It is advisable that Regional Operators periodically check the sanitary sanitary condition of water basins or surface water catchment areas.

In addition to protecting water resources it is also necessary to improve management and performance to generate longer term efficiency benefits. To achieve this it will be necessary to:

- Introduce inspection, operating, maintenance and monitoring procedures and operational checklists for activities undertaken. Where these already exist they should be reviewed and updated to ensure optimum performance;
- Develop unit costs for all water resources;
- Where multiple sources are in use, review conjunctive use to establish the most cost effective method of operation;
- Consider moth-balling or abandoning water resources that are surplus to requirements;
- Develop a programme for metering all water resources;
- Provide training to enhance operational staff's awareness and capabilities;
- Develop a programme for replacement of oversized and inefficient water abstraction pumping equipment;
- Develop a programme for the installation of pollution monitoring equipment at sites vulnerable to transient pollution;
- Develop emergency procedures for dealing with a major pollution incident.

8.6.3 Water treatment

8.6.3.1 Existing Situation

The structural condition of water treatment works is very variable throughout Romania from both a civil construction and equipment point of view. The larger sites are generally better constructed and equipped with some evidence of maintenance and investment. However some of the smaller rural sites are in a very poor condition and water treatment capability is very poor.

Recently, some of the larger works have been refurbished through grant supported schemes, and this investment needs to be broadened. There is also evidence of local investment being made available at some smaller water treatment works to tackle some of the fundamental deficiencies resulting from a lack of maintenance activities.

Ground water is generally is of good quality but can be high in levels of iron and manganese, some of the larger works have an aeration process and sand bed filtration to limit the levels of iron and manganese passing into supply. However some wellfields pump directly into supply with only chlorination for disinfection as a treatment process.

Surface waters have historically received screening, flash mixing using aluminium sulphate, sedimentation, either horizontal or radial, filtration and chlorination. Some of the larger treatment works have benefited from process improvements in recent years and in these cases wider use is being made of available coagulants, supported by the use of polyelectrolytes as coagulant aids. Facilities are not provided for recycling process water which can account for up to 10% of works throughput.

Laboratories are currently inadequately equipped for undertaking a full suite of analyses to report against all EC standards.

Operator knowledge tends to be rather limited.

8.6.3.2 Treatment Processes

Ground Water

Operation of ground water sources requires maintaining a balance between the capacity of the well or borehole, recovery of the underground reserves and the extracted volume of water. It is recommended that extracted volumes be as uniform as possible without sudden changes of speed of accumulation at the abstraction level or excessive drawdown of the water table. These occurrences can result in operational difficulties due to the accumulation of sedimentation sand that contribute to capacity reduction or water quality deterioration.

Operation of deep wells and boreholes requires monitoring of the following parameters:

- Flow, both integrated and instantaneous;
- Hydrodynamic and hydrostatic water level. This not only monitors the source capacity performance but also pump efficiency and its possible deterioration when considered in conjunction with distribution system input pressure;
- Water quality, both chemical and bacteriological. This should be done through a continuously flowing sample line;
- Time operation;
- Distribution system input pressure.

The degradation of well/borehole capacity or water quality may be caused by sedimentation of fine particles of sand collected inside the abstraction strata or filter cavity, thus restricting the flow. A further contributing factor may be corrosion of moving parts within pumps or a build up of lime deposits, or biological deposits caused by iron feeding bacteria. Regular planned maintenance of pumps and rising pipework should be carried out on a regular basis (suggest 5 years). This will require taking the well/borehole out of commission and lifting out the pump and pipework for a maintenance overhaul. Regular maintenance can also be supplemented by back-washing of rising pipework with water, or a mixture of air and water, injected at high pressure. This will have the effect of clearing deposits that are reducing pump output and performance.

Iron and manganese present the major treatment challenges regarding ground water treatment.

In Romania, some ground waters have elevated levels of iron and manganese. These can be removed by aeration. This process is detailed in the section below.

Surface Water

Raw water storage

The primary function of raw water storage is to create favourable conditions for self purification through sedimentation and the reduction of bacteria due to the chemical action of oxygen dissolved in water. It also provides a buffer for meeting peaks in water demand and a standby capability for coping with transient raw water pollution.

Screening and grit removal

The first stage of surface water treatment is the removal of suspended or floating debris that protects the subsequent treatment processes and equipment from damage. Since suspended or floating debris can vary in size from sticks and large branches down to very fine particles that can cause turbidity, it is usual to remove the larger debris by course and fine screens. These can be either fixed or rotating with a facility for self cleaning. The finer, but denser, mainly inorganic matter is removed by allowing the water to pass slowly through a chamber allowing the solid matter to settle to the bottom. The aim is to remove grit so as to prevent wear of machinery and unwanted accumulations of heavy inert matter in pump sumps or flocculation/sedimentation tanks. It is usual to design these grit chambers to settle out only those suspended particles that are larger than 0.2mm in diameter and have a specific gravity of greater than 2.65.

Aeration

The primary function of aeration is to provide oxygen from the atmosphere for the oxidation of dissolved iron and manganese to their insoluble form and to liberate carbon dioxide and hydrogen sulphide, thereby reducing corrosiveness and removing hydrogen sulphide. The other benefit of aeration is that it increases the dissolved oxygen content in water causing it to have a sparkling appearance and fresh taste.

There are two main aeration methods, water into air and air into water. The first method is designed to produce small droplets or thin sheets of water exposed to the atmosphere and the second method designed to create small bubbles of air that rise through the water being aerated. Some aerators operate by a combination of both methods.

Cascade aerators are the most commonly used type of aerator due to their simplicity of operation, however, its effectiveness of carbon dioxide removal is only 50% compared to 90% for spray aerators.

Pre-disinfection

The objectives of pre-disinfection are:
- To allow a prolonged contact period for very effective disinfection of heavily polluted waters;
- To oxidise soluble iron and manganese to there insoluble form in order that they may be precipitated out;
- To bleach out colour matter;
- To neutralise free ammonia in the water.

It also reduces algal growth in flocculation tanks and on filter media thereby increasing the length of filter runs. Chlorine is the most common disinfection agent used but does have disadvantages. It is not suitable for waters containing high organic loads as chlorine reacts with the organic matter to produce trihalomethanes (THM's) that are carcinogenic. It can also impart taste and odour into the water. It is for these reasons that other sterilising processes utilising chlorine dioxide, ozone and ultraviolet light have been introduced.

Chemical mixing

The principle objective of chemical mixing is to obtain a rapid and uniform dispersal of treatment chemical for optimum coagulation and flocculation. Optimum dosing rates are determined by laboratory jar tests on the raw water. The most commonly used coagulant in Romania is aluminium sulphate, although iron based sulphates are also suitable for the process. The coagulation and flocculation processes can be assisted by the use of polyelectrolytes. pH control of the water is also important and in this respect it may be necessary to adjust levels through the addition of either acids or alkalies as appropriate.

Sedimentation and flotation

Sedimentation is the process during which settleable floc is formed through coagulant action on suspended solids and thereby reduces the amount of suspended particles that have to be removed by subsequent filtration. In addition to removing suspended and colloidal matter, it also removes bacteria and viruses. Studies have shown that virus removal of between 90 – 99% can be achieved through careful control of the coagulation and sedimentation process. The sludge formed during the process is removed through bleeding with the need to periodically take tanks out of service for cleaning. There are basically three types of tank that carry out the process, all of which are in service in Romania, they are:
- Horizontal flow tanks;
- Inverted pyramidal tanks;
- Radial flow tanks.

Flotation achieves the same objective as sedimentation but floats the floc rather settling it. This is achieved through the injection of fine bubbles into a flotation chamber. The floc so formed then rises to the surface of the tank for subsequent removal.

Sludge that is generated as part of the sedimentation or flotation process can be significant, often in the order of 3 – 5% of the total volume of water treated.

Filtration

After separating most of the floc, water is filtered as the final step to remove remaining suspended particles and unsettled floc. The most common type of filter in use in Romania is the rapid sand filter where water flows through a depth of sand or graded media. More recently activated carbon or anthracite have been added to the surfaces of filters to assist in removing organic compounds and contributing to enhanced taste and odour of the water. Because granulated activated carbon (GAC) requires regeneration on new works it can also be added as a supplementary treatment stage after rapid gravity filtration. Most particles pass through the surface layer but are trapped in pore spaces or adhere to the sand particles. The filtered water is then collected through a system of under-floor drains. Filters clog with time and require to be back-washed with a sequence of water and air. This removes the particles that have become embedded in the filter. The washwater generated during this process needs to be disposed of along with the sludge generated by the sedimentation processes. The current method of disposal in Romania is discharge into a sewer of water course which is not environmentally acceptable and in future will require process treatment and sludge concentration prior to removal from site. This can be minimised by intermediate settlement and returning the supernatant water to the works inlet. This can have the effect of reducing the technological water usage from up to 14% down to 2-3%.

Some water treatment plants employ pressure filters that work on the same principles as rapid gravity filters except that the filter media is enclosed in a steel vessel and the water forced through it under pressure.

Membrane filters can be used for filtering both drinking water and sewage (for reuse). For drinking water, membrane filters can remove virtually all particles larger than 0.2um, including giardia and cryptosporidium. They are an effective form of tertiary treatment when it is desired to reuse water for industry or before discharging into a water course that is used for water supply purposes downstream.

Other types of filtration, such as slow sand filtration, lava filters and ultrafiltration are not in use in Romania.

Disinfection

Disinfection is accomplished by to filter out harmful microbes in the last stage of purifying drinking water. Water is disinfected to kill pathogens which pass through the filtration stage of treatment. Possible pathogens include viruses, bacteria including Escherichia Coli, Campylobacter and Shebelle, protozoan's, including G Lamblia and other Cryptosporidia. Following the addition of the disinfecting agent it is usual for water to be held in a contact tank to allow the disinfection process to complete before supplying the water into the distribution system. The level of disinfection dose should be sufficient to maintain a residual at the extremities of the distribution network. One common problem in Romania is the high level of dosage required at treatment works to achieve the residual requirement. This can give rise to taste related complaints from customers and also make the water the water corrosive.

The most common disinfection method in the water industry is the addition of chlorine dosed in gaseous form from cylinders, drums or bulk containers. Strict health and safety procedures have to be adhered to in using this method of disinfection due to its toxic nature. For smaller installations the use of sodium hypochlorite solution can be considered. All forms of chlorine are widely used despite their respective drawbacks. One major drawback is that chlorine reacts with organics in water and can form potentially harmful trihalomethanes (THM's) and haloacetic acids (HAA's) as well as imparting taste and odour to treated water. Chlorine is effective in killing bacteria but only has limited effectiveness in removing the pathogens, Giardia lamblia and Cryptosporidium.

Chlorine monoxide is another fast acting disinfectant that does have a number of advantages over chlorine although not so widely used. It does not generate THM's and is more effective in dealing with viruses, bacteria and pathogens. However the use of chlorine dioxide for water treatment leads to the formation of chlorite which has to be limited in potable waters to a maximum of 1 ppm. It can also impart an odour into water and this aspect needs to be carefully considered.

Chloramines are another chlorine-based disinfectant. Although chloramines is not as strong an oxidant it does provide a longer lasting residual than free chlorine or form TMM's or HHA's. Water distribution systems disinfected with chloramines may experience nitrification due to the use of ammonia in the process resulting in nitrates being generated as a byproduct.

Ozone is a very strong disinfectant that is widely used in Europe. It is effective in inactivating protozoans and works well against almost all other pathogens. To use ozone as a disinfectant it must be created on site and added to the water by bubble contact. Some of the advantages of ozone include the production of relatively fewer dangerous by-products, compared to chlorination, and the absence of taste and odour produced by ozonisation. Although fewer by-products are produced, it has been identified that ozone produces small amounts of the potentially carcinogenic Bromate. One of the main disadvantages of ozone that it leaves no disinfectant residual in the water, therefore it is usually necessary to further disinfect to supplement the ozone process.

In some cases ozone is used for disinfection. This requires addressing of the related health and safety issues.

Ultra Violet (UV) radiation in inactivating cysts, provided the water has a low level of colour so the UV can pass through without being absorbed. The main disadvantage this method of disinfection is that, like Ozone, it leaves no residual disinfection in the water. Consequently this process also requires the further addition of an alternate disinfectant process to generate a residual.

Hydrogen peroxide is another disinfectant that has potential use. The potential is similar to that for Ozone but requires the addition of formic acid to increase its effectiveness. The main disadvantages are that it is slow working and increases the acidy of the water it purifies.

Additional treatment options

Fluoridation – fluoride can be added to the water supply for the purpose of preventing tooth decay. Dosage needs to be carefully controlled as fluoride can also cause mottling of teeth. There are opposition groups that campaign against the use of fluoride on the grounds that it is mass medication.

Water conditioning – this is a method of reducing the effects of hard water. It uses soda ash (sodium carbonate) to precipitate out the hardness salts thereby reducing the encrustation build-ups within water distribution systems.

Plumbosolvency reduction – in areas with naturally acidic waters of low conductivity, water may be capable of dissolving lead pipes that it is carried in. It will also elevate the levels of lead in the water supply. The addition of small quantities of phosphate ion and elevating the pH both assist in reducing the plumbosolvency effect.

General improvement requirements

In terms of developing a strategy to improve the management and performance of water treatment sites and generate longer term efficiency benefits it will be necessary to:

- Introduce inspection, operating, maintenance and monitoring procedures together with operational checklists for activities to be undertaken. Where these already exist they should be reviewed and updated to optimise performance;
- Develop procedures for dealing with transient raw water pollution incidents;
- Consider the provision of on-site storage for recycling process water and determine if it is cost effective to carry out;
- Develop unit costs for each operational site;
- Provide training to enhance operational and laboratory staff awareness and capabilities;
- Introduce pH control to assist coagulation and thereby optimise the sedimentation stage process;
- Prior to the carrying out of major investments for process change, pilot the new process or processes over a period of time to enable the effectiveness and suitability to be determined.

Operational selection

With the reducing demand for water in Romania there may be the opportunity to select the sources that are put to operational use. This needs to take into account both operational and financial considerations:

- The effect of introducing differing qualities of water into a water network that could give rise to long term discolouration problems;
- The impact that flow reversals can have in terms of generating potential discolouration problems through conjunctive use;
- The cost implications of conjunctive use, a lower cost water against a higher quality, higher cost water.

It may also be possible to mothball, or even abandon and sell off, operational sites. In selecting the most appropriate solution it is necessary to take into account total and whole life costs of each operational site.

8.6.4 Distribution

8.6.4.1 Existing situation

Water networks comprise pipes of concrete, cast iron, ductile iron (lined and un-lined), steel, asbestos cement, uPVC, polyethylene, and glass fibre reinforced plastic. With the exception of some recent investments, pipes are of poor manufacture and networks are in a poor condition as evidenced by the high levels of network leakage. There are no cathodic protection systems in place so metallic pipes are prone to external corrosion in aggressive soil areas. Systems are generally open and operated within pressure control zones although little is done in terms of pressure reduction to reduce network losses.

Limited system inspection is carried and network management is reactive and generally of a manual nature.

Existing systems are often in a poor state of repair. This is a major contributor to high NRW levels.

Customer meter coverage is good and investments in the near future will improve the situation further. As a consequence of the meter coverage position, water demand in recent years has reduced considerably which has meant that network capacity is excessive. This could cause water quality deterioration in the future when network rehabilitation and other initiatives will contribute to reduced levels of leakage.

Reservoirs

Reservoirs are provided on all networks to balance peaks in demand. The standard design incorporated a 20 – 30% capacity for fire-fighting purposes. Quality of construction is variable. Storage volumes were designed as 12 hours for urban areas and 24 hours for more rural areas. However these periods have increased significantly in recent years due to reductions in per capita consumption and industrial usage.

Pumping stations

Pumping stations are provided on the network where necessary to maintain pressures within defined zones. Some pump replacement programmes have been introduced to take advantage of more appropriately sized and efficient units. Significant efficiency losses result from poorly designed pipework layouts. Some demand scheduling is carried out to take advantage of lower night time tariffs but scope exists for its wider application. Little consideration is given to maintenance accessibility in station design.

Metering

Metering of customers has been a long established practise in Romania and more recently investment schemes have included the metering of sources. However little use is yet made of measuring flows within distribution systems. There are several types of meter in common use with selection based on the type of end user, the required flow rates, and accuracy requirements. There are three common methods of flow measurement in use, displacement, velocity and electromagnetic, with the most common types of meter being:
- Positive displacement meters;
- Single an multi-jet meters;
- Turbine meters;
- Combined meters;
- Differential pressure meters (including venturi and orifice types)
- Magflo meters.

The first two are generally for customer metering (15 - 50mm diameter) whilst the rest are more typically used for operator metering or specific usage.

With the reduction in per capita demand a large proportion of the original domestic meters are oversized and where they are working are now incapable of measuring low flows. This has been recognised and meter replacement programmes introduced.

8.6.4.2 Strategy for improvement

Water transmission

All components that form part of water transportation systems, both raw and treated, should be inspected at least twice per year. The inspection should be made if possible by the same personnel, in order that they accustomed to the details and able to notice differences from one inspection to the next. The result of the inspection is registered into an Inspection Report whose content will be developed by the Head of Department.

The Inspection Report will form the basis for:
- developing the maintenance plan and identifying the necessary works;
- executing repair works;
- warning customers if the defects reported are related to service parameters (water supply interruption, supply restrictions) or its quality (e.g. measures for additional disinfection);
- taking measures against unauthorised activities in the sanitary protection area;

During the inspection, the following are aspects need to be checked:
- sluice valves, washouts and air valves: condition and the status of operation, the presence of water in any chamber and its suspected source i.e. mains water or ground water, in order that the repair team are prepared for follow-up work;
- river crossings: structural condition, any evidence of river erosion of the banks that could affect its structural stability, protective coatings, air-release valves condition, accessibility for access, condition of insulation etc;
- status of land surface provided as sanitary protection area: uncontrolled waste deposits or use of prohibited substances, infringements of land use, illegal water use, evidence of pipeline leakage, security fencing:
- means of hydraulic hammer elimination: construction condition, working mechanisms condition;
- checking the status of sampling points for assuring reliable quality monitoring.

All findings need to be recorded in order that appropriate follow-up action can be planned and organised with the appropriate skills and resources allocated.

Maintenance works can be carried out by locally or centrally organised teams and need to consider more fundamental elements than those carried out during a biannual inspection. This will include:
- accessibility to chambers and fittings: the sanitary protection areas are cleaned and maintained as required;
- valve packings are checked for leakage and tightened as necessary, access ladders within chambers are checked, protective coating are maintained;
- national road access and railway under-crossings are checked: weekly;
- stability of the ground on the route and possible settlement is checked monthly;
- evidence of water losses on the pipe sections are checked;
- possible unauthorised connections are controlled monthly;
- the marking/signalising systems of the transmission mains are checked and if necessary, renewed annually;
- pipe sections where there are problems (iron rust, biological growths etc.) are repaired as appropriate.

In order to establish a good functional performance of transmission mains, periodical checking of pressures and water losses needs to be made. A training plan needs to be in place to train staff as required.

Reservoirs

O&M personnel need to monitor the condition of storage reservoirs involving, security, insulation, ventilation, access ways, and water losses etc. This is achieved through remote monitoring and regular site inspections. They will also keep records of the water level in the reservoir, possibly inflow and outflow, and, if sensitive to water quality, temperature. Procedures and recording systems need to be in place to capture this information.

The protection of water quality in the distribution networks will be assured, by complying with the maximum time the water is permitted to be retained in storage facilities. Water quality needs to be verified by water analyses performed at the maximum time intervals imposed in the permits. These laboratory analyses should be undertaken by the ROC in conjunction with the Sanitary Police.

Regular cleaning and inspection programmes need to be developed to maintain the integrity of water quality in storage facilities.

Distribution networks

Activities needed to keep distribution networks at optimum condition require systematic inspection and maintenance procedures that involve:

- Inspection and operation of all sluice valves, control valves, hydrants, air valves on an annual basis. Chambers and covers need to safe and accessible. Defects should be programmed for subsequent rectification;
- Meter chambers and associated covers need to maintained in accessible order. This can be linked to the meter reading programme with identified defects programmed for subsequent rectification. Chambers should be kept in a dry condition;
- All access chambers should be kept free from debris;
- When highway reconstruction or resurfacing work is carried out check should be made that fittings have not been buried and access covers are at the correct surface level;
- All access works are made secure and well signed and illuminated to protect pedestrians and vehicle users;
- Adopting a proactive approach to reducing network leakage by introducing the principles contained in the *NRW Guidelines* document;
- Ensuring that designated water sampling points are kept accessible and in a functioning condition;
- Flushing and swabbing programmes are in place for networks that are prone to discolouration problems;
- Procedures need to be in place for the safe completion of work covering excavation, repair and backfilling;
- Hygiene procedures are in place for maintaining water quality when repairs to the network are being undertaken. All efforts must be made to prevent ingress of groundwater when carrying out works;
- After mains repairs are carried out, care must be taken when recharging the system to vent entrained air;
- Customer warning methods should be developed for all planned maintenance works;
- Target times should be set for all main and service repairs;
- Flow and pressure checks should be carried out in pressure sensitive areas to ensure levels of service are being maintained.

Regular inspections and pro-active maintenance programmes need to be part of network O&M.

To support distribution operation and maintenance activities in the field it is necessary to have:

- Comprehensive mains and service pipe records. Initially these will be in hard copy form but should be eventually transferred onto a GIS system that can be accessed by distribution staff including repair

crews. The data recorded should include pipe location, size and material, position of all valves, fittings and connections;
- A procedure for recording main and service pipe information when excavations are made for repair purposes.
- A procedure for liaising with other utilities and the highway authority to obtain information on services and obtaining the necessary permits prior to opening the highway;
- Developed procedures for eliminating lead and galvanised service pipes from the network. This could take the form of a phased replacement programme based on a priority of need;
- Computerised network models that can be used to simulate operational situations as well as designing network improvements and extensions.

Pumping stations

An important part of maintaining adequate supplies and pressure in distribution networks is the correct operating regime and a Planned Preventative Maintenance (PPM) scheme for pumping stations. This should include:
- The ability to maintain system pressure at adequate levels whilst maximising the financial benefits of advantageous power tariffs;
- Regular operational and security inspections;
- Planned maintenance of equipment that is coordinated to enable the work to be undertaken with the minimum number of personnel i.e. if a two man attendance is required on safety grounds a mechanical fitter works with an electrician;
- Pressure vessels are inspected and tested in line with legislative requirements;
- Pumping stations are automated as far as possible and operating information transmitted back to centralised control points for control purposes. Information that needs to be telemetered back is:
  - Pump in operation;
  - Station inlet and outlet pressure;
  - Alarm conditions;
  - Valve status;
  - Power utilisation;
  - Hours run.

Metering

Metering is key to the life-blood of the ROCs. It provided income to the company from customers and the ability to assess demands and plan for the future. Through NRW programmes system performance can be established to drive, objectively, network rehabilitation programmes. Therefore it is necessary to ensure:
- Meters should be located in accessible locations with good access for reading and maintenance and sited to record all customer consumption. It should be remembered that meters sited downstream of the ROCs responsibility of supply, which is the boundary of the public highway, could fail to register private leakage;
- Meters should have an upstream stop-valve that can be isolated for service pipe or meter maintenance purposes.
- Meters should be sized to ensure the highest accuracy, taking into account rate of flow and the water quality in the distribution network. In this respect, meter installation (and replacement of old meters) programmes should form part of investments;
- A meter maintenance programme is in place to monitor the accuracy of meters over time;

- A policy should be developed that considers the optimum useful live of a water meter before it is either refurbished or replaced, this takes into account that meters slow with time which reduces the revenue that ROCs have potential access to;
- Seals should be made between the meter and the service pipework to ensure that customers do not tamper with the meter;
- Meter/provision of water supply agreements need to be in place to define ownership and maintenance liability responsibilities;
- **Secondary metering –** The practice of installing meters within departments on individual branch pipes is now becoming more common in Romania. However because of the design of internal plumbing systems, several meters are usually required per apartment. Whilst the practise does enable the customers to better manage their water usage and minimise waste, it should not be used as a basis for charging for water. The ROCs responsibility for supplying water finishes at the boundary with the public highway and this is ideally where the charging meter should be located. Customers should not be dissuaded from installing secondary metering but it should be made clear that meter charges for apartment blocks or housing associations will be based on the boundary meter. Any apportionment of private pipework loss is a matter for resolution between the housing association and the apartment owners.

Secondary metering enables customer to better monitor and manage their water use. But these secondary meters should not be used for invoicing purposes.

- For the provision of supplies to new or refurbished apartment blocks in multiple ownership, separate metered supplies are advocated. This is also advocated in areas where there is difficulty in getting disconnections approved for partial or non-payment of water charges. This situation is being piloted in Galati, where it is expected to increase the collection rate in the pilot area from 50% to 90%;
- Domestic meter reading is currently undertaken on a monthly basis. This could be reduced as water demand patterns are well known and estimated volumes invoiced to customers. However, customers should be advised to keep an eye on registered consumption to minimise the effects of supply pipe leakage. Actual meter reading should be undertaken at least once per year;
- The use of ‘intelligent metering’ for customers is a technology that has potential for the future. This enables customer demand data to be remotely transmitted to the ROC. It has a number of advantages and disadvantages.

The advantages are:
- Increased demand control;
- Early identification of supply pipe leakage;
- Cost-effective tariffs;
- Improved customer demand information;
- Better customer awareness;
- Savings in meter reading costs
- Improved carbon footprint.

The disadvantages are:
- It needs to be done on a relatively large scale to make cost effective;
- There could be a conflict with the levels of service provided;
- Set-up and operating costs;
- Uncertainty about future outcome.

8.6.5 Wastewater collection

8.6.5.1 Existing situation

Waste water collection networks are predominantly of concrete construction with some recent investments using PVC. Most systems are in a poor state of repair due to old age, erosion of pipes, the use of rigid jointing systems that have failed, and in some cases obstructions caused by tree roots. Consequently the number of blockages cleared and repairs carried out are very high. In some towns wastewater collection systems have become heavily silted thereby considerably reducing their effectiveness and contributing to foul flooding.

8.6.5.2 Strategy for improvement

Introduce inspection, operating, maintenance and monitoring procedures and operational for activities to be undertaken. Where these already exist they should be reviewed to optimise performance.

> ***Regular inspection and maintenance programmes should be undertaken, particularly on the ageing systems.***

Checking procedures will include:

- Checking of manholes, covers and gully gratings for correct functioning;
- Checking for the presence of depressions on the lines of sewers that could indicate a collapse;
- Clearing surface debris that could find its way into sewers or gulleys
- Check and clear gulleys after heavy rain as they may have become blocked;
- Check the functioning of overflows and the effect on the receiving watercourses, this is particularly important after heavy rain and during periods of low river flow;
- Check the quality of wastewater discharged from commercial customers;
- Check for unpleasant and gaseous smells that could indicate sewage septicity;
- Check for rodents in the sewer network;
- Check for the presence of toxic pollutants that could find their way into the collectors;
- Ensuring access ways are kept clear for carrying out maintenance purposes.
- Checking for illegal connections.
- Checking the sewers with the use of CCTV for the presence of tree roots, blockages illegal connections and infiltration. This will also enable rehabilitation needs to be prioritised.

Following routine checking immediate maintenance work should to address any defects identified. This will include:

- Replacement of missing or defective manhole covers and gulleys;
- Resetting of manhole covers and gulleys following road re-surfacing works.
- Rebuilding of collapsed manholes and sewers including access ladders;
- Flushing or rodding of collectors to remove blockages;
- Clearing of blocked gullies;
- Ensuring gulley traps contain water;
- Cleaning of retention basins;
- Stability works at discharge points.

Pumping stations

Pumping stations should be regularly inspected and maintained with special attention given to the following:

- Site security;
- Electrical compliance;
- Correct system operation;
- Pumps and associated equipment are routinely maintained;
- Level probes are kept free from grease and rags that could affect their control;
- Inefficient pumping machinery should be replaced. This should be verified by the carrying out flow and energy tests.

Work safety

The working conditions under which the operation and maintenance of wastewater collection networks are performed are harsh and may be dangerous to human health and safety. Potential issues include infection by contagious diseases, body injuries and exposure to toxic matter.

Accidents and diseases are mainly caused by:

- Exposure to toxic materials or suffocation by toxic gases (CO, CO2, methane gas, H2S etc);
- Diseases or infections due to contact with the environment;
- Explosions due to flammable gases;
- Electrocutions due to damaged or improperly insulated electric cables;
- Falls into chambers or manholes with high wastewater flows.

Health and safety: essential!

Health and safety aspects need to have a high priority when working on wastewater collection systems. Workable procedures need to be set in place.

Prevention of accidents, infections, and other health and life threatening situations is a priority issue. Staff must be trained in all aspects of safety and safe working procedures. This will include first aid, preventative measures and utilisation of protective clothing. All operational and maintenance staff must pass a thorough medical examination and be vaccinated against the main waterborne diseases (typhoid, hepatitis etc). They should also be examined on a daily basis for small wounds and scratches and if necessary denied access to work locations.

All workers should be required to wear special protective clothing comprising, boots, overalls, goggles, hard hats etc. On service premises there should be a two compartment locker room for clean and soiled clothes as well as shower facilities. Apart from the standard protective clothing inspection and working teams should be provided with miners' lamps, gas masks and safety belts.

Before entering a wastewater collector, it is necessary to open 3 lids upstream and downstream in order to perform a 2-3 hour venting before permitting access. Smoking or using an open flame must be prohibited at all times. If lamps extinguish, artificial ventilation must be used.

When working on the highway, traffic must be properly directed. The workplace should be sufficiently marked with road signs and barriers. At night all workplaces should be well lit. Each workplace should display contact details for the operator or contractor carrying out the work in order that they can be contacted outside normal working hours in the case of an emergency.

People working inside the wastewater collectors must wear safety gear including a belt and a rope with a length corresponding to the distance between the two cambers being accessed. Staff assisting at the surface must have access to a first aid kit and be trained in its use. Mobile communication equipment is essential for site safety and should be made available.

Special attention should be given to the danger of electrocution from cables buried in close proximity to collectors or being used for illumination purposes. Such illuminating devises should be limited to 12 or 24 volt.

8.6.6 Wastewater treatment – existing situation

With the exception of where investment has been made through aid programmes to some of the larger works, sites are in a poor condition and in many cases only provide partial treatment. The quality of construction is poor and electrical and mechanical equipment operate inefficiently. As a consequence compliance against Romanian and EU quality standards is poor.

> ***Existing wastewater treatment plants are often in poor condition and operate inefficiently.***

Laboratories are currently inadequately equipped for undertaking a full suite of analyses to report against all EC standards.

Operator knowledge tends to be rather limited.

Treatment processes

Primary treatment

Primary treatment removes the materials that can be easily collected from the raw wastewater and easily disposed of. The typical materials that are removed during primary treatment include fats, oils and grease (also referred to as FOG), sand gravels and rocks (also referred to as grit), larger settleable solids including human waste and floating materials. This step is done entirely by machinery and collectively known as mechanical treatment.

Screens

Screens are the first part on the primary treatment stage and serve as the first rough separation of floating solids transported by the wastewater. Screens are periodically cleaned and the retained debris removed either manually or mechanically. The debris is either retained in temporary pits or skips, incinerated, compressed or shredded for transportation to a solid waste disposal site.

Operation of screens is relatively simple and requires only periodic cleaning. Manual cleaning is usually done by rakes in intervals determined by the volume of solids in the flow. Mechanical cleaning equipment is best operated continuously to avoid accumulations of solids and possible flow restriction. The equipment should be properly maintained and lubricated.

After this stage conditioning chemicals such as ferric chloride or lime can be added if necessary.

Sand traps

Sand traps are sedimentation tanks that are designed to retain heavy inorganic particles (up to 0.2mm dia) through natural settlement and thereby limiting the wear and tear on pumps and equipment in the remaining treatment stages. For optimum operating performance velocity through the sand trap (also known as a detritor) need to be maintained within design limits. Water flow is regulated based on incoming flow and is directed to different compartments or by changing the water level in a compartment. Removal of the settled solids should be done once or twice per day or when the solids level reaches the design limit.

Washing of the sand traps can be performed manually or mechanically. During manual washing the compartment is turned off, water drained and sand removed. At high capacity works the sand removal is done mechanically. Sand is removed from the trap continuously by specialised equipment for sand and water handling.

There are a number of operational problems that can affect sand traps when flow velocities fall outside design limits. In the case of velocities falling below the minimum design level this can result in premature fermentation of sewage resulting in premature build-up of solids. This can be overcome by:
- Reducing the number of functioning compartments;
- Using partitions;
- Reducing the length of the sand trap.

When velocities exceed the design maximum, the opposite consequence occurs, solids are not settled out in the process and have to be removed in subsequent stages of treatment with the inherent risk of damage to process equipment. Again, this situation can be managed by:
- Increasing the number of functioning compartments;
- More frequent removal of deposited solids;
- Building additional compartments when a works design flow has been exceeded.

Primary clarifiers

Primary clarifiers or as they are also known, primary sedimentation tanks, need to be large enough for faecal solids to settle and be treated and processed and floating substances such as grease and oil can rise to the surface and be skimmed off.

Primary clarifiers can be varying types, horizontal, radial or vertical but need to be equipped with mechanically driven sludge concentration scrappers that force the sludge into a hopper in the base of the tank for pumping for further treatment stages. Regardless of their type, primary clarifiers should be designed and properly equipped to ensure:
- Equal distribution of the total flow between the number of tanks in operation;
- Homogeneous intake and distribution of water circulation;
- Uniform disposal of clarified water;
- Continuous collection and disposal of floating materials;
- Collection and disposal of sludge deposited on the bottom;
- Periodic draining and drying of the plant for overhaul and repair purposes.

The efficiency of all types of primary clarifiers increases by proper removal of the primary sludge. Floating sludge masses, as well as gas bubbles, are indicators that the sludge is not being evacuated at the correct rate. The efficiency of primary clarifiers can be improved by the following:
- Regular removal of accumulated deposits from stationary areas by brushing or water jetting;

- Regular cleaning of equipment designed for the removal of floating matter;
- Prompt repair of all wastewater and sludge leaks;
- Regular inspection. The parts of clarifiers that are submerged should be inspected annually. This will require the tanks to be taken out of serviced and drained to facilitate the cleaning, inspection and carrying out of mechanical and structural maintenance.

Secondary treatment

Secondary treatment is designed to substantially degrade the biological content of wastewater. There are two classifications of secondary treatment systems, suspended growth and fixed film. The former includes the activated sludge process and the second trickling filters and rotating biological contactors. The advantage of suspended growth systems is that they occupy a smaller space for treatment volume than fixed film systems and are less susceptible to very low temperatures. However fixed film systems are better able to cope with drastic changes in the amount of biological material and can provide higher removal rates of organic material and suspended solids and also use less energy.

Activated sludge

This is basically a two stage treatment process, the first involving the injection of air into an active sludge tank followed by secondary clarification.

In the aeration tank, a combination of wastewater, micro-organisms (active sludge) and air, supply the conditions for fermentation and thus biological processing of the wastewater. For correct functioning, micro-organisms need ‘food’ – biological material provided by the wastewater and sufficient amount of oxygen provided by the aeration system. The organisms then consume biologically degradable wastewater impurities thus cleaning the wastewater. Aeration is generated either mechanically, through surface mounted mixers or through submerged fine bubble diffusers. The latter is now becoming more common because of its better control and improved energy efficiency.

The cleaned wastewater is then fed to the secondary clarifiers where the cleaned wastewater is separated from the active sludge by gravity with part of the active sludge being re-circulated back to the aeration tank.

There are a few potential problems for aeration tank operations that need to be rectified immediately when identified. The most common failures occur are an increase in the sludge index resulting in sludge on the surface of the aeration tank. This can be the result of multiple factors such as an excessive load of organic substances, the presence of toxic substances or a decrease in oxygen content. There are a number of solutions that can deal with this problem including; reducing the concentration of matter in suspension in the aeration tank, reducing the rate of re-circulated sludge, increasing the dissolved oxygen content, chlorinating the re-circulated sludge or introducing fermented sludge into the activated sludge.

Another failure is the appearance of sludge on the surface of the secondary clarifiers. This is normally caused by excessive nitrification of wastewater. Bacteria take oxygen from the nitrates dissolved in the wastewater resulting in the formation of gaseous nitrogen and carbon dioxide. Corrective measures include increasing the flow of re-circulated activated sludge, decreasing the flow in the aeration tank, increasing the sludge collection velocity or reducing the wastewater aeration process time.

The formation of foam on the surface of activated sludge tanks can also be an indication of failure. These are mostly caused by detergent or fats and can be eliminated by the use of anti-foam substances, increasing the quantity of re-circulated sludge or increasing the concentration of material particles in suspension (active sludge).

Biological filters

Biological filters consist of layers of granular material such as gravel, stones, ceramics or plastics with large surface areas that provide support for the growth of micro-organisms. Wastewater containing impurities is introduced to the surface of the filter by rotating sprinklers and it then percolates through the filter media and is cleaned by the feeding micro-organisms. If a single pass is insufficient to clean sufficiently, the wastewater is re-circulated as necessary. While retaining impurities the microbiological colony grows. When it exceeds a limit, it is forced by the flow to detach from the surface and flows into secondary clarifiers. Start-up of a biological filter takes up to about 3 to 4 weeks depending on ambient temperatures. The introduction of active sludge can expedite this period considerably. Because of the cold winter climate in Romania this type of filter is not common in the country.

Proper operation of biological filters requires the following:
- Uniform and adequate loading of wastewater and daily inspection of rotating applicator sprinklers and effluent ;
- Removal of surface debris blown onto the filter;
- Snow removal during winter;
- Regular cleaning of clogged intakes and drainage systems;
- Re-circulation of wastewater dictated by the level of treatment required.

Operation of biological filters requires continuous attention and prevention of failures. The main problems needing attention are:
- *Water overflowing the surface* – This is usually caused by filter surface clogging and can be corrected by cleaning, chlorinating or replacing the surface area;
- *Insect presence* – This is normally caused by a contaminated surface not covered by flowing wastewater, consequently it can be eliminated by ensuring a continuous application of wastewater and periodic washing of surrounding surfaces with light chlorination;
- *Icing of the filter* – This will occur at low temperatures and as mentioned previously a reason why this type of filter is not widely used in Romania. It can be reduced by decreasing the re-circulation rate and regulation of the distributor orifices to avoid fine dispersion.

Other types of secondary treatment

There are a number of other types of secondary treatment that can be considered for specialised applications such as fluidised bed reactors, membrane bioreactors and rotating biological contactors.

Tertiary treatment

> ***Tertiary treatment processes will be required to enable full compliance with European Wastewater Directives.***

Tertiary treatment provides a final stage to raise the effluent quality before it is discharged to the receiving environment. More than one tertiary treatment process may be used at any treatment works. The processes could include filtration, lagooning and constructed wetlands.

Filtration

Sand filtration removes much of the residual suspended matter. If filtered over activated carbon it will also remove toxins.

Lagooning

Lagooning provides settlement and further biological improvement through storage in large manmade ponds or lagoons. These are highly aerobic and colonisation by native macrophytes, especially reeds is often encouraged. Small filter feeding invertebrates such as Daphnia and Rotifera greatly assist in treatment by removing fine particulates.

Constructed wetlands

Constructed wetlands include engineered reed beds and a range of similar methodologies, all of which provide a high degree of aerobic biological improvement. It can often be used as an alternative to secondary treatment at works serving small communities.

Nutrient removal

Wastewater may contain high levels of the nutrients, nitrogen and phosphorous. Excessive discharges can lead to the encouragement of weed and algae growth which, when they die off, lead to de-oxygenation of watercourses and the production of polluting toxins. There are different treatment processes to remove nitrogen and phosphorous.

Nitrogen Removal – Denitrification requires anoxic conditions to encourage the appropriate biological communities to form and facilitated by a wide diversity of bacteria. Sand filters, lagooning and reed beds can all be used to reduce nitrogen, but the activated sludge process, if well designed, can do the job most easily. Since denitrification reduces nitrogen to nitrogen gas, and electron additive. Depending on the wastewater, this can be organic matter (faeces), sulphide ot methanol.

Phosphorus removal – Phosphorus removal is achieved through chemical precipitation with addition of iron or aluminium salts. The resulting chemical sludge is difficult to handle and the added chemicals expensive. However, phosphorous removal by chemicals requires a significantly smaller footprint than biological removal. It is also easier to operate and a more reliable process.

Disinfection

The purpose of disinfection of wastewater is to substantially reduce the number of micro-organisms in the final effluent. Common methods of disinfection include chlorine, ultra-violet light and Ozone. Chloromine, which can be for water treatment, is not suitable for wastewater disinfection due to its long lasting residual characteristic.

Chlorine – chlorination remains the most common form of disinfection for wastewater due to its low cost and long term history of effectiveness. One disadvantage of chlorine is its reaction with organic matter that can generate carcinogenic compounds that can be harmful to the environment. Additionally, because chlorine can be harmful to aquatic species it may be necessary to de-chlorinate before final discharge, with the inherent additional treatment costs.

Ultraviolet light (UV) – UV radiation causes damage to the genetic structure of bacteria, viruses and other pathogens making them incapable of reproduction. Because no chemicals are involved it does not have an adverse effect on organisms that later consume it. The disadvantage is one of cost with high lamp maintenance and replacement and also the need to have an effluent that is highly treated.

Ozone – Ozone has good disinfection capabilities without generating the un-favourable by-products as with chlorine. However is has high maintenance costs and generates a number of health and safety concerns.

Package plant and batch reactors

For space considerations, treating difficult wastewater, dealing with intermittent flow or to achieve higher environmental standards, a number of hybrid treatment plants have been developed. These usually combine all, or at two of the three, of main treatment stages. They are of particular benefit to works serving small populations and offer a viable alternative to building individual structures for each process stage. Plants can typically deal with wastewater flows of between 5000 and 8000 m3/day.

Package plants can use the following technologies:

- Activated sludge treatment that can provide extended aeration and reduce bio-solids;
- Sequential batch reactor (SBR), that utilises activated sludge mixed with raw incoming wastewater and aerated;
- Membrane bioreactors (MBR) where the membrane develops a high level of bio-activity and results in an excellent effluent, however the membrane does require periodic cleaning and has higher capital and operating costs;
- Sludge digestion, nutrient removal and disinfection.

The disadvantage of such processes is that precise control of timing, mixing and aeration are required. This requires a precision that is only achieved with computer operation linked to process sensors in the plant. As such it is unsuited where such controls are unreliable or the power supply intermittent.

8.6.7 Sludge treatment and disposal

Sludges accumulated in wastewater treatment processes must be treated by digestion and disposed of in a safe and effective manner. The purpose of digestion is to reduce the amount of organic matter and the number of disease- causing micro-organisms present in the solids. The most common treatment options include anaerobic digestion, aerobic digestion and composting.

The choice of wastewater solids treatment method depends on the amount of solids generated and other site specific conditions. However, in general, composting is most often applied to small scale applications, followed by aerobic digestion with anaerobic digestion the most common for larger scale municipal applications.

Sludge treatment and disposal need to embrace good carbon footprint principles.

Anaerobic digestion

Anaerobic digestion is a bacterial process that is carried out in the absence of oxygen. The process can be either thermophilic digestion, in which sludge is fermented in tanks to a temperature of 55℃, or mesophilic, at a temperature of around 36℃. Although allowing a shorter retention time (and thus requiring smaller tanks), thermophilic digestion is more expensive in terms of energy consumption.

One major feature of anaerobic digestion is the generation of biogas which can be used for the generation of energy for electricity and heating. This can be used locally and for larger works it excess electricity can be exported to the regional grid.

Aerobic Digestion

Aerobic digestion is a bacterial process occurring in the presence of oxygen. Under aerobic conditions, bacteria rapidly consume organic matter and convert it to carbon dioxide. The operating costs are characteristically much greater for aerobic digestion because of the energy costs needed to add oxygen to the process.

Composting

Composting is also an aerobic process that involves mixing the sludge with sources of carbon such as sawdust, straw of woodchips. In the presence of oxygen, bacteria digest both the wastewater solids and the added carbon source and, in so doing, produce a large amount of heat.

Sludge disposal and strategy

When a liquid sludge is produced it is usually thickened (dewatered) to reduce the volume needed to be transported off-site for disposal. This is achieved by pressing or centrifuging. In Western Europe extensive use is also made of incineration. In considering a sludge strategy for future operations outlets for disposal on a regional basis need to be considered. These could include:

- Agriculture;
- Incineration;
- Land reclamation;
- Industrial crops;
- Composting;
- Landfill;
- Product manufacture (cement).

When developing a long term strategy a number of broad objectives and business drivers need to be considered which are:

- Disposal to landfill should only be considered as a long-term contingency option due to its environmental impact and high cost;
- Identify, on a regional basis, beneficial and sustainable outlets that involve recycling to agricultural land or production of renewable energy from sewage sludge and biogas generation;
- Integration of minimising the carbon footprint;
- Minimising other environmental impacts;
- Financial implications from both a CAPEX and OPEX point of view;
- Ease of promotion to the general public (e.g. public acceptability);
- Minimising customer impact (e.g. nuisance).

Research into sludge strategy options is ongoing to access potential options and new technologies. A summary of current and potential options is summarised in the following table:

Table 8.10: Sludge treatment and disposal options

Outlets	Advantages	Disadvantages
Energy production (incineration).	Benefits of energy recovery.	Planning and perception costs.
Landfill.	Low cost.	Unsustainable due to limited capacity.
Recycling to land.	Recycles nutrients and organic matter.	Possible negative perception and potential odour issues.
Composting.	Good quality product.	Relatively expensive. Poor carbon footprint.
Land reclamation and Forests.	Used to stabilise soil, re-contour disturbed land, re-generate brownfield sites.	Can require considerable lorry movements, high energy use, odour issues.
Energy production (power station).	Renewable sources, readily available outlets.	Regulated under Water Industry Directive (WID). Few WID compliant plants.
Energy production (gasification).	Efficient destruction/energy recovery. Smaller plants available.	Unproven technology for sludge. High unit cost.
Energy production (H2).	Energy efficient production.	Technology still in development.
Thermal driers.	Land outlets or energy recovery.	High energy use, difficult technology.
Co-composting/digestion	Links with local authority waste strategies.	Still requires an agricultural outlet or land bank.

8.6.8 Wastewater treatment - strategy for improvement

In terms of developing a strategy to improve the management and performance of wastewater treatment plants and generate longer term efficiency benefits it will be necessary to:

- Introduce inspection, operating, maintenance and monitoring procedures and operational checklists for activities to be undertaken. Where these already exist they should be reviewed to optimise performance.
- Develop procedures for dealing with hazardous discharges and emergency incidents.
- Improve operator and laboratory process knowledge through training.
- Improve the capabilities and analysis reliabilities through enhancing works laboratories to accredited status.
- Consider opportunities for the provision of storm water balancing storage, using existing structures if possible.
- Develop unit costs for each wastewater treatment plant.
- To enable effluent standards to comply with EU standards in the future, massive investment will be needed to upgrade existing sites. Process reviews and feasibility studies should be prepared and sources for funding explored.

Work safety

Operation of a wastewater treatment plant bears the risk of injury, infection, suffocation and explosion. Work safety rules must be strictly endorsed by management and observed by all. Prevention of bodily injuries involves simple actions and awareness as well as following safety rules. All staff need to:

- Avoid manual lifting of heavy machine parts by using the lifting systems that need to be made available at the works;

- Use protective safety clothing and equipment during all maintenance and operational activities;
- Avoid falls and slips by installing and using hand rails at all levels of gangways and bridges. Safety belts and anchoring must be used over specified heights;
- Provide rubber carpets at all electrical control points and the use of non-conductive protection gear when working on live electrical equipment;
- Observe explosion protection measures.

Prevention of infection – The harmful pathogenic nature of the working environment in wastewater treatment plants requires compliance with specific sanitary and hygiene rules such as:
- Wearing special equipment inside the facility and in adjacent areas to protect the skin from direct contact with possible substances and materials;
- Providing and protecting the drinking water source, toilets, locker rooms, canteens bathrooms and leisure facilities;
- Establishment of first aid points and sanitary first aid kits as necessary for use by suitably trained first-aiders;
- Mandatory and regular medical control and vaccination against typhoid, tetanus and hepatitis.

Prevention of asphyxia – Prevention includes detection and marking of all places, which by their purpose and the type of process may constitute areas of decreased oxygen concentration. Usually these are the chambers and sewer manholes, ventilation shafts from pump houses, aeration tank chambers, clarifiers and fermentation tanks etc. Use of an open flame in such locations should be strictly forbidden. Work in such locations should be carried out by teams equipped with gas masks for respiratory system protection.

8.6.9 Systems for Improving Efficiency of O&M Functions

The new institutional arrangements, which require regional utility companies to work within the terms of their delegated services contract, will transfer from central and local governments to the ROCs a substantial share of responsibility for future planning of O&M activities, planning development of infrastructure, and for funding of capital investments. Therefore, the ROCs should acquire new opportunities and increased motivation to determine the optimum arrangements for operating, maintaining and developing the publicly owned and utility owned assets that they are responsible for. This will require changes and redefinition of the O&M system, budgets, standards and practices.

Various systems can be developed by the utilities to redefine and improve the efficiency of O&M activities in response to the changes that occur as a result of regionalisation.

In Appendix 21 (Guide and Outline Strategy on O&M Management Systems) is given information and guidance on creating or redefining the following O&M management systems:
- <u>O&M Site Guidance Documents</u> giving information on the sites of the main water and wastewater installations. It is recommended that the ROC's O&M management team should prepare (or update) and adopt easily accessible and understood documents holding information about the O&M aspects of assets at all sites managed by the ROC. The main aims are to help operators quickly to become familiar with each site so that they can be deployed on different sites as necessary for efficient operation and maintenance work, to record various modifications, adaptations and extensions to the assets and systems that have occurred over time. The general scope of site guidance documents could include, for example, overview of technological processes, capacities, equipment specifications, electrical systems, routine operations, incident procedures, drawings, site layout, site development history, flow diagrams, site services, health and safety, personnel involved in O&M functions, etc.

- An O&M Work Management System is a systematic procedure that relates a ROC's asset management system with the resources required to operate and maintain the assets. It can be used to help a ROC optimise use of O&M personnel and other O&M resources. The characteristics of O&M work vary: operations often involve personnel based at one location carrying out regular series of routines and activities; whereas, maintenance work often requires personnel to work unsupervised at different sites. This implies a need for analysis and understanding of routine and non-routine work activities and also a sound appreciation of the relative quantities of work activities. The guide includes information on identification and recording of work activities, ranking the priority of work activities, frequency of work activities, assessment of resources required, and reporting.
- Standard Operating Instructions (SOIs) specify a ROC's method for performing an O&M work activity to the required standard. SOIs define how to keep an asset running by defining the optimum operational practices and methods for corrective action when problems arise. The guide includes information on general features of SOIs, basic principles of an SOI, and a guideline format of an SOI for a WTP.

The Appendix includes also an outline of a strategy that can be prepared and used by ROCs to plan the development and introduction of improved O&M management systems. More specifically, the purpose of the strategy is to help (a) prepare a ROC-wide planning framework on how O&M management systems shall in future be modernised and unified throughout the Company and (b) to take full advantage of the potential benefits of economies of scale on O&M functions resulting from the formation of the ROC.

8.6.10 Mechanical and Electrical Equipment[10] Maintenance

Historically, planned maintenance of equipment has been carried out on assets as a basic "catch-all" routine inspection at pre-determined frequency e.g. annually before winter period. Such a process is relatively easy to implement but may add little value in terms of risk reduction and is expensive to resource.

A modern approach to planning maintenance schedules in some industries is described as "Reliability Centred Maintenance" (RCM) and is based on the assessment of risks and consequences of failure of items of equipment. This, in turn, directs the main resource available for assets maintenance at those assets, which, should they fail, pose a major threat to the ROC's operational and commercial performance.

In the water industry, the cost of some failures can be very difficult to calculate. For instance, the failure of a sewage pump or of chlorination equipment might have little or no impact on the revenue the company receives, but such failures can have significant consequences for the company. For this reason a different approach has to be taken to identifying and comparing risks and subsequent ranking of the importance of failures of equipment assets.

The preparation of an equipment maintenance strategy can help a ROC to develop a rational and more efficient way of planning maintenance of equipment. An equipment maintenance strategy needs to consider several types of maintenance that could replace a basic, reactive approach including:
- predictive maintenance
- preventative (non-invasive) maintenance
- corrective maintenance.

[10] Equipment refers to the mechanical and electrical installations of a ROC's water supply and wastewater systems.

The equipment maintenance strategy determines on a ROC-wide basis what planned and programmed maintenance work should be carried out on equipment and considers what potential problems may require an unplanned, reactive maintenance response. The equipment maintenance strategy should form part of an Integrated O&M Strategy for a regional operating company (ROC).

In Appendix E22 (Guide and Outline Strategy on Equipment Maintenance) information is provided on factors relating to equipment maintenance, selection of maintenance methods and on development of an equipment maintenance strategy. In addition, an outline of an equipment maintenance strategy is also included.

The strategy can be used by a ROC to inform the various departments and branches about how the ROC anticipates the impacts of regionalization, on the main requirements and procedures for equipment maintenance, the need for changes in equipment maintenance after new equipment is installed under current and future investment programmes. The strategy also can serve ROCs as an internal guide showing the actions planned to achieve required improvements in maintenance of equipment and as a basis for contribution to the Company's Business Plan.

8.6.11 O&M cost optimisation

Optimisation of O&M costs is one of the main tools available to ROCs to raise efficiency and improve financial results. A ROC's responsibilities to the community it serves ('service to society') demand that the company should optimise costs in all its spheres of activity. Some ROCs are not yet taking advantage of the full potential of the economies of scale and continue to operate in different locations in the same manner as before regionalisation. In order to realise the expected benefits of regionalisation, the ROCs should be encouraged to concentrate different activities, including O&M activities where practicable, in order to use available resources more efficiently.

However, cost reduction should not be treated as an end in itself. Planning and actions towards cost optimisation and cost management should be based on the strategic goals of the ROC.

The main guidance themes described in Appendix E23 (Guide and Outline Strategy on O&M Cost Optimisation) include: incentives for cost savings and motivation of staff, classification and accounting of costs, practical use of information derived from cost analysis, preparation and use of a cost optimisation strategy. These themes are aimed at leading the ROCs towards a higher degree of integration of O&M costs management across all localities of the ROC.

Specific water and wastewater operating cost should be used as an indicator to monitor changes in O&M costs over time and will be measured as total annual water and wastewater O&M costs divided by total annual volume of water sold (RON/m^3 billed). However, with new infrastructure investments, the water and wastewater O&M costs are likely to increase, especially on the wastewater side as a result of investing in WWTPs. Therefore, specific O&M costs need to be re-based from time to time to reflect major changes in the assets being operated and maintained.

During the FOPIP 2 services it became clear that, in many ROCs, O&M costs are neither controlled nor managed, one of the reasons being that O&M costs are considered by the ROC as an accounting issue. The guide on O&M cost optimisation therefore includes recommendations on devolving some responsibilities for O&M budget planning and cost management to O&M managers and heads of technical departments. This process of delegation of O&M cost management is an important step towards motivation of personnel to identify and implement cost reduction actions. It is also important that a clear and mutually acceptable balance of incentives for cost optimisation is established between the parties (ADI and ROC) to the delegation contract.

To ensure that these incentives and motivation factors can be successfully used, they must be approved by the ROC management team and agreed with the ADI. Following this, the ROC should appoint a manager who will be responsible for achieving cost savings and a group of staff for the preparation and implementation of an O&M cost saving strategy that will clearly define actions, implementation dates and expected outputs for each stage.

8.6.12 Integration of O&M Strategies and Contributions to the Business Plan

Although each of the O&M strategies discussed above can be described in a separate, stand-alone document it is important to recognise that there will be areas of overlap between the strategies and care is needed during preparation of each strategy to ensure that its contents are not in conflict with the contents of other strategies. A coherent approach to the development of the O&M strategies needs to be adopted and the ROC personnel involved in preparation of a strategy, and its adoption for implementation, need to work in a cooperative and supportive manner under the supervision of the ROC's management team.

Each O&M strategy can be used as a basis for preparing a contribution to the ROC's business plan. Typically, each business plan contribution on an O&M topic will include a brief summary of the general directions of the relevant strategy, the associated actions that are necessary to implement the strategy, the time periods and costs. The estimated costs of investments that might need to be made to achieve satisfactory progress on implementing each O&M strategy should be included in the business plan together with information on the source of funding.

The process whereby O&M personnel contribute to the preparation of the ROC's business plan will help to ensure that potential coordination issues can be avoided.

It is important for personnel from the operations and technical departments and the quality monitoring departments (depending on the organisational structure of the ROC) to work together with the ROC management team on the preparation of O&M contributions to the business plan. The same personnel would usually become responsible for successful implementation of aspects of the business plan and the achievements of relevant objectives within the desired time periods.

8.7 Energy management

8.7.1 Introduction

The treatment and distribution of water, collection, treatment and disposal wastewater require large amounts of energy at almost all stages of the process. In terms of revenue cost it is the highest consumer of an operating company's budget next to manpower.

The ROCs needs to take all necessary actions to eliminate inefficient use of energy on all of the Company's working points.

The need for effective energy management is therefore of paramount importance in ensuring that companies provide efficient service to their customers at an acceptable price, whilst remaining profitable and able to invest in new assets for future demand.

This section of the manual sets out to identify potential source of high-energy consumption for the Regional Operating Companies (ROCs) that are participating in the ISPA – FOPIP project and where the focus of attention may be placed in order to reduce energy cost.

Within the scope of this section it is intended to identify in detail potential operational processes, currently undertaken by the ROCs and how these processes can be optimized and potential efficiency savings made.

This section needs to be read in conjunction with the guidelines for Asset Management Planning (AMP), section 8.2 of this manual and Non-Revenue Water (NRW), section 8.3 of this manual

Methodology used

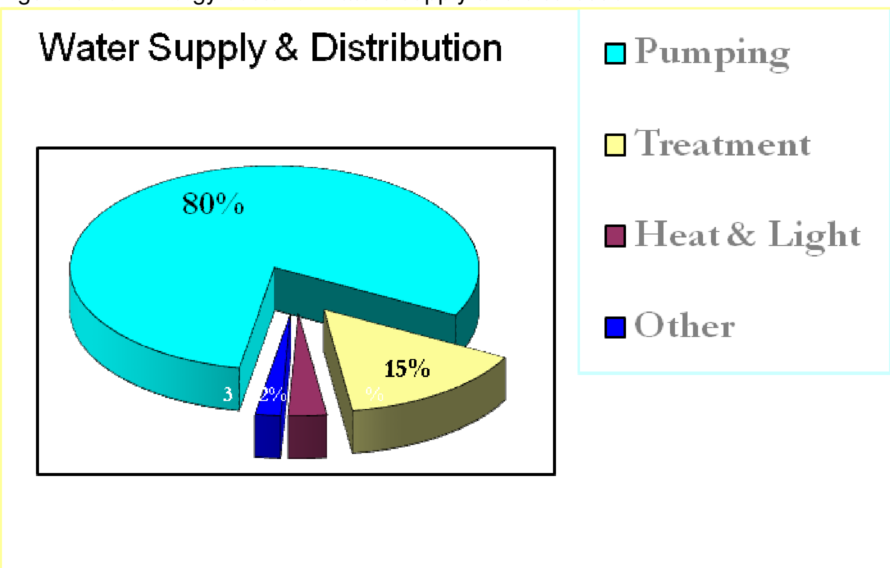
The methodology used to prepare the recommendations is outlined below.

- Identification of the highest use of energy within the ROC's.
- Visit to a selection of ROC's and assess the current position regarding energy management.
- Form a generic list of potential areas where significant savings can be made.
- Make recommendations where improvements will have short-term payback periods.

8.7.2 Indicative energy costs by function

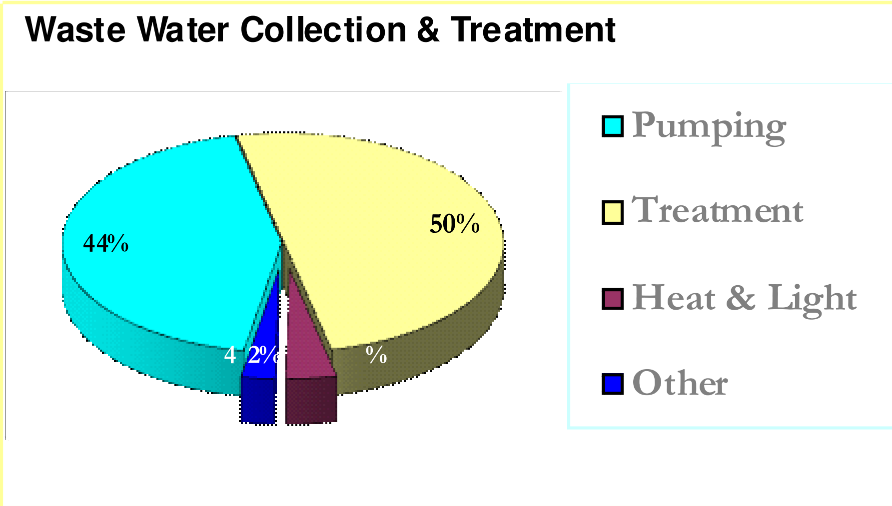
Energy costs are a major contributor to operational expenditure.

Figure 8.15: Energy costs for waters supply and distribution



From the chart above it is clear that the main resource focus for the water supply and distribution function is in the pumping activity. Given the age and condition of the installed assets a reduction of 30% would not be unrealistic if remedial measures were put into place.

Figure 8.16: Energy costs for wastewater collection and treatment



Within the wastewater collection and treatment functions the proportions are predictably different, with pumping and treatment costs shared. Therefore the resource should be focused on pumping efficiency and treatment. The efficiency of wastewater pumps is always lower that the clean water counterpart and it may be beneficial to concentrate on treatment process optimisation in the first phase of the strategy implementation.

In the case of wastewater treatment there is a fundamental issue that must be addressed relating to works operation, since it would seem that in a large proportion of the ROC's the biological treatment process is turned off to reduce energy consumption. In the future this will not be an option and in addition the demand of higher effluent quality standards will require additional energy over and above the current requirements.

8.7.3 Recommendations for energy management strategy

The ROC need to demonstrate to IDA that, after establishment as a Regional Operator, the company respects its obligations to improve the efficiency of the energy use and to mitigate the impacts of increased use of energy for wastewater treatment and potential energy cost increases, through a preparation and implementation of a strategy, into a finite period of time.

In Appendix E24 (Outline for developing the Strategy for Energy Management) are provided information and guidance for preparation of this strategy. The purpose of this strategy is to help the water company to prepare a planning framework for the company's future improvement energy consumption efficiency, in all locations where are their activities.

This strategy will describe the company's current problems, current energy management procedures, future objectives for optimizing the specific energy consumption, methodologies and approaches proposed for improving the procedures and practices.

As part of the energy cost reduction strategy it is essential to target any available resource in the area where the most significant savings can be made. The charts in the previous section are indicative of where the highest proportion of energy is used. It is important to remember these are indicative figures and each ROC should produce actual figures in relation to its current operating costs.

The recommendations made in the energy cost reduction strategy are based on these indicative figures and prioritization of the recommended actions should be made following the analysis of data in each of the ROC's functional activities.

The following recommendations are made for consideration in each ROC's Energy Management Strategy.

Provide management support and control

The need to manage the implementation process is vitally important if the process is to be successful, and will require the full support of senior management. The role of senior management will be to:
- Ensure the reason for change is publicised to the entire workforce.
- Communicate the current position for identification of improvements and the need for change.
- Obtain the support and buy-in from all levels of staff by involvement and communication.
- Provide accurate and timely information, accessible in the workplace.

> ***Process implementation needs to be well managed and led by a senior manager. An action plan needs to be developed and disseminated to staff.***

Resources should be made available to facilitate this process in the company, and the following actions should be considered.

Appointment of an energy champion

The appointment of an energy champion or person to be responsible for the energy use within the company is an essential part of the implementation process.

Their role will involve:
- Identifying waste
- Monitoring energy bills.
- Keeping staff informed of the company's energy strategy.
- Reporting to senior management on how much is spent on energy in each sector of the business.
- Providing new ideas for energy savings.

The role of an energy champion does not need to be a formal or full-time position and it could be incorporated into an existing role.

Develop an Action Plan

Development of an action plan to drive the process forwards. The following recommendations should form the basis of the plan. Start with low/no cost measures to drive forward the energy efficiency message:
- Assign responsibility and accountability to individual members of staff.
- Encourage key staff members to devise individual action plans, forming the basis of their everyday activities.
- Compile a matrix to define roles and responsibilities.
- Integrate energy concerns into the management structure.

- Organise a priority list of energy saving projects.
- Communicate action plans throughout the workforce.

The success of these actions will give support to the on-going energy management programme and perhaps those measures likely to involve further cost or planning.

Collection of data

The collection of data will provide an understanding of the current position with regard to energy consumption as previously mentioned.

Meter readings for all sites should be recorded on a monthly basis to establish energy consumption and provide early warning of potential problems. The readings should be displayed in graphical format and compared with the same month of the previous year to highlight significant variances, plant failure, or any waste. Collection of data provides a basis for benchmarking the company's consumption. It also enables a comparison within other organizations of from the same sector.

Implementation and training

Additional training may be required for key staff and should undergo detailed training in order to equip them with the skills to present energy data and statistics to the rest of the team. In this way, successes and failures can also be communicated and energy saving principles will be assimilated into existing management practices.

Develop a Communication Plan

In the communication process staff at all levels should be involved and their feedback obtained for future energy saving projects. A staff member from each department should be nominated as an energy co-ordinator to collect information and ideas and to communicate with other members of staff. It may be considered beneficial to identify a specific area in the workplace to provide key information for all employees.

Financial appraisal

It is essential to ensure that all members of staff are aware of the benefits that energy efficiency can bring to the company, and the following points may be considered:
- Cost savings, reduced customer charges and increased profitability.
- Improved competitive advantage and customer perception of the company.
- Enhanced social responsibility and corporate image through commitment to preserving the environment.
- Provide a healthier working environment.

This will help in gaining commitment for an energy management programme within the company.

It is essential that all asset refurbishment, new schemes, and process options should consider energy usage and other revenue effects of capital investment as a priority. Schemes that require significant increase in energy should be reconsidered.

Benchmarking and comparison

It is useful to compare energy usage with that of other sites and companies in the same sector. Many businesses assume that energy is a fixed cost, but increasing the company's energy efficiency will go straight to the bottom line and improve profitability. If data is available companies should compare their energy use with similar companies in the same sector. Doing this will give a good indication of the current level of efficiency and the potential for any improvement. One simple method of comparison is to look at specific energy consumptions i.e. energy use (kW) divided by your production output (m^3). Alternatively, make a comparison of energy data for specific pieces of machinery such as pumps, blowers, and aerators.

The development of joint KPI's with other Regional Operating Company's will provide strategic and tactical information. The information from strategic KPI's is at high-level and for use by senior managers and directors. Tactical KPI's will be more detailed and drill down to plant and sub-meter level if necessary.

Benchmark targets should be set and progress against performance should be monitored.

Energy measurement and saving

It is essential to record energy usage accurately and regularly poor quality, no information, or inadequate data have been the demise of many well-intended schemes. It is only possible to ensure buy-in and ownership if there is a feeling of confidence that real commitment and progress is being made.

Installation of sub-meters

To gain detailed information as to the efficiency of individual items of plant it will be necessary to meter each item of electrical equipment. Installing sub-meters to energy intensive plant is relatively inexpensive and can provide vital information as to how an asset is performing. Individually monitoring the energy consumption of energy-intensive plant and equipment will provide data to establish energy use patterns. This can also identify areas where savings can be made.

An effective monitoring strategy should:
- Identify items with energy consumptions of greater than RON 100,000 per year and sub-meter these first.
- Collect monthly data and start to identify trends in energy use.
- Monitor data for sudden changes in energy use and investigate why these occur.
- Compare data against benchmarks from comparable equipment where available.

Re-invest a proportion of savings

When significant energy savings have been achieved it is useful to consider if re-investing a proportion of energy savings into additional energy efficiency measures will generate further savings as part of a spend to save initiative. As technology is constantly changing and as energy management techniques improve, energy efficiency strategy works best as a continual improvement process rather than by installing one-off measures.

In order to reinvest savings wisely it will be necessary to monitor any existing energy savings measures and the savings made. It may be useful to reinvest a proportion of the savings in further saving measures. To do this it will be necessary to analyse which measures were successful and prioritise areas to invest in where further work needs to be done. Analyse the payback periods to pinpoint future goals and objectives.

Electricity tariff management

The potential for tariff negotiation with the electricity supply companies in Romania would appear to be limited. The problem is compounded by the very complicated method by which tariffs are calculated.

A copy of the tariff calculation methodology is available in Government Order No 39 dated 25 October 2007.

It is possible to manage the operation of assets within the current electricity tariff regime. Management of the electricity tariff can provide significant savings if operation of high usage are undertaken at low tariff periods, where possible at night. In cases where this is not possible these operations can often be minimised at high tariff periods with little or no effect on the operational process.

High energy operations worthy of consideration are:
- Sand filter back washing
- Storm tank empting
- Combined heat & power plant optimisation
- Aeration dissolved oxygen levels

Plant and equipment optimisation

The selection, operation and maintenance of equipment and plant has the most significant contribution to offer in terms of energy saving. It is essential that any new scheme or refurbishment is given both pre and post project appraisal. Any scheme should identify clearly what the energy effect of the scheme will be. In the senior management project approval process this factor should always be give high priority, and any scheme which does not justify the energy savings must be further investigated.

Electric motors and drives

Modern day high efficiency electric motors have a significantly higher efficiency, than older motors of the same power output. Higher efficiency motors perform the same function as their lower efficiency counterparts; yet consume around 5% less energy. They usually 'pay back' their slightly higher purchase cost within 2 years, and may qualify for tax benefits or other subsidies as part of the government policy to reduce carbon emissions as part of the Kyoto Protocol, provided in Appendix E16

The practice of rewinding motors should be carefully examined as it may be more rewarding to negotiate replacement motor prices with a suitable and reputable supplier. This should form part of the companies purchasing and maintenance strategy.

Electric motors that are re-wound motors are normally less efficient than the original and actually lose 1% efficiency each time they are rewound.

Operating cost of electric motors

A fully loaded electric motor will typically consume the same in electricity costs within its first month of operation as its purchase price. The energy costs over the life of a motor amount to 75% of the total costs. This far exceeds the purchase price, even for motors not in continuous service.

Consideration of this fact should lead to better justification for high efficiency motors as well as for correct motor sizing. This is particularly relevant here in Romania with the large reduction experienced in water demand in recent years.

> ***High efficiency and correct sizing of motors will make significant contributions towards reducing energy cost.***

Regular walk around audits of the site may identify inactive motors and attention given to such items as stirrers running on empty tanks, ventilation fans in unoccupied areas and pumps running against a closed or limited head.

Power curves for motors show a decrease in efficiency when driving less than optimal loads. Correctly specifying a motor for its duty may mean that a smaller motor is used which saves on purchase cost. It also pays back almost the same saving again each year in reduced electricity demand.

It is necessary to size the motor to match the load or alternatively increase the load to match the motor's size; this could be achieved by increasing throughput or alternatively implementing a 'batch' operation where the motor is switched off between cycles.

Motors are up to 15% less efficient when running at half their rated load.

The type of starter used for electric motors can have an effect on the power consumed by the motor. When star delta connected motors are permanently under loaded, their losses in delta may be relatively high. It is possible to reconfigure a lightly loaded motor's electrical connections from 'delta' to 'star'

For motors running at less than 40% of rated output (and whose load never exceeds 58% of their full rating), a 10% electricity savings could be achieved by reconfiguring from 'delta' to 'star' connection.

Effective maintenance and efficiency optimisation

There is a direct link between effective maintenance and energy efficiency, and systems that are well maintained will reduce energy costs by up to 5%. Motors will wear as they age causing larger frictional losses, adequate maintenance will prolong the life of a motor and sustain optimum efficiency. It should be noted that poorly aligned direct couplings lose up to 5% efficiency and may result in premature failure of bearings.

Replace bearings and seals regularly and ensure lubricants are properly applied, this can save around 5% of the running costs over the life of the motor. This should form part of a planned maintenance strategy, including vibration analysis and thermography, which will give early warning of any impending problems

It should be noted that motor rewinding would cause a decrease in efficiency of 1%.

Optimise supply voltage

It has been identified that there is an intention by the electricity supply companies to change the current supply voltage from the current 380 volt for 3-phase supply to 440-volt +/- 10%. This change will have significant implications for the ROC's. This change has not been well communicated at the present time and some of the ROC's are unaware of this change.

This is a real cause for concern since electric motors operate at their best efficiency when their supply voltage is within +/- 5% of their rated nameplate voltage. Operating out of this range leads to overheating and loss of efficiency. A typical motor experiences a 1% drop in efficiency for each 5% variation in supply voltage. In practice a site may have a range of motors with varying nameplate voltages, from 380 through 440V; the optimum operating voltage for the site will be determined by identifying the motors with the largest energy consumption (considering loading and hours run). The supply transformer tapings should be adjusted to match the optimum operating voltage, for the largest energy consumption equipment on a particular site.

Power factor correction

Power factor is the ratio of the resistance presented by the motor to the combination of this resistance and the inductance. The current drawn by a motor is inversely proportional to its power factor. Ideally the power factor should be 1 (unity), the maximum possible value, which would signify no inductance. In practice, the power factor for most motors is in the range 0.8 to 0.9, i.e. less than 0.92, the threshold below which the electricity supply authority imposes a supplementary charge.

The inductance of motors can result in a poor (low) power factor. However, this inductance can be neutralised by connecting capacitors in parallel with the motor. Like inductance, capacitors repeatedly accumulate and subsequently discharge energy at various stages of the alternating current cycle; this does not represent an overall use of energy. When an appropriately selected capacitance is connected in parallel with a motor, energy repeatedly flows between the motor inductance and the capacitance but this is not seen by the electrical system upstream of the motor and capacitor.

Power factor correction equipment should be installed and maintained and checked regularly as part of a planned maintenance system. Checks should also be made on electricity bills to ensure that no surcharge has been applied as a result of a low power factor.

Compressed air equipment

The location of compressed air equipment should be considered for all new schemes, to ensure optimum efficiency and reduce energy consumption. Compressor and blowers should be mounted in a location where they have an unobstructed supply of cool air. This reduces its workload and therefore decreases energy consumption for the same pressure and volume.

A 5℃ drop in air intake temperature equates to a 2% drop in running costs.

Activated sludge plant optimisation

There are two principal processes to provide oxygen in biological phase of wastewater treatment, these being, surface aerators for each of the aeration tanks or diffused air provided by air blowers. Generally speaking the diffused air principle offers higher energy efficiency. These aerators perform two functions, namely they are to:

- Supply the oxygen needed to sustain the biological treatment process
- Agitate the mixed liquors passing through the aeration tanks and so inhibit the settlement of sludge in the aeration tanks

It is imperative to optimise the aeration process to minimise energy consumption, which is the largest single user of energy in the wastewater treatment process. There is a direct link between the level of suspended solids in the aeration reactor and the oxygen demanded by the process. Activated sludge plants should always be operated with the minimum number of suspended solid to provide adequate treatment. The level of mixed liquor should be checked twice per day as a minimum requirement and the surplus rate adjusted to provide the optimum level. That done the level of dissolved oxygen should be carefully controlled and consideration given to the installation of dissolved oxygen meters. Ideally these meters should control the amount of oxygen provided to the plant as part of an automated control process and is an essential part of any new scheme. Where this is not possible on currently installed assets other options may be considered such as the intermittent operation of blowers or aerators. The control of Dissolved Oxygen levels (DO) using DO meters and frequency converters to provide oxygen levels at the desired set point is another option. Consideration should be given to running all of the surface aerators for a portion of each hour (or possibly of each half hour). This portion should be determined by the demand for oxygen by the biological process. This operating philosophy is likely to result in a more satisfactory process performance and energy efficient operation. It would not be appropriate to suspend the operation of the aerators during the periods of "high rate" electricity tariffs. Install Dissolved Oxygen meters and frequency converters to provide oxygen levels at the desired set point. Although it is not practicable to turn off aerators at time of high rate tariff it should be possible to over-aerate at times of low rate tariff and to use this capacity as a buffer at time of higher rates.

Automation and control

Automated systems can provide optimum energy efficiency and process parameters when compared with manual control systems. It is however essential to ensure that systems are adequately maintained. This should form an essential part of the company maintenance strategy.

Automation and control systems need to be adequately maintained to assure reliability.

Should instrumentation and control systems not be adequately maintained, they can respond incorrectly to process variations. Staff will then stop trusting them and turn systems to manual operation. Control loops can also 'wander' due to changes in process that do not match the original tuning, or in some cases, due to wearing of components.

Consideration should be given to the reliability of an instrument when it is installed and always establish an appropriate maintenance and calibration schedule.

Once controls have been set to the correct levels, they should be checked regularly. It is commonplace for users to make short-term adjustments and forget to reset controls to the original level. Specific control settings, together with a description of their intended operation should be recorded and kept in an accessible location for user reference. Calibration of sensors and controls should also be regularly checked as these can drift over time, resulting in increased energy consumption and associated costs.

An automated control system can be an improvement over manual control since control systems respond to a defined variation in a defined way. Consideration should be given to instrumentation and control during plant changes to minimise the cost of improvements.

The most cost effective time to improve instrumentation and control systems is when other plant changes are made, and ensure that these aspects are considered at the planning stage of plant changes.

Generally speaking automated improved controls halve the variability in a process.

There is a need to establish a data gathering system to determine the current performance and additionally, some simple data analysis should enable optimisation of performance.

Pumps and pump controls

The transfer or pumping of water and absorbed energy is the highest single contributor to the revenue budget apart from manpower. It follows therefore that any efficiency savings made in this area will have a significant effect on efficiency improvements.

Reduced leakage will play a significant part in reducing energy and other costs and this is referred too in the NRW Guidelines.

Inefficiency in pumping systems can be caused by a number of factors or conditions; the most common of these is listed below:
- Incorrect selection of pump duty
- Incorrect selection of the pump type
- Poor design of pump and pipework layout
- Maintenance and wear of internal pump components
- Incorrect operating regime
- Poor motor efficiency.

These inefficiencies are now discussed in detail.

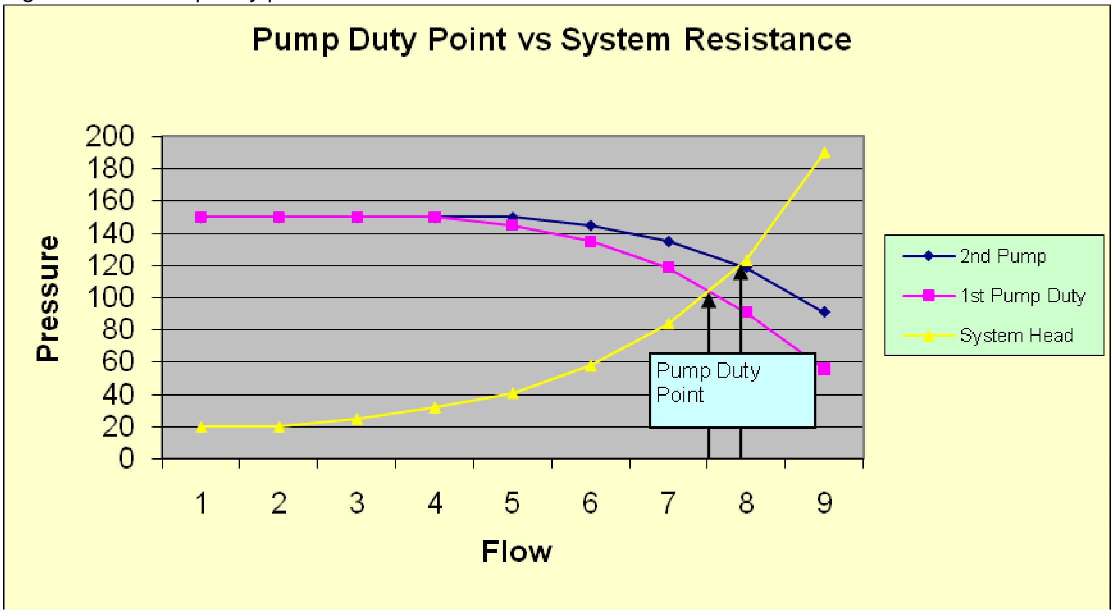
Pump duty point

Pumps should be selected for use when the maximum efficiency identified by the manufacturer meets the flow (Q) and pressure requirements (H) of the system. Whereas flow is relatively easy to identify this is not the case with pressure. The static head or lift dictates the pressure required and also the resistance generated by friction that is determined by the velocity of water in the pipeline, the pipeline characteristics, and internal roughness. Tables and software are produced by pump manufactures to assist in the identification of the calculated head generated (static head + system resistance) and is generally known as the system resistance curve. The system resistance is dynamic and increases as flow increases as shown in figure 8-17.

The head on the "suction" side of the pump is added or subtracted from the static head depending whether this is positive or negative, and will also vary according to the pipeline characteristics. The word "suction" when applied to centrifugal pumps although in general use is a misnomer, since such pumps do not suck, but rely on the force of gravity to force fluid into the pump. As a general rule for centrifugal, mixed flow and axial pumps the suction head must always be positive

The problem is more complicated when more than one pump is run in parallel as illustrated in Figure 8-17.

Figure 8.17: Pump duty point



As can be seen from the chart the effect of the second pump in terms of an increase in flow is minimal, whereas the increase in energy required would be considerable. If a third pump of the same duty were to start the effect on flow would be almost nil.

Pump type selection

There are a number of different pump types available for selection for a particular duty, such as screw, axial flow, mixed flow and centrifugal. For some application there will be overlaps in the type of pump that may be selected, and it is for the designer to make the most suitable selection based on the duty required from the pump, and the specification provided by the manufacturer.

Screw pumps are only suitable where large quantities of fluid are pumped against low heads and are seldom used in water treatment applications. They are generally used for wastewater treatment and occasionally for abstraction where the head requirement is minimal. The efficiency of these pumps is generally high.

Axial flow pumps will generate higher heads than screw pumps and are very efficient when large flows are required. These are again used for storm and wastewater pumping and also for abstraction where relatively low heads are required. These pumps operate in a similar way to an aircraft propeller, and actually screw the fluid through the pump body. When using these pumps it is very important to ensure there is minimum resistance in the suction pipe layout, since unlike centrifugal pumps the power absorbed is proportional to the total head and not actual flow.

Mixed Flow Pumps are a combination design of axial flow and centrifugal pumps. They have the advantage of higher efficiency than centrifugal pumps but are also capable of generating higher heads than axial flow pumps. Again such pumps are often deployed on wastewater, storm water and clean water application where the head required is relatively low.

There are numerous types of centrifugal pumps manufactured for an equally numerous variety of applications. This list is by no means exhaustive, but attempts to briefly identify the types in common use in the water and wastewater industry and where they may be applied in the water industry processes.

The benefits of correct pump selection will be complemented by well-designed suction and delivery pipe arrangements.

End suction open impellor

These pumps may be horizontal or vertical mounted, submersible, or dry well applications. The use of open impellors allows for the passage of solid objects and are frequently used in wastewater, storm water, and abstraction applications where relatively low discharge heads are required. The disadvantage of an open type impellor is that such pumps cannot achieve the high efficiencies of closed type impellers. As such, the application should be restricted to where there is a possibility of the pump having to pass solid objects, and would foul a closed type impeller.

Single stage split case centrifugal

These pumps are often used in clean water applications, can generate fairly high head pressures, and are very efficient. Normally they are horizontally mounted with side entry and discharge points The impeller design is of closed type, with cheek rings to reduce internal efficiency loss in the pump. The head generated in a centrifugal pump is based on the specific speed of the impeller, therefore the pump may be constructed using a large diameter impeller and run at low revolutions, or have a smaller diameter impeller and operate at higher revolutions. Many designers are not in agreement as to which is the best option, since both configurations have advantages and disadvantages. In simple terms high speed pumps are smaller and therefore have a lower capital cost implication and may be easier to install. However, higher speed equates to a faster rate of wear and requires more frequent maintenance if efficiency is to remain high. Therefore the whole life cost and location must be considered when making this decision.

Multi-stage centrifugal

Multi-stage pumps are used to generate high heads or pressure. The size or speed a single stage centrifugal pump will determine the head generated, and will always be limited to the physical characteristics. There will be occasions when higher heads are required; the designer then has few options but to install a multi-stage centrifugal pump.

Multi-stage pumps deploy closed type impellers with cheek rings and operate at high efficiency. The pump generates high heads by taking flow and pressure from the first stage and adding the energy imparted by the second stage and so on. Generally in water industry applications it is uncommon for more than five or six stages to be used, but for boiler feed applications where boiler pressure has to be overcome, more stages may be used. The same principle is also used on borehole pumps where high lift pressures are required. Generally these pumps are very reliable and operate with the minimum of maintenance. It is necessary to monitor the pump performance frequently since any change in duty or internal wear will rapidly result in a loss in efficiency and discharge pressure, this is particularly so if sediment is present in the pumping media.

Design and pipe-work layout

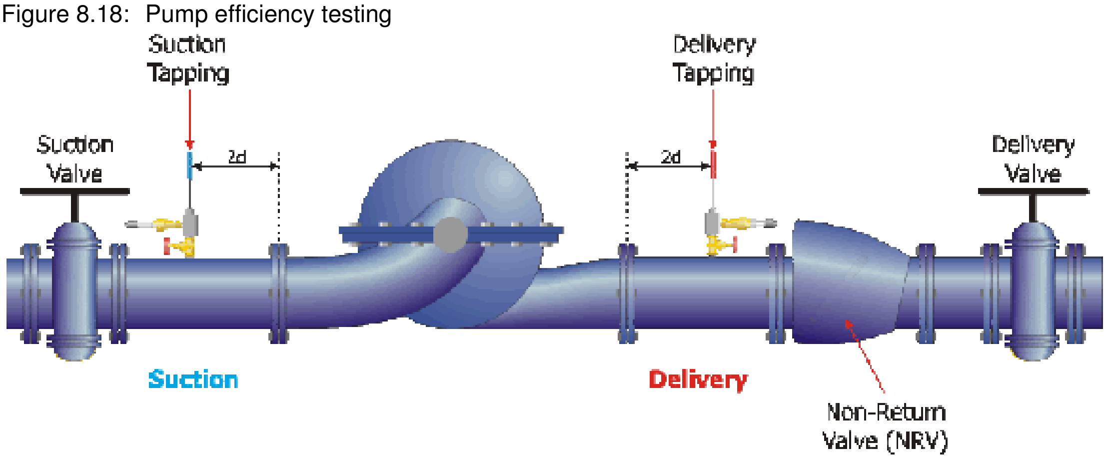
Even if the correct pumps are selected to provide maximum efficiency, this can be totally undermined by improper pipework and pump layout. The basics that should be considered are:

- Suction characteristics: ensure positive pressure is available at the pump suction when all pumps are operational with the minimum number of bends and elbows and no possibility of a suction vortex or partial air locking.
- Discharge characteristics: as with the suction pipe, ensure a minimum number of bends and elbows are used and where a pipe is connected to a manifold a "swept tee" is used to minimise turbulent flow. Joints in pipework must be smooth and without steps or other undulations and deploy proper gaskets. Consideration should also be given to provide low friction (Teflon) coatings to discharge pipework on new and refurbished schemes, this exercise is expensive and is unlikely to offer a significant pay back when undertaken as a retro fit.

8.7.4 Pump efficiency testing

It is essential, having completed a new pumping station scheme or refurbishment, that a pump testing exercise is undertaken. There are a number of methods of undertaking such a test, from a simple calculation of work done in terms of head and flow and energy used, to a more sophisticated method described as thermodynamic testing. As with most tests the information derived from the test is as good as the effort made to carry out the test. A simple calculation will provide a snapshot for the period of the test, but will not provide detail of effect of pumps running in parallel or at higher and lower frequencies where frequency inverters are installed. The equipment needed for undertaking pump efficiency testing is illustrated below in figure 8-18.

Figure 8.18: Pump efficiency testing



Thermodynamic pump efficiency testing

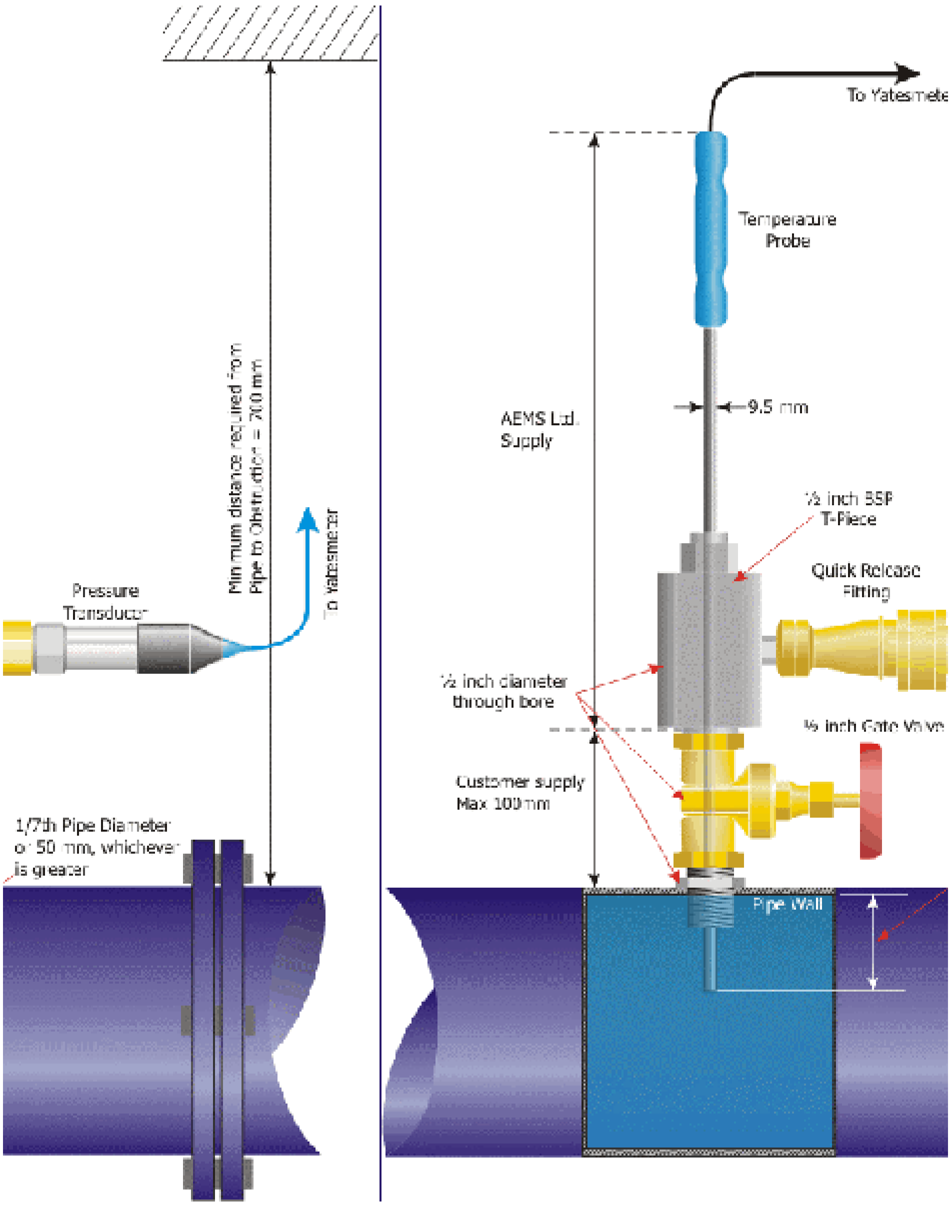
This method of pump testing provides very accurate results and should be considered in all pre and post project appraisal. Such a test will prove:

- Efficiency declared by the pump manufactures has been achieved
- Calculations relating to the system resistance curve illustrated in figure 6-16.
- Flow and head characteristics identified in the design are met
- Plant is maintained properly.

The test is carried out by recording electricity, head, and flow measurement in electronic format attached to a computer. The inlet and outlet temperature of the pumping media is also measured to a very high degree of accuracy and also linked to the computer. Software on the computer will calculate the pump efficiency to a very high degree under a number of operating conditions. The test requires the throttling of the discharge valve.

Equipment required for undertaking such tests is costly, but the savings can be enormous and is probably the most effective energy management programme for a water utility. An illustration of the pump test layout and equipment is given in figure 8-19.

Figure 8.19: Thermodynamic Pump Testing



8.7.5 Pump operation and maintenance

Without adequate maintenance the efficiencies gained from correct pump selection and station design will be lost if equipment is not maintained. Historically pump maintenance would have been undertaken determined by the number of hours run or elapsed time.

Maintenance frequency

It was considered good maintenance practice to remove pumps from service periodically and carry out a full overhaul of the pump and any associated equipment. However, intrusive maintenance of this type is expensive, and would normally result in the equipment being "over maintained", in that no overhaul was required at this time. The alternative is probably worse, in that the plant was "under maintained" or had been running for considerable periods in a very inefficient state or had actually failed. In some cases failure will result in consequential damage either to the equipment or to the reputation and public confidence of the operating company (ROC). Since no plant operates under the same conditions, the chances of getting the timing right are perhaps better taken on luck rather than judgement.

Maintenance techniques

The condition of the operational equipment should be understood at all times, and be assured that it is operating at the maximum efficiency and availability. In order to facilitate this process economically a means of non-intrusive testing needs to be undertaken. Performance testing of this type is described later in this document, but it may also be worth considering other monitoring techniques to enhance reliability and performance. A periodic infrared (12 months) survey of electrical equipment is inexpensive and will highlight any weakness in the electrical system likely to cause catastrophic failure, and vibration analysis, which will indicate failure of motor bearings and other mechanical components.

Pump operating regime

The manner in which pumps are operated can have a significant impact on both efficiency and maintenance frequency. As can be seen by the chart figure 6-15, simply starting an additional pump will not provide twice the flow as operating with one or anything like it in this example, and starting a third pump will do nothing but absorb energy.

Pump operation will impact on its efficiency and maintenance requirements.

Manual operation

Where pumps are controlled manually the pumping regimes must only be operated in the manner determined by the designer at the inception. If the plant has been designed for multiple pump operation the designer will have considered this, and ensured that multiple pump operation will provide adequate duty at the best efficiency.

Automatic operation

Pumps operating in automatic mode are more likely to operate efficiently providing the designer has identified the correct operating regime to meet the operational needs and also the pump duty points. Again periodic pump performance testing will confirm that the operating regime is correct for the type of pumps installed, and that there has been no shift in the operating parameters as a result of poor flow and/or pressure monitoring equipment.

Frequency converter

Frequency converters can have a significant benefit to the operating regime, providing they are suitable for the type of pumps and motors installed. In simple terms they operate by converting the analogue three phase sine wave to digital and expand or compress the waveform as required from the control system. Normal operation is between 38 and 60 Hz but it is unusual for pumps to operate efficiently over this range. Frequency Converters will require additional power to be provided by the motor when operating at the top end of the range. It is therefore important to consider this when undertaking a retrofit modification to an existing system; otherwise much of the benefit may be lost. It is also very important to consider the control parameters, which may bring in an additional duty assist pump, and the effect this may have on the pump efficiency.

8.7.6 Buildings and accommodation

Although not considered to be a high energy cost in the water utility sector, there are a number of simple considerations for completeness of the energy strategy. These are:

Heating and cooling

Ensure heating and cooling do not run simultaneously. If air conditioning is in use, it should be set to cool occupied spaces to no less than 24℃. Similarly, heating should be controlled to maintain a lower temperature level according to the building type and nature of activity being undertaken. The 'dead band' between the two temperatures, where neither system is operating, prevents the occurrence of both systems operating simultaneously and in competition with one another.

Seasonal adjustments

Make seasonal adjustments on control settings and achieve 5% energy savings. Reset controls in line with seasonal weather variations and between summer and wintertime. For example, heating should come on earlier when the weather is colder, and lower heating circuit temperatures may be acceptable in early spring and late autumn. Switch off unnecessary boilers in warmer months to reduce domestic hot water costs by around 5%. It may be necessary to consult specialists or installers for further advice.

Ensure temperature controls reflect building requirements. Do not overheat the workplace, or open windows in heated buildings.

Recommended temperatures include:
- Offices - 19℃
- Workshops - 16℃
- Stores - 10-12℃

For every degree of over-heating, fuel consumption increases by 8-10%, and the risk of other heat gains from office equipment, lighting and staff causing uncomfortably warm working spaces is also increased.

Lighting

Where large numbers of lamps are deployed it is worth considering replacing tungsten halogen floodlights with discharge lighting. Although tungsten halogen lamps are cheap to buy and have immediate switch on times they do not last very long and are expensive to run. Replace lamps that are on for significant periods of time when they fail with lower energy using alternatives such as sodium lamps or metal halide lamps. These cost more to buy, but use less energy, have longer lamp life and are less likely to fail prematurely so reducing energy use and maintenance time.

Any remaining Tungsten halogen lamps should only be used for security and safety purposes and should be controlled using presence sensors.

8.7.7 Combined Heat and Power (CHP)

CHP provides electricity and heating at a cheaper rate than they can usually be purchased from utility companies. A typical CHP system produces electricity and heat at the point of demand, the 'waste' heat from electricity generation is used to produce useful hot water or steam for digestion and other processes, such as heating buildings. Where installed on a wastewater treatment site, the resulting electricity and heat can be provided at a cheaper rate than supplies from utility companies for methane gas produced from the digestion process. Combined Heat and Power (CHP) is the simultaneous production of power (usually electricity) and usable heat.

There are four good reasons for installing Combined Heat & Power (CHP)
- Reduced environmental impact
- Cost savings,
- Supply reinforcement and supply reliability
- Alternative energy (biogas)

Environmental Impact

Anaerobic sludge digestion produces methane and carbon dioxide at a ratio of about 60% methane and 30% carbon dioxide. Methane gas has been identified as a significant cause of global warming. The prerequisite to a successful heat balance in the process is to ensure that digester sludge feed thickness is in excess of 4.5% dry solids (ds), and for ease of pumping no more than 6% ds, unless positive displacement pumps are used.

Cost savings

Where the system is designed and configured correctly and runs for most of the day and year, large savings can be made. Quality CHP systems may qualify for Enhanced Capital Allowances and their fuel input is exempt from the climate change levy. (*Still to be determined in Romania*)

A wastewater treatment plant can reduce energy costs by 90% if CHP is installed and the digestion process properly managed.

Supply reinforcement

CHP provides additional generation capacity to help meet site demand, although its use cannot guarantee the security of supply. CHP can be configured to operate as a source of power at times of high rate tariffs.

Alternative energy

The reuse of digestion process by-products is a significant source of renewable energy and will contribute to carbon dioxide emissions reduction targets. Should this material be discharged direct to the atmosphere, there is a failure to utilise an alternative energy resource and a missed opportunity to reduce fossil fuel consumption. This is particularly useful for organizations with negotiated agreements or which participate in emissions trading.

9. Financial management

9.1 Introduction

Financial management does not merely involve the creation of a finance function tasked with maintaining a set of financial records that are only able to be interpreted by trained finance staff. It also involves the creation of a system that not only records financial transactions but also makes use of the data so created as a tool for both day-to-day management and for the forward planning of the business. Therefore, financial management relates not just to financial accounting but also to the management and utilisation of financial data in such a way that the business obtains tools that assist management in meeting its stated objectives and monitoring progress towards them.

Financial Management is the management of the finances of a business in order to achieve financial objectives.

9.1.1 Purpose

The key objectives of Financial Management:

- To create profit for the business
- To generate cash
- To provide an adequate return on investment considering the risks and the resources invested

9.1.2 Key components

The key elements of Financial Management:

1. Financial Planning: management needs to ensure that enough funding is available at the right time to meet business needs:
   a. on short term funding may be needed to invest in equipment and stocks, maintenence and repairs, pay employees and sales made on credit.
   b. on medium and long term, funding may be required for significant additions to capacity of the business or to make acquisitions.
2. Financial Controls: an activity to help ensure that the business is meeting its objectives. Financial control raises questions such as:
   a. are assets being used efficiently?
   b. are the businesses assets secure?
   c. do management act in the best interest of shareholders and in accordance with the rules ?
3. Financial Decisions: financial decision-making relates to investment, financing and dividends.
   a. investments must be financed in some way – however there are always financing alternatives that can be considered. For example it is possible to raise finance money from selling new shares, borrowing from banks or taking credit from suppliers .
   b. a key financing decision is whether profits earned by the business should be retained rather than be distributed to shareholders via dividends; if dividends are too high, the business may experience a lack of funding to reinvest in growing revenues and profits further.

9.1.3 Key objectives

Objectives of Financial Management:

1. Provide support for decision making: financial management provides managers with the information and knowledge they need to support operational decisions and to understand the financial implications of decisions before they are made. It also enables managers to monitor their decisions for any potential financial implications and for lessons to be learned from experience, and to adapt or react as needed.
2. Ensure the in time, relevant and reliable financial and non-financial information: financial management gives managers the information that either forms the basis for calculating financial information, or is used for management control and accountability purposes.
3. Manage risks: financial management enables an organization to identify, assess and consider the financial consequences of events that could compromise its ability to achieve its goals and objectives and/or result in significant loss of resources. Financial management is an important component of risk management and needs to be considered with the full range of business risks, such as operational and strategic risks as well as social, legal, political and environmental risks.
4. Use resources efficiently, effectively and economically: financial management is necessary to ensure that an organization has enough resources to carry out its operations and that it uses these resources with due regard to economy, efficiency and effectiveness.
5. Strengthen accountability: financial management is essential for an organization to understand and demonstrate how it has used the financial resources entrusted to it and what it has accomplished with them.
6. Provide a supportive control environment: financial management contributes to promoting an organizational climate that fosters the achievement of financial management objectives - a climate that includes commitment from senior management, shared values and ethics, communication and organizational learning.
7. Comply with authorities and safeguard assets: financial management is essential to ensuring that an organization carries out its transactions in accordance with applicable legislation and regulations ; that spending limits are observed and that transactions are authorized. It also provides an organization with a system of controls for assets, liabilities, revenues and expenditures. These controls help to protect against fraud, financial negligence, violation of financial rules or principles and losses of assets or public money.

9.1.4 Decisions of the Financial Management

The decision function of financial management can be divided into the following 3 major areas:

- **INVESTMENT DECISIONS**: determine the total amount of assets needed by a firm. This is closely tied to the allocation of funds.

Types of investment decisions:

- Capital Investment decisions : large sums, non routine, longer term, critical to the business like purchase of plant and machinery or factory
- Working Capital Investment decisions: more routine in nature, short term but are also very critical decisions like how much and how long to invest in inventories or receivables

- **FINANCING DECISIONS**: After having made a decision on the number and type of assets to buy, the financial manager then needs to decide on how to finance these assets i.e. the sources of funds.

Financing decisions that need to be made are for example:

- Whether to use external borrowings/debts or share capital or retained earnings

- Whether to borrow short, medium or long term
- What sort of mix – all borrowings or part debts part share capital or 100% share capital
- The needs to determine how much dividend to pay out as this will directly affects the financial decision.

  - **ASSETS MANAGEMENT DECISION**: once assets have been purchased and appropriate financing is secured, it now involves the efficient and effective management of current assets such as cash, inventories and receivables so as to maximize returns and minimize the risks to liquidity.

Example of assets management decision:
- Extension of credit term to increase sales
- To hold more stocks or on a longer term.

Financial management is, therefore, the process that brings together all of the financial operations with the aim of managing the company's resources to enable it to achieve its defined objectives both efficiently and effectively.

This chapter identifies and describes a number of important issues for sound financial management for water utilities:
- Basics of financial management: the requirements and organizational setup (9.2)
- Accounting systems and principles (9.3)
- Financial planning (9.4)
- Cost control (9.5)
- Cash management (9.6)
- Water tariffs (9.7)
- Preparation and financing investments (9.8)
- Loans and option analysis (9.9).

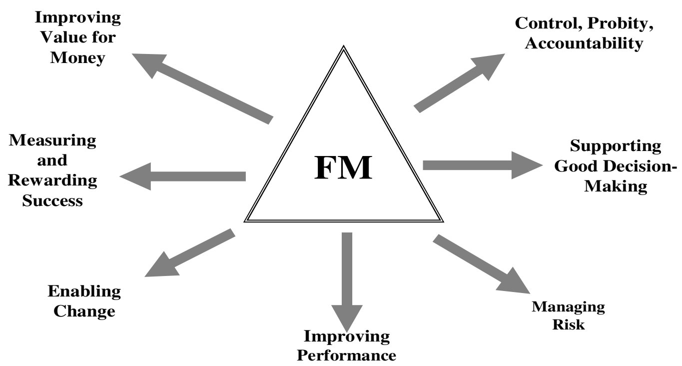
9.2 Financial management: requirements and organizational setup

9.2.1 The need for good financial management

Effective financial management is both critical and essential if any organization is to be successful in its endeavours. However, at the very start it must be recognised that financial management is more than just an administration and control process. It is the provision of timely, relevant and reliable financial information that provides a basis for better decisions in the overall management of the organization.

An effective financial management system impacts on all areas of the organization. The areas that can be influenced by an effective financial management system can be represented diagrammatically as follows:

Figure 9.1: Areas than can be influenced by an effective financial management



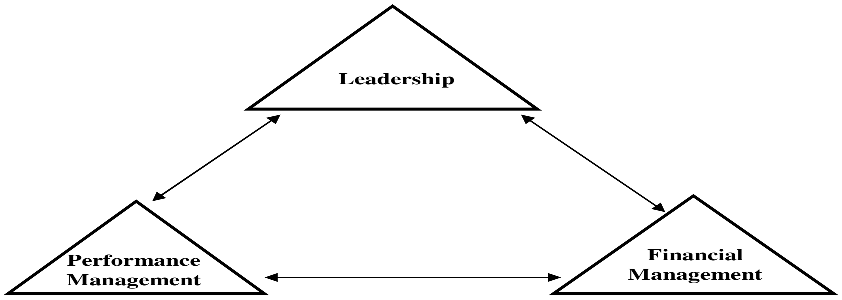
Thus sound financial management at its most basic provides:

- Essential information needed for those who manage and supervise the organization's day to day operations.
- Essential information needed for those persons or organizations vested with overall control and monitoring of the companies.
- Reassurance to stakeholders that the organizations resources have been used efficiently and for the purposes intended.
- A deterrent to fraud and corruption, since it provides internal controls and the ability to identify unusual occurrences and deviations.

9.2.2 Position of financial management in an organization

The actual position of financial management in the overall management structure can be represented schematically as follows:

Figure 9.2: The management model



The diagram points out that for there to be effective overall management in any organization there needs to be an inter dependency between:

- effective leadership for the overall management of the organization;
- financial management to demonstrate accountability;
- performance measurement to demonstrate the effective use of resources.

Each element in the model complements and supports the others thus ensuring that the organization operates in a consistent and effective manner. Therefore, effective financial management is essential if managers are to be able to exercise management control over all aspects of the business.

9.2.3 Requirements of financial management

For financial management to be effective there needs to be in place a suitable, well constructed and managed financial database. This database needs to be both kept up- to- date and structured in such a manner that it is able to respond to the specific management demands of the organization and be under the control of a well structured and appropriately qualified finance department.

It must be noted at the very start when either designing or confirming the existence of such a database that:

- There needs to be a set of policies and rules, known and understood by everyone, outlining how financial issues are to be dealt with.
- There is no magic formulae that can be adopted universally so that there is no one size fits all solution. Differing organizations have differing needs and therefore the system must be designed with a specific organization in mind.
- An open minded approach needs to be adopted, the rules and policies must be adapted and modified as the circumstances change. The imposition of either new or upgraded systems on top of old outdated practices will merely add to the problems rather than resolve them.

From this basis it is possible to provide a high level view of the work that needs to be done to improve financial management, namely:

Table 9.1: Task and objective to improve financial management

Task	Objective
Review the organization and structure of the Finance Department.	To create a Finance Department capable of providing a first class service to the utility by making best use of modern techniques and procedures.
Defining the Financial Policies and Rules by which the Utility operates.	To create a set of policies and codified rules, understood by everyone within the utilities, outlining the financial direction requirements and responsibilities.
Defining the Financial System to be used.	To create a modern fully integrated financial system, making the best use of modern technology, capable of meeting the needs of the utilities.
Defining the structure of the database to be used.	To create a database capable of meeting the individual needs of the utilities.
Reviewing and improving the financial reporting systems.	To create a structured and flexible reporting mechanism capable of meeting both the internal and external reporting requirements of the utilities.

9.2.4 Finance department organization

Central to any system of financial management is the department responsible for the control and maintenance of the financial database.

A thorough examination of the operation of finance within each of the utilities needs to be carried out preferably as part of an overall institutional review. An important point to note, however, is that all finance related functions should come under the control of a single person. This person will be responsible, on a day-to-day basis, for the efficient and effective operation of the finance function. This person will be an experienced, qualified finance manager who will be an important member of the corporate management team and will be responsible for ensuring that that team is kept fully aware of the financial impact of their decisions. The person’s actual job title will be dependent on local custom and practice but usually they will be referred to as Vice President (Finance), Director of Finance, Economic Director or Financial Controller.

The actual departmental structure below this person is very much dependent on the size of the organization; larger and more complex organizations tend to have a greater number of sub divisions based on increasing specialisation or technical skills. As a minimum, within the utilities under consideration, the structure will cover the following groupings:

- Financial accounting;
- Management accounting;
- Treasury;

The important point to note, however, is that the actual form needs to be acceptable to the individual utility. This can only be achieved by carrying out a comprehensive review, which will cover such items as:

Table 9.2: Overview of the financial management organization

Task	Objective
Current reporting lines and timetables	To identify that there is a clearly defined hierarchy for reporting purposes. And that duties and responsibilities are fully understood by all the staff involved.
The workload of each section.	To identify the actual workload of each section with the specific intention of

Task	Objective
	identifying bottlenecks and other areas of weakness.
Outstanding workloads.	To identify where there are specific problems within the utilities. This will include identifying the reason behind the backlog to enable measures to be put in place to overcome them.
Staffing levels.	Arising from each of the above points to determine the adequacy or otherwise of staffing levels.
Levels of skill.	Arising from each of the above points to determine the adequacy or otherwise of staff skills.
Training requirements.	Arising from each of the above points to determine the adequacy or otherwise of staff training and the training needs of the utility.
Working practices	To ensure that the working practices are effective and in line with modern thinking.

The best method of carrying out the above tasks is to carry out a thorough systems analysis of the current finance department operations. (This is equally true of all departments making up the individual utilities).

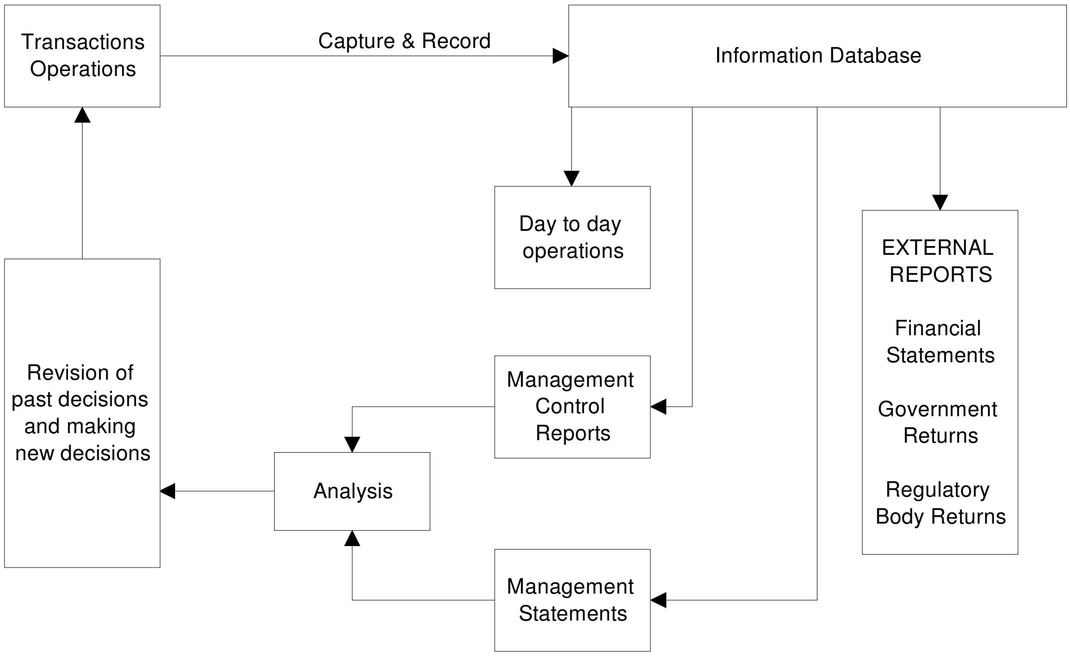
Whatever method is adopted in defining the departmental structure the following basic functions are central to any finance department operations:

- Financial Accounting, responsibility for the preparation and maintenance of the organization's historic accounts and external statutory reporting. Principal among its activities are:
  - recording business transactions
  - recording income / and the payment of debts
  - preparing statutory financial statements
- Management Accounting, responsibility for internal management reporting. Central to its activities are:
  - Recording, analysing and interpreting financial information
  - Provision of information for internal planning, control and decision making.
  - Budget preparation and budgetary control.
- Treasury management, responsibility for the management of cash within the organization. Cash is the lifeblood of any organization, it is also a resource that has to be managed. Central to its activities are:
  - ensuring that the organization receives the best return on cash not presently in use.
  - ensuring cash or facilities are available to pay creditors.
  - managing foreign exchange transactions
  - control and monitoring of bank accounts
  - cash flow forecasting and monitoring
  - control and monitoring of borrowing.

9.3 Accounting systems and principles

By definition an accounting system is the "methods, procedures and standards followed in accumulating, classifying, recording and reporting business events and transactions. The accounting system includes the formal records and original source data," (Barron's Accounting Handbook). The actual system, be it manual or computer based, can be depicted as in figure 9-3 (next page):

Figure 9.3: Accounting System Overview



The diagram demonstrates that each action taken within the organization generates a transaction that requires to be fed into a database. This database is then available to:

- Carry out the day to day activities of the organization, e.g. to calculate and pay wages or pay invoices.
- Produce control reports, these are designed to prove the accuracy of the database and provide audit trails that enable all transactions to be verified by independent audit.
- Produce internal management reports for the organizations managers. Scrutiny of these reports enables managers to take action on any areas that appear at variance with planned activity.
- Produce reports for external bodies / individuals, e.g. statutory accounts, tax returns etc.

9.3.1 Accounting system requirements

Any accounting system, be manual or computer based, consists of a series of modules. These can be defined as:

- The source systems – systems that are designed to capture and action the organizations basic transactions. This would cover such items as:
  - Introduction of employees time to enable wages to be calculated and payments made
  - Invoices to be entered into the purchase ledger and payments to be made.
  - Inventory transactions to be recorded and balances of inventories maintained
  - Customer records maintained in the sales ledger, bills raised and debts collected[11].

11 In the Water business Customer Accounting is frequently carried out in a separate system which is concerned with meter reading, customer billing, cash collection, and debtors management. The Sales ledger in the Accounting system may be used simply as a summary of the Customers Accounting system and for balancing purposes in the General Ledger.

- The General Ledger – the central depository of summaries of the transactions actioned and recorded in the source systems. This is the central record of the organizations accounts. The general ledger contains the accounts that make up of the organization's financial statements. Separate accounts exist for individual assets, liabilities, stake-holders equity, revenue and expenses.
- Reporting modules. – the means by which the data contained in the General Ledger is translated into reports that are used required by employees, management, shareholders and stakeholders to monitor, manage, and meet the legal requirements of the business.

9.3.2 Accounting systems integration

Prior to the advent of computers all records were maintained in written form in either loose leaf or bound ledgers with data being transferred from the subsidiary records to the general ledger at frequent intervals. Of necessity this exercise was manual in nature and involved the maintenance of control accounts to ensure that the general ledger and subsidiary records were reconcilable.

Computers greatly aided this transfer process when their introduction enabled this to be done automatically and electronically. However even with computerisation manual type practices remained with subsidiary records being summarised into batches prior to transfer to general ledger. Each of the source systems remained as separate entities with daily, weekly or monthly, depending on the organizations needs, updating of the general ledger. This process required the intervention of operators to trigger this batching and transfer exercise.

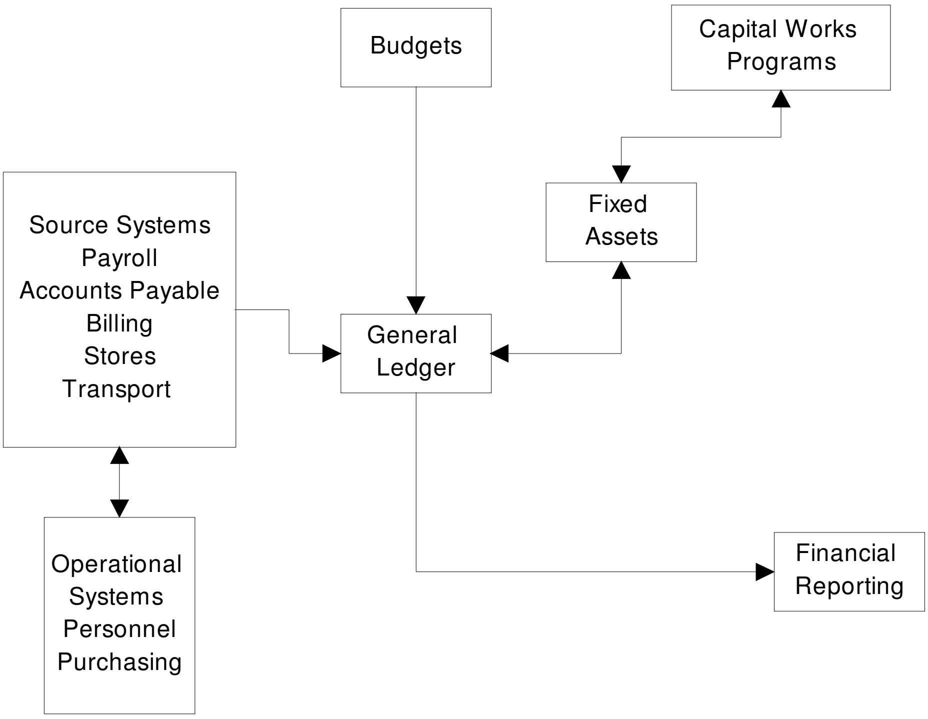
As the power and capabilities of computers increased then so did the potential for fuller integration of all parts of the accounting system. Integration as it is known today became reality with the development of real time system technology and the ability to network computers. This ability enabled flexibility with automatic update of systems and access to large numbers of users. This new technology enabled organizations to go beyond just integrating accounting systems. This is shown in figure 9-4.

This model demonstrates what modern computer technology can now provide where in effect systems can communicate between themselves; so that data used in an operational system can be entered once but then be used in such systems as accounts payable to pay invoices.

This can best be demonstrated by way of an example; the diagram in the figure demonstrates the process of purchasing an item for use within an organization. The cycle thus demonstrated is in use, with very little modification, throughout the world and consists of the following stages:

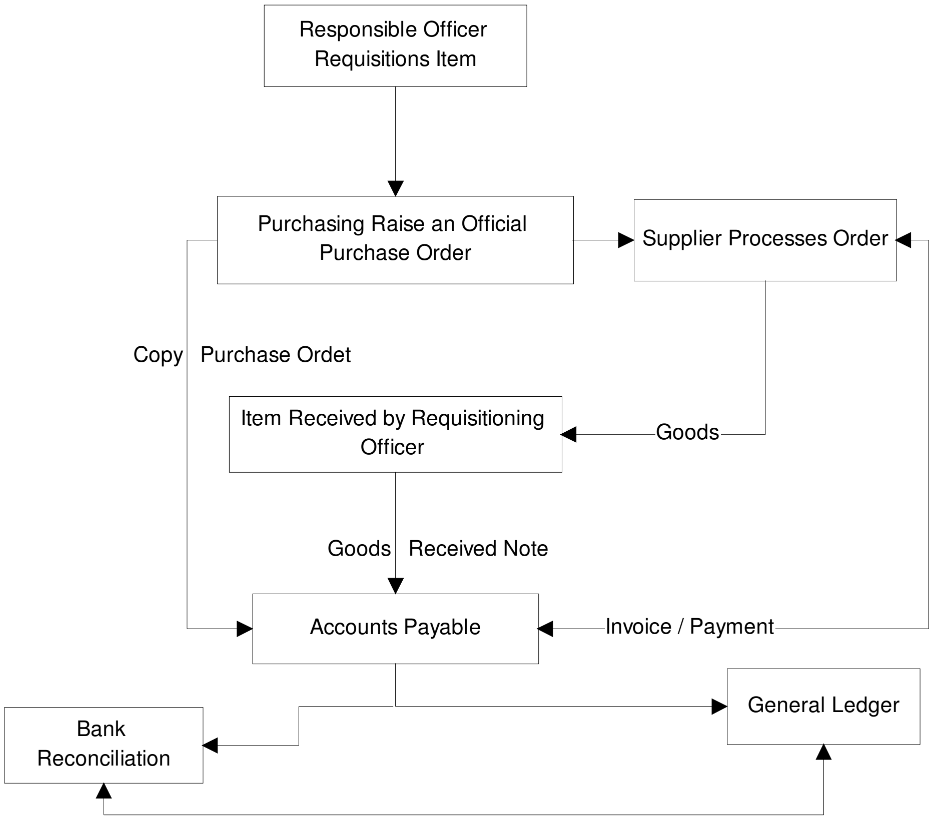
- A requisition is raised by an authorised officer for goods / services to be supplied.
- The requisition is converted into a purchase order and sent to the proposed supplier in addition a copy is sent to the accounts payable unit.
- The supplier provides the required goods and raises an invoice for them and submits it to the organization.
- The requisitioning officer receives the goods, checks and accepts them and raises a goods received note for onward transmission to the accounts payable function.
- Accounts payable collates all of the documentation together, purchase order, goods received note and invoice. If every thing is in order then payment will be made.
- The financial results of the above will be transferred to the general ledger.
- In the case of payments by cheque a bank reconciliation will be carried out at regular intervals.

Figure 9.4: Integrated Accounting System Model



All of these transactions added together are a costly exercise to any organization. They result in large amounts of paper being distributed through an organization with the potential for loss and delay. Modern fully integrated systems are capable of doing this exercise electronically with a minimum amount of manual intervention. In a modern system the requisitioning officer enters his requirements into the system, purchasing specifies the supplier to be used, the requisitioning officer enters the receipt and accounts payable enter the invoice. The checking, issue of order, payment and transfer of data to the financial records is all done automatically.

Figure 9.5: The Requisitioning and Receipt of Goods Cycle



9.3.3 Investing in an integrated accounting system

There are many advantages to be gained from investing in a properly structured integrated accounting system, namely:

- Greater accuracy, many of the systems have inbuilt validation routines that check the correctness of the raw data. In addition since the transfers are electronic there is less likelihood of transposition and other errors that accompany manual systems.
- Timeliness, without the need for excessive manual intervention timetables for the production of data can be shortened.
- Increased efficiency, the systems allow staff to take more interest in the data produced than in its actual production and control. Thus more time and accurate data is available to address the issues facing the organization.

There are currently available on the world market countless number of integrated accounting system. The reduction in cost and increases in computing power have put such systems within the reach of most organizations, both large and small. Most of the systems come in a modular format, each module being capable of standing alone if necessary, this allows some flexibility when introducing them to an organization. As a minimum a reasonable sized integrated system should contain the following modules:

- General Ledger
- Accounts Payable
- Fixed Assets
- Project Tracking (Job / Order Costing)
- Purchasing
- Budgetary Control
- Inventory / Stock
- Personnel
- Payroll.

9.4 CONTROLS of Financial Management

All businesses require a good knowledge of all available financial reports and the ability to interpret these reports in a useful manner. These financial reports must be based upon accurate internal reporting so that the integrity of the reporting procedures is not compromised. This can only be done by implementing and maintaining strict internal financial controls. Not to consider that a very serious part of the management of the business is to prevent the business against mismanagement and possible fraud. That is why the financial control system is so important .

The following basic questions should be asked :

GENERAL
1. Is the chart of accounts detailed enough to give adequate management information?
2. Is a double entry bookkeeping system used?
3. Who approves journal entries?
4. Does the company's manager understand the form and contents of the financial statements?
5. Does the company's management use budgets and cash projections?
    a. Are they compared to actual results?
    b. Are major differences investigated?
6. Are comparative financial statements produced?
7. Are the books and records kept up-to-date and balanced?
8. Who is responsible for producing financial information?
9. Are reasonable due dates imposed?
10. Is staff cross-trained in accounting functions?
11. Are storage facilities safe from fire, etc.?
12. Is access to accounting records restricted when appropriate?
13. Is insurance coverage regularly reviewed?
14. Is the company's management satisfied that all employees are competent and honest?
15. Are job references checked?

REVENUES
1. Is there a policy for credit approval?
2. Are customer debts files kept current?
3. Are sales invoices checks done regularly?
4. Are sales invoices approved for:
    a. Price?
    b. Terms?
    c. Cashing due-date?
5. Are all sales orders recorded on pre-numbered forms, and are all numbers accounted for?

6. Are sales invoices compared to metering documents?
7. Are sales invoices recorded promptly?
8. Are monthly statements for outstanding customer debts reviewed by the company's management?
9. Are statements for outstanding customer debts mailed by an employee other than the bookkeeper?
10. Is accounts receivable subsidiary ledger balanced monthly to control account?
11. Is an aging schedule of customers' accounts prepared monthly?
12. Are write-offs and other adjustments to customer accounts authorized by the financial manager?

CASH RECEIPTS

1. Does the company's manager or a responsible employee other than the bookkeeper or person who maintains accounts receivable detail:
    a. Open the mail and pre-list all cash receipts before turning them over to the bookkeeper?
    b. Compare daily pre-listing of cash receipts with the cash receipts journal?
    c. Are cash receipts deposited on a daily basis?
    d. Are cash receipts booked promptly to appropriate journals?
    e. Are cash sales controlled by cash registers or pre-numbered cash receipts forms?

CASH PAYMENTS

1. Are all disbursements except for petty cash made by payment order?
2. Are payment orders pre-numbered and all numbers accounted for?
3. Are all payment orders recorded when issued?
4. Are all unused payment orders safeguarded, with access limited?
5. Are voided payment orders retained and mutilated?
6. Are all payment orders signed by the company's manager?
7. Are supporting documents, processed invoices, receiving reports, and purchase orders presented with the payment orders and reviewed by the company's manager before he signs the payment orders?
8. Are supporting documents for payment orders properly cancelled to avoid duplicate payment?
9. Are payment orders payable to "cash" controlled ?
10. Are signed payment orders mailed by someone other than the person who writes the payment orders?
11. Are bank statements and cancelled payment orders:
    a. Received directly by the company's manager?
    b. Reviewed by the company's manager before they are given to the bookkeeper?
12. Are bank reconciliations prepared:
    a. Monthly for all accounts?
    b. By someone other than the person authorized to sign payment orders?
13. Are bank reconciliations reviewed and adjustments of cash accounts approved by the company's manager?
14. Are all disbursements from petty cash funds supported by approved vouchers?
15. Is there a predetermined maximum value limit on the amounts of individual petty cash disbursements?
16. Are petty cash funds :
    a. Kept in a safe place?
    b. Reasonable in amount so that the fund ordinarily requires reimbursement at least monthly?
    c. Controlled by one person?
    d. Periodically counted by someone other than the custodian?

ACCOUNTS PAYABLE

1. Are vendor invoices:
    a. Matched with applicable purchasing orders?
    b. Matched with applicable receiving reports?

   c. Reviewed for correctness of:
   d. Quantities received?
   e. Prices charged?
   f. Clerical accuracy?
   g. Account distribution?
2. Are all available discounts taken?
3. Is there written evidence that invoices have been properly processed before payment ?
4. Does the company's manager verify that the trial balance of accounts payable agrees with the general ledger control account?
5. Are expense reimbursement requests:
   a. Submitted properly?
   b. Adequately supported?
   c. Approved before payment?

RECEIVING
1. Are all materials inspected for condition and independently counted, measured, or weighed when received?
2. Are receiving reports used and prepared promptly?
3. Are receiving reports subjected to the following:
   a. Pre-numbering and accounting for the sequence of all numbers?
   b. Copies promptly provided to those who perform the purchasing and accounts payable function?
   c. Controlled so that liability may be determined for materials received but not yet invoiced?

PAYROLL
1. Are all employees hired by the company's manager and on legal basis ?
2. Are individual personnel files maintained?
3. Is access to personnel files limited to the company's manager or a designee who is independent of the cash functions?
4. Are wages, salaries and commission approved by the company's manager?
5. Is proper authorization obtained for payroll deductions?
6. Is payroll determined using authorized rates and:
   a. Adequate time records for employees paid by the hour?
   b. Records for employees whose wages are based on production?
7. If employees punch time clocks, are the clocks located so they may be watched by someone in authority?
8. Are time records for hourly employees approved by a foreman or supervisor?
9. Would the company's manager be aware of the absence of any employee?
10. Is the booking accuracy of the payroll payment ordered?
11. Are payroll registers reviewed by the company's manager?
12. Does the company's manager approve and sign payroll payment orders?
13. If employees are paid in cash, does the company's manager compare the cash requisition to the net payroll?
14. Does the company's manager maintain control over unclaimed payroll payment orders?

9.5 Financial planning

Financial planning is a process by which the organization establishes both long and short-term goals and objectives. The first part of the actual process is composed of the following three major elements:

- The Strategic Plan (See Section 4.1. and 4.2 Corporate Strategies and Investment Planning and Business Planning)
- The Annual Operational Plan (See Section 7.4 Cost Control).
- The Annual Capital or Investment Plan.

All of these elements are interrelated and each relies on or flows from the other; once the Strategic Plan has been formulated the annual operating and capital programmes can be developed using the guidelines established in that plan. An important point is that since the business environment is a dynamic one then planning requires continuous effort.

The second aspect of financial planning is the ability to manage or control the actual execution of the plans.

The final aspect of planning is the presentation of the plans; it is essential that all parts of the planning process are published and disseminated to ensure that they are understood and detract from possible confusion. Properly organised and prepared budget documents are essential to the success of any financial plan.

An important element of the financing planning process is represented by the budget preparation and by the preparation of the financial forecast as part of the business planning process.

A possible action plan for the budget preparation process is presented in the following table:

Table 9.3: Action plan for the budgeting process

Action to be performed	Effect of Improvement	Period
Set up the interdepartmental team for next year budget preparation	Better planning and develop medium and long-term development strategies Improved budgeting and controlling Formalize in a written document the short-term development strategy. Increase employee creativity; Improved medium- and long-term strategy.	**July**
The management team send the general strategies (vision) for the following years (3 pages document) covering: Strategy update; Tariff policy; Efficiency target; Points of attention Planning major investments;		**August**
All involved departments send relevant information to the accounting department.		**September - October**
Consolidation of information and preparation of draft annul budget for the next year.		**October**
Discussion and revision of the draft budget and issue of final budget		**November – December**
Send budget for approval of Administration Board and Local Council		**January – February**

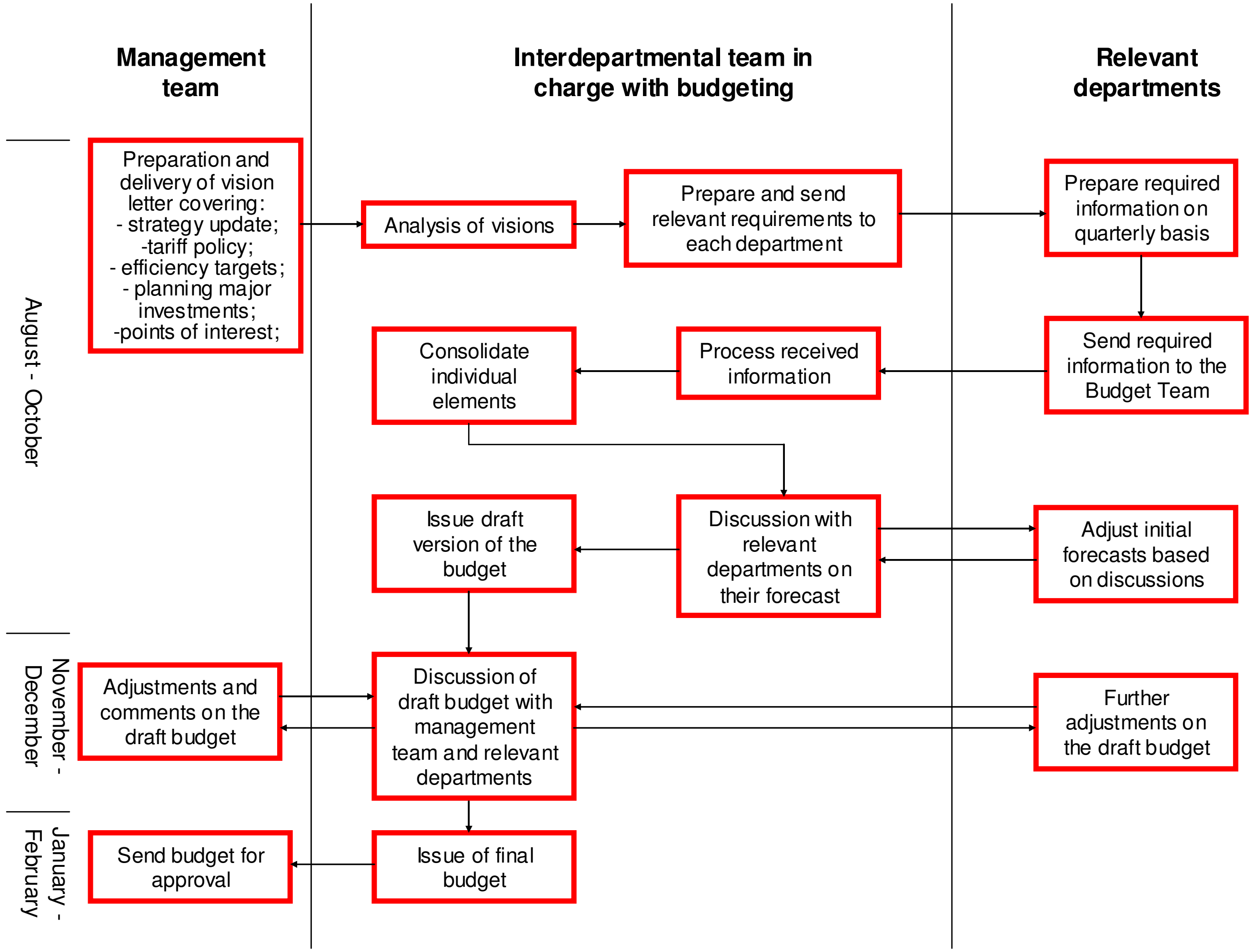
A budgeting process map presented in a schematic way is presented in figure 9.6.

A possible action plan for the financial forecast preparation process as part of the business planning process is presented in table 9-4:

Table 9.4: Action plan for the financial forecast process

<table>
<tr><th>Action to be performed</th><th>Effect of Improvement</th><th>Period</th></tr>
<tr><td>Set up the interdepartmental team for financial forecast update (as part of the Business Plan preparation or update process).</td><td rowspan="6">Better planning and improved medium and long-term development strategies
Formalize in a written document the short-term development strategy.
Increase employee creativity;
Improved medium- and long-term strategies</td><td>July</td></tr>
<tr><td>The management team send the general strategies (vision) for the following 5 years covering:
Strategy update;
Tariff policy;
Efficiency target;
Points of attention
Planning major investments;</td><td>August</td></tr>
<tr><td>All involved departments send relevant information to the accounting department.</td><td>September - October</td></tr>
<tr><td>Consolidation of information and preparation of draft financial forecast for 5 years.</td><td>October</td></tr>
<tr><td>Discussion and revision of the draft financial forecast and prepare final version.</td><td>November – December</td></tr>
<tr><td>Approve the revised version of the financial forecast as part of the updated business plan approval process.</td><td>January – February</td></tr>
</table>

Figure 9.6: Budgeting process map



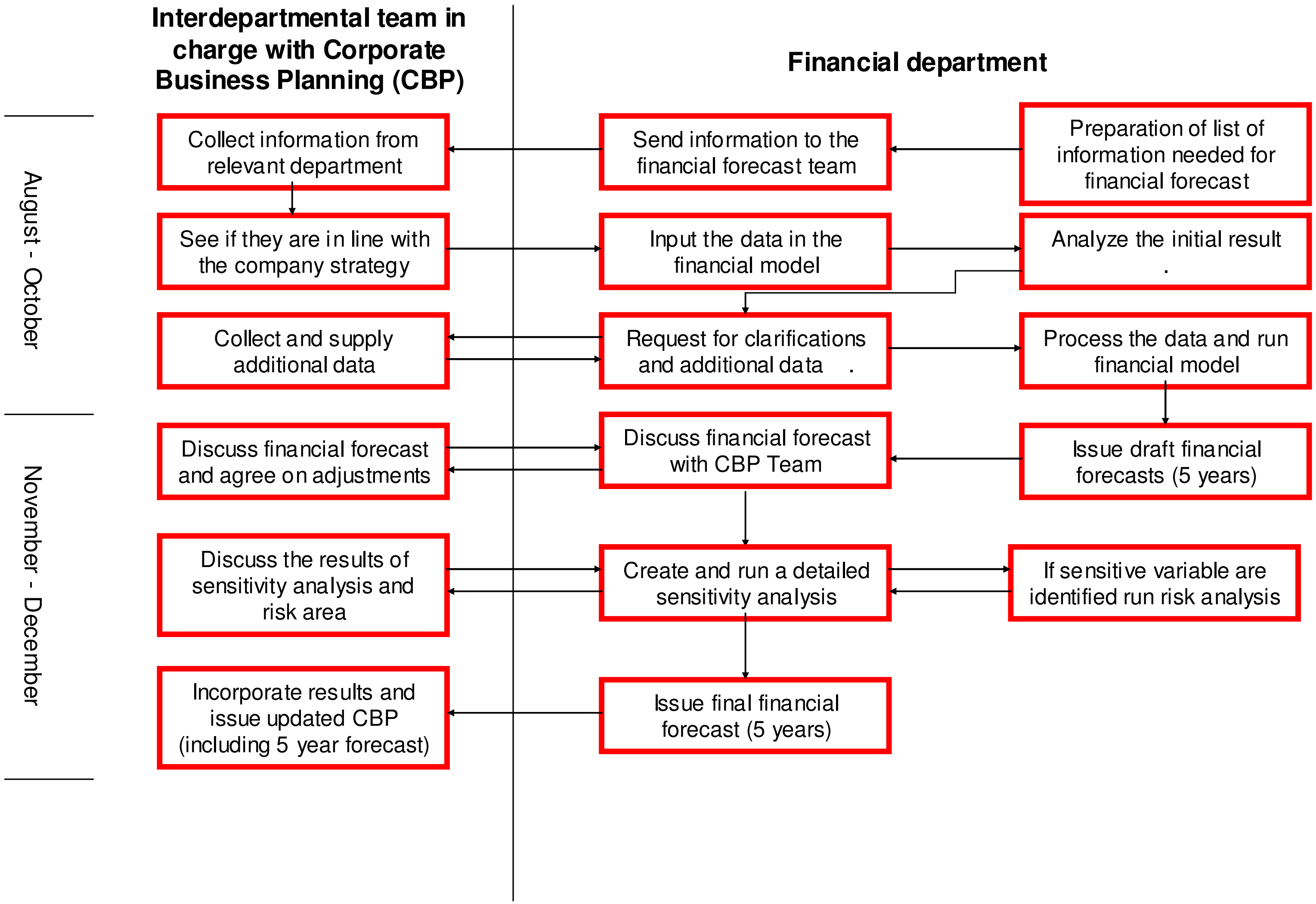
The process of preparing financial forecast on medium term is not very simple and requires some training. Due to this, it is recommendable that the first forecasting process to be performed with the assistance of a consultant in order to get used with the process and gain experience.

For the financial forecast process, if an integrated MIS module is not available, an Excel spreadsheet can be designed and used. This model can be prepared in-house by the company specialists of can be prepared by a consultant (a generic model) and then used by the company's specialists.

A financial forecasting process map presented in a schematic way is presented in figure 9-7.

Mott MacDonald
In association with MVV & CIMP

Figure 9.7: Financial forecasting process map



9.6 Financial Planning

9.6.1 Introduction

Planning is the process of organizing information for making decisions about the future.

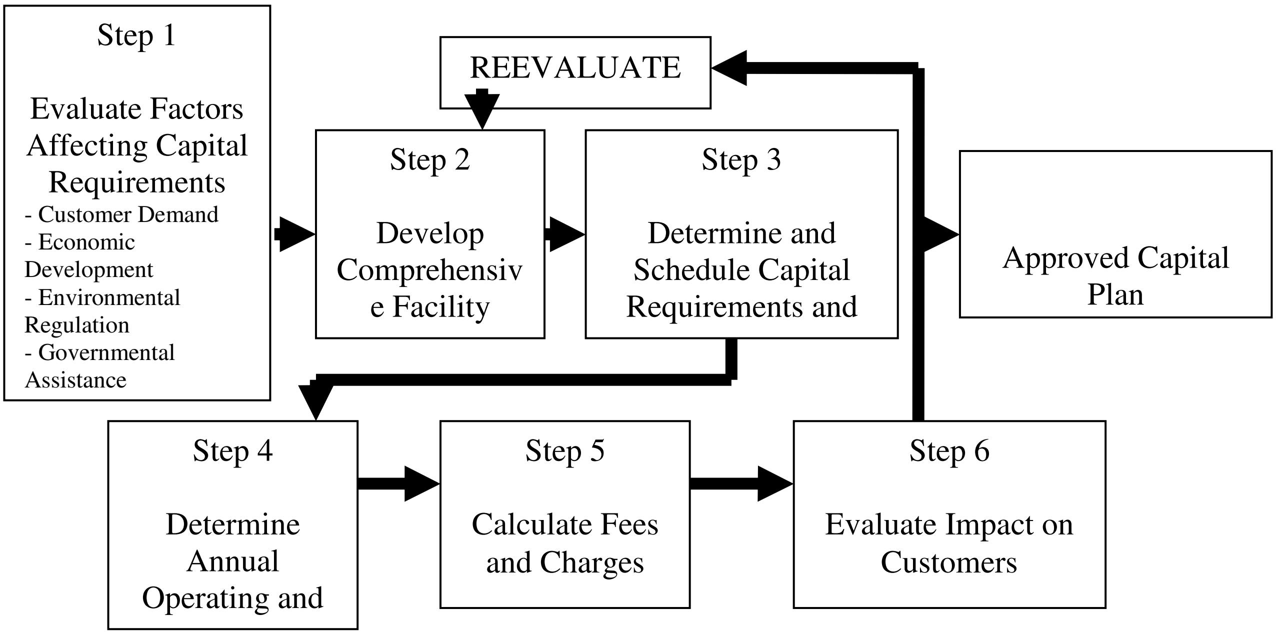
Planning is generally seen as a systematic process that raises the following questions:
- What are the goals and objectives of the planning process?
- What information and data are needed to develop the plan?
- What alternatives are there for reaching the goals and objectives?
- How can the alternatives be evaluated and implemented?
- How can implementation and progress be monitored and evaluated?
- Do the goals and objectives need to be changed?

This general process can be adapted and used to address virtually any substantive problem such as drainage, storm water management, flooding, water quality, wastewater planning or public finance.

Raftelis describes a six-step capital and financial planning process that is an adaptation of this general process:
1. Evaluate economic factors affecting capital and financial planning;
2. Develop a comprehensive facility master plan;
3. Determine and schedule capital requirements and evaluate alternative financing methods;
4. Determine annual operating and capital revenue requirements;
5. Calculate fees and charges;
6. Evaluate impact on customers.

The steps of establishing goals and objectives and collecting data are implicit in Raftelis' version of the planning process. His sixth step, evaluate impact on customers, is a specific version of the general steps of evaluating and monitoring alternatives and determining whether original goals and objectives are pragmatic.

Capital and Financial Planning Process (adapted from Raftelis, 1989)



The figure presents a more detailed version of Raftelis' capital and financial planning process.

Although the historical roots of this system are in water supply and wastewater planning, the steps are directly applicable for storm water management, regardless of whether the emphases of the plan are drainage, flood control, storm water management, water quality management or wastewater management. The point is to assess systematically how different alternatives achieve goals and objectives and to identify the best alternatives relative to a set of criteria. In other words, the challenge is to answer a set of simple questions in a rational, systematic way.

For example, the factors that affect capital requirements (Step 1) include:

- customer (i.e. public) demand,
- economic development,
- environmental regulations,
- deteriorating infrastructure,
- improved service quality
- utility and community philosophy.

Choices about goals, objectives, and alternatives require consideration of all these factors, many of which, when considered independently, point to different answers. Financial planning is, therefore, by definition a multi-faceted activity that requires tradeoffs among competing goals and objectives.

Financial planning processes are above all pragmatic exercises that involve "acceptable" solutions to real problems. It is often the case, in fact, that revenues required to meet capital "needs" simply are not available or would require charges, fees, or taxes that are politically unacceptable. As such, there typically are no single best solutions. There are instead solutions that work given the priorities and concerns of the people involved in and affected by the planning processes.

9.6.2 Financial Planning using the FOPIP2 Financial Model

Financial Planning as well as being an objective in itself is also an important part of business planning. In parallel with the physical parts of the Business Plan the Financial Plan complements the exercise and provides the financial proof of the practicality of the business plan. If the financial plan is practical then the action plan developed in the business plan can also work.

The sequence of events in Financial Planning to complement the Business Plan is:

- Prepare the Business Plan and decide on the Action Plan.
- Develop the costs associated with achieving the Action Plan,
- Factor those costs into the Financial Model
- Adjust the assumptions and parameters in the Financial Model until the results generated by the financial model meet both the financial and physical targets and objectives of the Operating Company.
- Using the level of assumptions and parameters required to meet the objectives and targets develop the basis of the Financial Plan in terms of what is needed to be done in order to achieve what is desired.
- If the financial plan is practical and achievable then it may be finalised.
- If the financial plan is not achievable or practical then one or more of the following may need to be adjusted until practicality and/or achievability are managed:
  - Modify the assumptions or parameters.
  - Adjust the timing or scope of the investment programme.
  - Review and plan for reductions in operating costs.
  - Plan for higher increases or changed structures in tariffs.

As part of the FOPIP 2 programme a financial model has been developed that whilst fulfilling other objectives such as tariff calculation is able to be used to assist in Financial Planning. The Model is attached as a CD to this document. Basic instructions for using the Model to help in producing a Financial Plan are given in Appendix F1.

The model developed under FOPIP 2 will assist in producing a plan for developing the financial plan for three years. The financial model that underlies the financial plan uses for base year data figures extracted from an Operating Company's standard financial statements, which are augmented by physical data from the company and standard statistical data from Romanian government agencies. There are also market and operational control data from the worksheet "Entry" in the model. Assumptions and parameters should reflect those prevailing in the business plan and found itemized in the worksheets "Projections", "Current", "Investment", "Concession Fee" and "Sensitivity" of the model. Each assumption or parameter will need to be reviewed, justified and substantiated.

Financial projections will then be generated by the model, based on data entered in the above mentioned worksheets and the results will be found in worksheet "Results".

Additionally Performance indicators that reflect the outcomes of the plan are calculated by the model, using the financial projections. These are found in the worksheet "Results".

9.6.2.1 Running the model

The base year should be altered to suit the particular needs of the time. Sometimes, when first running the financial model the base year data of an operator may be either unrepresentative or the assumptions and parameters adopted may not be completely in line with the longer term circumstances (for example the financial data may only be for one town whereas the ROC intends to operate in a number of towns the others of which either do not have data or have not been able to provide reliable data). The best available and most complete data should be used and this should be confirmed by reference to current company and environmental trends. Actual financial data (in so far as they are known) should be used as the base data in the tables, on the income statement and balance sheet. These do not, however, need to be from actual final audited accounts, a good pre-audited financial statement is quite adequate for the purposes of using the Financial Model. For the same year, when using real data, do not complete the tables' “Receipts and Payments", "Planned Cash Flow", and "Sources and Applications" those columns that remain white. Performance Indicators are calculated automatically, using actual data.

The financial plan will cover the period of the Business Plan and all the tables required will be produced by the model.

Appendix F2 contains a model/template for developing the financial plan. The model contains data that should be used as a guide on how to complete the data entry and how the results may turn out.

9.7 Cost control

9.7.1 Introduction

Management accounting focuses on the financial information needs of internal users. Cost accounting is the continuous and routine process of collecting, analyzing, classifying, recording and summarizing all the elements of cost incurred to provide a service, program, activity, product, project or unit of work regard-less of the funding source. A cost accounting system links financial and managerial accounting and encompasses concepts and techniques used in both.

There are five basic steps in setting up a cost accounting system:

1. Selecting cost/profit/investment centers: The first step is to select the service program or activity for which costs will be accumulated. A cost/profit/investment center is a specific organizational unit, program or activity under the control of a manager who has authority to incur and control costs/revenues/investments.

   Cost centers may also be profit centers which track revenues used to finance the service, program or activity. Cost/profit center managers are responsible for generating specific amounts of revenue. The transport revenue center would be expected to support a percentage of its operations through fees and charges.
2. Identifying cost components: The next step is to define and classify the costs to be reported. Direct costs are those that can be charged directly to the work performed and include labor, materials and equipment. Indirect or associated with more than one service or activity such as pensions, insurance, supervision, rent, utility charges, personnel, accounting, legal services.

   Costs are classified as direct or indirect depending on the extent to which they benefit a single or multiple cost centers. The distinction is complicated. For example, depreciation and fringe benefits may be direct or indirect costs depending on the circumstances.

   Costs may be fixed or variable or a combination of the two with both fixed and variable components. Fixed costs do not change whatever of the volume of work performed. Examples are rent and depreciation. Variable costs fluctuate in direct proportion to the total volume of work per-formed. Examples are labor and energy. If the costs are a mix of the two, the elements within the cost will have to be identified and the factors which drive their occurrence must be understood in order to plan for their affects.

Controllable costs are the costs subject to the control of the cost centre manager. Uncontrollable costs such as rent or support service costs are outside the manager's control. Full costs include all direct costs and a share of the indirect costs. Avoidable costs are those that would be eliminated or reduced if a decision is made to select one alternative over another such as contracting out. Marginal costs are involved in changing the level of service such as adding recycling to solid waste disposal or keeping the customer care centre open an extra hour each evening.

Life cycle costs are incurred over the useful life of a capital asset and include capital, maintenance and operating costs.

Managers must understand the different types of costs in order to select those, which are provide the most appropriate analysis in a particular situation and provide the best explanation of cost behaviour.

3. Allocating costs: The allocation of indirect/overhead costs to the cost centres requires careful analysis because these costs apply to more than one cost centre. Several methods are available to allocate department or government wide indirect cost including equations, step down method, direct method, consolidated method and internal service funds.

4. Activity Based Costing: This is the allocation of costs to activities which are then used in various ways, quantities and combinations in the creation of a product or service. A Guidance Document for Activity Based Costing developed under FOPIP2 is provided as Appendix F.3 and a set of spreadsheets providing a structure to carry out ABC is provided as Appendix F.4.

5. Establishing procedures to capture, accumulate and report costs: Well-defined written procedures are required to define the terminology and describe the methodology so that the users under-stand the system. Report formats and frequency should reflect user needs. User involvement in the design of the system is critical to its success.

9.7.2 Elements of an effective cost accounting system

Following is a checklist of the characteristics of an effective system to help you evaluate a cost accounting system:

- Provides timely, accurate, complete, relevant and useful cost information;
- Simple to administer arid easy to understand;
- Cost of the system doesn't exceed the benefits;
- Provides unit cost data and identify full costs;
- Provides written procedures;
- Facilitates comparison with forecasted and standard costs and other jurisdictions;
- Identifies inefficiencies and problem areas;
- Interfaces with other financial and management information systems;
- Conducive for use in cost estimating;
- Reflects high user involvement and satisfaction.

9.7.3 Importance of cost analysis

Careful analysis of cost information is crucial to determining the extent to which it is accurate, complete, timely and relevant. Intensive analysis ensures that the magnitude, nature and causes of high, low or unreasonably fast rising costs are understood. Analysis facilitates the identification of controllable and uncontrollable costs. Cost trends can be charted and areas warranting attention recognized.

Stringent analysis enables the manager to calculate variances from historical, planned or standard costs and to assess their underlying causes, near term significance and probable long term implications. Standard costing may reveal certain types of inefficiencies related to the purchase and use of resources. Through analysis the manager focuses attention on all aspects of service performance including outcome, quality, cost and customer satisfaction. A determination can be made if the service level is higher or lower than expected and if the anticipated results have been obtained for the costs incurred.

Analysis enables managers to identify and evaluate the full range of options for controlling, reducing or avoiding costs. Cost analysis provides the opportunity to examine alternative service delivery options and levels of service. A detailed analysis of costs ensures that future costs are considered and provides a mechanism for estimating or modeling future costs.

Comprehensive analysis provides for matching costs and revenues and examining imbalances. It encourages managers to explore ways of generating more revenue to offset costs including setting fees to recover full costs. Finally, overhead analysis can produce considerable savings in areas typically ignored. Savings of over forty percent are not unusual.

In summary cost analysis enables managers to:
- measure service results;
- increase accountability;
- uncover inefficiencies;
- fine tune services;
- increase productivity contain costs;
- justify budget requests;
- prepare performance reports.

Many techniques are available for analyzing costs including variance analysis, cost benefit analysis, program analysis, and cost/revenue analysis. You should become familiar with the various techniques and their advantages and disadvantages. Following are questions to assist you in your analysis:
1. Is the cost data accurate, complete, timely and relevant to the purpose for which it was collected?
2. Is the cost data received in time to diagnose problems and initiate corrective action?
3. Have the reasons for cost changes been identified including inflation, labor contracts, salary and benefit increases, overhead, mandates, changes in service levels, unnecessary work, inefficient procedures, improper work schedules, etc.?
4. Have comparisons been made with historical, planned or standard costs and variances identified and explained?
5. Have improvement plans been prepared to correct variances?
6. Has the cost data been integrated with other performance data including output, outcome, quality and customer satisfaction measures?
7. Have unit costs been calculated?
8. Have alternative cost control methods been considered including service reduction or elimination, contracting out, productivity improvements, application of technology, etc.?

9. Is the cost data useful in measuring future costs?
10. Have the factors influencing future costs been considered including the scope and quality of service, levels of service, methods, organizational structure and type and quality of labor, materials and equipment?
11. How could the cost data be improved?
12. How satisfied are you with the usefulness of the cost information?

9.7.4 Practical examples

Most of the water operators from Romania will face important restructuring process in the following years mainly as result of the regionalisation process and extension of area of operation. All this elements will have an impact on the cost control process.

9.7.4.1 Cost/profit/investment centres

A first element that has to be taken into consideration is the design of a new cost structure system considering the restructuring or extension of the area of operation. This split has to take into consideration the following criteria:

- Technical elements: individual vs. regional water and wastewater systems;
- Geographic elements: distances between localities, geographical barriers (mountains), etc.
- Efficiency elements: solution to assure a better management of costs.

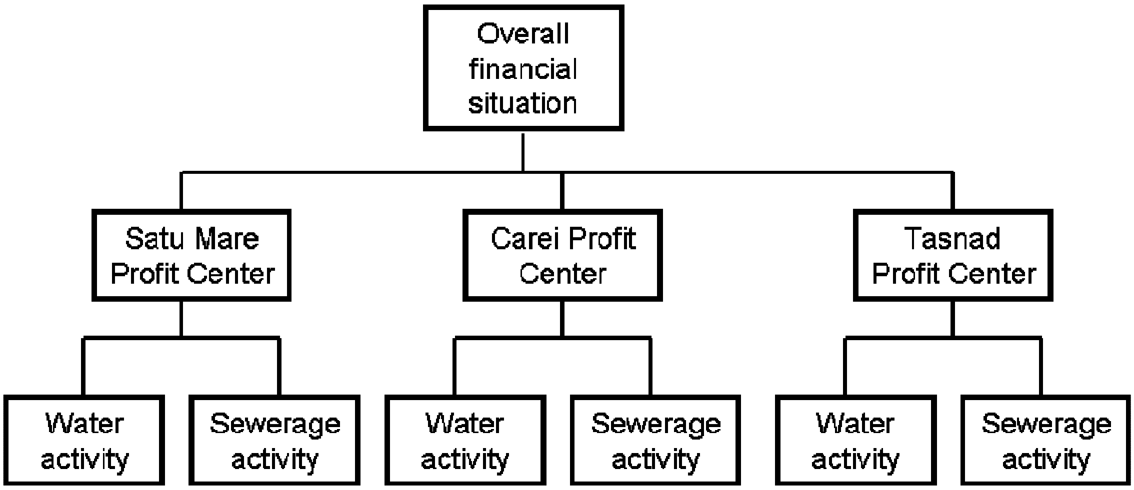
One example of split of the redesign of the cost control activity is the case of the operator from Satu Mare. The Company has implemented a cost accounting system on profit centres (investment centre) as result of regionalisation. The company keeps records separately on the each of the 3 urban areas (Satu Mare, Carei and Tasnad). The Company also prepares separate budgets for each of the profit centres and monitors the performances for each area.

Schematically, the profit centre system is presented in the Figure 9-8:

The results for the rural areas are included in the figures from the generic profit centre from relevant urban area (agglomeration).

There is no generic solution than can be applied for every operator. The system of cost centres has to be designed considering the technical particularities of each system, the geographic conditions, the tariff strategy and the efficiency strategies of the company. Each company should start from the general principles stated in this chapter and consider the local particularities in designing the cost centre structure.

Figure 9.8: Profit center system in Satu Mare



9.7.4.2 Monitoring of cost efficiency

After the cost structure system is designed there is a need for a good monitoring system. In order to have an efficient cost system, the following 2 elements have to be defined:
- The targets for costs;
- The monitoring system.

The targets for cost can be set in different ways:
- Individual costs elements like energy cost evolution, personnel costs evolution, individual energy consumption, average salary level, etc.
- Global cost elements: meaning that there is set targets for the level of total costs.

In designing the monitoring system the following elements has to be considered:
- If there will be an integrated monitoring system or if the monitoring will be done manually.
- Periodicity of monitoring: monthly, quarterly, annually, etc.
- Who will perform the monitoring?
- What will be the procedures in case of non-compliance with the targets?

In the water sector from Romania, the first real cost control monitoring exercised was implemented for the MUDP II operators which had some covenants in the loan agreement with EBRD (European Bank for Reconstruction and Development) regarding the decrease of total costs in real terms as result of investment implementation.

An example of this reporting system is presented in the following table:

Table 9.5: Cost control monitoring – MUDP II Operators

Date:	**31 December 2006**
Total comparative target costs=	180,580
Total actual comparative costs=	148,376

Date:	31 December 2006
Difference (million ROL)=	(32,204)
Compliance ? (YES/ NO)	YES

Even if this cost control monitoring system was very simple one, the result were important leading to improve in efficiency in most of the monitored operators.

Again, there is no generic solution than can be applied for every operator. The system of monitoring has to be designed considering the technical particularities of each system and the efficiency strategies of the company. Each company should start from the general principles stated in this chapter and consider the local particularities in designing the monitoring system.

9.7.4.3 Examples of ratios for monitoring the efficiency of costs

In the following year, most of the regional operators from Romania will have under implementation large scale investments projects (mainly cohesion funds applications) which will have a significant impact on the efficiency and on the operating costs evolution. Considering this, the monitoring of operating costs becomes very important not only to show the increase in efficiency of the operators but also for showing the efficiency of spending the public money (EU grants, state budget subsidies, local budget subsidies).

In this chapter there are presented only a few indicators than could be the base of a more complex monitoring cost monitoring system.

In order to assess the impact of investment costs on the level of operating costs, a set of indicators can be considered for the water and wastewater activities for each agglomeration included in the cohesion funds application and cumulated for the entire area of operation.

For example, for this ratio a set of targets can be set for some critical years like:

- 2008: the base year of the starting year;
- 2013: finalization of part of the investments from the cohesion funds application and, in some cases, conformation with the EU Water Directive;
- 2015: finalization of most of the investments from the cohesion funds application and, conformation with the EU Water Directive and EU Wastewater Directive (partial);
- 2018: conformation with the EU Water Directive and EU Wastewater Directive;

Some possible ratios are presented below:

1. Unitary energy consumption (kWh/m3)

Water activity

	2008	2013	2015	2018
kWh/m3 of produced water				
kWh/m3 of invoiced water				

Wastewater activity

	2008	2013	2015	2018
kWh/m3 of treated wastewater				

	2008	2013	2015	2018
kWh/m3 of invoiced wastewater				

2. Personnel efficiency (number of connected inhabitants per employee)

Total personnel (water +wastewater + other personnel) [12]

	2008	2013	2015	2018
Number of inhabitants connected to water system (A)				
Total number of employees of the ROC (water+ wastewater+ indirect) (B)				
A/B				

Water activity

	2008	2013	2015	2018
Number of inhabitants connected to water system (A)				
Number of employees related to water activity (B)				
A/B				

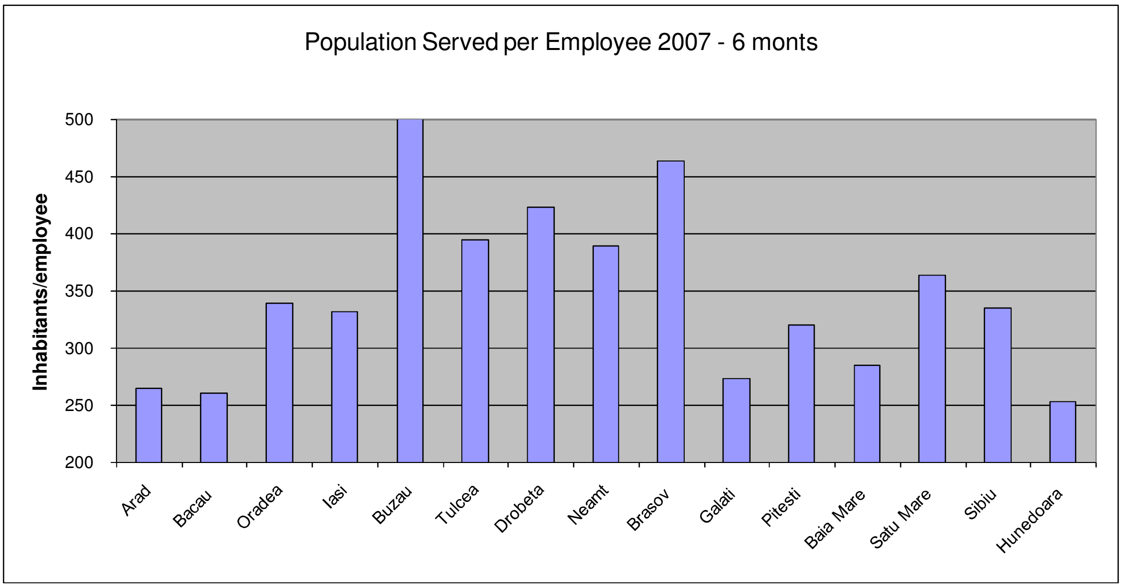
Wastewater activity

	2008	2013	2015	2018
Number of inhabitants connected to wastewater system (A)				
Number of employees related to wastewater activity (B)				
A/B				

As an example, in the following chart it is presented the situation of the number of customers per employee calculated for a number of operators as part of the FOPIP I benchmarking exercise:

[12] This ratio is included in the benchmarking system prepared by FOPIP I allowing comparison in the sector.

Figure 9.9: Number of inhabitants per employees



Source: FOPIP I benchmarking exercise

The fact that this ratio is included in the benchmarking system designed by FOPIP I allow the water companies not only to compare the evolution of their performances but also to compare their performances with the average and the best of the sector.

9.8 Cash management

9.8.1 Introduction

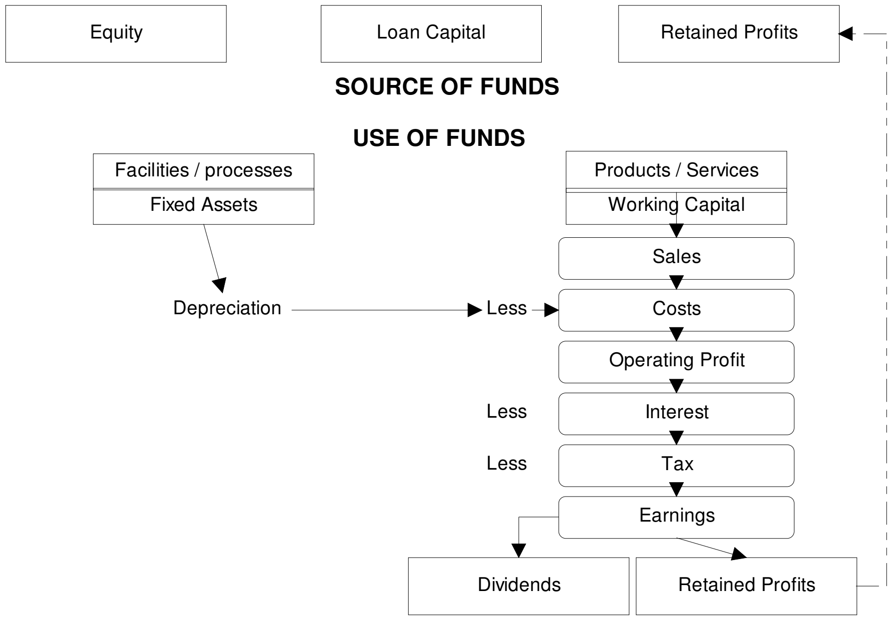
This section is therefore designed to provide both, an introduction to modern cash management principals and guidance as to how those principals should be developed for use within water utilities.

A basic objective of most business enterprises is to survive in a competitive market. The ability to do so can be measured in terms of profit growth and return on capital. Individual companies have their own particular targets concerning the type of goods or services produced, the degree of diversification of products and the market sector in which to operate; but all are directed toward the same goal, namely the continuation and improvement of the business. Attaining these objectives depends on the effective co-ordination of the main elements of a business's operations, namely, people, capital, facilities and information. These are the resources of the enterprise. An important part of this co-ordination effort is cash management.

Cash management can, therefore, be defined as the efficient collection, disbursement and temporary investment of cash surpluses.

Any enterprise will cease to exist if it is incapable of generating funds from within. This can be demonstrated in the following model (Figure 9-10):

Figure 9.10: The business financial model



It can be seen that an integral part of the source of funds is the retained profits, i.e. internally generated funds. Whilst enterprises may exist for a period by making use of their reserves there comes a point when those reserves have to be replenished. Therefore any enterprise must generate sufficient funds from its normal day-to-day trading operations to both maintain and in fact improve the existing level of business.

Obviously, therefore, as the model implies the actual making of profits is of paramount importance in achieving this internal source of funds. However, cash must not be confused with profit, since having cash at the bank and making a profit is not the same thing. Profit does not automatically generate cash flow of an equal amount during the period. Profit is measured by using accounting conventions, some of which have no bearing on cash flow. For example, depreciation, a non-cash item for the business, is charged against profit. Equally cash includes items that are not reflected in profit, e.g. capital expenditures.

Profitable businesses can experience cash flow problems, whilst none profitable businesses may, albeit temporarily, have surplus funds in hand. History shows that many highly profitable businesses have gone into liquidation as a result of running out of cash. In fact organizations that are going through a period of success, and as a result are expanding, can find themselves in a dangerous situation where their out-goings exceed their incomes to such an extent that they face a cash crisis and as a result find themselves vulnerable to liquidation.

Therefore, in assessing the health of an enterprise both profit and cash flow are equally important and it is only when both are properly managed that the business can continue to be successful.

In any business profitability comes from two key elements, namely:

- Ensuring that the business is earning the correct gross profit on the sale of its product and

- Controlling the level of overhead expenses.

Most modern successful businesses recognize the need to control these aspects of the business. This is demonstrated in the modern financial management techniques used to manage the resources of the business. Very few people fail to recognize the fact that to maximize the benefit to be gained from the business resources they need to be managed effectively.

For a business to be successful in achieving its objectives it is essential for that organization to have available adequate resources. All too frequently cash is seen as a by-product of the organizations business, a necessity but not a resource. However, cash is a resource just like manpower, equipment etc. and as such it also needs to be managed. Good cash flow is achieved by managing cash resources effectively.

As previously stated one of the main reasons for business failure is the shortage of cash. Therefore it can be truly said that cash is the lifeblood of any business. As part of the cash management process, therefore, it is essential that the cash need of the organization is assessed. This identification of cash flows will:

- Identify times when cash will be in short supply and appropriate plans can be made to cover this period.
- Ensure that sufficient funds are available for capital projects.

Allow decisions to be made based on the best available data leading to greater efficiency and increased profit.

It has been previously stated that profit and cash are not the same thing but there has to be a link. In fact the ability to link profit to cash is important not just to the business itself but also to potential investors. Common sense dictates that there must be a way of linking the two if only to prove that the stated profit is not illusory or merely a profit on paper. The importance of this point is reinforced when one considers that the accounting standards, issued by the International Accounting Standards Committee, require such cash flow statements to be produced as part of the financial reporting requirements. When analyzed it can be determined that the reasons for the difference are all related to accounting conventions and fall into two categories, namely:

- Inclusion of none cash items in the profit calculation, e.g. Depreciation.
- Timing differences of the recording of transaction, e.g. the use of accrual accounting.

It is possible by identifying these differences to arrive at a reconciliation of profit to cash. This is demonstrated in the figure below.

Figure 9.11: Profit to cash reconciliation

Operating profit

↓

Add back:
Depreciation

↓

Inc/Dec in Stock
Inc/Dec in Debtors
Inc/Dec in Creditors

↓

Interes Paid/Received

↓

Tax paid

↓

Capital expenditures

↓

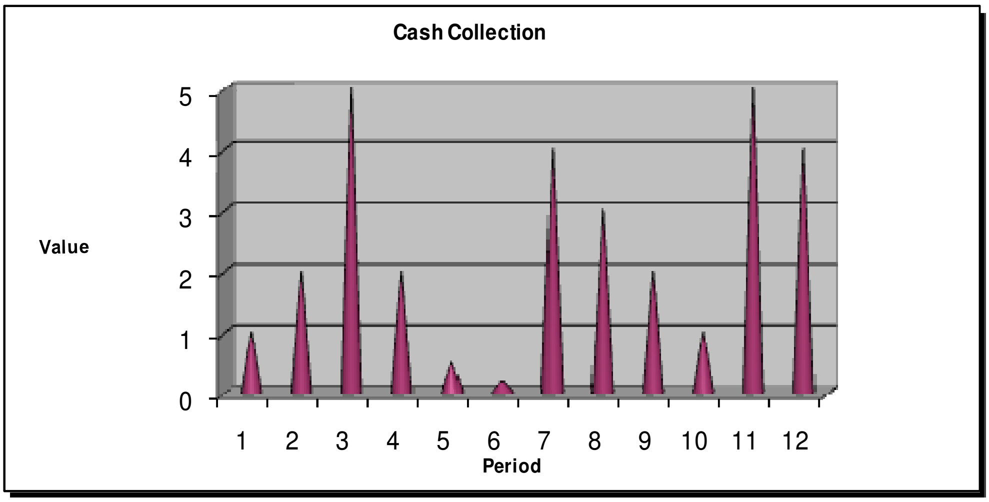
Inc/Dec in Share capital
Inc/Dec in Loan capital

↓

Net cash flow

In reality the relative weight that will be put on each of these motives will be very much dependent on the situation in which the organization finds itself. If an organization is struggling to maintain its cash position then it is likely to concentrate on the transaction motives. Whereas a cash rich organization will be looking to maximize its return and, therefore, adopt a more speculative motive. The point being that even within the same organization its motives may vary over a period of time. These changing circumstances can be demonstrated by the hypothetical example given the following figures showing the cash collection pattern over twelve periods.

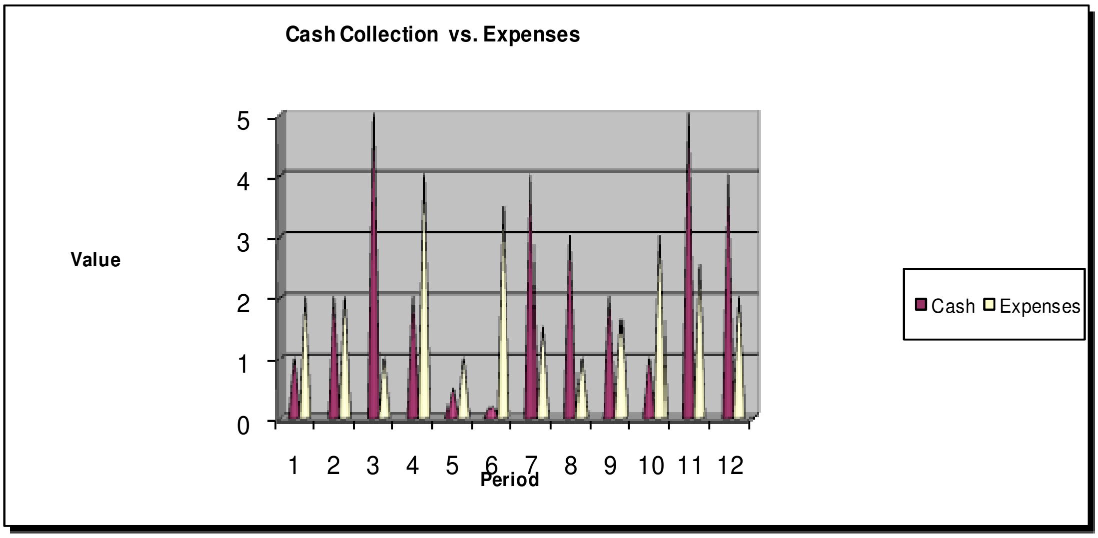
Figure 9.12: Cash collection pattern



In ideal world cash collections would be consistent throughout the period but in the real world most organizations find that this is not the case. For a variety of reasons, e.g. seasonality, holiday etc, the cash collections can fluctuate wildly. The hypothetical model attempts to demonstrate this fact. It can be clearly seen that cash collected is not consistent over the periods with particular problems being encountered in period six.

An important point to be made about cash is that very few organizations are in a position to exercise control over cash receipts. This is in contrast to expenditures when at least the organization can, within limits, decide when to make payment.

Figure 9.13: Cash collection vs. expenditures



If we then take the hypothetical model a stage further and add an expenditure profile to it then we can see that the position becomes even more complicated. This is demonstrated in Figure 9-13.

We can now see that the period problem is becoming an even greater problem. It is these inconsistencies in both income collection and expenditures that makes cash management so important. Only by actively forecasting and monitoring the cash situation can the period six problem be anticipated and planned for.

9.8.2 Operational cash management

Whatever the size of the organization, these need to be a designated area responsible for the control and monitoring of cash flows. In smaller organizations this responsibility may be vested in a single, senior, person. In the medium to large organizations there is usually a specialist section that is responsible, namely the Treasury Function. In medium size organizations where the expense of employing the necessary skilled personnel it is not uncommon to sub contract the task to one of the financial institutions. Whichever method of control is chosen the basic functions remains essentially the same, namely:

- Ensuring that the organization receives the best return on.
- Providing enough cash to pay debts.
- Control and monitoring of bank accounts
- Cash flow forecasting and monitoring
- Control and monitoring of borrowing

These tasks will be achieved by:

- Optimization of the cash collection systems.
- Negotiations with the financial institutions.
- Monitoring investment potential and needs.
- Optimization of the use of working capital and monitoring the systems necessary to achieve this.
- Advising on and arranging temporary and long term finance.

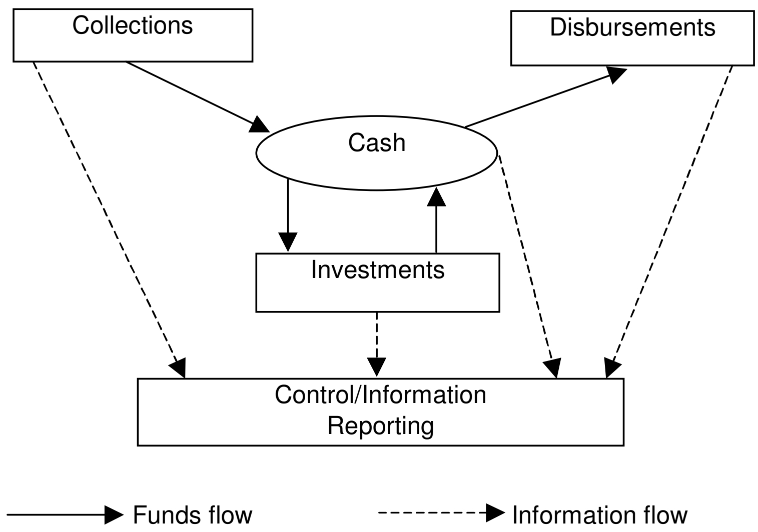
9.8.3 Cash management system

All cash management systems can be divided into two main areas, namely:

- Operation of the cash related systems and procedures.
- Monitoring and control of cash.

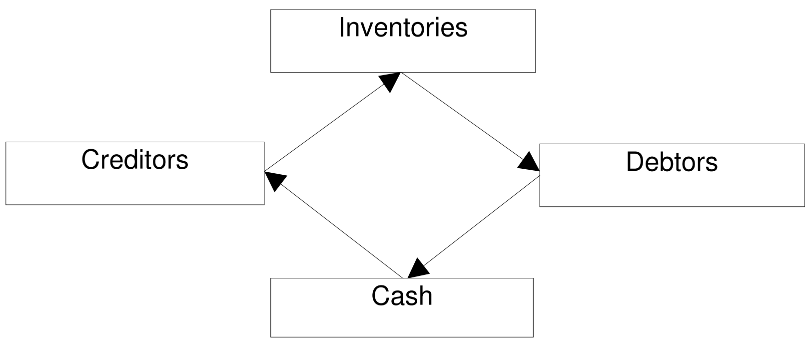
This is demonstrated diagrammatically in the following figure:

Figure 9.14: Cash management system



The model demonstrates both the flows of physical cash and information necessary to control and monitor it. Whilst, as previously stated, the Treasury Function has overall responsibility for the cash management system in reality all managers have a responsibility to ensure that they exercise control when incurring liabilities on behalf of the organization. To achieve control managers have to be made aware of how cash moves around the business. Therefore, to control the amount of cash needed to continue operations it is necessary to make sure that the cash flow is as fast as possible. To achieve this they need to identify the pressure points, there are three of these and they are demonstrated in Figure 9-15 below:

Figure 9.15: Cash flow pressure points



Each of these pressure points needs constant scrutiny to ensure that their potential is being maximized:

- Creditors: raw materials, utilities and supplies are needed to conduct business. To maximize the benefit to be gained here purchasing procedures and suppliers terms of business need to be examined.
- Inventories: maintenance of stocks of raw materials, work in progress and finished can be costly. Stocking levels need to be closely monitored. This is not important in water business.

- Debtors: To control debtors it is necessary to have in place the systems, procedures and policies to ensure speed in both billing and collection.

The monitoring and overall control of cash will be in the hands of the Treasurer or other designated senior officer.

9.8.4 Cash management techniques

The general idea behind cash management is that the organization will benefit by adopting systems and practices that result in "speeding up" cash receipts and "slowing down" cash payments. For achieving this, the following procedures are recommended:

- Accelerate collections: A number of methods are employed to speed up the collection process, namely:
  - Speed up the preparation and delivery of the invoice.
  - Streamline their debt recovery procedures.
  - Reduce the amount of time that a payment is received and the time that it is available for use within the organization.
  - Centralizing the billing and collection function.
  - Earlier billing of customers. Designing bill preparation schedules in a flexible manner.
  - In the case of distributed collection points requiring sub bank accounts all sub accounts are cleared down to zero every evening with the balances being transferred to the central account.
  - Providing local facilities for customers to pay, this involves the use of local banks, post offices etc.
- Slowing down cash pay-outs: There is principally one major way of slowing down the payment process, namely:
  - Deliberately hold back a payment: This method relies on knowing at any given point in time what is due for payment.

9.8.5 Cash flow forecasting

It is frequently said that cash is the lifeblood of an organization. By definition therefore the flow of cash through the organization is central to its well-being. However we cannot rely on the fact that cash is available we must attempt to forecast its movement to ensure its availability at the right place and in the right time. It is important to note that the cash forecast does not relate solely to the operational element of the business, i.e. the profit and loss account, but refers to all sources of cash and expenditures, e.g. sales, borrowing, capital payments, cash increases in equity, payment of dividends etc.

Cash flow must be forecast for the short, medium and long term. This is necessary for:

- The short term: to ensure the day-to-day cash requirements of the organization are being satisfied. This is usually done for anything between a week and three months.
- The medium term: this to identify potential future cash requirements. It is usually associated with the budget, revenue and capital, cycles. This forecast refines the long-term forecast and identifies such items as the need to borrow in sufficient time to take action.
- The longer term: this is to identify the cash requirements of the organization for a much as five years ahead and is closely associated with the Business Planning Cycle. An important point to this forecast is that it identifies the potential source of funds necessary for the effective implementation of the business plan.

The cash flow forecasts are prepared and controlled by the Treasurer. The daily cash performance is monitored against the forecast and any remedial action taken. The medium and long-term forecasts are used to determine and implement the organizations funding strategies.

It is important to note that the forecast also allows for the actual cash position to be included facilitating the monitoring process. The important point being that the forecast is an important document in that it is a working document whose assumptions must be verified and updated to take account of changed circumstance. Monitoring and update of the cash forecast is a daily job.

In FOPIP 2 project, a concept paper on Active Cash Management (ACM) in Conditions of Financial Uncertainty was developed (Appendix F5). ACM is tool that is used to ensure that the cash balances are maintained at the optimum level as defined in the organisations financial policies, and managed effectively so as to be both available when they are needed and planned for, and that until that need occurs they are utilised in generating additional income for the organisation. ACM has been developed to maximise the utilisation of cash within an organisation, thus providing protection against the financial hurdles of the external environment of the company. The system involves five major stages:

- Separation of receipts and payments at the lower levels of the organisation.
- Consolidation of all receipts balances at a high level within the organisation in order that the total balance available within the organisation may be most effectively used in the timely payment of cash commitments of the organisation wherever they may occur. This should be into a centrally managed Single Cash Management Account (SCMA).
- Centralisation of payments in order that full payment management can be exercised and full advantage taken of payment terms offered by suppliers.
- Utilisation (short term investment) of all remaining cash balances in order that they are productive in the time while they exist within the organisation.
- Elimination as far as is practical of all non-productive cash balances within the organisation and of all bank accounts that cannot be ‘managed centrally’ by the organisations Treasurers.

Water companies can benefit from ACM even if they do not at present have strong cash flows. The techniques used in ACM can assist those companies to strengthen their cash resources.

9.9 Models for calculation of water tariffs

This section contains a list of general principles which should be considered while planning the tariff strategy within the framework of the regionalisation program. The procedure is structured in the following chapters:

- Elements that impact the tariff strategy;
- Tariff strategy options;
- The consented solution for the cohesion funds;
- General recommendations;
- Structure of financial model for tariff analysis.

9.9.1 Legal basis and current methodology for water pricing in Romania

There is a new methodology for setting, adjusting and changing the tariffs for water and wastewater services since February 2007, published in the Official Gazette in March 20, 2007.

The methodology issued by ANRSC, dated 28 February 2007, defines the procedures and standards, through which the Regulatory Authority will establish, approve, modify or reject fees and tariffs, length of service and conditions for all water sales and other services performed by every licensee.

The main elements of the methodology are the following:

1. The tariffs should assure the economic viability of the operators, should meet the interest of the customers including the issues related to affordability and should create the premises for environment protection and conservation of water resources.
2. The tariffs set should consider the following elements:
   a. Production and operating expenses;
   b. -Maintenance expenses;
   c. Depreciation;
   d. Costs for environmental protection;
   e. Financial costs;
   f. Costs related to concession contract;
   g. Development costs (financial resources for development and investments);
   h. Profit share.
3. In case of international financed programmes, for which the Government has set special tariff calculations or formulas other than the ones provided by the methodology of ANRSC, the level and evolution of tariffs will be based on that special methodology;
4. The regional operators, part of an investment programme financed from external sources, will unify the tariffs for the entire area of operation according to the concession contract and/or the provisions of the international financing documents.

In cases of delegation contracts, if the local authorities have agreed with the operator rules or formulas for adjusting and modifying the tariffs, ANRSC will apply these rules or formulas if they are approved according to the legal provisions.

9.9.2 Elements that impact the tariff strategy

The elements that could have an impact and should be considered while planning a medium term tariff strategy are the following:

1) Cost elements for each operating centre. A recalculation of the costs for each operating area must be done, which will be undertaken considering the real costs (generally not all costs are pointed out clearly in small towns), as well as the regionalisation impact (economies of scale).

2) Local perceptions. There are two levels:

- At the regional operator' management team, where the covering of total costs in all operating areas and the possibility of investments is desired;
- At the local authority level, where a lower increase of the tariffs is wanted and there is the impression that with the operator's arrival their problems and responsibilities will just "disappear".

3) The impact of the future projects which would be financed from cohesion funds. Each regional operator is in the preparation process of a cohesion fund application. The financial and economical analysis realized during these projects will lead to the redesign of the tariff strategy. The main elements which should be taken in consideration are:

- The solidarity principle: is a principle deliberately provisioned by the European Commission and is translated into designing an unified tariff strategy;
- Affordability constrains: planning the tariff strategy by considering certain affordability constrains.

9.9.3 Tariff strategy options

In general there are two possible tariff options for the regional operators:
- Maintaining differentiating tariffs;
- Planning an unifying tariff strategy in a certain period

Pro and Cons arguments for each strategy are presented below:

Differentiated tariffs for each region:
- Pro:
  - Are easier to accept by the local authorities;
  - Reflect better each region's costs;
  - It's easier to analyze each regions' efficiency
- Cons:
  - Possible problems while administrating a large number of tariffs;
  - Cost allocation problems.

A unified tariff for the entire region:
- Pro:
  - Easier administration by ROC;
  - Easier administration of the situations in which an asset serves more regions (cost allocation).
- Cons:
  - Local authorities might not accept it:
  - The crossed subsidization of costs between regions (a resistance is still recorded in accepting the solidarity principle);
- Investments financing problems.
  - It might lead to lack of efficiency.

Each of the two options has to be completely analyzed before a final decision is made.

It must be taken in consideration that applying the solidarity principle is a precondition in order to ensure the financing for cohesion funds by the Ministry of Environment and Sustainable Development and by the European Commission.

The solidarity principle, at least theoretically, can be interpreted in two ways:
- Differential tariffs, but the same level of affordability:
  - The cases in which the invoiced quantities vary substantially;
  - The level of measurement is very low;
  - Significant differences between tariffs;
  - When the metering increases, the unitary consumption will uniform and, naturally, will tend to an unique tariff.
- Unique tariffs:
  - Remains to be established only the unifying period.

A tariff strategy can be considered to combine the two following options:
- Maintaining a differentiating strategy for a number of years;
- After a number of years prepare a unification schedule for tariffs;

However, a unified tariff strategy does not necessarily means that a single tariff level will be applied to all categories of customers. This is particularly relevant when, by using the affordability limits described in the following section, the resulting tariff levels do not allow the financial sustainability of the Regional Operator, thereby requiring a potentially differentiated approach or an increasing block tariffs system based on various level of consumption.

Such differentiation among customers or level of consumption is still compatible with a unified tariff system, meaning that the same tariff approach would be applied uniformly in the regional operator's service area.

The FOPIP 2 Consultant had developed for the use of the ROCs, guidance notes for tariff setting (Appendix F6). The document is dealing with aspects such as the basis of tariff calculation, the concession fee, the cost of water losses, the MRD fund, charging for stormwater collection and treatment, the frequency of tariff adjustments, types of tariff & their effect on the management of the business, approval mechanisms etc.

9.9.4 Agreed solution for the cohesion funds applications

In the first cohesion funds applications that were discussed and agreed with the European Commission the following tariff strategy was proposed and accepted by DG Regio.

The starting point was based on the principle similar services = similar tariffs and a proposal was made to unify the tariffs in the year when the finalization of the investments from cohesion funds will take place. According to the implementation schedule this will be reached in 2011-2012.

For these operators, the unification schedule has been clearly mentioned in the delegation contract for each operation area (city).

Also, while calculating the tariffs and the unifying schedule, the impact of the new assets resulted from investment implementation were taken into consideration considering the additional operating costs and incomes (connection level, increase in revenues, increase/decrease of operating costs, etc)

The affordability policy for water and wastewater projects with cohesion fund support is according to the policy of the Ministry of Environment and Sustainable Development the following:

- The affordability limit for the poorest 10% of households is set at 4% based on an assumed per capita consumption of 75 litres per day;
  - This corresponds to approximately 2-2.5% of the net income of an average income household assuming an average per capita consumption of 110 litres per day.
- Considering this policy, the affordability analysis should be performed at 2 levels:
  - Affordability analysis for low income households.
  - Affordability analysis for average income households.

The affordability ratio seems small, but in the last two years the average household incomes have increased significantly.

The working policy of the Ministry of Environment and Sustainable Development on affordability allows for tariffs to be set above the mentioned affordability levels, if this is necessary to ensure the financial sustainability of the ROC. In such case, measures needs to be developed together with the Intercommunity Development Association (IDA) to ensure that the poorest households' water services needs are met without creating an unbearable strain on their finances.

In order to estimate the average household income we should use the book “Revenues and Expenditures of Household” issued on quarterly basis by the National Institute for Statistics.

In the evaluation and approval process for the cohesion funds application and in the negotiation process of the co-finance loan contract, some elements might lead to a need for redesign the tariff strategy. That is why in the delegation contract, under the table with the tariff increases for the following years, a note should be inserted specifying that the unification strategy can suffer modifications due to the impact of the two above mentioned elements.

9.9.5 General recommendations

In the determination of the medium term tariff strategy the following elements should be taken in consideration:

- The unification of the tariffs should be taken in consideration as a target of the tariff strategy. This is one of the recommendations formulated in the EC’s appraisal mission of the cohesion funds applications, the solidarity principle being applied in this way.
- The term for tariff unification achievement can be established considering one of the following options:
  - Tariff unification in the next 1-2 years (short term) – recommended when there are no significant differences between the existing tariffs in different operating areas and the service level/standard are similar.
  - Tariff unification in 3-5 years (long term) – recommended when there are relatively significant difference between the existing tariffs in different operating areas and there are differences in service level/standard. The unification period can have as target the year of the cohesion funds investment project completion.
- Once the unification tariff term is established, a calendar of the unification for each tariff that exists has to be done and included as an annex to the delegation contract.
- Before taking over the operation at a regional level or in the first operating months (1-3 months), it is recommended to perform tariff adjustment in order to ensure that at least the operating costs and a margin for maintenance and repairs.
- In the evaluation and approval process for the cohesion funds application and in the negotiation process of the co-finance loan contract, some elements might lead to a need for redesign the tariff strategy. That is why in the delegation contract, under the table with the tariff increases for the following years, a note should be inserted specifying that the unification strategy can suffer modifications due to the impact of the two above mentioned elements.

9.9.6 Structure of financial model for tariff analysis

For designing and preparing a medium term tariff strategy, a financial model in Excel spreadsheet can be prepared and used. The financial model should have a separate sheet for each operating areas that currently has different tariffs. In each of the sheets, the following elements have to be analyzed and forecasted:

- Breakdown of operating costs considering the main cost elements (material, electricity, personnel, maintenance, concession fee, depreciation, etc.
- A separate breakdown of the main costs categories:
  - Electricity considering the quantities and the average prices;
  - Personnel considering the number of personnel, average gross salary and related taxes;
- Evolution of quantities split per domestic and non-domestic customers;
- The affordability ratio for domestic customers;

All of the above mentioned items should be calculated both for water and wastewater activities.

In each sheet, based on the forecast of quantities and operating costs, average tariff in order to cover the operating costs should be calculated. Also the levels for concession fee, profit share and development costs have to be set and used in the forecast. In a separate sheet the total costs for water and wastewater services has to be cumulated in order to calculate the average tariffs for the entire area of operation. These average tariffs could be the starting points in establishing the target levels for the unified tariff.

In Appendix F1 extracts for a financial model for calculating the tariff strategy for a regional operator are presented.

9.9.7 Example of calculation of the average household revenues

In order to identify the possible levels for future tariff increases maintaining high collection levels, an affordability analysis needs to be performed. An important component of the affordability analysis is the levels of household revenues.

This chapter presents the level of average household revenues at national level and a methodology of estimating the household revenues at county level.

The National Institute for Statistics does not provide figures for the average household income and household expenditures on county, respectively local level. The average household income at county level is calculated from the national average household income by applying a correction factor which is calculated from the ratio between the average national salary and the average salary in each county.

The average household income at national level is presented in the following two tables for the years 2006 and 2007 in nominal terms:

Table 9.6: Average household income at national level

Amounts in Euro/month	2006	2007
Average household income at national level	370,2	504,3
Urban area	413,9	571,8
Rural area	313,2	418,1

Source: National Institute for Statistics

As required for the calculation of the disposable household income, the amounts paid from the household budget for taxes, fees and similar items are presented in the following table for the years 2006 and 2007 in nominal terms:

Table 9.7: Average taxes, fees and similar items at national level

Amounts in Euro/month	2006	2007
Average household	49,9	68,9
Urban area	72,4	100,2
Rural area	20,6	29,0

Source: National Institute for Statistics

The average disposable household income at national level, calculated as a difference between the average household revenues and the average taxes, fees and similar items, is presented in the following table for the years 2006 and 2007 in nominal terms:

Table 9- 1: Average disposable household income at national level

Amounts in Euro/month	2006	2007
Average household income at national level	320	435
Urban area	341	472
Rural area	293	389

The correction factor used for estimation of the average household disposable incomes for each county can be calculated by comparing the national net average salary with the average net salary from each county. This method of estimation of the average household disposable income at county levels was used and accepted in the financial analysis for the cohesion funds application submitted to EU in 2007 and 2008.

Figure 9-16 and Figure 9-17 show the estimated levels of average household disposable income (in Euro/month).

Figure 9.16: Average household disposable income – South and East Regions

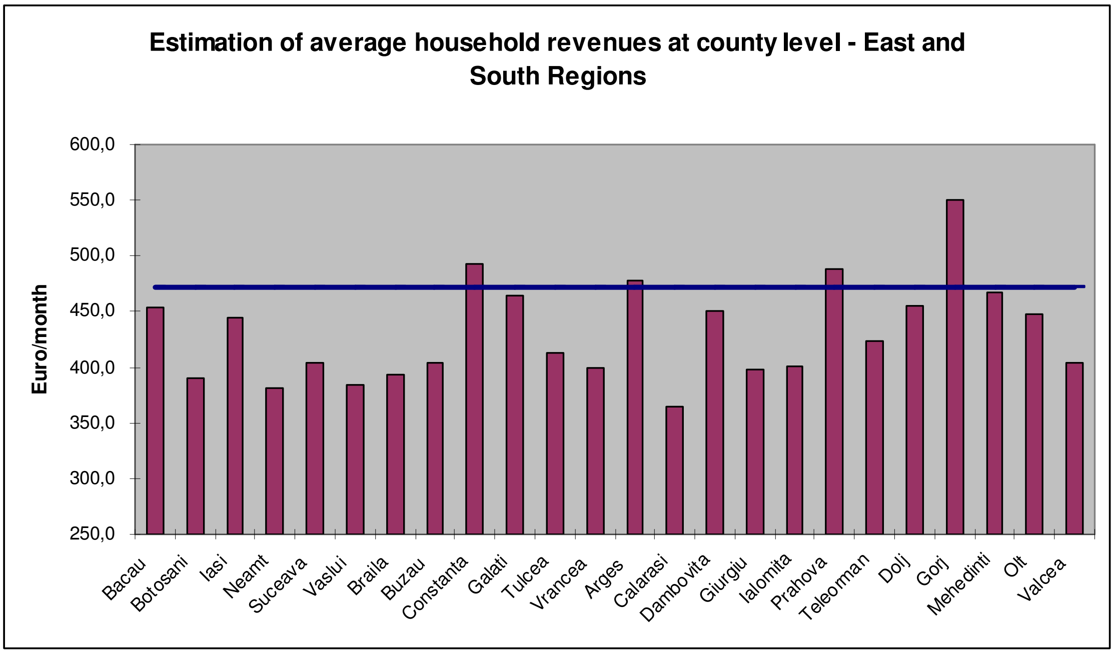
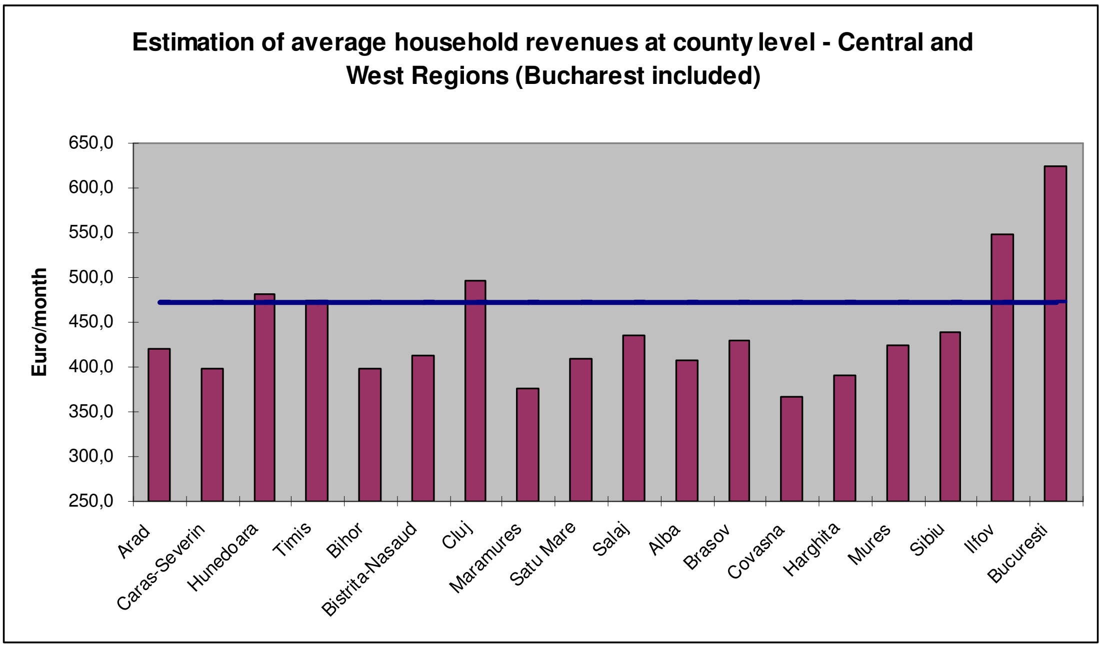


Figure 9.17: Average household disposable income – Central and West Regions



Form these chart we can see that the following counties have revenues above or close to the national average: Constanta, Galati, Arges, Prahova, Gorj, Mehedinti, Hunedoara, Timis, Cluj and Bucharest with its surrounding areas.

9.10 Preparing and financing investments in water utilities

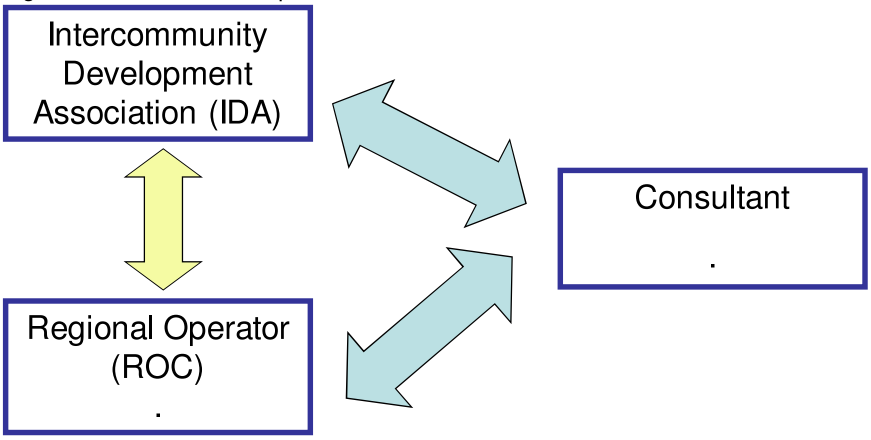
In the present, most of the water and sewerage operators are involved in preparation of master plans at a county level and investment projects which are to be included in the cohesion funds applications. In this context is more and more important that water and sewerage operators have a series of procedures to manage more efficiently the preparation process of investments projects.

The present guide illustrates general elements, important in the preparation process of the projects as well as their revision process.

9.10.1 Entities involved in the project preparation process

In the project preparation process are involved three important entities which should cooperate in order to ensure the success of the project preparation.

Figure 9.18: : Relationship between entities involved



On one hand there are the Regional Operator (ROC) and the Intercommunity Development Association (IDA) each with its own clear attributions:

- IDA:
  - It is responsible with development strategy coordination for the water and sewerage sector;
  - It has monitoring attributions of the ROC regarding the investment implementation process and their coordination with the general strategy from the master plan;
  - It has to be involved in the decisional process regarding the investment project;
  - It has to coordinate the decisional process referring to co-financing the projects (either is about credit or the local budgets' contributions);
  - It has to represent the interface between ROC and the Consultant, on one hand, and the local authorities on the other hand.
- ROC:
  - It has to be involved actively in all stages of the investment project preparation;
  - To manage the relationship with the Consultant preparing the feasibility study and funds application;
  - To ensure that the projects are complying with the strategies and priorities established by the master plan;
  - To coordinate with AID in the decisional process regarding the content of the project, of the financing strategy;
  - To set a team responsible with the project's preparation so that a maximum efficiency is ensured for the process;

9.10.2 Investment project analysis

The project preparation process should take place after a series of methodologies and guides.

In the first place the Romanian legislative provisions should be complied with in terms of methodology of realizing feasibility studies (Governmental Decision nr. 28/2008 regarding the approval of the general framework of the technical and economic analysis of public investments).

In the second place the specific methodologies asked by every fund source should be considered. Because in the proximate future the main investment source of water and sewerage operators will be represented by cohesion funds, we shall present in detail the methodologies for this option. The methodology requirements are regulated by the Council regulation 1083/2006.

The preparation of the cohesion funds projects is going to be achieved respecting the methodology recommended by the Ministry of Environment and Sustainable Development. In the present there is not a clear methodology, just a set of recommendations exist and are obtainable directly from the Ministry.

In order to ask financing from cohesion funds, the following set of documents need to be prepared (the main document categories):

1. Application form;
2. Technical feasibility study;
3. Financial-economical analysis (cost-benefit analysis);
4. Institutional analysis;
5. Environmental impact study;
6. Procurement strategy.

These requirements will be briefly discussed below.

1. Application form

It resembles the form for ISPA application and can be found on the European Union site at the following link:
http://ec.europa.eu/regional_policy/sources/docoffic/official/regulation/newregl0713_en.htm

It must be completed carefully because is the first document the DG Regio reads and a considerable amount of decisions are made on its account.

2. Technical feasibility study

In principle it respects the standard structure of a feasibility study, mentioning that attention should be paid to the analysis of options and the presentation of the project performance indicators.

Each technical solution chosen has to be done through an analysis of options that must be presented from a technical and economical point of view (a great attention is paid to this thing).

The performance indicators are generally established by the Ministry of Environment (will have to be requested) and will be calculated before and after the project implementation so that they reflect the way the project leads to the accomplishment of the national strategies objectives for Romania related to this sector.

3. Financial-economical analysis (cost benefit analysis)

The financial – economical analysis must be treated with great attention because within it the level and financing structure of the project is established (subvention level from the state budget, grants level from UE, local budgets contribution, credits, etc).

For the cohesion funds applications there is a methodology to realize the financial-economical analysis. The document is called “Guide to COST-BENEFIT ANALYSIS of investment projects - Structural Funds, Cohesion Fund and Instrument for Pre-Accession" issued on 16 June 2008 and can be found on the European Union site (in English) at the following link:

http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf

The financial–economical analysis must contain the following subcomponents:

a. ***Socio-economic analysis***: presents the social and economical context of the area in which the project will be implemented: population, unemployment, economical growth, GIP,/inhabitant, medium income per family, etc.

b. ***Financial analysis:*** realizes a complete analysis of the investment project. A few key elements should be followed while realizing the analysis:

- The analysis must be prepared using the incremental approach through which the project is "isolated" by the rest of the activity for a better analysis. In practice this is quite difficult especially in complex projects that have a lot of components and the next approach is used:
  - A first financial projection is made for the entire activity considering the project's impact;
  - A second financial projection is made for the entire activity, without considering the project's impact;
  - In the financial analysis it is used only the difference between the two (the incremental factor);
- A great attention must be given to the assumptions used:
  - Projection of the population and number of economical agents connected to the system;
  - Projection of tariffs considering the affordability strategy;
  - Projection of operating costs;
  - Collecting level;
- A series of key elements should result from the analysis:
  - The financing structure of the project, with a clear identification of:
    - Grant level;
    - State budget subsidy level;
    - Local budgets subsidy level calculated on each locality;
    - The level of the necessary loan that must be contracted by the operator.

c. ***The economical analysis***: realizes a complete analysis of the project considering, besides the financial elements, the impact of externalities over the project. The externalities represent economical elements which result from the project implementation. Examples of externalities:

- Environmental benefits on inhabitants as a result of decreasing pollution in the area;
- The decreasing of illness degree as a result of water quality increase;
- Work places new created or reduced on the construction and investment operating period;
- Economies made by a family resulting from the water connection compared with the existence of personal wells;
- Economies made by a family resulting from the water connection comparing with the existence of personal septic fosses.

d. ***Sensitivity analysis:*** Where the variation impact of the main variables used is analyzed. Its role is to show how reliable are the assumptions.

e. ***Risk analysis:*** Wher*e* the risk of variables considered as sensitive in the sensitivity analysis is analyzed. Risk analysis requires detailed mathematical calculation and a probability distribution must be calculated. Risk analysis is mandatory among the investment projects in order the consider contingencies for the project.

It is very important that the sensitivity analysis results are discussed in detail with all the decisional factors before finalizing the financial and economical analysis.

JASPER and the Ministry of Environment and Sustainable Development has issued a guide for the cost benefit analysis specific for Romanian water sector which can be found in the appendices.

4. Institutional analysis

The institutional analyses constitutes a detailed presentation of the institutional arrangements as well as the operator's capacities to implement the investment and to operate it in the future.

The institutional arrangement analysis must highlight the three important pillars:

- Intercommunity Development Association (IDA): association members, when it was constitute and which were the steps, main foresights and constitutive act, association personnel, existent budget, relationship between IDA and operator, etc
- Regional Operator (ROC): when it was constituted, operating area, when the operating of each city was performed, financial performances.
- The delegation Contract: contents, when it was signed, when the takeover of operation happened, etc.

Also will have to be highlighted the operator's strong points regarding the following aspects:

- Project implementation capacity (qualified personnel, past experience, internal organization, personnel preparing plan, etc) :
  - Tender procedures;
  - Work supervision;
  - Payment;
  - Contract management ;
  - Relationship supervising between constructors and financing parties;
- Regional operator's operating capacity after finalization of investment implementation (qualified personnel, experience, operating strategy, etc).

5. Environment impact study. Realizing an environment impact study must be according to the provisions of the Romanian legislation.

6. Procurement strategy. A greater attention must be given to tender strategy. In case of large projects (of 50 - 100 millions of Euro), designing an efficient tender strategy can assure an efficient and smooth implementation.

The possible options are:

1. **Small number of contracts (**3-5 contracts of 20-40 millions of Euro each**)**, each with a larger value.

Advantages of this approach are the following:

- Competition is created for constructors which will have to bid for a relatively small number of contracts and this could lead to favorable allocation prices;
- Generally is easier to manage a smaller number of contracts as well as a relationship with a smaller number of contractors.

Disadvantages of such a strategy:

- If there are problems regarding implementation (delays, dishonesty, etc), taking into account the big value of each contract, will have a significant impact:

2. **Big number of contracts** (over 10 contracts of 5-10 millions each**).**

Advantages of this approach are the following:
- If problems appear regarding implementation (delays, dishonesty, etc), taking into account the relatively small value of each contract, will have a relatively limited impact;
- A possibility might be offered to Romanian firms to participate alone at the auction, which might lead to an easier contract management (lack of subcontractors);

Disadvantages of such a strategy:
- Their big number facilitates possible “misunderstandings” between construction firms (regarding market partition) fact which will lead to eventual rises of the allocation prices and a greater power of negotiating for constructors;
- Competition is not encouraged on the construction market;
- It might be difficult to manage (it takes more project managers) the implementation and also the relationship with constructors (because there are many constructors);

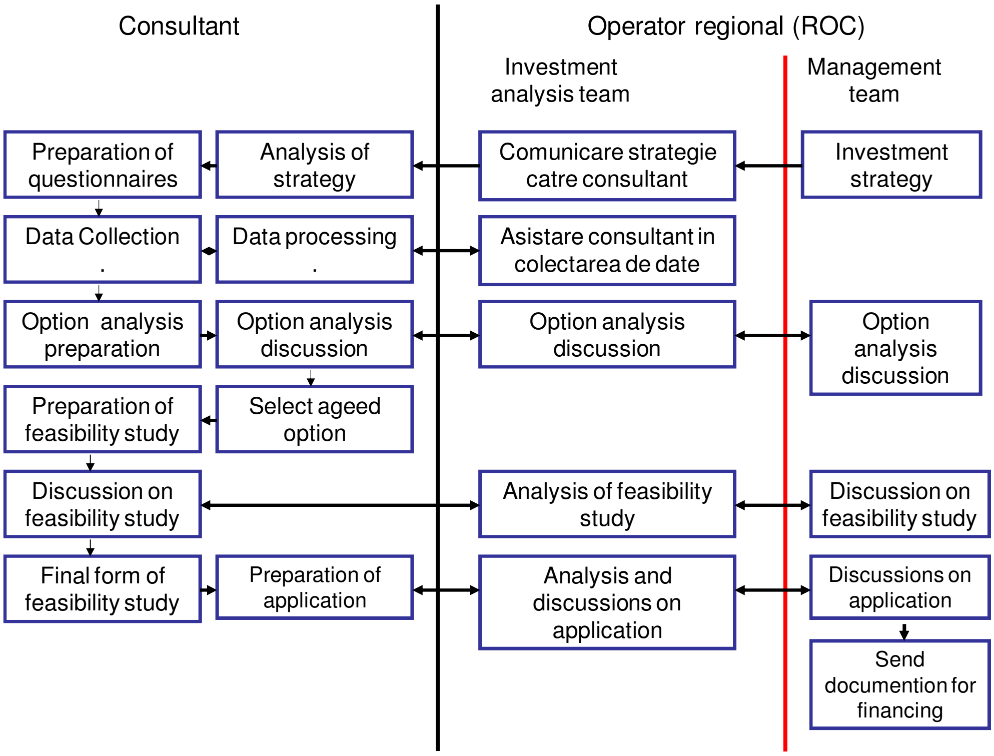
We can assume there is no correct strategy which should be applied to all projects. Although we recommend for the tender preparation period to carefully analyze each option and consider, in the decisional process, among the previous elements, the following factors:
- availability and preparation of existing personnel to be responsible for the implementation
- contractors relationship experience and work supervising;
- costs referring to external juridical consultants for the chosen strategy (in case of litigations, contract preparation, etc);

9.10.3 Relationship between ROC and the Consultant

Communication and working together is vital between entities involved in the preparation process. In these relationships, a very important role is played between the Consultant and the ROC.

The main elements of the ROC’s relationship with the Consultant are briefly presented in the following scheme.

Figure 9.19: Cooperation between ROC and the Consultant



It is very important that the ROC team responsible with the feasibility study and the fund applications permanently works together with the Consultant and is actively involved in each preparation stage of the studies.

A few frequent errors regarding process management between the Consultant and ROC that occur in the project preparation process:

- The operator's team doesn't get involved at all in the preparation process of the feasibility study components.
- *Recommendation:* they should work together with the consultant at each component preparation. Operator's team participates mainly in discussions referring to technical problems, neglecting the preparation process of the financial and institutional analysis. This is due to the following factors:
  - Usually the general directors and the majority of the management team are formed of engineers or technical personnel, who are not familiarized with financial analysis techniques.
  - Economical directors are generally not included in the project analysis stage; they take contact with the project only in the final stages. On the other hand the financial personnel involved from the beginning in the project don't have the necessary qualification to participate constructively in the process.

Recommendation: Paying more attention to all the preparation stages of a feasibility study and mainly to the financial and institutional part and including in the project preparation team financial specialists qualified for the process.

9.10.4 Managing the relationship with the financing entities and institutions

An important element of the preparation process but especially of the investment implementation is represented by the relationship between local entities involved and financing parties, internal or external.

In the category of entities involved are the Regional Operator as the project beneficiary and the Intercommunity Development Association (IDA) as a representative of local authorities and responsible with the development strategy.

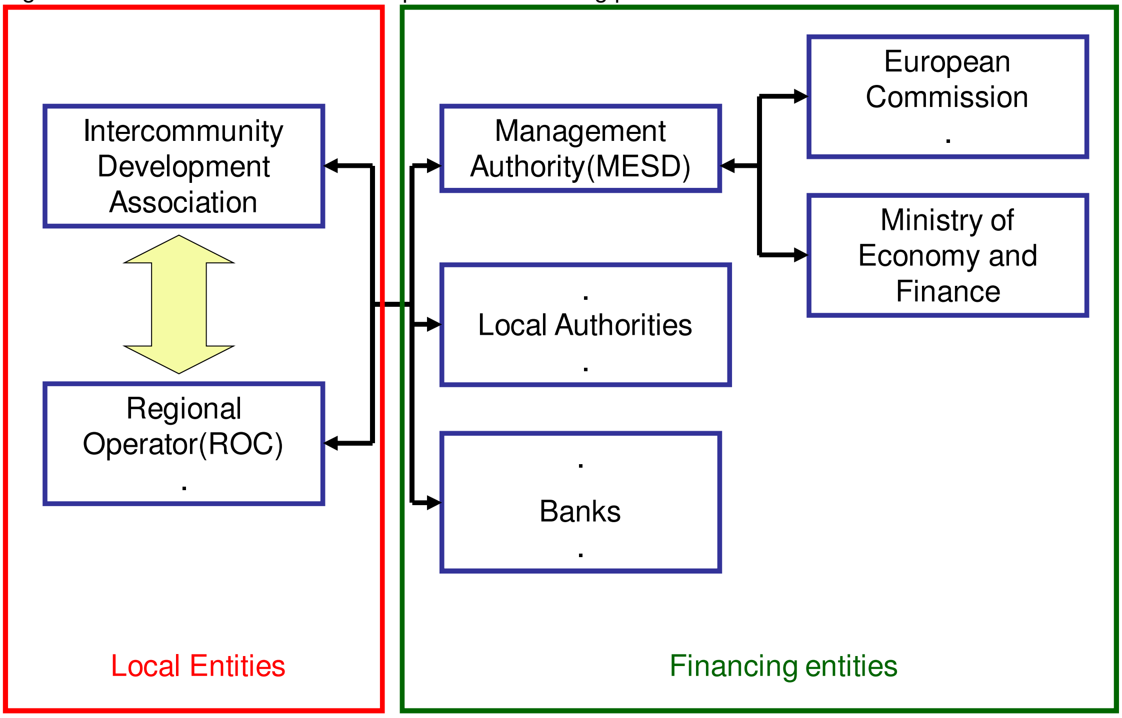
The next categories are in the finance parties' category:

- Management Authority (Ministry of Environment and Sustainable Development);
- Ministry of Economy and Finance by granting subsidies from the State Budget:
- European Commission by granting cohesion funds;
- Local Authorities by granting subventions from local budgets;
- Banks which grant credits for partial or total financing of the investment. Here are two categories:
  - Commercial Banks ;
  - International Financial Institutions (BEI, BERD);

Each of the financing parties presented above must be treated with great attention both in the discussion period regarding acquiring the finance and the project implementation and operation.

The relationship between the entities is presented schematically in the following figure:

Figure 9.20: Local entities relationship with the financing parties



Hereunder the main elements that are to be considered in relationship with each category of financing parties are sketched.

9.10.4.1 Relationship with the Management Authority (MA)

For the projects financed by the Sector Operational Programme Environment (SOP Environment) Management Authority (MA) is the Ministry of Environment and Sustainable Development.

- IDA should:
  - Discuss and agree with MA the investment and development strategy for ROC operating area (Master Plan);
  - Inform MA about the financing strategy of investments suggested at local level ;
  - Identify with ROC and MA possible financing investment sources;
  - Inform the Ministry of Finance and the European Commission through MA about the important elements from preparation and implementation process of projects;
- ROC should:
  - Identify with IDA and MA possible financing sources for investments;
  - Send reports to MA regarding project preparation process;
  - Inform the Ministry of Finance and the European Commission through MA about the important elements from preparation and implementation process of projects.

9.10.4.2 Relationship with local authorities

- IDA should:
  - Inform local authorities regarding investment implementing status;
  - Establish together with local authorities and ROC the budget contribution to investment financing;
  - Monitor the approved sums for investment financing are included in the local annual budgets;
  - Discuss and agree the tariff strategy to ensure credit reimbursement and investment financing from personal sources of ROC;
  - Discuss with local authorities eventual guarantees for co-financing credits;
- ROC should:
  - Answer to eventual information solicitations received from local authorities;
  - Relationship with ROC with local authorities should be realized through IDA;

9.10.4.3 Relationship with commercial banks

- IDA should:
  - Assist ROC in the negotiation process of the financing conditions;
  - Discuss the warranty conditions of local authorities in case the banks request this thing;
- ROC should:
  - Select the bank offering the best financing conditions through tenders (it organizes);
  - Send reports regarding project implementing process (in case the bank requests so);
  - Send reports regarding operational performances (financial situations, indicators calculus, etc) (in case the bank requests so);

9.10.4.4 Relationship with International Financial Institutions (EBRD and BEI)

- IDA should:
  - Assist ROC in the negotiation process of financing conditions;
  - Discuss guaranty conditions of the local authorities in case the banks request so;
- ROC should:
  - Select the bank offering the best financing conditions through option analysis;
  - Send reports regarding the projects implementing process (in case the bank requests so);
  - Send reports regarding operational performances (financial situations, indicators calculus, etc) (in case the bank requests so);

9.10.5 Investment projects assessment

Projects assessment process can be divided in two major components:
- Documentation preparation regarding investment made by a consultant
- Investment proposals by each local authority;

Further on we shall briefly analyze each case.

9.10.5.1 Document preparation regarding investment made by a consultant

In case the documentation regarding the investment (technical feasibility study, economical- financial study, etc) is prepared by a consultant, the company personnel must actively involved in the revising process of analyses prepared by a consultant.

The manner ROC proceeds in this case is described in detail in the section: “The relation between ROC and the Consultant”.

9.10.5.2 Investment proposal by each local authority

In case local authorities decide to finance the realization of feasibility studies or to apply for obtaining finances for investments in the water and sewerage sector, ROC must actively involve itself in revising process of the prepared studies and assisting local authorities regarding document preparation for obtaining the financing.

In the revising process of the feasibility studies, ROC must follow the procedure described schematically in the chapter that analyzed the relationship with the consultants. In the revising process of the feasibility studies prepared by the local authorities should be complied with the following principles:
- Investment is on the master plan list of priorities;
- The project is complying with the investment and operating strategy for ROC supplying area approved by IDA;
- Analysis how the project implementation will affect operating costs and incomes (supplementary clients, cost reductions/raises, etc) in order to capture these elements in the tariff strategy;
- Analyzing proposed technical solutions (if they are compatible with the existing systems)

Also ROC should assist local authorities in the preparation process of the documentation to ensure financing and project implementation success:
- Working together in the documentation proper preparation;
- Analyzing possible financing sources and choosing the optimal financing mix;
- Correlating tariff strategy with the project financing mix;

Also, ROC, as a future operator of the objectives, must actively involve in the implementing process of investments in order to ensure constructor’s complying with the technical specifications and implementing terms.

9.11 Loan contracting option analysis

In the present the majority of the regional operators are involved in the preparation of cohesion funds applications. One of the important decisions which operators have to take in the near future will be related with the credit for co-financing the investment from the cohesion funds application.

This chapter presents an analysis of the two possible options regarding contracting a credit:
- In RON;
- In Euro.

It is also analysed the impact of the principal external factors over the total costs connected to the credits. The considered factors are:
- The evolution of the exchange rate RON/EURO;
- The evolution of the reference interests BUBOR and EURIBOR;

9.11.1 Assumptions used

For this analysis we have spoken with a series of operators which are more advanced with the cohesion funds applications and we have selected the best offers for the credits in EURO and also in RON. These conditions are not present in this study (because they are confidential), but a comparative analysis will be done regarding the total annual credit costs including:
- principal reimbursement;
- interests;
- commissions;
- exchange rate differences.

The analysis has been done for a 5 million Euro credit, with a grace period of 5 years and a reimbursement period of 12 years (total period of 17 years). Also we have been considering two micro economical scenarios:
- an optimistic scenario: in which the RON will appreciate in report with Euro
- a pessimistic scenario: in which the RON will depreciate in report with Euro.

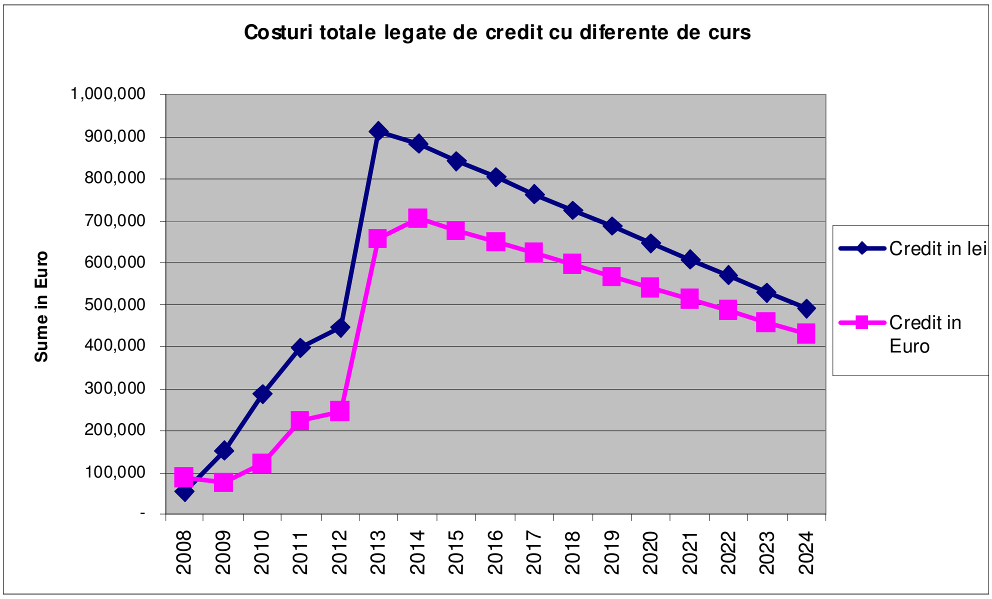
The variables to be analysed are:
- possible evolutions of the RON/EURO exchange rate
- possible evolutions of the interest rate (BUBOR and also EURIBOR).

9.11.2 The impact of the RON/EURO exchange rate

This paragraph presents an analysis of the impact of the exchange rate evolution over the total annual credit costs. An important factor is the exchange rate differences for the Euro credit.

The following figure presents a comparison between the total costs of the two credits, considering an evolution of the exchange rate that assumes an appreciation of RON in relation with Euro (blue line –credit in Ron, pink line-loan in Euro).

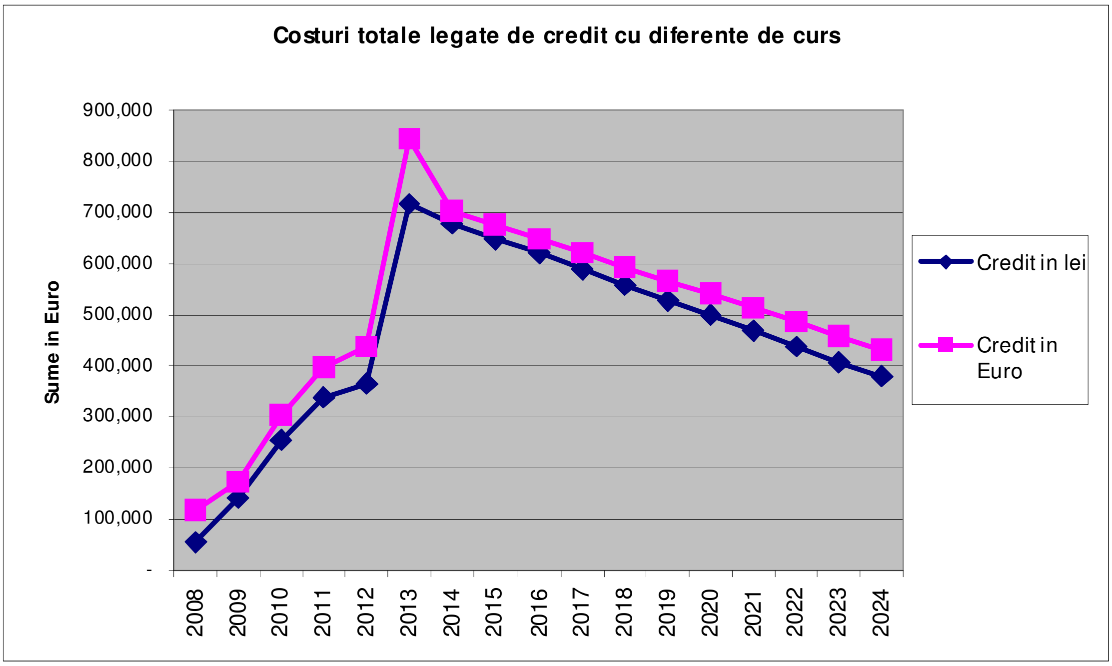
Figure 9.21: Comparison total credit costs considering an appreciation of the national currency



In this case it is noticed that in the actual crediting context, the credit in Euro is more profitable than the one in RON.

Taking in consideration a depreciation scenario of RON reported to Euro (which has happened in the last months), we have the following results (blue line–loan in RON, pink line - credit in Euro).

Figure 9.22: Comparison total credit costs considering national currency depreciation



In case we have a depreciation scenario reported to Euro, it is noticeable that is more profitable the loan in RON.

The question is: 'where is the balance point in which the two credits have equal costs?'

Most surely, for a higher profitability of the RON credits, at least on a medium term, a national currency depreciation is necessary. The equilibrium point is reached when the depreciation of the national currency is equal with the difference between the interests and the annual commissions of the two loans (percentage also).

Another important question: how will the exchange rates evolve in the following years? It is difficult to assess. The trend considered by the National Commission of Prognosis (www.cnp.ro) mentions that in the next years we shall register a national currency appreciation against the Euro.

If we consider the evolution from the last months when the RON depreciated reported to Euro after a few years of appreciation, we have some question marks.

We estimate that in the next years the appreciation process reporting to Euro from the following reasons:
- the appreciation of the national currency represents an important mechanism thru witch Romania is trying to recover the difference confronting by the European Union (for example: wages is you transform them in Euro) and probably the National Bank has targeted the appreciation of the national currency;
- the depreciation from last month is normal after an appreciation period of a few years (financial market rules) and the belief is that the trend will reverse in the following months;

In conclusion, we can say that, at least on a medium term and considering only the exchange rate impact, contracting a credit in Euro will generate smaller annual costs than contracting a credit in RON.

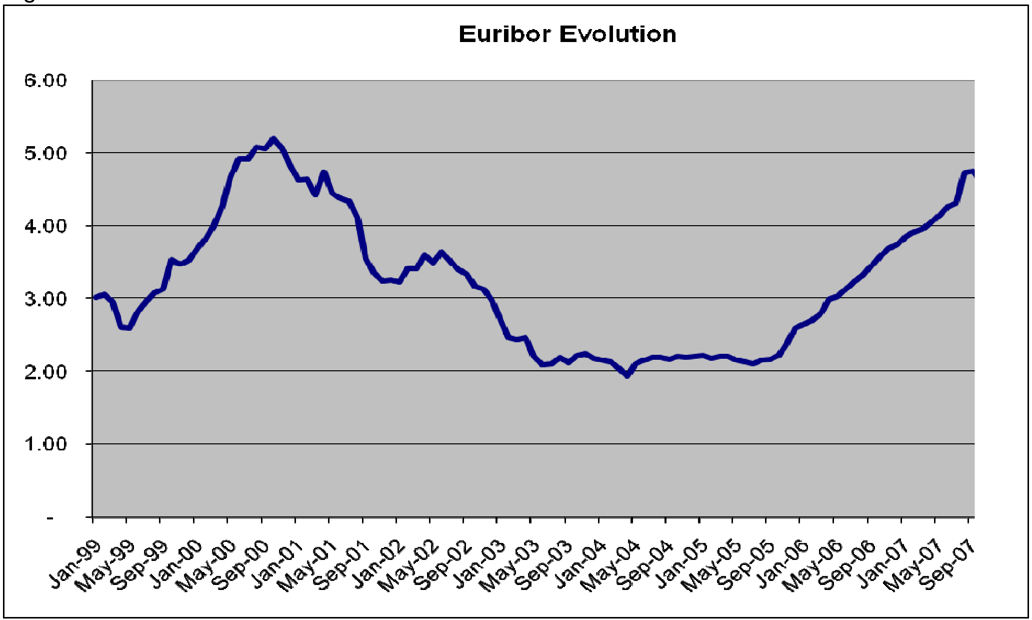
9.11.3 The impact of reference interests

In this chapter it is analysed the impact of the interests' reference rates over the total annual costs referring to the credit.

The two elements that affect the interest' rates are:
- for the credit in RON: BUBOR (in present is called ROBOR, but because the specialists are familiar with the old naming, we will continue using it in this study);
- for the credit in Euro: EURIBOR.

In the next chart is an evolution of EURIBOR (6 months):

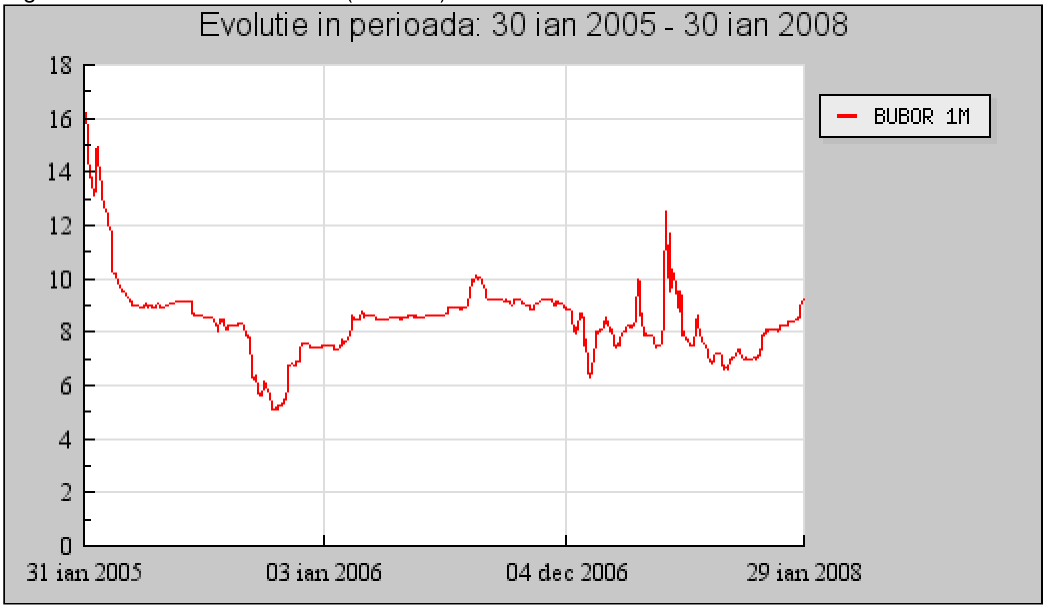
Figure 9.23: EURIBOR evolution



As it is noticeable, EURIBOR's value at 6 months was in December 2007 at about 4.77%. It is also noticeable that EURIBOR is in present close to the maximum value reached in 2000.

BUBOR evolution (at one month) is presented in the next graphic:

Figure 9.24: BUBOR Evolution (1 month)



Source: www.banking.ro

In the present (4 th of February, 2008) BUBOR at 1 month is 9.34% and at 6 months is 9.54%. (Source: www.bnr.ro).

The evolution of the two reference interests is quite hard to estimate. Although we shall make a series of estimations:

- We consider that EURIBOR will slowly decrease on a medium due to the following reasons:
  - It is close to the maximum values from the last years and the odds are favourable that in the future will decrease;
  - The economic rise in the EU is slowing down, and the Central European Bank (CEB) could take the decision to lower the reference income in order to stimulate the economical growth;
- We consider that BUBOR will slowly increase on a short term and will have a decrease due to the following reasons:
  - the macro-economical indicators of Romania have deteriorated, and in order to temperate the national currency's indicators and inflation rates, the National Bank might increase the reference interest (o rise from 8% to 9% has already taken place). Nevertheless we don't think that the reference interest will exceed 10%.
  - however, on a medium term (1-5 years, starting right from the second half of the year 2008) a decrease of the reference interest is expected. We believe that the reference interest from Romania will continue to decrease until it is approximately equal to the one in the Euro area, this equality being reached in the moment we adopt the Euro currency (around 2014).

To conclude, we can say that on a medium term, EURIBOR will be more reduced than BUBOR, making more attractive the loan in Euro.

9.11.4 Impact of margins related to interests rates

An important factor in the decision process regarding the contracting of a credit is represented by the interest margins.

In the present, for credits made in Euro, the margin is bigger than the one for credits made in Lei. As long as the difference between EURIBOR and BUBOR maintains itself large, the total interest from the credits in Euro (even if it has a bigger margin) will be more attractive. The problems will appear when BUBOR will start to decrease and the total interest in Lei will be approximately equal or even smaller than the interest in Euro (due to the margin differences). It is expected that in 4-6 years from now the interest for a credit contracted in RON will be even smaller than the one for a credit in Euro (considering the margins that circulate on the market at the moment for the two types of credits).

This will not represent a major problem because the competition within the banking market is more and more large and when, for example, the credit in Euro will be less profitable than the credits in RON available on the market, a renegotiation will be possible or refinancing the credit on better conditions from another bank. However, the refinancing costs will have to be analysed. Also an increased attention must be paid in negotiating the advance reimbursement conditions.

9.11.5 Conclusions

The decisional process regarding the currency of the loan is not easy and a lot of variables have to be taken in consideration.

The analysis has shown that the variables considered (exchange rate, interest reference rate and margin) are important elements which can switch the balance from a category to another.

Considering the actual crediting conditions and the consultants' expectations regarding the evolution of macro-economical indicators, the loans in Euro generate lower annual total costs that the loans in RON.

Considering all these we recommend to the operators to make a detailed analysis considering at least the variables presented in this study before they take a final decision.

In order to facilitate the loan decision making process for the ROCs, within the FOPIP 2 project was developed a complex excel model in order to provide the future beneficiaries of EU-financed projects with an in-depth look at the loan mechanisms and their service (Appendix F.7)

9.12 IMPLEMENTATION PLAN for Financial Management

9.12.1 Introduction

This is a guide which provides ROCs managers in developing a:
- Financial Management Plan
- Financial Planning Model.

The Financial Management Plan (shortly Financial Plan) provides the **qualitative** documentation and discussion, and the strategies on which the ROC's financial planning is based.

The Financial Planning Model (shortly Financial Model), or decision tool, provides a **quantitative** analysis of the business over time for a given financial management strategy.

9.12.2 The Business Plan approach to Financial Management

The Financial Management Plan takes information from each sub-plan contained in the Business Plan and converts this information into a financial management strategy, including development of a Financial Model. The financial management strategy is the key financial component of a ROC's Business Plan.

The overall objective of a financial management strategy is to:
- ensure that the business remains viable in both short term and long term;
- ensure that the services provided to customers give value for money;
- ensure statutory requirements are met;
- provide managers with sufficient financial information (e.g. costs, KPIs, projected budgets) to allow them to manage the businesses more effectively, and identify and implement efficiency improvements;
- confirm to stakeholders that the business is being operated appropriately for the long term.

9.12.2.1 The Financial Management Plan

The Financial Management Plan outlines the key strategies and objectives of the company. It establishes a qualitative basis for financial management of the company (i.e. what it wants to achieve).

9.12.2.2 Financial modelling

The Financial Model:
- is the core of the financial planning strategy ;
- will quantify the impact of the company's financial strategies and demonstrate (in money terms) the performance of the company over time ;
- identifies future capital works and funding requirements and highlighting the long-term impact of current revenue and funding strategies.

The Financial Model should include:
- a long-term cash flow forecast indicating that the business will be able to pay its bills as and when they fall due;
- a long-term operating statement indicating the relative profitability of the company;
- a balance sheet illustrating the changes in the businesses assets over time;
- a list of key performance indicators providing quantitative benchmarks for comparison of performance, both within the company (i.e. improvements over time) and between organizations (i.e. how the business compares with its peers).

ROCs may develop their own Financial Models using their existing information and software systems, provided that they meet all financial reporting and compliance requirements.

After initial financial modeling, planning strategies and some assumptions contained within other Business Plan sub-plans or Master Plan may need to be reviewed to ensure that the long-term financial viability of the ROC is maintained.

9.12.2.3 Relationship between the Financial Model and Financial Management Plan

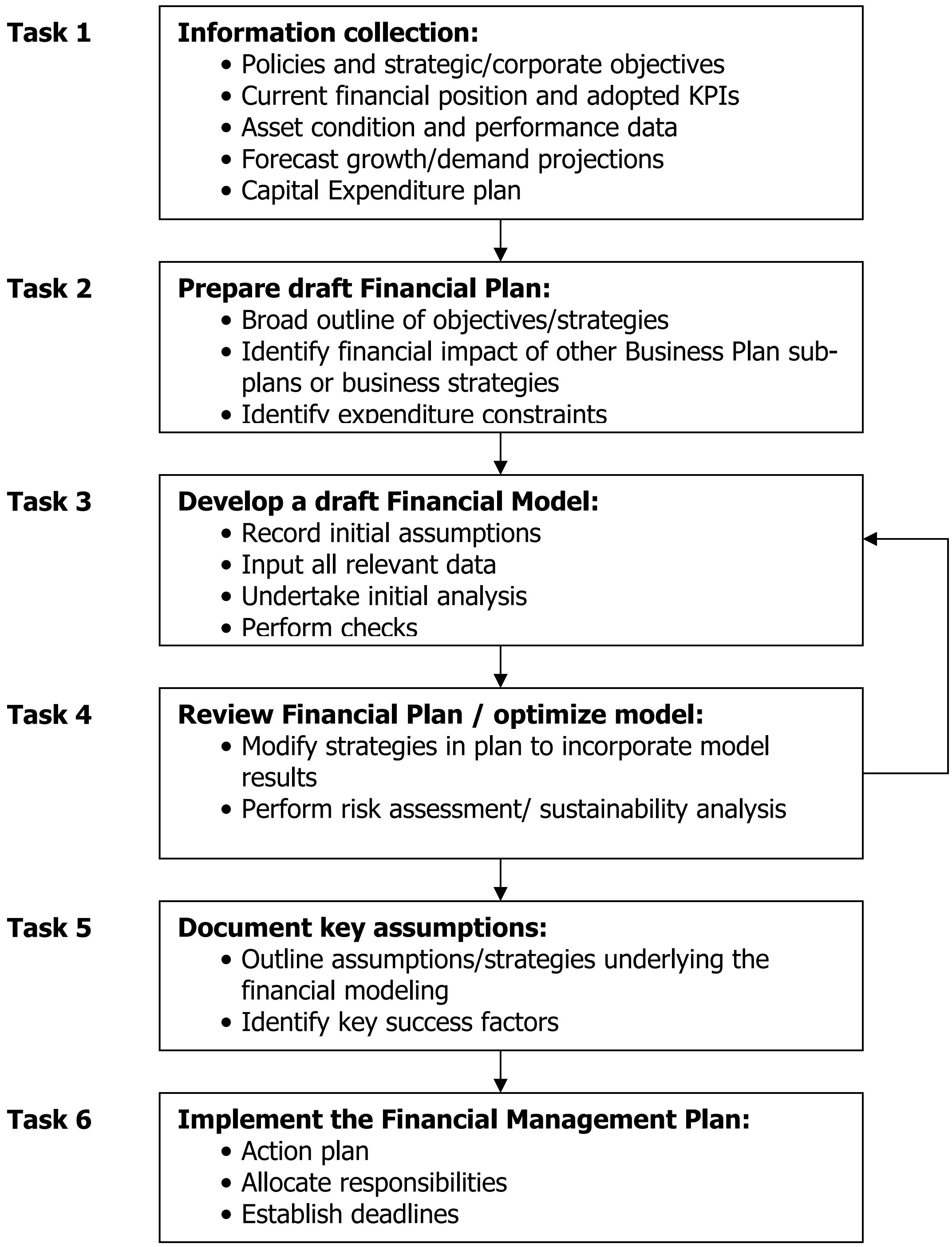
The Financial Model is essentially the core for the development of the overall Business Plan. Without the necessary financial resources, the ROC will be limited in implementing strategies to:
- achieve desired customer service targets;
- meet regulatory requirements; and
- meet financial obligations to owners and shareholders.

The Financial Model provides a projection of the financial performance of the ROC and the availability of financial resources in the medium and long term. The Financial Management Plan uses this information to determine and support the company's strategic direction.

9.12.2.4 Key output requirements of the Financial Management Plan

The development of a Financial Management Plan and Financial Model has been based on output objectives. This provides the ROC with the flexibility to develop a Financial Management Plan in a format that meets its own reporting requirements and can be more easily addressed using existing financial models, information and software.

9.12.3 The Financial Management Planning Process



9.12.3.1 Task 1: Collect information

The initial stage in developing the Financial Management Plan is to collect and collate relevant information.

Data on which the Financial Management Plan is based includes the following:
- obtaining broad company direction from the Corporate, Operational and Business Plans (if available);
- revenue policies (including tariff structure, infrastructure charges, subsidy availability, community service obligations etc.);
- any other financial policies (e.g. dividend policy, borrowing policy, full cost pricing, commercialization);
- identification of service standards levels;
- past financial performance (i.e. previous budgets or annual reports);
- outline of the company's current financial position (particularly asset values, reserves, cash, debt levels and loan repayment schedules);
- outline of service delivery strategy (from Business Management Plan);
- implementation plans for service delivery strategies as outlined in other Master Plan sub-plans;
- asset-related information (e.g. asset performance, value, age, depreciation, replacement cost profile);
- demographic data (i.e. population and demand projections);
- general financial assumptions (e.g. expectations for subsidy).

This baseline information effectively provides a picture of the company by describing exactly the ROC's current financial policy and position.

9.12.3.2 Task 2: Prepare draft Financial Plan

Using the information collated from the initial stage, the company should then establish a preliminary framework for development of the financial plan. This will include benchmarks of what the company is trying to achieve in terms of financial management including broad outline of goals and objectives for the immediate future of the ROC.

In addition, the financial impact of the other Business Plan sub-plans needs to be considered to ensure that proposed new initiatives are incorporated into the financial analysis.

Finally, a brief outline of the more obvious constraints on the company will assist in providing the framework boundaries for the Financial Model. Together, this information should be collated as a "draft" in the Financial Management Plan.

9.12.3.3 Task 3: Develop a draft Financial Model

Development of an appropriate Financial Model is usually an iterative process. First, all relevant financial data collected to date should be entered into the Model and a preliminary financial analysis undertaken.

Statement of cash flows

In establishing a Financial Model, ROCs may find it easier to first develop a statement of cash flows. This is an essential and basic building block for the Model. The statement of cash flows will be a list of the business's cash movements throughout the year. This can be divided into cash used for:
- operational activities;
- capital-related activities;
- financing activities.

The statement of cash flows is the most important component of the Financial Model for the business. If it indicates a large or repeatedly negative cash balance, this indicates that the business may not be viable (i.e. may not be able to pay its bills), and the original assumptions should be reviewed. It is not uncommon for a business to run a cash deficit for any given year, but if cash deficits compound over time then this may represent a problem. Until the statement of cash flows is completed and shows a regularly positive cash balance, there is little advantage in proceeding further.

Operating statement

The next step in development of the Model should be to establish an operating statement (profit-and-loss statement). Many ROCs will find that much of the information required for development of the operating statement can be drawn directly from the statement of cash flows. The main differences between the two will be the addition of “non-cash” revenues or expenses (e.g. depreciation) in the calculation of operating profit.

In addition, the operating statement may include an outline of how operating surpluses are to be distributed (e.g. dividend payment, retained earnings, transfer to capital account or other reserve account).

Forecast balance sheet

The final stage in establishing a Financial Model is to develop a forecast balance sheet. The balance sheet will take summary information from the statement of cash flow and operating statements and use these to illustrate changes in the business’s overall position over time. The balance sheet will show changes in asset balances (from cash balances, new capital works or donated assets) and changes in its liabilities (e.g. debt).

The way in which the cash flow statement, operating statement and balance sheet are interrelated is shown in figure below.

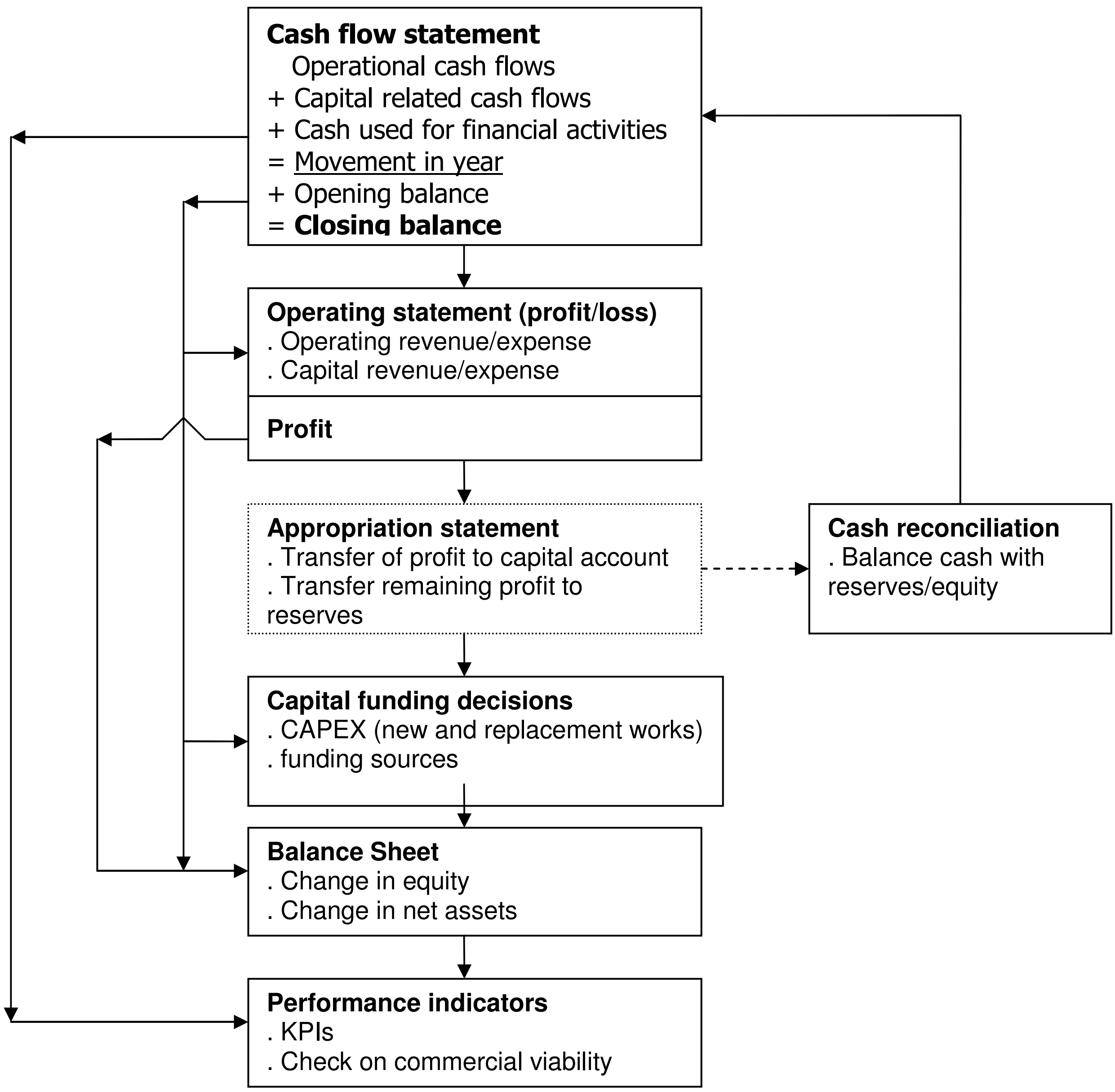
To demonstrate the long-term viability of the business, the Financial Model should be developed for a 10- to 20-year outlook. The decision as to which time period is most appropriate will be a function of the company’s size and available resources.

Checking the model

Once developed, the Financial Model should be checked against the following preliminary criteria:

- Is the cash flow balance consistently positive? (i.e. Does the business have sufficient cash to pay its bills as they fall due?)
- Are significant revenue increases required to fund capital improvements?
- Does the balance sheet indicate growth in the equity over time? (Sustainable management practices will be reflected in consistent growth in the company’s net assets or equity).
- Is the company profitable? The Financial Model should indicate a return on assets. Industry practice is to aim for a return of between 3% and 7%. However, provided the company generates sufficient cash and does not produce a large or sustained negative operational surplus, the company should remain viable.
- Is the capital structure consistent with the company’s borrowing policy? In addition, the more highly geared ROCs (i.e. high debt/equity ratios) should check that existing loan covenants are not breached over the longer term.
- Any assumptions made about subsidies for new or replacement capital works should be discussed with the relevant stakeholders.

If the model fails any of these tests, it may indicate a need to re-evaluate the revenue or capital expenditure regime to ensure that the business remains viable over the long term.



9.12.3.4 Task 4: Review Financial Plan and optimize Financial Model

The Financial Management Plan should next be reviewed to ensure that it incorporates the outcomes indicated by the Financial Model.

Modelling may indicate outcomes that differ from the objectives of the Financial Management Plan; this may necessitate changes to either the Model or the Plan, or both. Typically, the Model will be reviewed iteratively until these differences have been resolved.

In addition, key performance indicators (KPIs) should be checked against both internal performance targets (Are they improving?) and external benchmarks (How do we compare with similar companies?).

Risk assessment

Once the Financial Modelling and strategies contained within the Financial Management Plan have been reconciled, the ROC should undertake some initial risk assessment or sensitivity analysis to demonstrate the robustness of the overall Financial Management Plan.

Such risk assessment would include identifying key variables, and changing these to illustrate the overall effect of the company.

The key variables might include:
- significant changes in demand/revenue;
- changes in subsidy;
- increasing interest rates;
- premature failure of capital assets requiring changes in the replacement works program;
- increasing operational costs.

These sensitivity tests will assist in validating the overall Model or indicate areas of comparatively higher risk for the business. Where such high-risk areas are identified, they should be identified in the Financial Management Plan.

It is acknowledged as impossible to avoid all risk. Nevertheless, some risks have a low probability of occurrence, and it may be more practical to change the company's strategies to accept and manage risks of this kind. Identification of such risks will ensure that managers are conscious of these issues in the day-to-day operation of the business.

Trend analysis

Once the Financial Modelling is complete, graphs should be generated indicating year-to-year trends in terms of profitability, return on investment, operations, maintenance and administration (OMA) cost per property, cost per cubic meter (mc), debt/equity and other key variations.

As the final step in the process, the ROC should develop a brief commentary that outlines the rationale supporting the Financial Management Plan.

This commentary should outline at least the following:
- assumptions underpinning the financial analysis;
- proposed changes to the rates or tariff structure over the period modelled;

- proposed capital works program and the associated funding mechanisms (e.g. subsidy, debt, infrastructure charges);
- the required asset replacement program and associated funding mechanisms;
- comment on the attainment of target performance indicators;
- comment on the need for subsidy;
- comment on the cash flow for the company.

Iterations

Typically, most ROCs will find that they need to review key assumptions in the Model. This may occur several times until an appropriate result is obtained. This iterative process provides an opportunity for the ROC to assess the long-term viability of its proposed strategies.

The end result of this process may be a need to review/refine several other strategies within the Business Plan (in particular, capital works planning and revenue policy).

9.12.3.5 Task 5: Document key assumptions

Once the Financial Model has been completed and the preliminary results reconciled with the Financial Management Plan, the ROC should record the assumptions and key strategies on which the modelling is based.

This will include any changes to the company's overall financial objectives and any parameters identified in the sensitivity analysis that may affect the operation of the business.

Such recording of key assumptions will assist the company when it conducts its annual review of its financial strategies.

9.12.3.6 Task 6: Implement the Financial Management Plan

On completion of the Financial Management Plan, management of the ROC needs to provide a clear outline of the actions proposed to ensure the financial viability of the company over the long term.

This will include:
- allocation of responsibilities for completion of the set actions;
- nomination of a timeframe for attainment of key goals.

The finalized Financial Management Plan needs to address the output requirements and be presented as part of the overall Business Plan to the IDA, Local Councils or the Administration Council as a true and fair representation of the proposed financial position of the ROC for the immediate future.

Adoption of the Business Plan and supporting Financial Plan will act as the primary driver in management of the ROC business.

9.12.4 FINALLY: The continuous improvement process

In addition to the iterative process described above, the Financial Management Plan (including the Financial Model) needs to be reviewed and updated annually to test whether the assumptions made in the original analysis (e.g. timing of capital or replacement works) remain valid.

10. Commercial function management

10.1 Introduction

This chapter deals with aspects of the management of the commercial function of a water and wastewater company, particularly metering, billing and revenue collection, customer relations (CR) and public relations (PR).

Meter reading, billing and revenue collection are processes that use significant resources of a water company in terms of logistics, staff, equipment and others, thus generating significant costs. Many Romanian water companies still have “traditional” policies regarding meter reading, billing and revenue collection while modern technologies, methods and services are available and while customer needs had evolved. Revising these policies is necessary in order to introduce better and more modern procedures and to implement more effective, efficient and convenient systems and methods.

Customer Relations is about the ways in which a company communicates and deals with its existing customers, focusing in particular on the effectiveness of the end-to-end processes[13] for the customer. The modern customer expects value for money and good “customer care” and the water company should understand that provision of basic utility facilities does not make a difference, since customers take this absolutely for granted. Good customer relations will gain the support of the customers (including paying their bills in a timely manner) and will contribute to the long-term success and survival of the company.

Public Relations is about the water company communicating with its stakeholders, it is the “voice” of the water company in the outside world and involves an on-going, continuous process of creating and maintaining the company's public image. PR involves informing, influencing and motivating people to respond favorably to the business and to the message the company wishes to communicate. PR can help a water company to achieve its objectives by creating an environment where stakeholders with competing interests can communicate and agree amicably, thus saving time and effort and reducing blockages.

Although CR and PR have some distinct characteristics, both deal with the relations with the external stakeholders of a water company[14]. Customers are a particular type of stakeholders due to the very close and permanent relations with the water company . Customers are the most important reason of existence of a water company.

Customers:

- the water company’s life is depending on them;

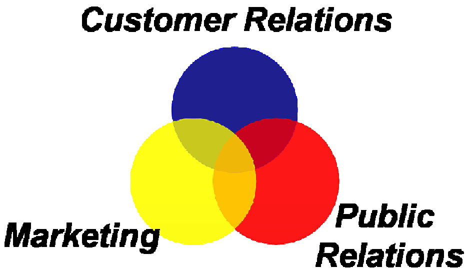
- the water company is there for them.

13 End-to-end processes are those business processes triggered by the client which end at the client (i.e. services requests, complaint handling etc.). An end-to-end process has a single objective but, where the process passes through several different functions or departments, it may become disrupted by conflicting functional objectives. They also often cross functional boundaries and, if each functional manager does not apply the same priority to the process activities, unnecessary delays can occur. Equally, over a period of time, the activities within the process can become distorted or unnecessary work can take place. Also, if the activities are not regularly checked back against the required output, and the output itself it not checked back against customer requirements, it is not unusual for the process to gradually fail in meeting the needs of customers.

14 Some authors consider customers therefore even actors inside the organization.

CR and PR, but also marketing, are very closely related areas; hence the water company need to synchronize these in terms of policy, organization, systems and practices.

Figure 10.1: Customer Relations, Public Relations and Marketing



What can be found in this chapter?

This chapter deals with policies, organizational arrangements and practices of water companies regarding meter reading, billing and revenue collection, customer relations and public relations.

The following topics are dealt with:
- Stakeholders and stakeholder analysis
- Policy areas and policy development
- Organizational setup of the CR and PR function
- Some selected arrangements and practices on CR and PR, notably:
  - regionalization and the consequences for CR/PR activities;
  - revenue collection
  - access to/contact with the water company
  - organizing customers' and public's opinions
  - complaints analyses.

A number of these matters are already part of the activities of the water companies. For some topics, FOPIP has initiated internal discussions and assisted the water companies in development and implementation.

Further, it should be realized that this chapter is not meant to be exhaustive regarding the aspects dealing with, particularly customer relations and public relations. It focuses on the matters where – in view of the FOPIP scope and purpose – the companies have main challenges and can make significant steps ahead in effectiveness, efficiency and customer-convenience.

Manuals, models and guidelines

Detailed and supporting information such as manuals, models and guidelines developed under FOPIP 1 and FOPIP 2 projects are provided as various appendices to this report in section G (on included CD). The following sections will mention these manuals, models and guidelines. These manuals, models and guidelines were used in the dissemination and promotion of the CR and PR instruments and practices.

10.2 Stakeholders and stakeholder analysis

Customer relations and public relations deal with the relations of the water company with its external environment. The first questions one should ask are "what relations, with whom?" With customer relations it is clear that we are dealing with customers and their problems when addressing the water company, it is often said that public relations are addressing the company's public at large. "Public at large" is, when looked into properly, a myriad of stakeholders with all kind of different characteristics such as interests, attitudes, powers over the water company and benefits in terms of water company's activity.

The customer does not exist as such; there are different types of customers.

-Domestic, commercial, institutional, industrial

-Drinking water, wastewater

-Big users, small users

-Young, old

-Adam & Eve, males & females

-Nobel prize winners, illiterate

-Good, bad & no previous experience

-Urban, rural

-Rich, poor

-Active, lazy.

Getting more clarity about the "'who is around the water company"' can be done by a stakeholder analysis. But why would it be beneficial for a water company to analyse its stakeholders? What is the scope of doing that?

Many Romanian water companies confront themselves with "unfriendly" attitudes from a part of their stakeholders, such as:

- lack of concern for any problems confronting their water provider
- little appreciation of their water and wastewater service
- general dissatisfaction
- resistance to changes, particularly relating to tariffs or the basis of charging
- intolerance of below-standard service levels
- reduced willingness to pay as customers
- lack of support and / or adverse reactions for initiatives and activities of public interest
- degenerations of conflicting situations in lose – lose or lose (ROC) – win (stakeholder) solutions

Stakeholder analysis can help the water company to better understand its stakeholders and the reasons behind stakeholders' attitudes, in order to influence those stakeholders' attitudes and behaviors from PR point of view or to better design its customer relations interface to better respond to customer needs, from CR point of view.

Before performing a stakeholder analysis, the first question which should find an answer is: "Whato are the stakeholders of a water company?" Stakeholders are individual people, groups, organizations or communities who, with respect to the business in general, or to a business objective or to a particular project:

- Are involved (could "make or break" the success)
- Benefit (it is done for them)
- Are affected (bear the consequences)

Stakeholder analysis is in this respect, an attempt to identify the key stakeholders, assess their interests in the water company, identify how these interests affect the water company, assess their influence over the water company and identify their current attitude towards it.

Stakeholder analysis – Main questions to be answered

- Who are there, around us?
- What are their interests or expectations with regard to our business, organization?
- What are their beliefs, values, behaviour?
- Positive? Neutral? Negative for us?
- What do we expect from, want from these actors?
- How to influence them?

A stakeholder analysis is a main starting point for determining how a water company can or should interact with its (main) stakeholders. Or in other words, the customer and in particular public relations strategies and actions of the water company should be based on a stakeholder analysis.

These stakeholders and the way the company wishes to interact with them may differ for each water company and it may differ over time. Some stakeholders may be very important during certain moments, but may have less importance one or two years later (e.g. the neighborhood during construction of a wastewater treatment plant). Thus water companies are recommended to periodically make an explicit stakeholder analysis "to see where they are and who is around them". The water company also should be aware of the fact that analyzing stakeholders can touch upon sensitive matters, can deal with indiscrete information and can generate conflicts by revealing certain interests, so discretion and careful handling of information handling and careful communication is required.

A list of imaginable stakeholders for Romanian water companies in included in Appendix G.1. This list should only be taken as an example and for inspiration. A guide on how to develop a stakeholder analysis is included in Appendix G.8., describing the phases, tools and necessary steps to be covered. Appendix G.9. (Guidance on Public Relations) is also including a guidance note on stakeholder analysis and how it can be used in developing a public relations strategy. An example on how to develop a stakeholder analysis for public relation purposes can be find in chapter 2 of Appendix G.11. (Public Relation Strategy for "Apa Dulce" Company). Each water company has to develop its own stakeholder analysis, based on their actual stakeholders and how the water company perceives them.

Guidelines, models and manuals developed by FOPIP 2

- Guide to develop a stakeholder analysis, Appendix G.8.

- Guidance on Public Relations, Appendix G.9.
- Template for a ROC's PR Strategy, Appendix G.11

10.3 Customers Relations, Public Relations and Meter Reading, Billing and Revenue Collection

Commercial aspects like customer relations, public relations and meter reading, billing and revenue collection require the permanent attention of any water company, Romania is not exempt. Moreover, Romanian water companies face three main types of challenges impacting on these functions.

Three main challenges:
- Regionalisation.
- Need for performance improvement, technically as well as financially. Revenue collection is main issue in this.
- Social and economic changes in society. People expect more and different things from the water company. The water company may use these changes to improve its customer relations.

Through specific policies and activities, these challenges need to be addressed by the water companies. A brief description and analyses of the main areas and topics:

a. Regionalization and transfer of customers. Particularly in the case a ROC takes over operations of a local operator, customers need to be properly informed about the changes and more specific, the relation between the customer and the company. Names and logos will change; communication and contact address may also see changes. Contracts with customers need to be re-concluded, but now with the new ROC. Also revenue collection systems (meter reading, billing, collection) may change. But also for existing customers that will not see direct changes in the interaction with the company, the regionalization process needs to be communicated in a more general sense.
b. The regional company and the way it operates. The regional companies differ in their institutional setup and management mechanisms from the old municipal operators. Public authorities, politicians, the various interest groups and mass media have to be properly informed about this and in the way their roles and responsibilities have been modified.
c. Revenue collection process (including meter reading and billing) convenience. Revenue collection processes need to be reviewed and modernized, to become effective and efficient as well as catering to the desire of customers. The practice of monthly reading of water meters should be reviewed for its efficiency and customer convenience. Payment through the banking system and other modern ways of electronic payment should actively be evaluated and utilized where appropriate.
d. Contacts and entry points. The situation that customers will for all their business come in person to the water company's office is old-fashioned. Customers working patterns are changing and they may even not be in a position to come to the company during normal working hours. A twenty-four hours economy and life is emerging. Customers wish to get things done at one place, and at one time and not be channeled from office to office to meet the needs of the water company's employees or as as directed by them. Means of communication are dramatically improving: for example mobile telephone, and internet. Also IT&C applications within organizations can make information available at any desired place: persons do not need to physically transfer information from one place to the other, but information systems can and will do so electronically. Water companies need to address this development and challenge by e.g. streamlining the customer related processes and entry points to the company. Particularly customer services organized as one-stop shop and internet applications (website and electronic interaction) can increasingly play a significant role.

e. General image of the water company. Water companies have often an image of being traditional, dull, bureaucratic and inefficient. Such an image is not conducive for the relations with customers and the public in general. A more positive and modern image should be aimed at.

These above described areas and topics are in varying degrees addressed by water companies. Depending on the needs and priorities of the companies, FOPIP has and is supporting the water companies with these issues through e.g. discussions with management, organizational analyses and design, guidelines and advice as well as training of staff.

10.4 Policy and strategy development for CR and PR

A CR strategy and a PR strategy are:
- Longer-term plans -
- To guide decisions (it gives a framework, but leaves still flexibility)
- Aiming at certain outcomes (it is result-oriented)

► Expresses a "'Firm Intention"' what you want to achieve and how.

The development of a CR and a PR policy and strategy for the water company needs co-operation between top management and the CR & PR experts. The CR and PR policies and strategies are partially the result of a higher-level business plan or strategy. So, the CR and PR policies and strategies are top-down derived from the overall business plans and strategies. On the other hand, the "'field reality"' – results, activities, constraints, needs and challenges – do form important input. That is the necessary 'bottom-up' approach to policy and strategy development.

Strategy development should be carried out in a practical way and in practical terms. The following questions can help to develop strategies on CR and PR.

Strategy development in practical terms
- Time horizon: approximately 3 to 5 years
- What do you want to be, have achieved by then? Policy
- Where are you now? (What is the current situation)
- What to do to achieve your policy? (Decisions, actions, instruments)
- What to do on short term? (Short term objectives for the first 1 – 2 years and action plans)
- What resources do you need? (knowledge, personnel, finance, logistics etc.)

The FOPIP 2 Consultant has developed more guidance on Customer Relations and Public Relations for the ROCs. More details on what are customer relation and public relations policies and strategies, why any ROC needs them and what are the steps to develop them can be found in Appendix G.9. (Guidance on Public Relations) and G.10. (Guidance on Customer Relations). A model for a public relations policy and strategy can be found in Appendix G.11. (Public Relations Strategy for "Apa Dulce" Company). A model for a customer relations policy and strategy can be found in Appendix G.12. (Customer Relations Strategy for "Apa Dulce" Company)

Guidelines, models and manuals
- Guidance on Public Relations, Appendix G9
- Model for a ROC's PR Strategy (Public Relations Strategy for Apa Dulce Company), Appendix G.11
- Guidance on Customer Relations, Appendix G10
- Model for a ROC's CR Strategy (Customer Relations Strategy for Apa Dulce Company), Appendix G.12.

10.5 Organizational setup of customer relations and public relations

10.5.1 Development of commercial function

The commercial function – notably activities on contracts, water sales, revenue collection and customer relations – is an important part of the primary process of the water company. The 'reason of existence' as well as the sustainability of the water company is heavily depending on the performance of the commercial function.

FOPIP has promoted and supported the development and professionalization of the commercial function through properly positioning of the commercial function in the organization chart:

- The direct interaction with customers (e.g. meter reading and revenue collection) will remain to take place in the different operational areas (locations) of the water company, because the water company customer is located in different operational areas. These activities are typical de-central activities.
- Steering and management of the commercial function need to be given shape from regional level. The water company should therefore have a commercial manager and a limited number of specialists in the regional head office structure. The regional management function gives functional guidance and support to the de-centralised commercial function. This regional commercial function deals with e.g. commercial analyses, planning and evaluation, debt management, framework and guidance on billing, revenue collection and customer relations in general.
- For the bigger companies, the commercial manager may be one of the directors, directly reporting to the general director. For smaller companies, the commercial manager may be part of the economic department.
- Some operational activities, such as data entry and bill processing (printing) may be done centrally, at regional level.
- The commercial function has a number of related activities with public relations. Hence, proper co-ordination and mutual support is required.
- IT&C applications are to support these processes and eventual data transfer.

Organization models as promoted by FOPIP 1 include the above sketched setup (see Chapter 7.5).

10.5.2 Public relations function

Public relations can be seen as a separate function of a company, or as an integral part of the commercial function. Most companies recognize clearly the need for a distinct public relations function in the company. Also, most of the companies have to some extent a PR function, although this may be organized not always as a dedicated PR department, but as part of e.g. cabinet or secretariat of the general director, part of the commercial function or of the legal function.

PR remains an important task for the water companies. Particularly with the new regional operators with a new institutional setting and the process of taking other operators under their wings, PR is even more important than for a normal running water company.

A separate note is available on the purpose, tasks and organization of the PR function. This note includes a draft job description for a PR officer.

Guidelines, models and manuals

- Strengthening of the Public Relations function. Appendix G.2.
- Guidance on Public Relations Appendix G9

- Model for a ROC's PR Strategy (Public Relations Strategy for Apa Dulce Company), Appendix G.11.

10.6 Regionalization: the customers' side

Regionalization aims at increased professionalism and improved economies-of-scale for the water sector. It is obvious that also the customer-related activities need to be looked at:
- What will change or need to change as a result of regionalization?
- What improvements can be made with regard to customer processes?

A number of improvements regarding the customer processes may be made even without regionalization. But regionalization may trigger and offer even better and new opportunities to do so. This section will describe the main aspects of regionalization with regard to the customer relations and customer-oriented processes.

10.6.1 A regional company, establishing new relations

For a substantial number of customers, the old service provider will cease to provide water supply and wastewater services and a new one – the ROC - will take over the services.
- In the majority of counties the water company in the county's capital will become the ROC and take over operators that work for the other local councils. Those operators can be a Regia, a local council SC or even a privately owned operator. For the customers in the county capital little will change: their service provider will remain their service provider. It will 'only' expand its service areas to other towns and villages. However, the customers in the other local councils will get a new water company: their old water operator will transfer into the ROC.
- In a few cases, a completely new ROC was or will be established. This new water company will take over all the old water companies. In that case, all the customers will get a new water company.

In all cases, the new regional setup and the new water company have to be properly introduced to the customer. The ROC has to make itself known to its customers, its name should be remembered, relations have to be established or refreshed, the eventual consequences for the customers have to be disseminated.

This all requires public relations and customer information campaigns that are well-tuned to the formal institutional establishment processes: establishment of IDA, establishment of ROC and the signing of the delegation contract. See for details of the formal setup Chapter 2. Customers have to be duly informed prior to the transfer, during the transfer and likely also in a couple of moments after the formal transfer.

Topics

A number of topics will or may have to be dealt with in these information campaigns:
- What is the reason, purpose of the change? (A bigger company, increased professionalism, better services, improved possibilities for expansion)
- Who actually will be my new water company? (Short explanation on formal setup, the governance structure, addresses etc.)
- When will the new ROC take over? (date of taking effect of delegation contract)
- What are the changes for the customers? (name of the company, logo, bills, revenue collection process, contact possibilities etc.)
- What will at least in the short run not change? (e.g. continuity of billing; same persons and processes)
- Steps and timeline in the changes and effects for the customers

- How are the customers' interests safeguarded? (Tariffs: how set and approved? Terms and condition of services: ANRSC)
- What does the ROC expect from the customer, what does the customer need to do (if anything)?

Methods and media

For the information campaigns, the following methods and media can be considered. The list is however not exhaustive.
- Letters to customers
- Leaflets, brochures
- Website
- Mass media (radio, TV, newspaper)
- Posters in public places (e.g. cash offices, premises of water company)
- Information through own personnel (own personnel is to be well-informed!)
- (Increased) presence and expose during public events (local exhibitions and fairs, community meetings); water days, environment days etc.
- Sponsorship of local events
- Open days for new and well-functioning facilities (treatment works, laboratory etc.).

Normally the necessity of the information campaigns should result from stakeholder analysis and the analysis of the current situation, both part of the public relations strategy (see also Appendices G.9. and G.11.). But it might be the case that the water company will initiate the information campaigns before having finalized its public relations strategy. In any case, a communication plan should be developed. A guide on communication plan development together with a model for a communication plan for "Apa Dulce" company is included in Appendix G.13, developed in the FOPIP 2 project.

10.6.2 Contract with customers

The ROC will take over the customers from the old operator. That means that the contractual relation between the customer and the old operator is transferred to the ROC. In principle, the rules and mechanisms for this transfer are duly laid down in the delegation contract (See Chapter 3). In this transfer, the old contract will relatively simply be transferred; there is not something like a formal termination of the old contract and entering into a new one with all individual customers. Also the rights and responsibilities with regard to payment (e.g. debts, credits and down payments) are transferred from the old operator to the ROC.

Yet, a number of matters that may require streamlining and attention:
- Customer identity.

The ROC should work with unique and standardized customer identity. It is likely that the old operators have different administrative systems, hence the way the customers are identified will be different. Also, the geographic identity should be unique: due to integrating various towns and villages, there may be duplicates in names of streets. (Multiple occurrence of e.g. Unirii, Stefan cel Mare, Iancuo de Hunedoara etc.). Customer identity should preferably directly point out the geographic location of the client.

- Streamlining Terms and Conditions

In some cases, there may be differences in the Terms and Conditions of the customer contracts. For the ROC it is of course recommended to work with only one set of Terms and Conditions, not with a series of them. This means that streamlining of these is recommended. In case this can notcannot be done prior to the integration in the ROC this needs to be taken up energetically and with high priority.

- Negotiation of contract for non-domestic customers

With a limited number of customers, the ROC may need renegotiation of the contract. That may be the case for e.g. main industrial customers, institutional customers etc. Reasons may be e.g. environmental compliance (discharge of wastewater).

10.6.3 Billing and revenue collection systems

Regionalisation may form a trigger and reason to review, re-design and adjust the billing and revenue collection systems. The various ‘old’ operators may have different billing and revenue collection systems; streamlining and harmonising of these into one ROC system will usually be desirable. Further, particularly the meter reading, billing and revenue collection systems are often full with traditions which are not necessarily effective and efficient. Last but not least, quite some human resources efforts and hence cost are devoted to meter reading, billing and revenue collection. A close look at the meter reading, billing and revenue collection system and attempting to harmonise and improve these activities is therefore called for. That can be in the interest of the customer as well as the water company.

The meter reading, billing and revenue collection system include the following processes:

- Meter reading: a monthly pattern by meter readers? Or something different?
- Bill processing and printing: central by the ROC headquarters, de-central in each location?
- Bill distribution: which distribution system? Meter readers, postal services or even something different?
- Payment system: cash? At the water company? Involvement of banks? Or other possibilities?

It is important to recognize that whilst the water company may perceive these processes solely as a means of maximizing its incomes, for the customer, these are essential elements of the customer service. Thus, in re-designing the system the water company should take into account the changing role of the meter reading, billing and collection activity. Re-design should start with defining a meter reading, billing and revenue collection policy in order to re-align all the processes to a common goal. Revising the “traditional” policy is necessary in order to introduce better and more modern procedures and to implement more effective, efficient and convenient systems and methods both for the customer and for the water company. Meter reading, billing and revenue collection policy has to be congruent with the customer relations policy, since meter reading, billing and revenue collection are part of customer services. Appendix G.15,developed by the FOPIP 2 Consultant, deals with meter reading, billing and revenue collection policy development, alternatives for re-designing the relevant processes, options analysis and selection for the implementation of the preferred options. Appendix G.3, developed in the FOPIP 1 project also discusses these systems and the available options for re-designing them.

The water companies in Romania have different systems and practices in operation. Also, other public service organizations (electricity, gas, telephone) have similar customer processes. It is worthwhile to take learning and inspiration from these experiences.

Guidelines, models and manuals

- “Revenue collection”, Appendix G.3.
- “Guidance on Meter Reading, Billing and Revenue Collection”, Appendix G.15

10.6.4 Contact with the water company

As a result of regionalisation, the contact possibilities for customers with the water company may change and expand. The customer may be served from other points and by other means than what he was used to. E.g. telephone contacts may not only be handled by the local operator, but also from central level. This may be the case when a regional ‘call centre’ is established that deals with all telephone calls from customers through the whole service area. Dispecerat (dispatcher) may cover the operations in more than one town. It may also include visiting the customer service office in town A regarding a connection elsewhere in the service area of the ROC. Procedures and information systems may allow for that and make it possible.

Apart from the convenience to the customer, these contact possibilities can greatly contribute to the effectiveness and efficiency of the water company.

Contact with the water company is particularly important from the customer relation point of view, since customer relations are dealing with the end-to-end processes (processes initiated by the customer and having a result for the customer). To initiate an end-to-end process, the customer has to contact the water company, so in this respect the water company must strive to make contact by the customer as easy and as friendly as possible and has to take advantage of the new Internet and mobile technologies to open new contact channels for the customers.

10.7 Revenue collection

General

The revenue collection process (including meter reading, billing and revenue collection) is a crucial process for the water company as well as its customers. Revenue collection commonly consists of meter reading, billing and collection of payments.

Revenue collection process

- Determining the volume of water used (meter reading)
- Data entry
- Bill preparation (verification, calculation of volumes, tariffs etc.)
- Bill printing
- Bill distribution
- Payment by customer

The revenue collection process is frequently the only regular occasion in which interaction takes place between the water company and the customer. The image of the water company is heavily conditioned by what the customer perceives with regard to the revenue collection process. The water company should therefore make the greatest effort to streamline and organise this process into a user-friendly convenient, effective and efficient experience.

Further, the revenue collection process forms a considerable process in terms of manpower, organization, logistics and other resources. Cost control of this process is hence urgently called for.

Water companies in Romania are quite different with regard to their revenue collection systems. Where some companies are well-advanced and modern, other companies are still rather traditional in their ways of revenue collection and customer relations. It was observed that quite some companies – even the better and modern ones – can still improve and streamline their revenue collection processes. That is in the interest of both the customers and the company itself.

Changing situations, possible improvements

Technologies are changing. Customers' situations, preferences and behaviour are changing. Society is changing. Cash transactions are gradually being replaces by bank transactions and are likely to move further to electronic transactions. There are therefore various reasons and circumstances that can lead to the conclusion that what was perhaps 5 years ago an appropriate revenue collection system is not longer appropriate and may even be becoming obsolete. The water company has periodically to review whether their revenue collection systems are still adequate and properly geared up to modern demands and possibilities.

In the review and re-design of the revenue collection process, one should look at the whole process rather than trying to optimize a single step. E.g. a change of reading pattern from monthly to quarterly or even annually may also relate to and have consequences or possibilities for different billing and payment systems.

Also review and re-design has to be done by keeping in mind that the process should also become a customer oriented process and not only company oriented. There is no point in reviewing and re-designing the process without having a goal for doing that, so formulation of an appropriate policy is important for the following reasons:

- The process secures the main cash source of the company and can generate problems in the day to day company operations, due to insufficient revenues and/or inadequate cash flow
- The process uses significant resources in terms of logistics, staff, equipment and others, thus generating significant costs for the water company
- The process allows the company to interact regularly with its customers and get a valuable feed-back from the clients who can be used to improve services and customer relations.
- The way the process is dealt will have an important impact on company image, determining if the customers will regard the water company as a modern and efficient one or not.
- New technologies with increased efficiency and effectiveness and more adapted to customer needs are available bringing benefits both to customers and water companies.
- Customers' preferences and habits are constantly evolving and changing together with their life style, so constantly evolving systems, methods and technologies have to be adopted to fit the new customer needs.
- Regionalization and increasing the scale of operations require new solutions for the various particular situations that may occur while applying unified principles and standardized procedures and practices for the process.

An example of a meter reading, billing and revenue collection policy can be found in Appendix G.15 and is quoted below:

"Metering, billing and revenue collection are processes that use important resources and impact significantly on our customers, so our metering, billing and collection policy is to develop and implement such systems and to use such methods and technologies that can provide our company with the necessary cash in time to sustain our business and can best satisfy customers needs and preferences related to these activities. We will do this by taking into account that systems, methods, technologies and customers' habits change overtime and that the preferred alternative to achieve our policy has to be feasible from business and from company's staff point of view"

Meter reading

Meter reading is commonly done by water meter readers in a monthly pattern. However, one can also consider:

- Quarterly or yearly reading
- Reading by customers (who submit the readings to the water company by mail, phone, internet or personal visit).

Change of the reading methods and patterns has a considerable effect on the cost involved.

Bill processing and printing

Particularly in view of the regionalisation and professionalization of the water companies, it is likely that gradually centralised bill processing and printing will take preference rather than decentralised processing and printing. At central level, equipment and conditions may be far better and better organised than could be at local levels. Also, links with financial systems (accounting) and reconciliation with bank payments are easier to make than at de-central/local levels.

Bill distribution

Distribution of bills can be done through different ways.

- Distribution by meter readers
- Other water company staff
- Postal services
- Courier
- Sharing with other service utilities (e.g. gas, heating, electricity. Then often also joint payment)
- E-mailed bills.

In many cases, it is still the water company itself that distributes the bills, either by meter readers or other staff. Often, this is not the most cost-effective way. Postal services and couriers may offer competitive rates for bulk mailing. Outsourcing of distribution needs to be considered, certainly in view of the increased scale of operations of the water companies. Also, customers may perceive a bill neatly delivered by postal services or courier as ‘modern’ and efficient compared to delivery by the water company itself.

Payment methods

For some water companies, domestic customers pay their water bill in cash at a pay point (cash office) of the water company. There are however a number of alternatives available which require consideration and/or promotion. Notably a change from cash transactions to bank-based transactions is recommended.

- POS transaction at the water company’s office
- Cash payment at post offices and banks
- Bank transfer
- ATMs
- Direct debit with banks
- Standing order to water company
- Payment at certain commercial agents (e.g. big stores, gas stations)
- Pre-paid systems
- Door-to-door collection (however, in general not recommended)

Change of revenue collection system, additional measures.

A change of revenue collection system and practices may require a number of additional measures to be taken by the water company. These may be e.g.:

- Adjustment of the customer database and billing system.
- Renewal and updating the general terms and conditions of services.
- Revision of individual contracts with customers
- Information campaign to the customers
- Promotional measures to stimulate customers to use new systems (e.g. presents, discounts)
- Information to the water company's own personnel.

Guidelines and manuals

- The Guideline 'Revenue collection' developed in FOPIP 1 project discusses the whole revenue collection system and options in more detail. Appendix G.3.
- The Guideline "Guidance on Meter Reading, Billing and Revenue Collection" developed in FOPIP2 project in Appendix G.15. also discusses in more details process policy setting and alternatives to be considered.

10.8 Access to and contact with the water company

In general, customers appreciate smooth access and exchange of information with public services organizations, also water companies. Customers have less and less time to come in person to the water company for business. Further, working hours and business premises of the water company may not be convenient for the customer. Also, modern information systems enable the companies to serve the customers more directly and on one location rather than requiring the customer to go to different places or to come back at different moments. Finally, the scale of the water companies – from locally to regionally – in some cases require re-arrangements in order to operate effectively and efficiently in its customer relations. For the water company these aspects lead to the need to review and re-design the whole customer relations process, having in mind the central aspect of the customer interactions with the water company.

Review, re-think and re-design the ways your customers interact and communicate with the water company.

- Speed
- Convenience
- Business hours
- Places (in person, telephone, mail, e-mail, internet)
- Number of interactions (how many times for solving one matter).

As for reviewing and re-designing the revenue collection process, reviewing and re-designing the customer relation process needs to be guided by a goal, so formulation of a policy and strategy beforehand is recommended. Guidance in customer relation policy and strategy formulation is given in Appendix G.10. and a model of a customer relations policy and strategy is given in Appendix G.12.

The recommended main ways to streamline the access of customer to the water company and exchange information are the following:

1. Payment by banks

Increasingly, customers prefer to pay by the banking system rather than at the cash offices of the water companies. Some water companies already implement payment by banking system to a large extent. (Then often, the cash office shows predominantly older people that are not used yet to banking systems or prefer to pay by cash as a matter of routine, socializing). Payment by bank allows customers to pay at more places than only the cash office of the water company. Payments may be made through the whole nation or even from abroad.

2. One-stop shop concept

For the customer contacts, customers appreciate in general to have one clear place where all the business can be dealt with. In such a one-stop shop concept, the water company has one 'counter' – help desk - for the physical visitors and deals with the customer there. All information is available at that counter or, alternatively, the water company will solve the matter back office. Such a one-stop shop is advantageous for the customer because he does not need to transfer himself to the different officials/departments of the water company.

One-stop shop requires re-arrangement of the tasks and processes, including information systems, within the water company. Re-designing the end-to-end processes of the water company in order to implement the "one stop shop" concept, can lead to re-designing of some other interrelated business processes. More information on this can be found in Appendix G.14. (Support document regarding the customer relations processes), developed by the FOPIP 2 Consultant. For the employees, this can be advantageous because the package of tasks can be far broader and more interesting. Also, the employee will deal with the client 'from begin to end' and not only a single step in the process. That increased responsibility with the employee is in general in the interest of the company, the client and the employee. Also the water company should dedicate a proper location for the help desk office, central and in the same time easily accessible for the customers by individual or public transportation means. Parking place, queue management systems, audio-visual or information giving systems, toilets, a waiting area and adequate facilities for disabled people should also be considered.

3. Customer phone services

Integration of the telephone contacts with customers through one central point is recommended. This central point – call centre – will in principle handle all telephone questions, complaints or suggestions of customers and only in incidental cases transfer these to other offices. A proper information system with customer information should be available. Office hours may be extended, e.g. to late afternoon-early evening to serve the customers. Outside office hours, the dispatch office (dispecerat) will deal with the incoming calls, but only for emergencies.

Proper informing the customers on the appropriate telephone numbers and office hours is needed, e.g. on the bills, signboards, telephone books and website. It is preferable for the convenience of the customer that the water company has one dedicated telephone number which automatically directs the call to the free customer operator in the call centre. If possible, a green line (TelVerde) should also be made available for the clients.

4. Websites

Websites and particularly interactive communication may greatly streamline customer relations, particularly for more distant customers and outside normal working hours. Also, peak hours through phone services and physical offices may be reduced by offering website communication. Websites can provide lots of information on the water company, its procedures and answers to questions. Further, by an interactive website (e.g. e-mail communication, meter readings from customers) customers may provide specific questions and information to the water company. Websites can also be a valuable tool for the complaint handling process, by providing a dedicated page to the customers. Alternatively, websites can host secured pages for online payments made by the customers. More information on websites can be found in section 10.9.

Guidelines and manuals

- Guideline ‘Revenue collection’ Appendix G.3. and Appendix G.15 (Guidance on Meter Reading, Billing and Revenue Collection) discusses payment systems in detail.
- Guideline ‘One-stop shop concept for customer services’. Appendix G.4.
- Guideline “Guidance on Customer Relations” Appendix G.10
- Model “Customer Relations Strategy for Apa Dulce Company” Appendix G.12
- “Support document regarding the customer relations processes”, Appendix G.14

10.9 Websites

Websites are regarded as one of the main ways of interaction between the water companies and its customers and general public. It was observed that the FOPIP 1 and FOPIP 2 companies have to a very different degree functioning websites. A brief summary is given below.

Table 10.1: Websites of Water Companies included in FOPIP I & FOPIP II

County/operator	Website	Access (easy, logic to find)	Quality of information	Interactive	Bill Payment online	Complaints & other online	Languages
FOPIP 1							
Arges SC Apacanal 2000 SA	http://apacanal2000.ro/	+	++	+	No	No	RO
Brasov SC Compania de Apa Brasov SA	http://www.apabrasov.ro/	++	++	++	No	Yes	RO, EN
Buzau SC Compania de Apa SA	http://www.cabuzau.ro/	+	+	+	Yes	No	RO
Deva-Hunedoara SC ApaProd SA	http://www.apaprod.ro/	0	+	0	No	No	RO
Galati SC Apacanal SA	http://www.apa-canal.ro/	+	+	+	No	No	RO
Maramures SC Vital SA	http://www.vitalmm.ro/	0	0	+	No	No	RO
Mehedinti SC SECOM SA	No website	-	-	-	-	-	-
Neamt SC Apaserv SA	http://www.apa-serv.ro/	++	+	+	No	Yes	RO, EN
Satu Mare SC Apaserve SA	http://www.apaservsm.ro /	+	+	+	No	Yes	RO, HU
Sibiu SC Apacanal SA	http://www.apacansb.ro/	+	+	+	No	Yes	RO
Tulcea SC Aquaserv SA	http://www.aquaservtulcea.ro/	+	0	0	No	No	RO
Valcea SC Acvarim SA	http://www.acvarim.ro/	0	0	0	No	No	RO
Valcea SC Apavil SA	No website	-	-	-	-	-	-

County/operator	Website	Access (easy, logic to find)	Quality of information	Interactive	Bill Payment online	Complaints & other online	Languages
FOPIP 2							
Alba Apa CTTA Alba SA	http://www.apaalba.ro/	+	+	0	No	Yes	RO
Bacau SC Compania de apa Bacau SA	http://apabacau.ro/	+	0	0	No	No	RO
Bacau SC Apaserv Bacau SA	http://www.apaserv.ro/	0	0	0	No	No	RO
Botosani SC Apa Grup SA	http://www.apagrupbotosani.ro/	0	0	0	No	No	RO
Braila SC CUP Dunarea Braila SA	http://www.apabraila.ro/_	0	0	0	No	No	RO
Calarasi SC Ecoaqua Calarasi SA	http://www.ecoaqua.ro	0	0	0	No	No	RO
Caras Severin SC Aquacaras	http://www.aquacaras.ro/	0	+	0	No	No	RO
Cluj SC Compania de Apa Aries SA	http://www.caaries.ro/index.php	++	++	++	No	Yes	RO
Covsana SC Goscom SA	http://www.apa-sfantugheorghe.ro/	+	+	+	No	Yes	RO, HU
Dambovita SC Compania de apa Targoviste SA	http://catd.ro/	0	+	0	No	No	RO
Giurgiu SC Apa Service SA	No website	-	-	-	-	-	-
Gorj SC Aparegio Gorj SA	http://www.aparegio.ro/	+	+	+	No	No	RO
Harghita SC Harviz SA	No website	-	-	-	-	-	-
Hunedoara	No website	-	-	-	-	-	-

County/operator	Website	Access (easy, logic to find)	Quality of information	Interactive	Bill Payment online	Complaints & other online	Languages
SC Apa Serv Valea Jiului SA							
Olt SC Compania de Apa Olt SA	http://www.caolt.ro/	0	0	0	No	No	RO
Prahova SC Hidro Prahova SA	http://www.hidroprahova.ro/	+	0	0	No	No	RO
Sibiu SC Apa Tirnavei mari SA	http://www.apatarnavei.ro/	++	+	+	No	Yes	RO
Suceava SC ACET Suceava SA	No website	-	-	-	-	-	-
Teleorman SC Apa Serv SA	No website	-	-	-	-	-	-
Vaslui SC Aquavas SA	No website	-	-	-	-	-	-
Vrancea SC CUP Focsani	No website	-	-	-	-	-	-

Qualitative assessment with 0 (low/poor), + (average) and ++ (good).

Based on the assessment, the water companies were given feedback with regard to their website. A form indicating the possible information a website may contain is provided in Appendix G.5.

10.10 Getting information: organizing CR and PR reviews, feedback and suggestions

Keeping in touch with the customers and the public is of vital importance for the water company. The water company should not just be reactive, but should have a pro-active attitude in getting to know customers' and public's opinions, ideas, perception, desire and preferences. Getting that information is part of CR and PR; the CR and PR departments should organise themselves for it. This means: listening to and inviting the stakeholders to comment. Also, this means taking stock of performance through indicators and benchmarks.

Common ways are:
- Complaints and suggestion procedures
- Customer appreciation surveys
- Focus groups
- Benchmarking & indicators

Complaints and suggestions

Complaints handling is one of the end-to-end processes belonging to the customer relations function. Besides handling the complaints, much can be learnt from complaints and suggestions from customers. Apart from corrective actions after 'errors', it may also indicate areas where improvements may be possible.

Complaint

> ***The customer has a problem and although it may even be a perceived problem, he/she may be right!***

Often, there is a sliding scale between 'complaints', 'suggestions' and even 'requests'. What in first instance may be seen as a complaint is often a suggestion or request for something different that was actually offered.

Complaints and suggestions
- Corrective and re-active: to take individual corrective measures for the customer for cases were performance of water company was below standards.
- Preventive and pro-active: to take learning for future improvements, to review and perhaps change organizational arrangements.

Handling complaints and suggestions should therefore also be done tactfully. It requires also skilled staff that does not only know the current standards and procedures, but is also sensitive and open to other ideas and perceptions.

Customer appreciation surveys

Customer appreciation surveys are systematic investigations about customers' experiences, appreciation and ideas. These surveys can be conducted through e.g. interviews, written survey, telephone calls or website surveys.

For most purposes, the water company does not need ‘scientific levels’ of customer appreciation and ideas. So, one does not need response from all customers or samples of a couple of hundreds. Usually, one can already get a pretty fair idea through responses from a sample of 100 – 200 customers. In case these surveys are conducted regularly, one will see the customers’ appreciation and ideas over time. When desired, additional questions can be asked or surveys may be conducted.

Focus group discussions

The water company can invite (or invite itself) with selected target groups of stakeholders. Semi-structured discussions can be held with these ‘focus groups’ on selected topics of common interest. Focus groups may be e.g. association of owners, industrial clients, the health institutions, food and beverage industry, rural clients. Also non-customer focus group discussions can be held.

Although the water company should facilitate these dialogues, its role is particularly to listen to the responses. Focus group discussions may be very useful for topics were opinions, perceptions are perhaps less obvious and structured and where one has to analyze and ask deeper questions. Focus groups can also reveal refreshing and alternative insights, if properly facilitated.

Benchmarking and indicators

Use of indicators may assist the CR and PR function on getting more insights. Indicators can be used internally in the water company, whereas benchmarking are external indicators that allow for comparison with other water companies.

Indicators should preferably be linked to and reflect the company’s customer relations performance standards.

Indicators and benchmarks however do not tell you directly what is the case, problem or expectation; they can assist in ‘that something may be the case’ and that you may have a deeper look into it.

It is recommended when developing a CR and a PR strategy that the water company defines performance indicators and target standards to be achieved in a certain period of time. Looking into the current level of the indicators, defining measures that enable the water company to reach the targeted standards and monitoring the evolution in time of the indicators will help the water company to improve its CR and PR functions. More on CR and PR indicators and standards can be found in Appendix G.9. and G.11. for PR and Appendix G.10 and G.12. for CR.

Guidelines, models and manuals

- Guidance on Public Relations Appendix G9
- Public Relations Strategy for Apa Dulce Company, Appendix G.11
- Guidance on Customer Relations Appendix G10
- Customer Relations Strategy for Apa Dulce Company, Appendix G.12

10.11 Complaints and suggestion procedures

Most of the companies do have a complaints (and suggestion) procedure, often as part of their quality management system. These procedures state the various steps in handling these complaints and suggestion as well as time lines for solving these. Also, seeing the internal reports from e.g. customer departments and dispatch offices (dispecerat), customers appear to find the way to the water company. In addition, the water companies have to report their 'complaints' regularly to the national supervising agency ANRSC. In that sense, most companies have working complaints and suggestion procedures and there is little need in drafting procedures and/or addressing the possibility for customers to file a complaint or suggestion.

Two issues are however to be addressed for improvement, both about how the company internally deals with the complaints and suggestions.

- In many procedures, the complaints are – at least officially – partially dealt by the general director, usually for decision who will deal with it and/or a formal signature on letters to customers. Whereas such may be appropriate for very sensitive issues, for the majority of complaints that high-level attention is not necessary and not desired. Additionally, such procedure may be possible in small one-location companies, but is not appropriate anymore in a multi-location regional company. Some companies reported to deviate often from the formal procedure in order to deal directly with the complaints at lower and more appropriate levels and functions. That as such is a recommendable move and arrangement, but is not in line with the formal procedure. Re-thinking and re-design of the procedures to make these more efficient and actually followed in practice is therefore called for.
- None of the companies avails of a systematic, proper analyses and 'learning system' regarding complaints and suggestions. The complaints and suggestions are individually dealt with and statistics are kept, mainly for external reporting. However, there is little sign of organizational learning by systematic analyses, drawing conclusions and putting forward recommendations to improve systems and procedures of the company.

Guidelines and manuals

- Guideline 'Complaints analyses'. Appendix G.7

10.12 Customer information and education programmes

When developing a public relation strategy, the water company may come to the conclusion that customer information and educational programmes are required in order to achieve the PR policy goals. The type and contents of these programmes will depend on the particular situation of the company reflected in its PR objectives.

Notably the following topics/areas can be part of such programmes:

- Campaigns on proper water use and environmental management (e.g. water saving, discharged wastewater quality)
- Working of the water company (technology, organization). This may particularly be directed to develop understanding of the functioning of the public service company with the general public and customers.
- Open House days for the general public to e.g. water treatment plant, wastewater treatment plant, laboratory.
- Changes of billing and revenue collection procedures.
- Education of school children, as part of developing environmental consciousness.
- Information on the regionalization, notably local operations brought under an umbrella of a regional operation and the consequences for customers.
- Information to public authorities, public officials and politicians regarding the way of working of the water company.

It is very important that before the water company starts consuming resources for these customer information and education programmes, the scope, the objectives and the communication objectives which will be achieved through these programmes are clearly defined. Communication plans and campaign plans should be developed beforehand, in order to achieve these objectives within the available budget. More information on PR strategies, objectives and communication plan development can be found in Appendix G.9. and G.13.

The water company of Pitesti (SC Apacanal 2000) has developed and implemented an interesting programme for school children. Such programmes may be replicated in other companies too.

Guidelines, models and manuals

- "Guidance on Public Relations", Appendix G.9.
- "Guide Regarding the Communication Plan", Appendix G.13.

Appendix A: Appendices to Chapter 3

A.1 Template Constitutive Act and Statue of the Intercommunity Development Association

A.1.1 Draft Constitutive Act of IDA

This Appendix has been included in the FOPIP 1 version of the Manual and it has not been amended. For details, please see its electronic version.

A.1.2 Decision no 855 from 2008-10-22

This Appendix has been included in the FOPIP 1 version of the Manual and its contents have not changed. For details, please see its electronic version.

A.2 Template for the Incorporation Act of the Regional Operating Company (ROC)

This Appendix has been included in the FOPIP 1 version of the Manual and it has not changed. For details, please see its electronic version.

A.3 Template Delegation Contract for the Water and Wastewater Service's Management

This Appendix has been included in the FOPIP 1 version of the Manual and has not been amended. For details, please see its electronic version.

Appendix B. Appendices to Chapters 4&5

B.1 Tools and Techniques – applications and examples

BRAINSTORMING

What is it

Brainstorming is a means of getting a large number of ideas from a group of people.

What can it be used for

- When there is a need to identify a large number of ideas or options
- When looking for innovation
- When looking for process improvement
- To stimulate meetings when progress is stagnant

How to do it

1. State the problem and check everyone understands it
2. Choose a scribe to write down all the suggestions
3. Write de topic to be brainstormed at the top of a flip chart
4. Get the group to put forward their ideas, maintaining the following guidelines:
   a. Do not debate suggestions, even those that seem silly or inappropriate
   b. Generate and record as many ideas as possible
   c. Cross fertilise – pick up on diverse suggestions
   d. Get everyone to contribute
5. If the session appears to be drying up pick on the wildest idea and see if that generates more

Points to remember

- All ideas should be recorded
- Do not discard wild or silly ideas
- If necessary have a warm up session to get the group to relax
- Do not drag the session out when it has dried up

EXAMPLE OF BRAINSTORMING

Reducing the level of debt

REDUCING THE LEVEL OF DEBT

- Reduce charges
- Customer education
- Disconnection
- Ration water
- Easy payments
- Slot meters
- Banded charges
- Social assistance
- Council help
- Reduce debtor days
- Incentives for early payment
- Prosecute for non payment
- Charge based on family income
- Utility welfare fund
- Provision for bad debt
- Introduce metered standpipes
- Prize draw for prompt payment

AFFINITY DIAGRAM

What is it

This tool is used to gather ideas, opinions and issue and organise them into based on the natural relationship between each idem.

What can it be used for

- When a team is faced with a large number of ideas
- When wide ranging issues need to be identified
- In resolving chaotic situations

How to do it

1. Follow the same principles as for brainstorming
2. Record all suggestions on a flip chart and then transfer each item onto a 'post-it'
3. Then post all 'post-its' randomly on a wall

4. All participants arrange the 'post-its' into naturally occurring groupings. This should be done in silence
5. The participants then decide generic headings
6. Place the 'post-its' under their generic headings.

Points to remember

- Put all suggestions on 'post-its'
- People should be allowed free access to group the 'post-its' at will
- Try to establish broad groupings for the generic headings

EXAMPLE OF AN AFFINITY DIAGRAM

What parts of the business would we like to see improved?

Training	Finance	Customer service	Operations	People Issues
Foreign language	Reduce debt	Reduce complaints	24 hr water supply	Incentive schemes
	Improve cash flow	Be customer friendly	Reduce discolouration	PRD
	Maximize income	Speed of response	Reduce leakage	Recognition
	Increase profit	Education	Improve taste of water	Lines of communication
	Computer systems	Give customers what they want	Improve final effluent	Canteen facilities
	Reduce billing errors	Improve standard of service provided		Conditions of service

HISTOGRAM

What is it

A Histogram is used to show data is spread across a range of pre-selected values or ranges. It is also known as a frequency distribution.

What can it be used for
- To show the spread of data
- To determine means of distribution frequency

How to do it
- Collect data and establish how many items there are.
- Establish the range of data.
- Divide the data into a number of ranges, the following table can be used as a guide:

No. of items of data	Number of ranges
0 – 49	5 – 7
50 – 99	6 – 10
100 – 249	7 – 12
250 +	10 - 20

- Construct a frequency table for the data collected (see example).
- Draw the diagram based on the frequency table (see example).

Points to remember
- The number of classes will dictate how clearly a pattern will emerge
- There may not necessarily be a pattern
- Look out for irregularities in the histogram and verify data for accuracy
- If there is more than one pick, there may be more than one contributing factor

EXAMPLE OF A HISTOGRAM

Age distribution of an organisation

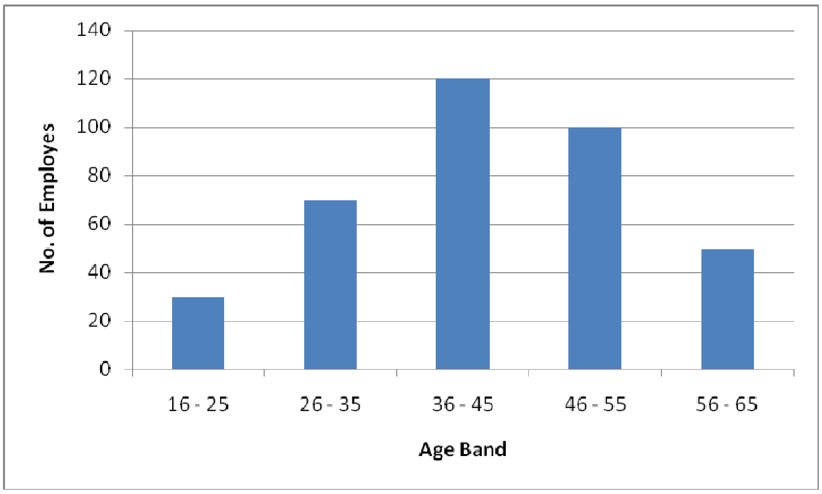
An organisation wants to look at the age profile of its workforce. The data collected produces the following frequency table and histogram:

Frequency table

Age Band	No. of Employees
16 – 25	30
26 – 35	70

Age Band	No. of Employees
36 – 45	120
46 – 55	100
56 – 65	20

Histogram



CAUSE AND EFFECT ANALYSIS

What is it

Cause and effect analysis breaks a problem down into its component parts. The individual elements of each component are built up in diagrammatic form to resemble the skeleton of a fish.

What can it be used for

- To enable team members to use their expertise to identify the causes of a problem
- To provide ideas for data collection

How to do it

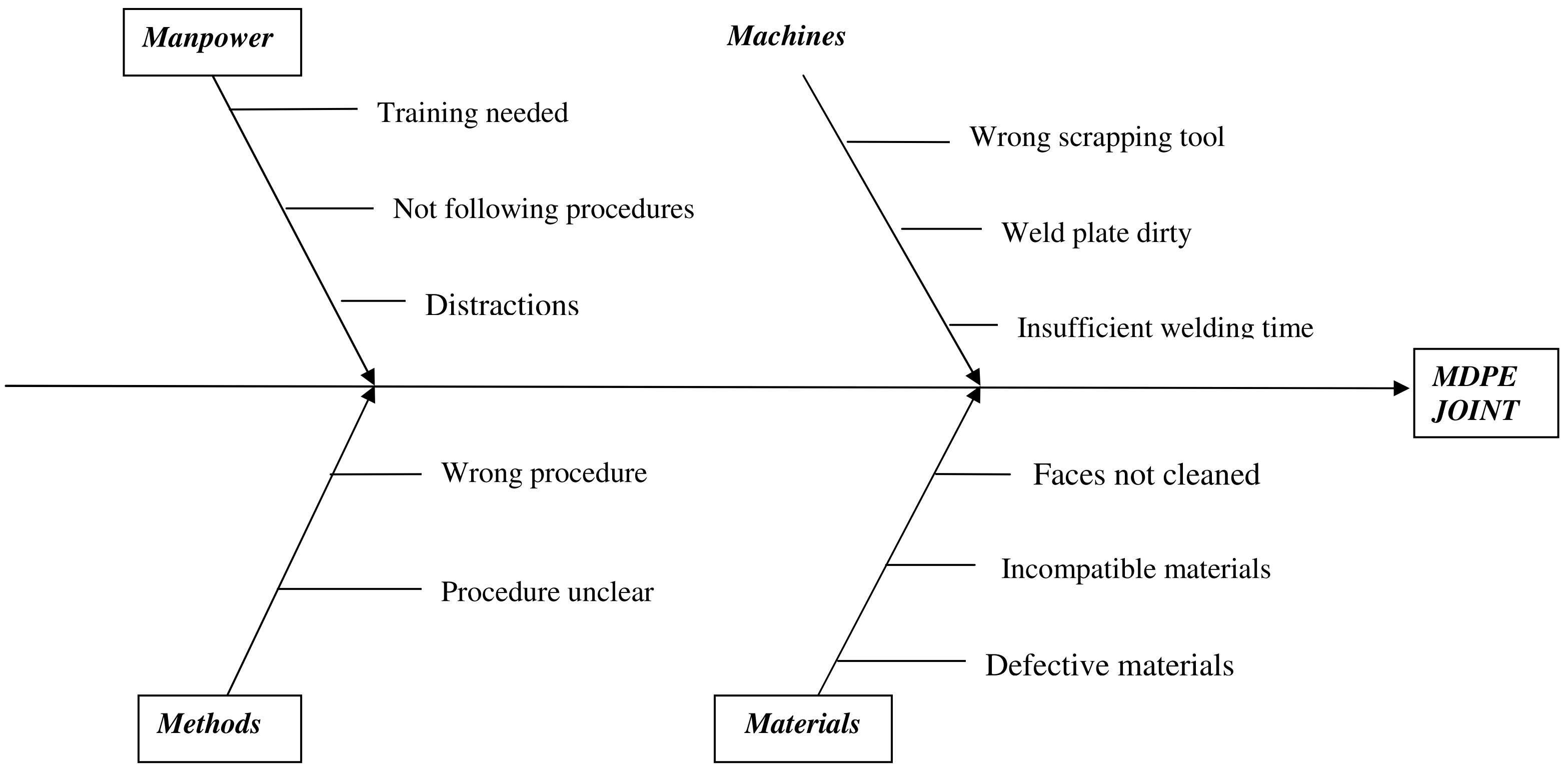
- Write down the problem in a box on the right hand side of a flip chart.
- Draw arrowed lines to represent the main framework. The framework will typically have four main categories, manpower, machines, methods and materials, but there can be more.
- Brainstorm the categories and add to the skeletal framework.
- Gather and evaluate data on the individual causes identified in 3.

Points to remember

- Use the rules as in brainstorming to ensure everyone contributes
- Display diagrams publicly so that they can be added to
- Additional cause and effect diagrams can be developed to break problems down further.

EXAMPLE OF CAUSE AND EFFECT ANALYSIS

MDPE joint failures



FLOWCHARTS

What is it

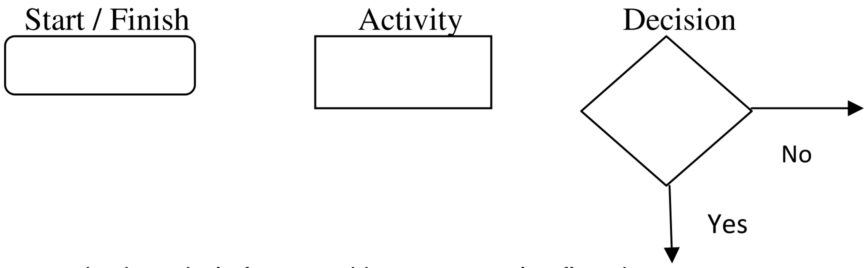
A flowchart is a representation of the steps in a process using standard symbols.

What can it be used for

- To identify the path that a process or produce follows to enable deviations to be identified
- It can often uncover gaps in the understanding of a process
- It can reveal unnecessary or duplications in a process, thereby enabling processes to be simplified

How to do it

- Understand simple flowchart symbols:



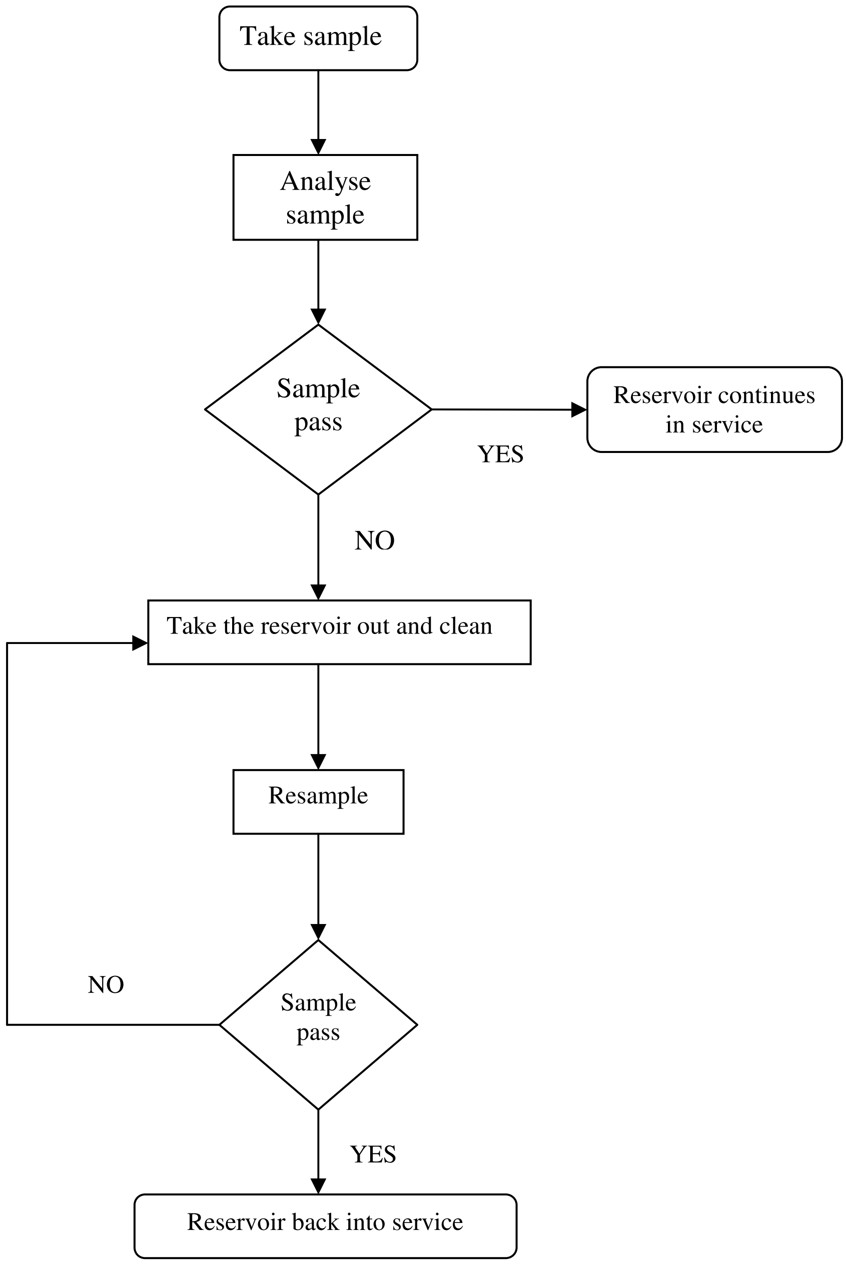
- More standard symbols for use with more complex flowcharts.
- Draw a flowchart that reflects the steps actually taken.
- Evaluate the flowchart to see where improvements can be made.

Points to remember

- Define the boundaries of the process clearly
- Stick to the three simple flowchart symbols if possible

EXAMPLE OF A FLOWCHART

Reservoir sampling action flowchart


Take sample
Analyse sample
Sample pass
YES
Reservoir continues in service
NO
Take the reservoir out and clean
Resample
NO
Sample pass
YES
Reservoir back into service

PARETO ANALYSIS

What is it

Pareto Analysis is a technique that enables the major problem areas to be easily identified. It is a special form of bar chart that helps determine which problems to be solved in what order.

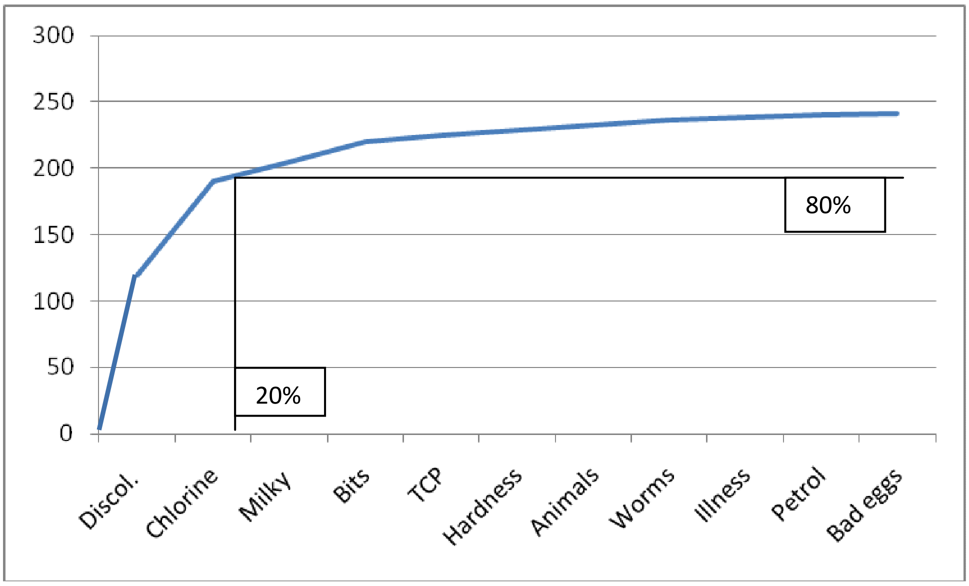
What can it be used for
- To prioritise the order in which problem areas should be tackled
- To further enhance other techniques such as brainstorming and cause and effect analysis

How to do it
- List the errors, costs or activities being analysed with their respective incident occurrence alongside.
- Convert the occurrences to percentage of the total so that they make up 100% overall.
- Construct a bar chart with the scale on the vertical axis on the left side indicating number of occurrences, the vertical scale on the right side, percentage, and on the horizontal axis, the incidents categories. The horizontal axis should plot from the highest number incidents from the left to the lowest on the right.
- The Pareto Diagram is completed by plotting the incidents against each category.

Points to remember
- The major problems occur on the left hand side of the diagram where the slope is steepest. These should be tackled first
- Quite commonly 80% of problems occur over only 20% of categories.

EXAMPLE OF PARETO ANALYSIS

Water quality complaints
- Discolouration 120%
- Milky water 15
- Animals in supply 4
- Chlorine taste 70
- TCP taste 5
- Illness in house 2
- Bad eggs smell 1
- Petrol smell 2
- Worms in supply 3
- Hardness 4
- Bits in supply 15



B.2 European Benchmarking Code of Conduct

EFQM (formerly the European Foundation for Quality Management)
The European Benchmarking Code of Conduct – 2007 (http://www.efqm.org/en/tabid/127/default.aspx)

Introduction

Benchmarking – the process of identifying and learning from Good Practices in other organisations – is a powerful tool in the quest for continuous improvement and performance breakthroughs. The authors and sponsors have produced this European Code of Conduct to guide Benchmarking encounters and to advance the professionalism and effectiveness of Benchmarking in Europe.

It is based upon the Code of Conduct used by APQC and the wording has been modified to take into account the requirements of competition law. The layout and presentation have also been modified to provide a more positive chronological approach.

Adherence to this Code will contribute to efficient, effective and ethical Benchmarking.

1. Principle of Preparation

1.1 Demonstrate commitment to the efficiency and effectiveness of Benchmarking by being prepared prior to making an initial Benchmarking contact.

1.2 Make the most of your Benchmarking partner's time by being fully prepared for each exchange.

1.3 Help your Benchmarking partners prepare by providing them with a questionnaire and agenda prior to Benchmarking visits.

1.4 Before any Benchmarking contacts, especially the sending of questionnaires, take legal advice.

2. Principle of Contact

2.1 Respect the corporate culture of partner organisations and work within mutually agreed procedures.

2.2 Use Benchmarking contacts designated by the partner organisation if that is its preferred procedure.

2.3 Agree with the designated Benchmarking contact how communication or responsibility is to be delegated in the course of the Benchmarking exercise.

Check mutual understanding.

2.4 Obtain an individual's permission before providing his/her name in response to a contact request.

2.5 Avoid communicating a contact's name in an open forum without the contact's prior permission.

3. Principle of Exchange

3.1 Be willing to provide the same type and level of information that you request from your Benchmarking partner, provided that the principle of legality is observed.

3.2 Communicate fully and early in the relationship to clarify expectations, avoid misunderstanding, and establish mutual interest in the Benchmarking exchange.

3.3 Be honest, complete and timely with information submitted.

4. Principle of Confidentiality

4.1 Treat Benchmarking findings as confidential to the individuals and organisations involved. Such information must not be communicated to third parties without the prior consent of the Benchmarking partner who shared the information.

When seeking prior consent, make sure that you specify clearly what information is to be shared, and with whom.

4.2 An organisation's participation in a study is confidential and should not be communicated externally without their prior permission.

5. Principle of Use

5.1 Use information obtained through Benchmarking only for purposes stated to and agreed with the Benchmarking partner.

5.2 The use of communication of a Benchmarking partner's name with the data obtained or the practices observed requires the prior permission of that partner.

5.3 Contact lists or other contact information provided by Benchmarking networks in any form may not be used for purposes other than Benchmarking.

6. Principle of Legality

6.1 Take legal advice before launching any activity.

6.2 Avoid discussions or actions that could lead to or imply an interest in restraint of trade, market and/or customer allocation schemes, price fixing, dealing arrangements, bid rigging or bribery. Do not discuss costs with competitors if costs are an element of pricing. Do not exchange forecasts or other information about future commercial intentions.

6.3 Refrain from the acquisition of information by any means that could be interpreted as improper, including the breach, or inducement of a breach, of any duty to maintain confidentiality.

6.4 Do not discuss disclose or use any confidential information that may have been obtained through improper means, or that was disclosed by another in violation of a duty of confidentiality.

6.5 Do not, as a consultant, client or otherwise pass on Benchmarking findings to another organisation without first getting the permission of your Benchmarking partner and without first ensuring that the data is appropriately 'blinded' and anonymous so that the participants' identity are protected.

7. Principle of Completion

7.1 Follow through with each commitment made to your Benchmarking partner in a timely manner.

7.2 Complete a benchmarking effort to the satisfaction of all benchmarking partners as mutually agreed.

8. Principle of Understanding and Agreement

8.1 Understand how your Benchmarking partner would like to be treated, and treat him/her in that way.

8.2 Agree how your partner expects you to use the information provided, and do not use it in any way that would break that agreement.

9. Benchmarking with Competitors

The following guidelines apply to Benchmarking with both actual and potential competitors:

- In Benchmarking with actual or potential competitors, ensure compliance with competition law. Always take legal advice before benchmarking contact with actual or potential competitors and throughout the benchmarking process. If uncomfortable, do not proceed. Alternatively, negotiate and sign a specific nondisclosure agreement that will satisfy the legal counsel representing each partner.
- Do not ask competitors for sensitive data or cause the Benchmarking partner to feel he/she must provide such data to keep the process going.
- Do not ask competitors for data outside the agreed scope of the study.
- Consider using an experienced and reputable third party to assemble and 'blind' competitive data.
- Any information obtained from a benchmarking partner should be treated as internal, privileged communication. If "confidential" or proprietary material is to be exchanged, then a specific agreement should be executed to specify the content of the material that needs to be protected, the duration of the period of protection, the conditions for permitting access to the material, and the specific handling requirements that are necessary for that material.

Benchmarking Protocol

Benchmarkers:
- Know and abide by the European Benchmarking Code of Conduct.
- Have basic knowledge of Benchmarking and follow a Benchmarking process.
- Prior to initiating contact with potential benchmarking partners, determine what to benchmark, identify key performance variables to study, recognize superior performing companies, and complete a rigorous self assessment.
- Prepare a questionnaire and fully developed interview guide, and share these in advance, if requested.
- Possess the authority to share and be willing to share information with benchmarking partners.
- Work through a specified contact and mutually agreed arrangements.
- When the Benchmarking process proceeds to a face-to-face site visit, the following behaviours are encouraged:
- Provide meeting agenda in advance.
- Be professional, honest, courteous and prompt.
- Introduce all attendees and explain why they are present.
- Adhere to the agenda.
- Use language that is universal, do not use jargon.
- Be sure that neither party is sharing proprietary or confidential information unless prior approval has been obtained by both parties, from the proper authority.
- Share information about your own process, and if asked, consider sharing study results.
- Offer to facilitate a future reciprocal visit.
- Conclude meetings and visits on schedule.
- Thank your Benchmarking partner for sharing his/her process.

Important notice:

> ***This Code of Conduct is not a legally binding document. Though all due care has been taken in its preparation, the authors and sponsors will not be held responsible for any legal or other action resulting directly or indirectly from adherence to this Code of Conduct. It is for guidance only and does not imply protection or immunity from the law.***

B.3 Guidance for MP preparation

This section was developed for the previous version of this Manual by FOPIP 1 project team.

For details, see the electronic version of this Appendix.

B.4 Guidelines for FS development

This section was developed for the previous version of this Manual by FOPIP 1 project team.

For details, see the electronic version of this Appendix.

B.5 Guidelines for CBA development

This section was developed for the previous version of this Manual by FOPIP 1 project team.

For details, see the electronic version of this Appendix.

Appendix C. Appendices to Chapter 6

C.1 Worksheet Strategy

C.1.1 Strategy analyses and development Worksheet

Introduction

For analysing the company's situation and developing a (draft) strategy, you will need:
- 1 flipchart for Table External Analyses and Table Internal Situation
- 1 flipchart for SWOT analyses
- 1 flipchart for proposal strategic objective and strategic actions
- a couple of black markers
- some critical but particularly positive thinking and open-minded colleagues
- frank and open discussions
- a step-by-step approach. The latter is given below.

This strategy analyses and development may be used for a company as a whole as well as for a specific functional area. (e.g. HR, commerce, technical). In the latter case, integration in the company's overall strategy is still necessary.

Steps

Step 1 Analyse the external environment. Current and future.

Question: What is happening or is likely to happen that may have a relation with or impact on the organisation or your specific work field/functional area?

Examples:
- Labour relations, trade unions
- Legal changes, requirements (safety, health)
- Changes in labour market (where and how do you get your personnel)
- National remuneration systems
- Changes of technology (technical and non-technical)
- Changes in society, demands from customers
- Financial streams (subsidies, investments, how people pay their bills)

Make on a flipchart a table with the main topics. Indicate the topic, briefly what it is all about and the (expected) positive (+) or negative (-) influence, impact on the water company or your specific functional area.

1. External analyses

Topic	Short description	Influence/ Impact (+/-)
1		
2		
3		
4		

	Topic	Short description	Influence/ Impact (+/-)
5			

Step 2 Analyse the internal situation. Current and future.

Question: What is happening or is likely to happen that may have a relation with or impact on the organisation or your functional area?

Examples:
- Age structure of staff (experience, retirements)
- Changes of technology, systems, procedures (technical and non-technical)
- Efficiency improvement measures, costs
- Vacancies, promotions
- Decision-making, communication
- Integration of new operators in ROC.

Look at and consider also:
- Performance indicators, general for the company and/or specific for your functional area
- General performance of the water company
- Your suggestions for improvements

Make on a flipchart a table with the main topics. Indicate the topic, briefly what it is all about and the (expected) positive (+) or negative (-) influence, impact on the water company or your functional area.

2. Internal analyses

	Topic	Short description	Influence/ Impact (+/-)
1			
2			
3			
4			
5			

Step 3 Conduct SWOT analysis

Combine step 1 and step 2 in a SWOT analysis.

3. SWOT analysis

	Positive factors, forces	Negative factors, forces
Internal	Strengths	Weaknesses
(we have…)	1.	1.
	2.	2.
	3.	3.
External	Challenges	Threats
(outside there are…)	1.	1.
	2.	2.

	Positive factors, forces	Negative factors, forces
	3.	3.

Step 4 Determine 3 – 5 strategic areas

Determine 3 – 5 areas that are vital for the company and that you consider the company or your functional area should try to influence, to improve and to achieve.

Step 5 Determine objectives

5A.Overall strategy

Formulate in one or two short sentences your proposed overall vision, strategy. *(Imagine you are the real bos. What would you tell the company and the world the company wants to be, to do, to achieve, to fight for regarding the company).*

Write this 'functional message', 'philosophy' on a flipchart.

Overall strategy (draft)

5B.Specific objectives

Determine for your selected strategic areas the specific objectives. Take a time horizon of approximately 3 years.

Question: "What does the company, you, your functional area wants to do, achieve the next 3 years?"

Check whether these objectives fit within the (draft) overall strategy.

	Objectives
1	
2	
3	
4	
5	

Step 6. Determine strategic actions

Determine for each of the specific objectives how to achieve this and with what. Consider eventual alternatives, options. Be creative! Also unusual solutions may be welcomed!

Present these strategic actions on a flipchart.

Strategic actions

	Objective	How, by what means
1		
2		
3		
4		
5		

C.2 MIS Tender Documentation

This section has been developed in two parts / volumes, as part of FOPIP 2 project activities. The contents of these two volumes are as follows:

- Instructions to tenderers
- Draft contract and special conditions, including annexes
- Draft contract
- Special conditions of contract
- General conditions of contract
- Technical specification (the technical specification is included separately in volume 2)
- Model financial offer
- Model performance guarantee
- Pre-financing guarantee form
- Administrative compliance grid
- Checklist for documentation column of admin compliance grid
- Checklist for technical compliance
- Evaluation grid
- Tender submission form
- Format of the declaration referred to in point 3 of the tender submission form
- Format of the list of key experts and their cvs referred to in point 4 of the tender submission form
- Curriculum vitae
- Statement of exclusivity and availability
- Tender guarantee form
- Financial identification form

For details, see the electronic version of this Appendix.

Appendix D. Appendices to Chapter 7

D.1 Organizational chart design

Introduction

This guideline was prepared under the project „Technical Assistance for Strengthening the Institutional Capacity of ISPA Final Beneficiaries in the Water and Waste Water Sector in Romania (Europe Aid/119629/D/SV/RO).

The current Romanian policy with regard to the drinking water and waste water sector aims to reorganize local operators into a regional operating company (ROC). This ROC then integrates a number of local operators in a certain geographical area. This regionalization aims at improved performance through improved management and professionalism as well as through benefits from economies of scale. Further, regional operators are also one of the requirements for future European Union Cohesion Funds financing.

The institutional framework for regionalization consists of three key elements:

- A Regional Operating Company, in charge of the actual management and operations, that is water supply and wastewater services to the customers in different localities;
- The Intercommunal Development Association (IDA), uniting the various local councils and acting as a main governing body of the regional water services;
- A delegation contract that manages the relation between the ROC and the local communities.

The ROC will be the sole entity combining and integrating the various local operators. As this implies (i) merging various local operators and (ii) working on a regional instead of a local scale, a proper organizational framework is required. In that organizational framework, the intended managerial and professional benefits for the total of operators should be given shape. That reorganization may for some operators, notably the smaller ones, imply a considerable change: not longer be responsible for all matters, but being part of a stronger and bigger 'family'. But also for the usually bigger company in the 'capital' this means some important changes: responsible for management and operations literally at more distance and dealing with more variety, at a far larger scale.

This guideline aims to provide a proposal for the organization chart of the ROCs. It offers a main regional framework structure to sketch the regional functions and the local functions. In case deemed useful, also some options are offered.

One should keep in mind that the organization structure is an important, but just one design parameter of an organization. A good organization structure is necessary, but not sufficient to become a proper performing organization. Other important parameters are: numbers and qualifications of staff, communication, systems and procedures and management style. Together with the organization structure, these 'make' the organization!

For convenience of the reader, this Guideline is structured as follows:

- Chapter 2 gives a background as well as the main design principles for the ROCs.
- The proposed general organization charts for the ROCs are provided in Chapter 3.

Main philosophy and design principles for the organization

This Chapter deals with the background philosophy and main design principles for the regional water companies. With a proper understanding of these design principles, the proposal for the regional framework structures can be better appreciated. Also, the individual water companies may wish to give their particular elaboration and 'touch' to the organization chart. With a better appreciation of the background and design principles, such elaborations are easier to discuss and lay down in an organization chart.

Regionalization

Prior to the design philosophy and principles, it is important to clarify the difference between 'central management' and 'regionalization'. Before 1989, the water supply and wastewater sector was centrally organized and managed. After 1989, management of the water supply and wastewater services became the responsibility of the local governments (local councils). These local governments managed the services through notably a Regia organization, a publicly owned company or through a concession/management contract to a private operator.

Regionalization unites a number of local operators into a more solid and professional organization: the Regional Operating Company. The local governments remain still responsible for the overall services, but in a different managerial setting. They participate in the ROC through shares and through management arrangements.

The consolidation and integration of local operators may be according to political-administrative areas (e.g. county) and/or river basins.

Design principles

The main design principles for the structuring of the ROC are the following:

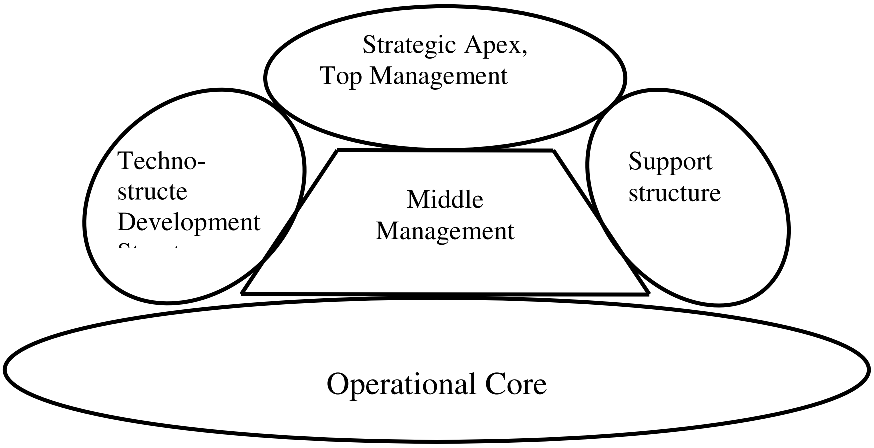
- An overall framework model that uses five typical but distinct organizational function (Mintzberg model)
- A framework with two distinct levels: local operations at the basis and regional level overall management, steering and expert functions.
- Operations geographically or sector-wise arranged
- Centrally arranged support, working for the local operations
- Appropriate levels of autonomy for managers
- Take in considerations local specific circumstances regarding technology, complexity and human resources.

Mintzberg model

The Mintzberg model[15] is quite helpful in defining the various functions in the regional operator. Mintzberg's model distinguishes five groups of rather distinc functions that have their typical organizational place and characteristics.

Figure 0.1: Mintzberg Model

[15] Henry Mintzberg, The Structuring of Organizations, 1979.



The typical responsibilities for these five parts of the organization as well as examples for the water companies are elaborated in the following table.

Table 0.1: Mintzberg structures

Structure	Description and examples
Operational core	The primary process of the organization. The processes that constitute the 'right of existence' for the organization. Those parts of the organization that directly produce the products or the services. For the water company: Water production, distribution and transport. Waste water collection and treatment, maintenance and routine repairs. Revenue collection, customer relations, meter reading, cashing etc.
Strategic Apex, Top Management	Overall responsibility for the organization. Strategy, directing, supervision. For the water company: IDA, the Shareholders' General Meeting, the Board of Directors, the General Director and other directors/top managers.
Technical / Development Sector (Technostructure)	Technical expertise that gives shape and steering to the main processes (primary processes) of the company. Can include 'technological' as well as 'financial-administrative' expertise, depending on the primary process of the organization at stake. For the water company: short-, medium- and long-term technological and physical development. Technical and design planning. Implementation of investment projects. Asset management /GIS. Environment protection monitoring and control. Quality Assurance. Central laboratory. Finance & Accounting. Commercial policy.
Support structure	General professional and support services: legal, audit, human resources, procurement, security, secretariat, etc. For the water company: legal, HRM, Public Relations, security, transport.
Middle Management	Operationalization of overall strategies and plans. Operational coordination. Information transfer and communication between the various functions in the organization. For the water company: heads of departments, treatment plants,.

Regional and local activities

In the regional framework structure, the local operational activities need to be separated from the regional management, development, strategy, supervision and support activities.

- With this separation, the responsibility at local level will be mainly the primary process: the direct operations of water supply and wastewater service provision. That is what the local operators already do and there is little need to manage this operation and maintenance regarding the primary processes directly from regional level. For development activities, major troubleshooting and other non-routine or irregular activities, the local operators can rely on a pool of experts at regional level.

- The regional level will be mainly dealing with overall strategy and management for the whole company, overall supervision and provision of expert services and support to the operating branches.

In this principle, at local level management will be responsible for what can be locally managed. Regional level will be an overall management and expertise services centre.

Geographical or sector-wise grouping

The regional framework for the operating core has two different options for its main way of organizing: geographically or sector-wise organized.

These options are outlined below:

Table 0.2: Options: geographical or sector organization

		Geographical		
		Area A	Area B	Area C
Sectors	Water supply sector	Production Distribution	Production Distribution	Production Distribution
	Wastewater sector	Collection Treatment	Collection Treatment	Collection Treatment

Geographical grouping: An operational area (A, B, C etcetera) is formed by one city or a number of cities/towns that form a logic and reasonably coherent group. The areas are managed by a manager directly subordinated to the regional Operations Manager. The area manager is responsible for the operations of both the water supply and the wastewater activities in 'his' areas.

Sector grouping: The Operational Core is divided in sectors: water supply and wastewater. Each sector is run by a manager each directly subordinated to a superior at the regional level. The Water Sector is in charge withal the water supply operations in the region: production, transport and distribution (all networks in the region). The Wastewater Sector deals with all the wastewater operations in the region: collection of waste waters (all networks in the region) and treatment facilities.

Central & de-central

Regionalization means that for some activities there may be a choice whether these should be at regional or at local level. There are some considerations:

- Often, local managers wish to avail of all services and functions. They do not want to rely on support that is not within their direct control. Therefore, they may wish to arrange of all 'necessary' support at their level. However, such situation would likely result in rather inefficient deployment of human and material resources and/or not benefiting from economies of scale and higher levels of professionalism that can be achieved when this support is organized from regional level.
- Some of the operational activities can or need for reasons of efficiency and effectiveness be managed and carried out at or from regional level. This is notably the case for billing, major repairs and

maintenance and a number of commercial interactions with the customers. For activities that are indeed done locally, this may mean that these are 'centrally managed, locally operated' (de-concentration).

- With the assistance of IT systems, differences between 'central' and 'local' become in practice less prominent. Also, centralization and de-centralization of activities can be greatly facilitated. Information can 'real time' be brought to and used at the levels and places where it is necessary. This means e.g. that activities that traditionally were carried out at local level can be done at central level and vice versa. For example, the revenue collection and customer relations can be coordinated from the central and performed at the local level.

Management autonomy

A certain degree of autonomy in management is needed at the local level for the managers to adequately manage the local level activities. That is part and consequence of the overall management philosophy of the ROC. Central/regional levels will give a framework, but local and lower management (heads of operational centres, heads of sections, heads of treatment plants etc.) are given the task and responsibility to manage within that framework. The mandate of these managers should be properly backed up with information and communication systems and budgets. Of course it is vital that the responsibilities of these managers are linked with the needed authority (powers).

Local circumstances

Each specific organizational chart will further have to consider the local circumstances: complexity, size and features of the operations and the human resources in different areas of the region.

For example:

- A surface water production plant is much more complex than a well field with a pumping station, also with more staff and different functions/activities. This means that this production plants needs more and more detailed structuring than a well field.
- Some ROCs will have physical infrastructure that is technically interconnected, for example a central treatment plant and long transport networks serving more localities; other ROCs will predominantly have 'stand alone' physical infrastructure. That infrastructure may determine e.g. whether there is a preference for a sector-wise structured operations or geographically structured operations.
- A region where qualified personnel is relatively easy to find and employ is different from the areas where qualified personnel are hard to find.
- Transport of materials, equipment and people in some areas may be quite challenging and hence, determine organisation arrangements.

Organisation structure – general proposal

General

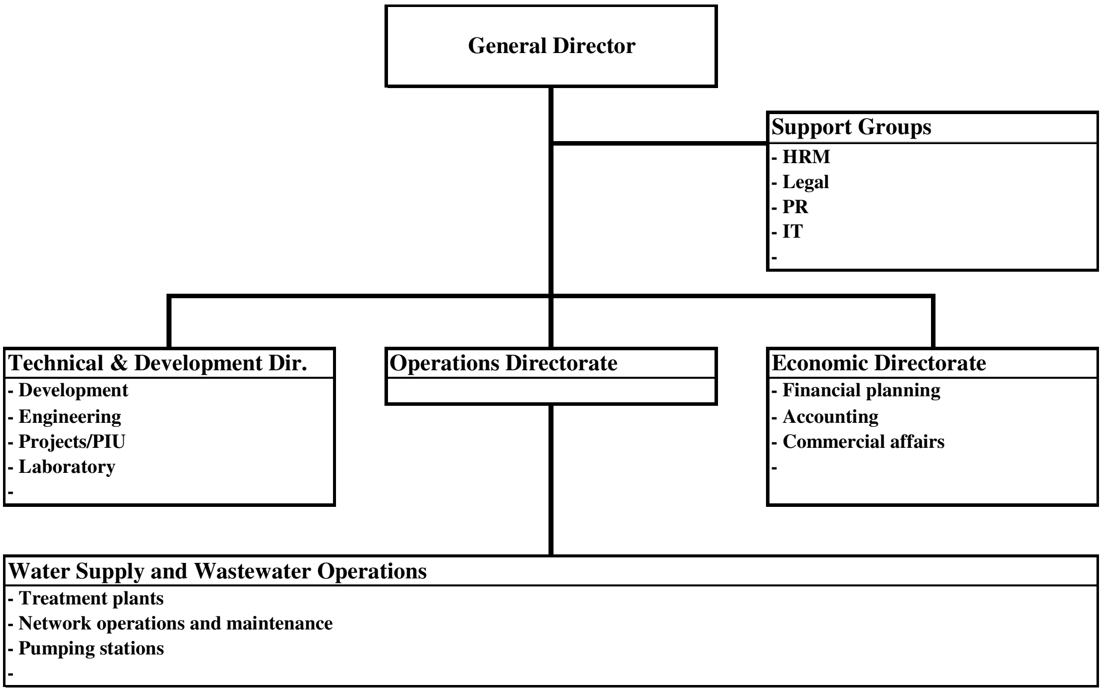
This chapter outlines the framework organization structure for a ROC. The following sections will describe:

- Overall regional structure (par. 3.2)
- Technical Development Directorate (par. 3.3)
- Economic Directorate (par. 3.4.)
- Operational Directorate, with two options: geographically organised and sector-wise organized (par. 3.5).

ROC's overall regional structure

The overall structure for the ROC would in general look as shown in the figure below.

Figure 0.2: Overall structure ROC



The various parts in this generic model as well as eventual options and variations will be elaborated in the following paragraphs.

The regional headquarters will be responsible for the performance of the ROC as a whole. This level is responsible for the strategy of the ROC, technical planning and development, financial planning and management, and maintaining the contact and communication with third parties. It serves as a resource centre for operational units by providing guidance and support for operational services.

The **technical/techno-structure departments** in a water company are typically planning, engineering, PIU and Central Laboratory. Financial management and commerce are also 'techno-structure' as these guide heavily the primary processes.

The **support departments and units** will carry out a series of activities related to the smooth performance of the ROC. Regional assistance departments perform general activities of legal, HR, PR nature, audits, etc. Furthermore, the managers of Directorates coordinate the activity from the central offices.

In addition, the Romanian legislation stipulates that operators need to establish a number of functions/units directly subordinated to the General Manager. Actually, these may not in all cases be compliant with the modern organization ideas and rules.

The regional headquarters is divided in three Directorates (Technical / Development, Operations and Financial) and a number of support departments or units. An overview of the main tasks of these organizational units is given below. There is an **option** to structure the Financial Directorate in two separate Directorates: a Financial / Accounting directorate and a Commercial directorate.

The **Operations Directorate** is made up of the primary processes in the field. The Director Operations (and his central staff) are the linking pin between the regional structure and the operations in the field. The directorate can be organized in two ways:

- **Geographically**. In that case, one sees the operations as different operation zones, each including water supply and wastewater. In this alternative, an operational zone consists of a city or is a group of cities or towns. The head of such an area manages both water supply and wastewater in that area. Figure 3 shows this geographic setup. The geographical setup is particularly recommended when the water supply and wastewater systems between certain areas are 'stand-alone' systems and not interconnected. This structure facilitations easy communication and mobility of technical staff and may therefore be beneficial in view of efficiency and effectiveness of human resources. Additionally, a geographical structure gives somewhat more room for local (semi)autonomy.
- **Sector-wise**. This means that water supply and wastewater are separated in the operations directorate. Here, the operations are at first separated between a water supply wind and a wastewater wing. This may result eventually in two operational directorates: one for water supply and one for wastewater. Figure D.4 and Figure D. 5 show this alternatives and the options. The sector setup may be advisable when water supply and wastewater systems are interconnected over larger areas (e.g. interconnected towns and cities). When systems become larger and more complex, this specialization can be an advantage.

Figure 0.3: Operations – geographical

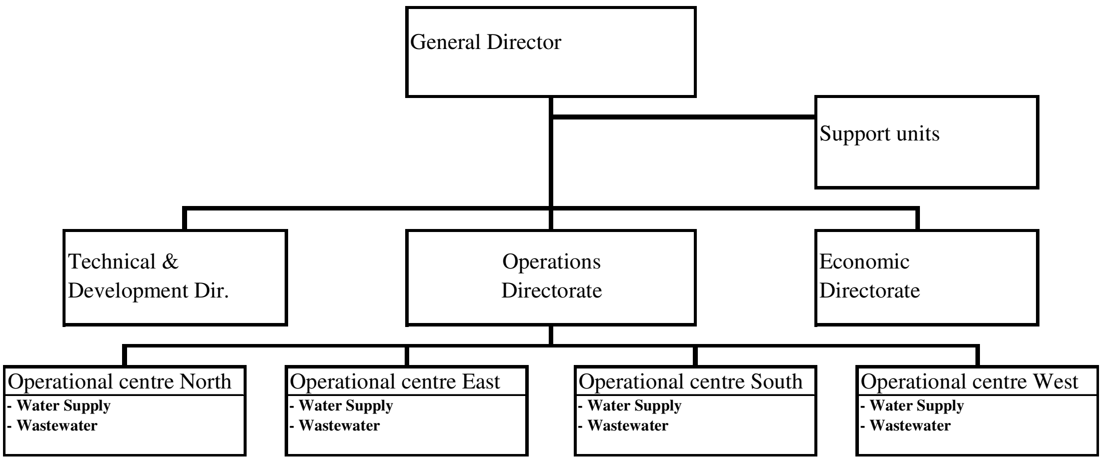


Figure 0.4: Operations – sector-wise, one directorate

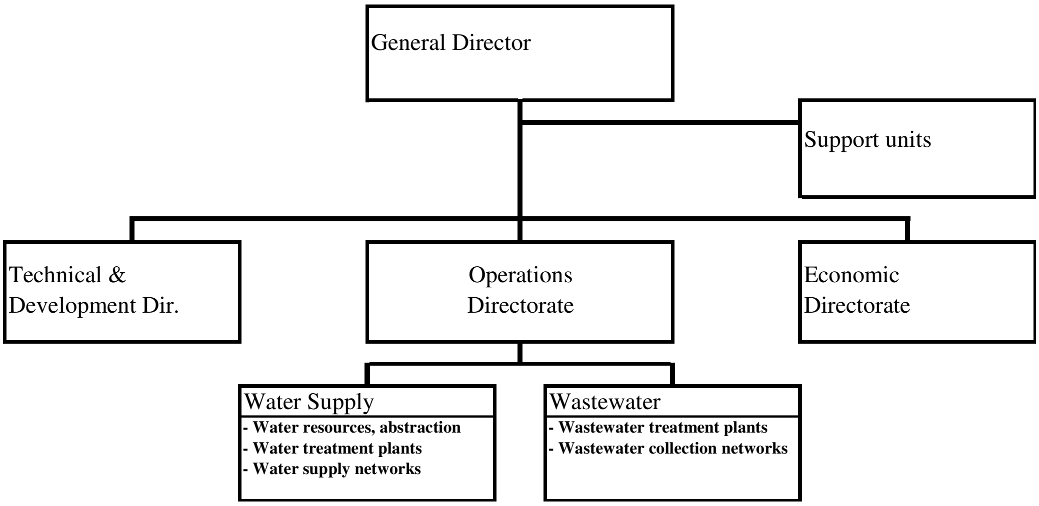
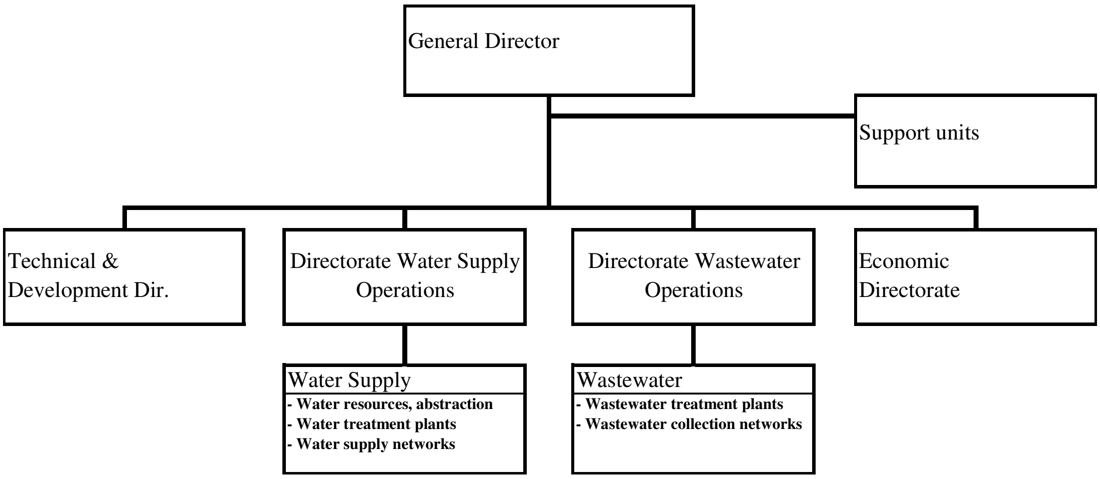


Figure 0.5: Operations – sector-wise, two directorates



The number of support departments and units directly subordinated to the General Manager is generally high (there can easily be 7 support units). These support units together with the direct reporting of the directorates puts stress on the 'span of control' of the General Manager. It is therefore in practical terms recommended to group and combine certain units and departments or alternatively, to create an 'umbrella administration department' under a director administration or deputy manager.

The position of the Procurement / Supply Department is always somewhat debatable. It may be attributed either to the Financial Department (because it implies financial resources), or independent and directly subordinated to the General Manager (as it carries out 'sensitive' activities in the light of the applicable Romanian laws) or to the Operations Department which is seen as the main procurement beneficiary.

Technical / Development Directorate

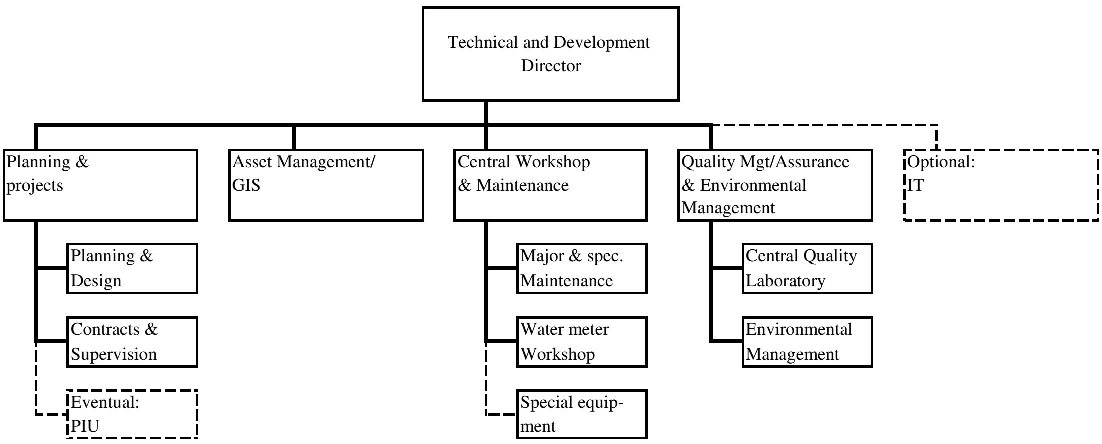
In general terms, the Technical / Development Directorate is responsible for the planning and internal supervision of the ROC's technical services (However, NOT the operations! These are supervised by a

Director Operations). It also deals with the strategic planning including investment projects, drafting and design activities, quality control and monitoring of environmental issues, large infrastructure maintenance project, etc.

As noted, the PIU (Project Implementation Unit), in quality of technical department, will necessarily pertain to this structure, as outlined in the chart with a dotted line. Given the large investments enabled by European funds, there is an **option** that PIU be directly coordinated by the General Manager.

An option is to place the IT activities under the Technical & Development Directorate. These are as such a support activity, but there is sometimes something to say in favour of having this technical activity here. See the organizational chart.

Figure 0.6: Organization Chart – Technical / Development Directorate



Economic Directorate

The function of the Economic Directorate (or: Financial-Economic Directorate) is to control and supervise the financial flows and the commercial and economic activity of the ROC. Even if the operational units hold a certain level of autonomy in planning, budget allocation and expenses, the general planning, supervision and control are carried out through this directorate. The scope of this department is to combine the data collected from different operational units and to provide the management with proper financial information.

The Economic Directorate has also an important role in the revenue collection process. There is a separate wing within the Economic Directorate which deals with the general management and central operational tasks of revenue collection. Even if the operational units are responsible for the reading of meters and the collection of revenue by means of cashier desks and collecting agents, the billing is centrally carried out at the regional level by a Economic Directorate specialized unit.

The Economic Directorate is not only in charge with the supervision, but also for assisting offices in customer relations as well as the achievement of budgets and the drawing of accounting records for operational centers.

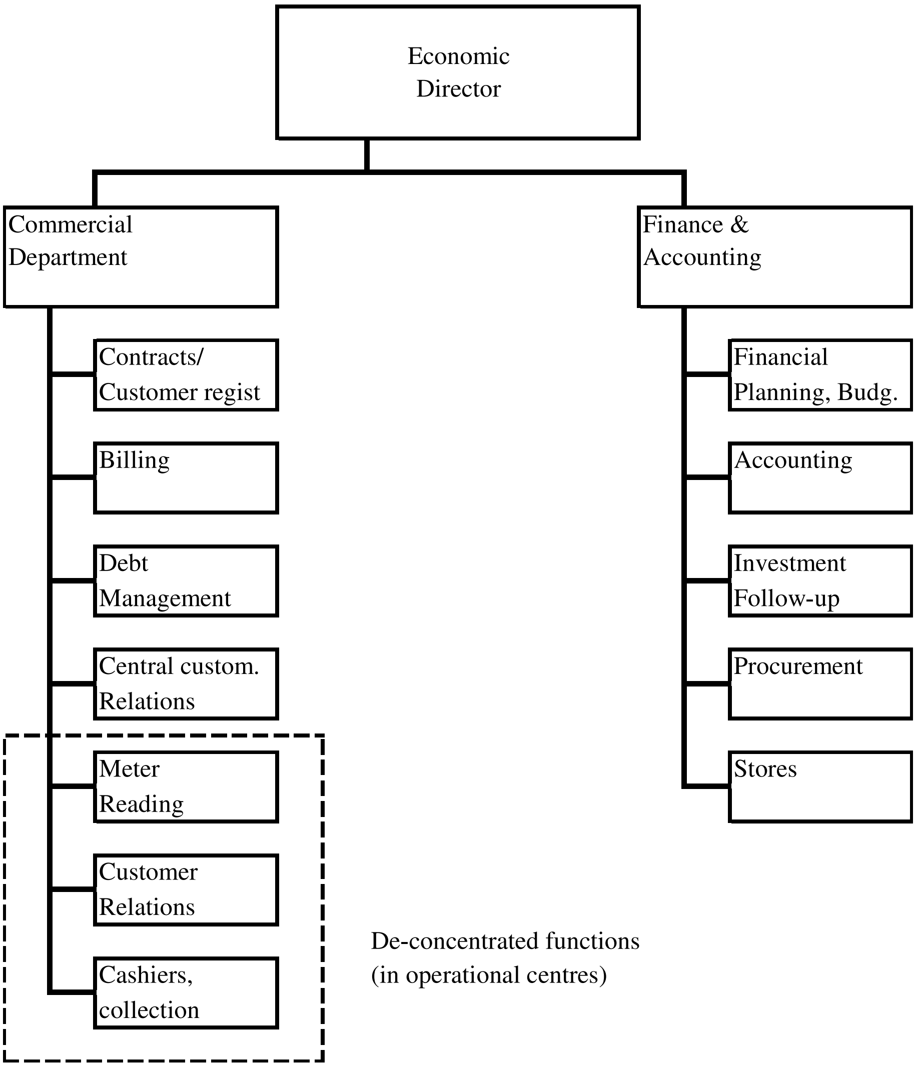
An **option** is to devolve the commercial/customer related matters into a separate directorate: **Commercial Directorate**.

This Commercial Directorate is typically responsible for:
- Marketing and promotion
- Management of revenue collection process
- Debt management
- Central data entry and billing
- Management of customer relations and contracts
- Supervision, guidance and support to de-central meter reading, cashing and customer relations functions.

Particularly for the bigger companies, a separate Commercial Directorate is recommended.

With this option, the Economic Directorate becomes more financially oriented – the name Financial Directorate would then be more appropriate - with key functions:
- Financial planning (budgets)
- Treasury
- Accounting
- Procurement
- Stores

Figure 0.7: Organizational chart of the Financial Directorate



The de-concentrated departments operate locally through assignment of personnel. In terms of hierarchy, they belong to the regional structure but also cooperate with the local structure.

Operations Directorate / Operations Centers (local level)

The actual water supply and wastewater operation and maintenance activities – the primary processes – are all in the Operations Directorate. As already introduced earlier, the Operations Directorate may be structured in two ways:

- Geographically. In this structure, the operational centres may be a municipality and the surrounding area, a group of towns and localities or (in case of a very large city) a part of the city. Each operating centre will have its water sector, wastewater sector and some joint services.
- Sector-wise. Here, the basic structure is according to water supply or wastewater. Within these sectors, one may find different locations and facilities.

The Operations Directorate houses the primary process of the ROC. Its prime task is ‘keep the daily business running’: water supply treatment and distribution to the as well as wastewater collection and treatment. The far majority of operational activities are located here; it is also likely that the far majority of the ROC’s personnel is in the operations directorate. The various units within the directorate have some level of autonomy for their responsibilities. They are also likely to be a cost centre in accounting terminology.

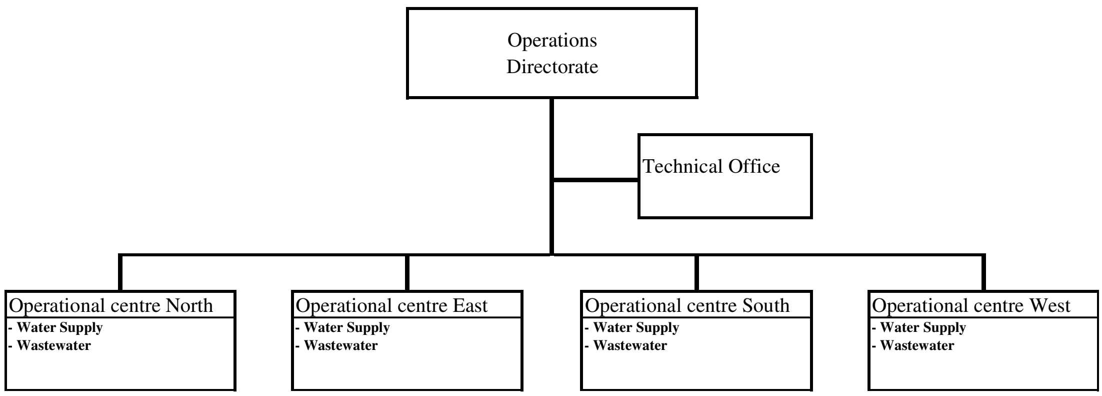
Communication between the ‘head office’ and the field activities is vital, certainly in case of a number of regionally spread operations. Also, the head office should carefully balance the needs and interests of the various local operations. For those reasons, a small technical secretariat or support office is required directly reporting to the Operations Director. This secretariat is mainly involved in planning, monitoring, reporting and co-ordination of the operational activities and as liaison with various regional level functions. This office may also act as centralized dispatch centre. In principle however, dispatch is a function belonging to the different field operations, responsible for monitoring, steering and troubleshooting on operations. It will therefore in general be subordinated to an local operational manager. It may be centralized for reasons of efficiency and effectiveness, but is as such not a central function.

Geographic structure

The geographic setup for the Operations Directorate would therefore look as illustrated in the figure below.

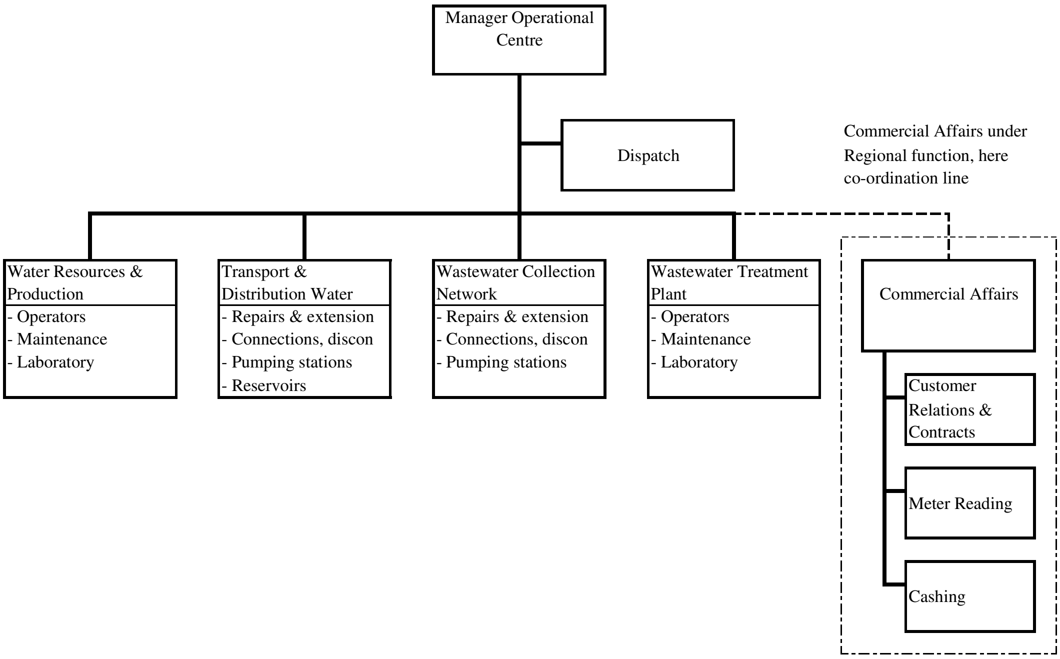
In order to identify geographic areas, the indications North, East, South and West are used. Each of these stand for a certain area, e.g. a municipality, a group of localities or (in very big cities) part of the city.

Figure 0.8: Operations Directorate, geographical



A geographically structured Operations Centre would look in more detail as shown in the next figure.

Figure 0.9: Operation centre details



The operational centres will be responsible for the regular business in their area. The Operation Centre Manager is responsible for the total package of tactical and operational water supply and wastewater services. To dispose properly of this responsibility, adequate mandate and resources are required.

It should be noted that the commercial affairs in an operational centre are part of the centrally organized Commercial Affairs/Commercial Directorate. However, these activities are locally implemented, so 'de-concentrated'. At the level of the operational centre there should be a good communication and co-ordination link. (E.g. technical operations versus customer relations, meter reading, connections/disconnections).

Sector-wise structure

The sector-wise structure is meant to specialise the drinking water supply activities respectively the wastewater activities. That may be useful for larger, complex and interconnected networks. As 'specialisation' is the main principle, it is logical that within a certain sector the next differentiation is according to function (what, e.g. production, distribution), not according to area (where). (Theoretically, also within a sector one can first have areas and only thereafter functional departments. This is however less likely).

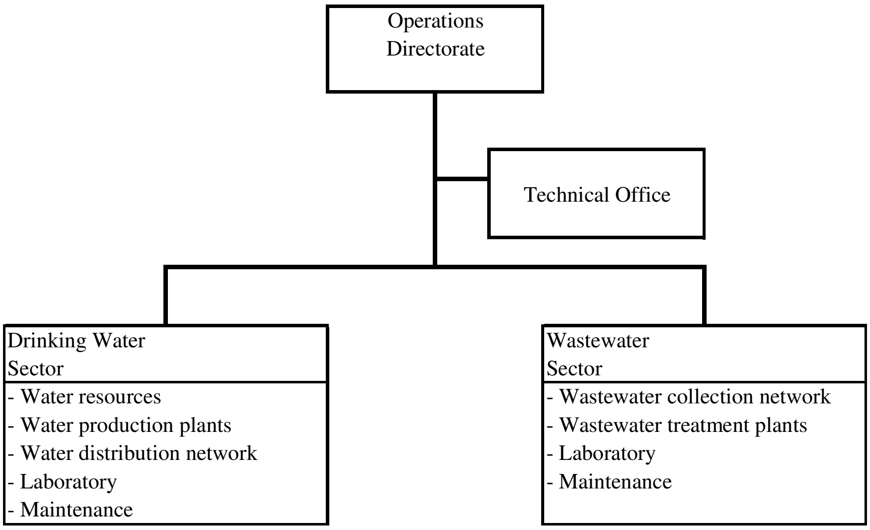
The organisation chart for a sector-wise organised Operations Department is depicted in the figure below (next page).

Within a certain function one will find in general some geographical differentiation with certain responsibilities, e.g.:

- Drinking water production plants: Water Treatment Plant A, Water Treatment Plant B, Water Treatment Plant C.

- Distribution or wastewater collection networks: Network X, Network Y, Network Z.

Figure 0.10: Operations, sector-wise setup



The sector-wise structured organisation of the operations directorate requires at local levels a certain way of co-ordination between the water sector, the wastewater sector and the (de-concentrated) commercial/customer service affairs. How this should be given shape in the organisation structure is much depending on the local situation. Also, apart from the formal organisation structure, information and communication systems play an important role in this. It is however evident that for the geographic areas mechanisms and structures should be given shape to co-ordinate and integrate water supply, wastewater and customers services.

D.2 Water Company Assessment – Work list

A. Purpose

This assessment is part of the integration and restructuring process, with the objective to create a professional, effective and efficient regional water company. Individual water companies/operators have to be merged into a broader regional framework.

Main purpose of the water company assessment is to make an inventory and gain insight in:

- What is there
- How does it function (technical, administratively, financially, organisation)
- What are critical issues (problems, challenges, successes)
- What keeps the management 'busy'
- Who is there
- Capability of organisation.

Hereunder, a number of fields of interest of this assessment are dealt with. For each field, a number of lead questions, checks etc. are indicated. The user is recommended use these skillfull as well as to be flexible, curious but persistent in his activity to collect information.

Fields:

1. Organisation structure
2. Organisation in the landscape
3. Primary process – water supply
4. Primary process – wastewater
5. Customer processes
6. Development activities
7. Personnel & HRM systems
8. Main management systems
9. Finance and accounting
10. Support functions and systems
11. Outsourcing
12. Physical facilities & premises
13. Organisation culture, climate

B. Fields of interest

1. Organisation structure

Collect recent and approved organisation chart. (In case absent, try to draw an organisation chart with a couple of key actors and find consensus)

Are the lines of authorities clear? (Check for double lines, dotted lines, units getting inputs from more than one supervisor/manager).

Can the main functions of the organisation be recognised clearly in the organisation chart?
- Operations: water supply, wastewater, treatments, pumping stations, network operations and maintenance.
- Development and expertise support: engineering, lab, environment, quality assurance, maintenance
- Finance and accounting
- Commerce, customers: revenue collection, customer services
- Support: HR, legal, PR, IT, audit/internal control, offices and premises

Are there any white areas, unclarities?

Is there a recent ROF? Is this ROF tuned with the organisation chart?

2. Organisation in the landscape

What is the organisation's history? How and when was it established? Under which organisation has it resorted?

External environment, Force field analysis. What are the main stakeholders and what is their influence on the company (positive, negative, eventual strength)?

(Stakeholders local government, county, other utilities, customers, trade unions, suppliers, banks….
Strengths can be indicated by plus, double plus, minus, double minus)

Actor	Main interest	Positive	Negative

Actor	Main interest	Positive	Negative

3. Primary process – water supply

Collect a drawing/map of the main infrastructure. Alternatively, draw a map with assistance of key actors.

What is the water resource? (There may be more than one source)

What kind of treatment technology is used? (Describe briefly; there may be more than one location/technology)
- Production capacity installed (m3/month)
- Production capacity used (m3/month)
- Utilisation level (percent)
- Number of staff (operators, supervisors/management/lab)

Assess in the field the status and performance of technology
- Properly functioning
- Well-operated
- Condition, maintenance level
- Any obvious problems, backlogs etc?

Pumping stations
- Locations
- Capacity

Reservoirs
- Locations
- Capacity

Key figures
- Water produced (m3/month)
- Water distributed (m3/month)
- Water sales (m3/month)
- Non-revenue water (from above, percent)
- Supply hours
- Km of network
- Number of interventions/leakages (average/month)
- Number of staff for network operations/maintenance

What are main successes, what goes allright, are you proud of? (Top 5)
1.
2.

3.
4.
5.

What are main concerns, problems? (Top 5)
1.
2.
3.
4.
5.

What are crucial issues, matters that need to be watched and managed carefully?

4. Primary process – wastewater

Collect a drawing/map of the main infrastructure. Alternatively, draw a map with assistance of key actors.

What kind of treatment technology is used? (Describe briefly; there may be more than one location/technology)

- Treatment capacity installed (m3/month)
- Treatment capacity used (m3/month)
- Utilisation level (percent)
- Number of staff (operators, supervisors/management/lab)

Assess in the field the status and performance of technology

- Properly functioning
- Well-operated
- Condition, maintenance level
- Any obvious problems, backlogs etc?

Pumping stations

- Locations
- Capacity

Key figures

- Water received (m3/month)
- Water treated (m3/month)
- Water sales (m3/month)
- Km of network
- Number of interventions/leakages/blockages (average/month)
- Number of staff for network operations/maintenance

What are main successes, what goes allright, are you proud of? (Top 5)
1.
2.
3.
4.

5.

What are main concerns, problems? (Top 5)
1.
2.
3.
4.
5.

What are crucial issues, matters that need to be watched and managed carefully?

5. Customer processes

Collect information on numbers and types of customers (date 31 Dec 2007, or other distinct moment)

Water supply

Customers	Contracts Number as of 31 Dec 2007	Volume Sales in m3/month	Money Revenues in RON/month
Domestic – total			
- associations			
- single households			
Commercial			
Institutional			
Grand total			

(or other used distinction in categories)

Wastewater

Customers	Contracts Number as of 31 Dec 2007	Volume Sales in m3/month (if known)	Money Revenues in RON/month
Domestic – total			
- associations			
- single households			
Commercial			
Institutional			
Grand total			

Collection efficiency.
- What is collection efficiency (in percentages) for the various types of customers?
- What are eventual problems in collection of revenues?

Describe the revenue collection process briefly
- Billing frequency
- Meter reading

- Processing of data towards bill printing
- Bill distribution (who, how)
- Collection of revenues (how, where)

Describe the complaints and request process briefly
- How to file complaint/request
- How many complaints, irregularities etc. average per month

Physical contact points with customers

Check/assess briefly:
- Payment points
- Counters
- Customer relation offices
- Dispecerat
- Phone
- Website
- Others…

Problem areas in customer relations

Identify areas, causes, actors in eventual customer related problems

(E.g. quality of services, complaints, political pressure, payment problems)

Is there a monthly overview of customer complaints, irregularities available?

Try to view the customer process from the point of view of customers.

What is exceptional, striking, good, poor?

6. Development activities

In technical, financial, administrative, organisational etc. fields various activities may be conducted to improve the infrastructure, organisation, processes etc.

Are there any recently completed development/upgrade/reorganisation activities conducted? (Briefly describe which and results)

Are there any activities currently on-going? Which (list)?

Are there any development activities planned or intented? Which, what purpose?

7. Personnel & HRM systems

Collect a detailed list with functions, organisation units and numbers

Staff numbers summary

Management	
Specialist and administration	
Workers – qualified	
Workers – non-qualified	
Total	

Any major changes in the number of staff during the last three years?
- Which staff, numbers, reasons?

Are there any vacancies?
- Which function
- What is/are reason(s) for not filling these vacancies?

What training was conducted last year (2007)
- Training type (topic, duration, on-job/off-job, place), number of staff participating

Is there a training plan for this year?
- Get a copy.

Has the company one of the following systems in place and operational? (Describe and assess briefly)
- Job descriptions
- Performance appraisal system
- Salary system
- Reward, motivation and bonuses

8. Main management systems

Are there regular meetings with key management? (Indicate what meetings, participants, frequency)

Are there regular reports regarding performance? (Frequency, scope? Assess quality)

Is there a master plan or other multi-year development plan available and in place?
- What plan?
- If not, what is done to develop one?

Are there any formalised internal communication systems between management and other personnel?
- Meetings
- Communication bulletins (notice boards)
- News letters
- Instructions notes

Management and troubleshooting
- To what extend is (top)management occupied with operational matters, incidents that should be dealt with at lower levels?
- What types of issues keeps (top)management busy?

(Interventions by phone or visitors during meetings, interviews may be helpful to assess this).

9. Finance and accounting

Collect the main financial reports (profit/loss, balance sheet)

Is accounting done centrally, de-centrally?

Is accounting done with computers?

How is the financial state of affairs?
- Turnover
- Profitability
- Accounts receivable, bad debts
- Creditors (non-paid suppliers…)
- Forecast

What are the main financial issues?

10. Support functions and systems

Screen and assess the various support functions and systems
- What is there? (people, technology, …)
- What are they doing, what is strikingly not there/done?
- What are successes? What are bottlenecks?

Support functions and systems:
- IT
- Finance and accounting
- HRM
- Maintenance (specialised, central)

11. Outsourcing

Any activity outsourced, done by third parties?
- Security
- Revenue collection
- Maintenance

Does the company consider activities to be outsourced? (Which, why)

12. Physical facilities & premises

Assess and describe findings/conclusions with regard to the physical facilities, buildings and premises.

Try to see this through the eyes of (i) clients; (ii) professional visitors and (iii) own staff.
- How are offices and premises located? (strategic locations, access)
- Integrated or scattered
- Dedicated „water" or shared with others?
- How do the offices and premises look (organised, run down, modern etc.)
- Cleanliness, tidiness ('toilet, archive and parking place check')

- Communication means (phone, information system, internet, …)
- HSE: health, safety, environment, ergonomics
- Places that are off-limits for certain groups, security arrangements
- Identity and marking of places

13. Organisation culture, climate

Although usually subjective and without data, try to find out…

Corporate identity, spirit
- Does the personnel show a feeling of corporate identity, belongingness?
- Is there a joint feeling of proud for the business, the organisation?
- Is it for the regular personnel generally clear 'what is going on'? (E.g. crucial matters in operations, new projects)

Are there certain factions, distinct groups in the company that lead to non-productive tensions?

Do people feel that they are 'seen', rewarded and motivated by the company?

Try to describe the way of communication as observed in key words (E.g. formal/informal; open/closed; initiatives; control&command; top/down; bottom/up; hierarchical/horizontal allowed, encouraged).

D.3 Manual on Personnel Planning

This manual was developed as part of the project "Technical Assistance for institutional strengthening of ISPA final beneficiaries in the water and wastewater sector' (ISPA measure 2003 RO 16 P PA012).

This manual aimed to assist HR experts and managers with the introduction and implementation of a pro-active personnel planning. It presents a number of key considerations as well as a step-by-step methodology for personnel planning. Main topics included:
- Key elements and considerations in personnel planning
- Analyses for personnel planning: the inputs and variables that may influence personnel strength
- Moving from analyses to plan
- Personnel plan format
- Implementation of personnel planning
- Monitoring of personnel planning and the related activities.

For details, see the electronic version of this Appendix.

D.4 Job Analysis

D.4.1 Introduction

In an organization, there are different jobs to be done. To be an effective and efficient organisation, these jobs need to be properly structured, designed and described.

Job analysis is the process to define and document the work that need to be performed and the requirements of a job. Job and task analysis is performed as a preliminary to successive actions, including to define a job domain, write a job description, create performance appraisals, selection and promotion, training needs assessment, compensation, and organizational analysis/planning.

Job analysis looks therefore in the tasks and activities, responsibilities, material resources (equipments, tools etc.) and human resources (education, skills, behaviour etc.), necessary and sufficient to achieve the job objectives.

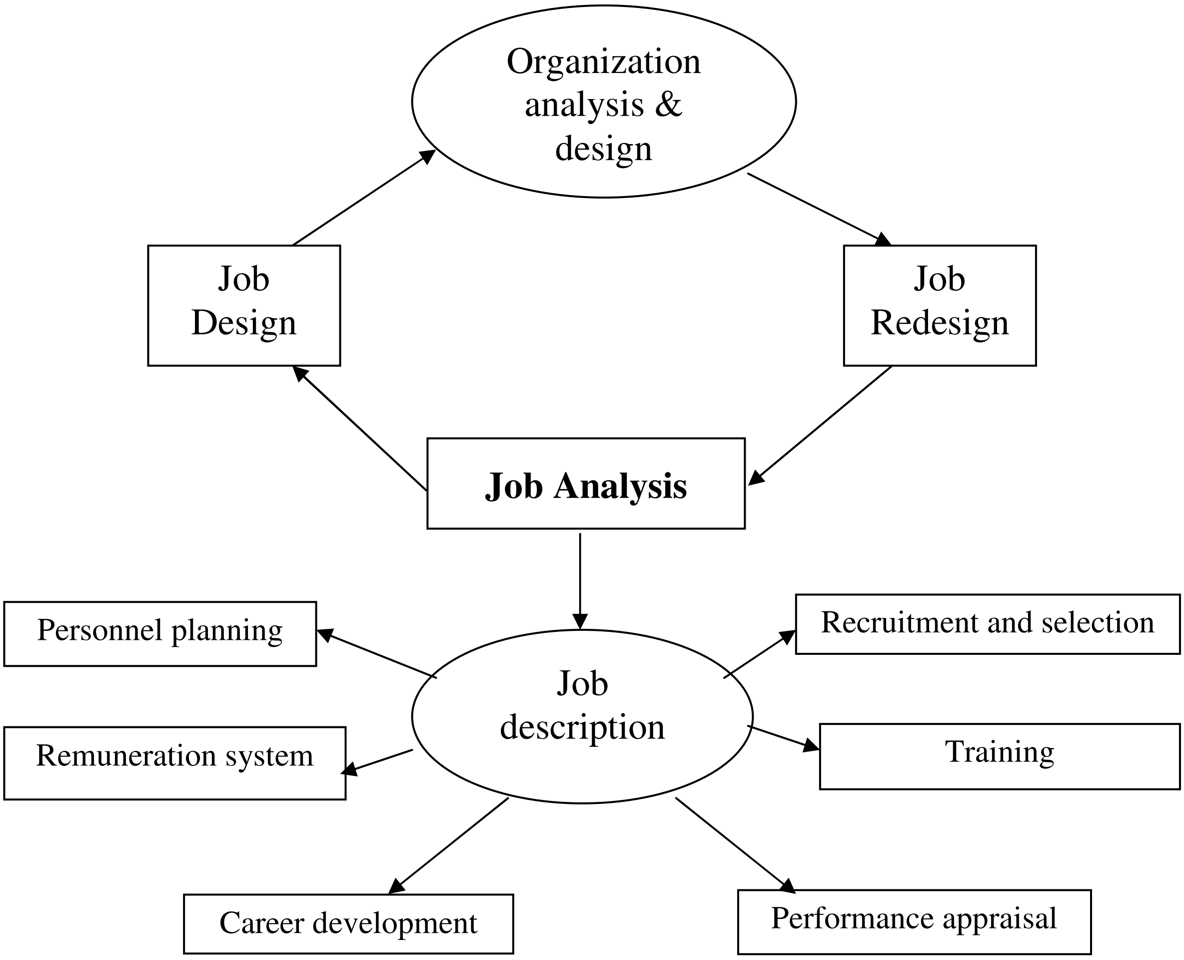
Job analysis has two different types of outputs: Job descriptions and job (re)design.

2.JOB ANALYSIS AND JOB DESCRIPTIONS

Job analysis is in order to facilitate the set up of the jobs description, which are documents with a strong influence over the following HR activities, notably:

- Recruitment and selection
- Personnel planning;
- Performance appraisal;
- Payment scheme;
- Training,
- Career management.

The various purposes of job analysis may result in looking into different aspects and hence, has different outcomes. Therefore, the first question which you have to answer before starting the job analysis is: **What is the purpose of job analysis? What do we want to address?** Only after you find the answer to this question, you are able to make a meaningful job analysis!



3.JOB ANALYSIS AND JOB DESIGN

Job analysis may also result in job design. Here, two types of job design can be distinguished:

- ***Job design***, focused on structuring and mapping all the individual characteristics;
- ***Job redesign***, if the job needs to be changed, notably enlarged, enriched, or specialized.

Job design is used when you want to determine the specifications of the jobs, in order to set up a proper organisation structure and determine the main organisational processes. But also reversely: the organisation structure and the main organisational processes determine the jobs.

Job redesign is an activity necessary if the work results are unsatisfactory (in respect with productivity, quality, work security), or the objectives of the organization are changed, or because of a change in technology, or a restructuring process occur.

A. Job design

The analysis will try to respond to a series of questions, like:

- Which are the job objectives, activities and tasks?
- Which are the responsibilities?
- What type of equipment and tools are needed?
- What type of education, skills and behaviour one needs to have in order to occupy this job?

In the job design process, 5 analytical instruments could be used:
1. Documents analysis (organization structure, quality assurance documents, company regulations, manuals, technical and administrative instructions, etc.);
2. Interviews with the managers/HR department – to find out job's objectives, main activities, necessary tools and equipments, and work relations with other jobs within and without the department. The output of these interviews will be a List with activities, related with the job analysed.
3. Interviews with the job holders (when there is more then a single job holder, it is better to organize group discussions) – the interviews are meant to check up, and improve, the list obtained after the interviews with the managers.
4. Direct observation – the analyst will observe the way the job holder is working and how the tasks are completed during the day. Usually, the analyst will note all the important observations into a Guide of Observations.
5. A report of job analysis – a synthetic paper, with all the information gathered during the analysis. The report must structure the information accordingly with the following chapters: title of the job, position in organization, type of job (full time, part time, or project base), the objectives, main activities with the necessary tasks to fulfil it, equipment and tools, functions and responsibilities, number of persons.

The report will be used to elaborate the job description, and it will be a part of the report regarding unit analysis, or department analysis.

B. Job redesign

As the name said, job redesign is an analysis which notably reviews and aims to improve existing (see A).

There are 3 ways of actions:
1. Enlarge the activities (include different tasks of a similar level);
2. Enrich the job (include tasks of different level)
3. Specialization;

1. Enlarging the activities

This means increasing the numbers of activities and tasks, maintaining the scope of the job. The enlargement is a horizontal development of the job. Practically: maintain the same level, while adding more activities!

Here you can find two different situations: a static process, when you transfer the activities from one post to another; a dynamic process, when you establish new types of activity for your jobs.

Pros	Cons
The job will be more divers.	New costs (increase of payment – only if the activities are new for the company)
Increase of satisfaction	More time to accomplish the tasks
Invites the use of skills.	

Pros	Cons
Adds to experiences	Resistance to change could become bigger.

2. Enriching the job

This means to develop the scope of the job, making the job more complex by adding more activities and responsibilities. The enrichment is a vertical development within the organization.

Pros	Cons
Increase of motivation	Some are resistant to receive more responsibilities
Invites maximum use of the skills and experience from the worker.	Fear of exercising the responsibilities and even fail to act accordingly.

3. Specialization

The job specialization means to simplify the job. Usually that means to have jobs with a reduce scope, with specific activities which demand very specific skills. The secret with specialization is to avoid to overdone it! Otherwise you will limit the possibility of finding the right person for the job.

Pros	Cons
The job requirements are more clear	Standardisation of production
The tasks are completed in a very precise way.	Isolation, lack of team work
Standardisation of production	Reduced employability

D.4.2 Templates for Job Analysis

There are different methods to conduct a job analysis. These methods are elaborated hereunder.

Depending on the situation, some methods may be more effective and efficient than others. Hence, a clever selection is required.

I. Documents analysis

Information gathering by this technique can consist of:

a. Job position within organization:
   - Organisation chart
   - Name of the job
   - Name of the department
   - Supervisor's designation
   - Close subordinate jobs
   - All the subordinated jobs

b. Main activities
   - What is to be done
   - What are critical issues, risks
   - Performance standards

c. The relations and functions in the organization
   - is replaced by:
   - is replacing:
   - hierarchical relations with:

- functional relations with:

d. Equipments, tools and instruments
   - Physical equipment
   - Work instructions, manuals, quality assurance system

e. Working conditions
   - Safety measures and instructions
   - Eventual aggravating matters, health risks
   - Irregular working hours

f. Education and skills required (if this information is available!):

II. Interviews with the Manager/HR department

- Q1. Which are the job's objectives?
- Q2. Which are the main activities?
- Q3. What kind of tools, equipments and instruments are necessary?
- Q4. Which are the work relations with other jobs, within and without the department?
- Q5. Which are the education, knowledge and skills needed to perform the job?

III. Interview with the individual job holder

- Q1. Which are the jobs objectives?
- Q2. Which are the activities and tasks?
- Q3. Which are the responsibilities?
- Q4. What kind of tools and equipments are necessary?
- Q5. What promotion possibilities are available?
- Q6. What training needs?
- Q7. What about job conditions (work schedule, type of work, place, hazards etc.)?
- Q8. There is any type of confidentiality related with this job?
- Q9. What about education, knowledge and skills to perform the job?

IV. Interview with focus group of job holders

A group interview, with the same type of questions as with individual job holders (see III).

V. Questionnaires

Instead of interviews, the job holder(s) can also be asked to respond through questionnaires. The questionnaires have the same type of questions as with individual job holders (see III).

VI. Direct observation

It will be observed: job conditions (work schedule, type of work, place etc.); equipments and tools used during the work; relations with the others; time spend; number of persons.

Job analysis report

The report must structure the information accordingly with the following chapters:

1. Introduction: reason, purpose for job analysis and which jobs this covers.

2. Presentation of information – in the following structure:
- the title of the job analysis,
- position in organization,
- type of job (full time, part time, or project base),
- the objectives, main activities with the necessary tasks to fulfil it,
- equipment and tools, functions and responsibilities,
- education, knowledge and skills needed.
- number of persons.

4. Conclusions: - how to transfer the information in a job description.

D.4.3 Job analysis questionnaire

This section has been developed as part of FOPIP 2 project.

For details, see the electronic version of this Appendix.

D.5 Performance Appraisal System Manual

D.5.1 Performance Appraisal Manual

This manual was developed as part of the project "Technical Assistance for institutional strengthening of ISPA final beneficiaries in the water and wastewater sector' (ISPA measure 2003 RO 16 P PA012). This manual aimed to assist Romanian water companies with the introduction and implementation of PAS. It described the elements, criteria and steps in a PA system as well as the introduction of such a system.

Main aspects included in thus Manual:
- Background on performance appraisal
- Key elements of the PAS
- Intermediate model for PAS
- Procedure and timeline
- Explanations steps
- Guidance to staff involved in PA
- Introduction of PA system

For details, see the electronic version of this Appendix.

D.5.2 Performance Appraisal Guidelines and Manager's Training Form

This section has been developed as part of FOPIP 2 project in order to help in the implementation of the Institutional and Training Plans.

For details, see the electronic version of this Appendix.

D.6 Training Needs Assessment and Training Planning Manual

D.6.1 FOPIP 1 Manual

This manual was developed as part of the project “Technical Assistance for institutional strengthening of ISPA final beneficiaries in the water and wastewater sector' (ISPA measure 2003 RO 16 P PA012).

This manual aimed to support the water companies, particularly the HRM experts and managers, in development and implementing of systematic and structured training. It particularly offers a methodology for training needs assessment and training planning.

For details, see the electronic version of this Appendix.

D.6.2 FOPIP 2 TNA questionnaire & checklist

This section has been developed as part of FOPIP 2 project in order to help in the implementation of the Institutional and Training Plans.

For details, see the electronic version of this Appendix.

D.7 Outsourcing Manual

D.7.1 Outsourcing Manual

This manual was developed as part of the project “Technical Assistance for institutional strengthening of ISPA final beneficiaries in the water and wastewater sector' (ISPA measure 2003 RO 16 P PA012).

This manual aims to assist water companies in getting a better insight on the possibilities for outsourcing, give a better background to decide on outsourcing and how an outsourcing arrangement can be implemented.

For details, see the electronic version of this Appendix.

D.7.2 Guidelines on analyzing the outsourcing potential

This section of the Manual has been developed as part of FOPIP 2 project in order to help in the implementation of the Institutional and Training Plans.

For details, see the electronic version of this Appendix.

D.8 Guidelines on Career Development

These guidelines were developed as part of the project “Technical Assistance for institutional strengthening of ISPA final beneficiaries in the water and wastewater sector' (ISPA measure 2003 RO 16 P PA012).

The structure of the Guidelines:

- general information on career development.
- practical ways and instruments to give shape to career development.
- what the water company can and should do in terms of CD.

For details, see the electronic version of this Appendix.

Appendix E. Appendices to Chapter 8

E.1 ROCs current position on existing asset databases in the light of the need for the restructuring process

During the critical analysis phase of the FOPIP project, a review of the current asset databases of the participating utilities was carried out. The review was carried out in the light of the need for the restructuring process leading to regionalisation and the anticipated major investments in new infrastructure needed to expand coverage of water and wastewater services.

The method used for assessment was based on a Questionnaire that was sent to all participating ROCs. The Questionnaire was structured in two sections as to allow the assessment of key aspects in asset management:

1. Asset inventory (data fields, use, methods for assessment of asset condition & criticality, maintenance & repair history)
2. Maintenance and repair planning (methods and procedures, priorities, responsibilities).

The main findings are summarised below.

Asset Inventory data:

- 80% of the ROCs the assets are organized in groups
- 60% of the ROCs hold technical specification data
- 93% of the ROC hold data on the age and the remaining useful life of the assets
- 60% of the ROCs hold data on the condition grade
- 7% of the ROCs hold data on the criticality
- 87% from the ROCs hold data on the procurement costs
- 13% from the ROCs hold data on the replacement costs
- 27% of the ROCs hold data on the repair history

Asset Inventory use:

- The information system is used, in general by the financial – accounting system, clients.
- The technical and operation department does not use the same information system
- Most of the data on the interventions are recorded on paper.

Asset condition and criticality assessment method:

Most common methods, by group of assets (water and wastewater networks, equipment) used by ROCs for assessing asset condition and criticality are as follows:

- Water and wastewater networks
  - age
  - failure incidents history
  - the condition (for some of the ROCs)
- Equipment
  - age
  - operational time
  - technical parameters

The box below presents some examples, selected from the filled Questionnaires submitted by ROCs, on the methods used for assessing asset condition and criticality, organized by group of assets (water and wastewater networks, equipment).

Water and waste water networks: • age • failure incidents history • annual revisions • claims *Equipment:* • age • nr. hours of functioning • technological efficiency
Water and waste water networks • commissioning year, the quality of material, the frequency and type of incidents registered in the operational fiches *Equipments* • commissioning year, hours of functioning, equipment's technical book and fact-findings of the scheduled technical inspection
Water and waste water networks • the condition – statistical estimations based on age and failure incidents *Equipments* • condition • hours of functioning • probability of failure
Water and waste water networks: • no and type of intervention registered on the respective pipe section • cost of repairs • the commissioning year / useful life • the nature of the field where the pipes are located *Equipments:* • the frequency of replacing the parts in motion • year of manufacture / the commissioning year • grade of usage • useful life / technical specificatiosn / operational guidelines

Maintenance and repair history:

- The assets inventory has been taken over by the Local Councils without data on technical specifications
- The failure incidents history is recorded on paper the work orders and can be found in the accounting department and operations departments
- Partial failure incidents history is available only for the capital repairs – increasing the assets value - recorded at the accounts.
- The history of revisions and repairs can be found on work orders.
- The take over assets are not included in the database.
- Data and technical specifications are summarized in asset fiche, in the claims register in the dispatcher unit, in the register with the daily work schedule – with the foreman and in repairs notification.
- The repairs history is available only for the capital repairs; Asset fiches and work order registers are available in operational units and are updated daily.

Maintenance and Repair Planning methods:

The following box presets examples of planning criteria and procedures used by ROCs, as described in the Questionnaire used for analysis.

Planning criteria and procedures
Criteria for planning the repairs and regular revisions: • equipment condition • usage degree • method of operation • recommended useful life • time between failure • cost of repairs or replacement costs
Each task force, sector, unit, branch prepares it's own plan for repairs and maintenance of its operational assets. At the ROC level the annual plan for repairs and maintenance plan is prepared.
Water and waste water networks • useful life • nr. of failure incidents *Mechanical – electrical equipment* • nr. of hours of functioning
• nr. of hours of functioning • criticality (importance in system) • no of failure incidents
• nr. of hours of functioning • condition at the technical revision • technical specification correlated with age • number of incidents recorded in the previous month • weak operational parameters • nr. of operational hours

Priority setting criteria

Priority setting
• condition grade • repairs costs • importance in the service supplying
• physical condition • importance in the system • technical specifications
The importance of objective and/or intervention
Repairs: nr. of clients affected, volume of water losses, water leakage location, type of client, consequences, law onservance, environmental protection *Maintenance*: service continuity, technical parameters (Q, p), # of clients affected (network sectoring), contractual liabilities, service improvement
• Networks – in correlation with the street repairs and as per the available funds • Equipment – according to the importance of the technological process • Maintenance – according to the schedule
Condition assessment, age, criticality based on a hierarchy of the key elements of the system such as: water sources, main trunks, pumping stations, reservoirs, distribution mains, secondary, etc.

E.2 Asset Management Plan – Outline

1. Asset Inventory

Description

- Organization (e.g. by process, by type of asset, by location, etc)
- Fields available, content and description of data
- Requirements for updating and Responsibilities (who, what type of data, how often)

Analysis

- Asset Condition Assessment (methodology, templates, responsibilities)
- Criticality analysis (methodology, templates, responsibilities)
- Remaining useful life analysis (methodology, templates, responsibilities)
- Asset valuation (methodology, templates, responsibilities)

3. Key Planning Assumptions

System analysis

(Customer requirements, Population forecasts, Water demand Wastewater flows, Water network, Wastewater network)

Performance Indicators

(actual, targets, proposed measures to reach the targets)

4. Maintenance, Rehabilitation and Renewal Planning

Needs analysis

(maintenance, rehabilitation and replacement needs – methods and criteria, priorities)

Implementation Plan

(Operation and Maintenance, Repair and Replacement Plan, Capital Investment)

5. Asset management process review and improvement

- Performance measurement
- Proposed measures for improvement
- Implementation plan.

E.3 AMP Implementation Plan – Model

Activities in Asset Management Plan	Responsible	Deadline	Estimated Budget (RON, man/hours)

Or, more detailed (recommended):

Problem:								
The causes of the problem:								
Solution (approach):								
Implementation:								
Action	Resources						End date	Responsi-bility
	information's		materials/ equipment		human resources			
		cost		cost		cost		
TOTAL	___		___		___			___

E.4 Impact on Asset Management Plans of Future Investments

Future investments in the water supply and wastewater sector will need to be planned to take account of environmental issues, customer service standards and changes in overall performance levels.

Asset management help ROCs in managing capital infrastructure – minimize the total cost of designing, acquiring, operating, maintaining, replacing, and disposing of capital assets over their useful lives, while achieving desired service levels.

Asset management planning helps ROCs to establish the priority of assets and to determine when the assets should be rehabilitated and replaced so as to maintain the desired level of service and cost efficiency.

For each operator, asset management assistance during FOPIP can be considered a project comprising two major stages:
1. planning – i.e. preparation of the Asset Management Plan
2. implementation – i.e. preparation of asset inventory and use of this database through an integrated software package for decision making

ROCs, being now in the regionalization process and taking over new systems, will have to review their amp as to update and extend the key planning assumptions and maintenance, rehabilitation and renewal planning for the entire area of operations.

Furthermore, the planning process itself should be reviewed and the Asset Management Plan should be reviewed and updated annually with the following information:
- asset management process review and improvement
- performance measurement

- proposed measures for improvement
- implementation plan.

Ideally, the AMP should be the basis for the financial needs forecast and for the development of rehabilitation and replacement schedule in accordance with system's priorities.

At the beginning of FOPIP assistance, if all ROCs had Asset Inventories that included information on the type of assets, technical data, location, technical lifespan, only a few of them had and used in practice the information on the history of maintenance and repairing operations, asset condition, performance, or replacement value, i.e. the key information for decision making with regard to maintaining, rehabilitating or renewing the assets.

Asset condition, performance and criticality are extremely important information that needs to be included in the asset inventory. All management decisions regarding maintenance, rehabilitation and renewal are made based on these aspects.

Knowing the condition of assets, and knowing where to prioritize rehabilitation and replacement spending helps utilities preserve assets, maintain reliable service, and understand long-term financial needs.

Not all assets are equally important to the system's operation – some assets are highly critical and others are not critical at all.

Criticality analysis has several important functions among which allowing a ROC to manage its risk and help determining how to better allocate the rehabilitation and renewal funds.

In order to make a sound investment prioritization, each ROC will have to asses the criticality of the assets in its system.

Life-cycle costs analysis was introduced to ROCs through FOPIP assistance as tool that helps evaluating investment alternatives.

Life-cycle cost analysis should be the basis for ROCs' investment decisions, i.e. for identifying which assets need regular maintenance and repairs, rehabilitation or to be replaced. The information needed for life-cycle cost analysis is contained in the asset inventory.

If all cost information related to an asset (historical costs for all maintenance and repair activities, rehabilitation cost, replacement cost) is included in the asset inventory, the Rehabilitation and Capital Investment Plans can be easily generated, analyzed and decided upon.

A comprehensive asset inventory and the associated asset management software will allow ROCs to make sound decisions for resource allocation.

Priority in resources allocation will be given to:
1. critical assets
2. assets in poor condition
3. assets with shorter remaining life
4. assets with less redundancy

5. assets that are not cost efficient

The investments included in the Master Plans can be easily prioritized based on the above criteria.

Other investment needs, that may not have been included in the existing investment programs or Master Plans can be easily identified and investment projects prepared based on a thorough analysis of the system.

Once an investment is implemented, the result is immediately visible in the asset inventory by registering the change in the condition of respective assets. The ROC's AMP should be updated on annual basis as to reflect these changes.

E.5 Condition Grading

An example of asset condition grading is provided in the matrix below.

This is a simplistic approach that provides reasonable accurate data for starting to assess the condition of assets for a water or wastewater system.

Over time, the condition assessments can be done more accurately using the same principle and replacing the estimates for condition grade with real values resulting from specific measurements.

The model below can be used to determine the condition by associating to each asset the grade that better describes its functional status.

For a reasonably accurate assessment, the definitions for each grade should be very well thought through, clearly expressed and specific so that a common understanding amongst ROC personnel is achieved on the condition of each group of assets.

Grade	Description of Condition	Definition
1	Very Good Condition	Only normal maintenance required
2	Minor Defects Only	Minor maintenance required (5%)
3	Maintenance Required to Return to Accepted Level of Service	Significant maintenance required (10-20%)
4	Requires Renewal	Significant renewal/upgrade required (20-40%)
5	Asset Unserviceable	Over 50% of asset requires replacement

Condition Grading Template

Asset Group.................................

Date of assessment.................................

Responsible for assessment.................................

Asset name	Asset code	Condition

Definitions[16]

Grade	Description of Condition	Definition
1	Very Good Condition	
2	Minor Defects Only	
3	Maintenance Required to Return to Accepted Level of Service	
4	Requires Renewal	
5	Asset Unserviceable	

E.6 Criticality Assessment

The Criticality Assessment model presented below is a very efficient tool for assessing criticality.

This criticality assessment is a simplistic approach that provides reasonable accurate data for start assessing the criticality for a water or wastewater system.

Over time, the criticality analysis can be done more accurate, using the same principle and replacing the estimates (for probability and consequences) with real values.

The model below can be used to determine the criticality of each of the assets, in 3 steps:

Step1: Estimate the probability of failure for each asset (probability estimates ranks from 0,1 = low probability to 0,9 = high probability)

Step2: Estimate the of consequence (cost) of failure for each asset / group of assets (cost of failure estimates could rank for e.g. between 1 = low cost and 5 = high cost)

Step 3: Calculate the Criticality Index (CI) by multiplying the estimates of probability and cost of failure for each asset.

Asset	Probability of failure (A)	Cost of failure (B)	Criticality Index (CI) (C=A*B)

[16] Definitions for Condition grade are specific for each group of assets; They should be developed by each ROC

Criticality Assessment Template

Asset Group.................................

Date of assessment...............................

Responsible for assessment.................................

Asset name	Asset code	Probability of failure	Cost of failure	Criticality Index (CI)
		(A)	(B)	(C=A*B)

Definitions[17]

Probability of failure	Definition
0,1	
0,3	
0,5	
0,7	
0,9	

Cost of failure	Definition
1 (very low)	
2 (low)	
3 (medium)	
4 (high)	
5 (very high)	

E.7 Technical Lifespan

(According to Government Decision 2139/2004)

[17] Definitions for Probability of failure and cost of failure are specific for each group of assets; They should be developed by each ROC

Code	Asset name	Technical lifespan (min-max), years
1.8.	Construction works for the water, waste water supply and land improvements	
1.8.1.	Drilled or dug wells	24-36
1.8.2.	Drains for water supply	24-36
1.8.3.	Water catchment areas	32-48
1.8.4.	Pipes for water supply and sewerage	32-48
1.8.5.	Corridors for water supply and evacuation	32-48
1.8.6.	Pipes for the water supply, including crossings, distribution networks, underground corridors for technical installations	24-36
1.8.7.	Pipes for sewerage, except for:	32-48
1.8.7.1.	- technological pipes for acid waters	24-36
1.8.8.	Water treatment, desalinization and waste water treatment plants	24-36
1.8.9.	Surge tank	32-48
1.8.10.	Deposit tanks, sludge drying beds, irrigation and infiltration fields, except for:	16-24
1.8.10.1.	- irrigation channels	24-36
1.8.11.	Concrete reservoirs tanks for water	40-60
1.8.12.	Water pumping and distribution plants, except for	32-48
1.8.12.1.	- floating pumping stations	16-24
1.8.13.	Constructions and technological installations for water and waste water supply	32-48
1.8.14.	Light constructions (huts, storage rooms, tents, etc.	8-12
1.8.15.	Other constructions for water and waste water supply, land improvements not included in the subgroup 1.8.	24-36

E.8 Asset Inventory Model

Asset name	ID	Type of property	Group	Inventory no.	Accounting Code	Location	Physical and Technical data	Age	Remaining useful life	Failure incidents (date, type of repair, cost, etc)	Condition	Criticality Index	Acquisition cost	Depreciation	Current Value (actual value including maintenance and repairing costs)	Replacement cost

E.9 Outline Strategy for Reduction of Leakage and Unaccounted for Water (NRW)

……………………………….

(name of ROC)

STRATEGY FOR REDUCTION OF LEAKAGE AND UNACCOUNTED FOR WATER (NRW)

Strategy prepared by: **Strategy approved by:**

Date

CONTENTS

Summary of Main Aspects of Strategy to Reduce the Quantity of NRW

Issues to be addressed:

The need to demonstrate to ADI that after establishment of the Regional Operator, the ROC respects its obligations to organise and manage effectively the reduction of leakage and unaccounted for water across all localities of the ROC and has set out an effective strategy to achieve this within a reasonable time period.

Background to the issues:

The Government's expectations on regionalisation and use of capital investment in the municipal water sector using Cohesion Funds are:

- for ROCs to optimise the performance of the operations and quality of supplied services by using joint resources and facilities efficiently across the ROC;
- for improved reliability of operations;

Reducing the amount of NRW will help OR to improve its financial situation.

Solution (approach):

This strategy describes the current problems of OR, the future objectives for reducing NRW, proposed approach and methodologies to improve procedures and practices for measuring losses, identifying how and where losses occur and remedying them to reduce the amount of water not invoiced.

The Strategy sets the directions of the main intended actions for reducing the amount of NRW; the results of actions will be reported at intervals as the strategy is implemented.

Our approaches to reduce the quantity of NRW are important parts of the future management activities in the effective and efficient operation of the OR.

Therefore we will organise and coordinate the work on reducing NRW losses across all the localities of the ROC and prepare monthly reports with prescribed content / format on activities and on the values of performance indicators relating to NRW losses.

Implementation Plan: See Section 5.

Introduction

i. Purpose of the strategy

ii. ROC Objectives Regarding Reduction of NRW

The main objectives of the Company regarding reduction of NRW are to:
- reduce NRW to a value that is optimal from technical and economic points of view
- contribute to O&M cost reduction
- help delay the future need to invest in new water production facilities
- improve the perception of our customers regarding tech efficiency of the ROC's water supply activities
- find a sustainable way of making continuous improvement in NRW control so that the Company will become recognised as achieving good improvements in NRW.

iii. Ways to Use the Strategy

This Strategy to reduce the amount of NRW can be used by OR as:
- a tool to manage and to monitor implementation of the actions needed to reduce NRW
- a means to inform various ROC departments and sections on how the OR management team expects the impact of regionalisation to impact upon the ways the ROC will work to reduce the quantity of NRW
- a contribution to the company's future Business Plan
- a means to demonstrate to the ADI and other interested bodies that OR management team is aware of the problems that may arise due to the amount of NRW on the company's budget, and that the OR is preparing a set of proposals to reduce it.

iv. Coordination of NRW Strategy with other Internal Documents of the ROC

This strategy is linked to and must be coordinated with other activities and internal documents of the OR, such as:
- on-going or planned technical assistance projects that will support the ROC on reducing uninvoiced water, on rehabilitation of water supply systems, provision of specialist equipment, etc.
- Feasibility Study;
- operational procedures implemented and certified for water supply installations;
- human resources operation and maintenance;
- other relevant internal documents

v. Documents used as a Basis for this Strategy

- Contract delegating water and wastewater services;
- Regulation of water and sewer services, according to Order no. 88 of A.N.R.S.C.;
- Feasibility study and tender documentation for CF;
- asset management plan;
- ...., system procedures implemented and certified in the OR;
- procedures for intervention in cases of emergency;
- other relevant procedures

Present Situation on NRW Measurement and Control

Flow Measurement Points – water production and distribution

Locality	Position in the water supply system	Existing of the water meter		Water meter diameter	Water meter type	Year Installed	Condition (see key below)
		Now (#)	In the future (#)	(mm)			
Town X	Abstraction (surface, wells)						
	On the raw water trunk line						
	Inlet in the WTP						
	Outlet from the WTP						
	On the drinking water trunk line						
	Inlet in the storage reservoirs						
	Outlet from the storage reservoirs						
	Inlet to the distribution networks						
	In the distribution networks – in key positions (bulk meters)						
Town ?							
Town ?							
Etc.							

Condition Key: 1 = good working; 2 = poor condition / incorrect size; 3 = unknown

Proportion of Water Supplied into the Distribution Networks that is Metered

Locality	Volume of Water Supplied into the Distribution Networks		
	Estimated Total Volume Supplied into the Distribution Networks	Metered Volume Supplied into the Distribution Networks	Un-metered Volume Supplied into the Distribution Networks

Locality	Volume of Water Supplied into the Distribution Networks				
	(m3/year)	(m3/ year)	(% of total)	(m3/ year)	(% of total)
Town X:					
- Supply point 1					
- Supply point 2					
- Supply point 3					
- Supply point ?					
Town ?:					
- Supply point 1					
- Supply point 2					
Town ?:					
- Supply point 1					
- Supply point 2					
Town ?:					
Etc.					

Flow Measurement Points – on connections to clients

Locality	Type of Connection	Existing of the water meter		Water meter diameter	Water meter type	Year Installed	Condition (see key below)
		Now (#)	In the future (#)	(mm)			
Town X	Domestic						
	Commercial / industrial						
	Institutional						
	Other						
	....						
Town ?	Domestic						
	Commercial / industrial						
	Institutional						
	Other						
	....						
Town ?	Domestic						
	Commercial / industrial						
	Institutional						
	Other						
	....						
Etc.	Domestic						

Locality	Type of Connection	Existing of the water meter		Water meter diameter	Water meter type	Year Installed	Condition (see key below)
		Now (#)	In the future (#)	(mm)			
	Commercial / industrial						
	Institutional						
	Other						
	....						

Condition Key: 1 = good working; 2 = poor condition / incorrect size; 3 = unknown

Proportion of Water Supplied to Clients that is Metered

Locality	Volume of Water Supplied to Clients				
	Estimated Total Volume Invoiced to Clients	Volume Supplied to Clients that is Metered		Volume Supplied that is Metered for Invoicing Clients	
	(m3/year)	(m3/year)	(% of total)	(m3/year)	(% of total)
Town X:					
Domestic					
Commercial / industrial					
Institutional					
Other					
....					
Town ?:					
Domestic					
Commercial / industrial					
Institutional					
Other					
....					
Town ?:					
Domestic					
Commercial / industrial					
Institutional					
Other					
....					
Town ?:					
Town ?					

Pressure Measurement Points

Locality	Position in the water supply system	Existing of the pressure meter	Pressure meter type	Year of Installation

		In present	In future
Town X	Raw water trunk line		
	Drinking water trunk line		
	Distribution network		

Diagnosis of NRW Related Problems

Water Supply System Problems Affecting NRW

Locality	Position in the water supply system	Problems
Town X	Raw water trunk line	
	WTP	
	Drinking water trunk line	
	Drinking water storage reservoirs	
	Water distribution network	
	Production meters	
	Distribution network meters	
	Meters on client connections	
	Other ...	
Town ?	Raw water trunk line	
	WTP	
	Drinking water trunk line	
	Drinking water storage reservoirs	
	Water distribution network	
	Production meters	
	Distribution network meters	
	Meters on client connections	
	Other ...	
Town ?		

Water Meters Testing and Repair Facilities (actual situation, measurement and testing bank, etc.)

Locality	Water meter type	Diameters (mm)	Measurement and testing bank		Problems
			Yes	No	
Town X					
Town ?					

O&M Problems Affecting NRW

Locality	O&M Topic	Main Problems

Town X	Measurement and records of water production	
	Organisation of NRW monitoring and control work on distribution networks	
	Network inspection procedures	
	Network repair procedures	
	Personnel resources	
	Equipment	
	Client meter and records of consumption	
	Other ...	
Town ?	Measurement and records of water production	
	Organisation of NRW monitoring and control work on distribution networks	
	Network inspection procedures	
	Network repair procedures	
	Personnel resources	
	Equipment	
	Client meter and records of consumption	
	Other ...	
Town ?		

Action Plan to Reduce the NRW Values

The following steps are identified as part of the action plan for implementation of the NRW reduction strategy:

- Establish NRW monitoring and control group with clear responsibilities and reporting arrangements
- Create water balance for each locality
- Assess accuracy of measuring treated water entering the distribution networks and plan for improvements where necessary
- Assess accuracy of measuring water consumed by customers and plan for improvements where necessary
- Determine if passive or active leakage control in the distribution networks will be adopted
- Improve inspections of distribution network pipe routes to detect visible leakage
- Carry out tasks as shown in following specific action plan tables
- Organise a format for reporting by branches and other localities on implementation of NRW reduction activities.

Examples of Action Plan for Specific NRW Reduction Objectives:

Objective: Ex.: Estimate losses due to client meter errors				
Method of achievement : Pilot project on typical group of Client meters				
Expected Benefits: To be calculated based on pilot project results				
Responsible for the objective: Technical Director				
Actions	Cost	Responsible	Resources Required	Term
1. Select existing meters as sample for estimation of errors	-	Head of distribution office in cooperation with Client Billing Department		
2. Analyse records of past consumption and calculate correct size of meters for selected samples	-	Head of distribution office in cooperation with Client Billing Department		
3. Replace selected meters with calibrated meter of correct size	15.000	Head of distribution office	Calibrated meters (new or repaired)	
4. Determine period (months) for pilot trial measurement at each selected meter installation	-	Head of Technical Department		
5. Analyse recorded consumption using calibrated meter of correct size	-	Staff of Technical Department		
6. Extrapolate results and assess potential benefits and cost of larger scale programme for correct sizing of client meters	-	Head and staff of Technical Department		
Etc.				
Total costs	15.000			

Objective: Ex.: Reducing leakages on the network with x % in xx months				
Method of achievement : Reducing pressure on the whole system with x bar				
Cost economy: ?.???.??? RON/an (saved mc x cost/mc)				
Responsible for the objective: Operations Director				
Actions	Cost	Responsible	Resources to purchase	Term
1 Analysis of network and identifying the less favoured points	500	Head of projection office		30.07.08
2 Measuring the service pressures in less favoured points of the network	5.000	Head of distribution office	Pressure transducer and data loggers 4 pieces	15.09.08
3 Reducing pressure at the exit from the plant with 0,5 bar	100	Head of water plant		16.09.08
4 Re-measuring pressures in critical points	1.000	Head of distribution section		25.09.08
Etc.				
Total costs	20.000			

Other specific action plan tables for actions or pilot projects as necessary for each locality including for example:

- Updating of ROC records of production meters at all points where treated water enters the distribution networks
- Updating of ROC records of client meters at all connections
- Programme of installing or replacing of production meters where there is no meter or the existing meter is of incorrect size, excessive age, incorrect class, etc.
- Programme of installing or replacing of client meters where there is no meter or the existing meter is of incorrect size, excessive age, incorrect class, etc.
- Programme of leakage control / network repairs
- Network modelling and analysis of specific sub-networks of the distribution systems at all localities
- Etc. ...

Reporting on NRW

NRW control is of major importance to the proper performance of the ROC's obligations under the terms of our contract under the ADI for delegated water supply and wastewater services. Therefore our company prepares monthly reports on the activities of our NRW group / department.

Example Contents of NRW Reports:

1. Summary: including:

- Actual and target values of main performance indicators on NRW
- Personnel involved in NRW Task Force
- Water balance *(Overall ROC)*
- Main activities carried out in reporting period
- Obstacles to progress
- Activities planned for next period

2. Metering:

- Production metering *(New meters needed, condition of existing meters, repairs and calibration, costs)*
- Customer metering *(New meters needed, condition of existing meters, repairs and calibration, costs)*
- Distribution zone meters: *(New meters needed, condition of existing meters, repairs and calibration, costs)*

3. Water Balance

The values of the water balance can be for rolling periods of time (e.g. 12, 6, 3 months) and for each locality and for overall ROC

4. Values of Network Indices and Network Monitoring Results

- NRW (%)
- NRW (l/km/year)
- LKN (m3/km/year)
- ILI
- ELI

The values of the indicators can be for rolling periods of time (e.g. 12, 6, 3 months) and for each locality and for overall ROC

5. Main activities Planned for Next Reporting Period

6. Resources Available and Required to Implement Activities

(Personnel, materials, equipment, etc.)

Annexes

Annex1 – Information on Existing Systems and Diagnosis of Issues

Sketches of the water supply systems for each locality of the ROC with symbols indicating:
- production facilities and capacity at each locality
- locations of flow measuring points for all localities (so far as known actual situation and planned for the future)
- locations of pressure gauges (so far as known actual situation and planned for the future)
- transmission pipelines
- distribution networks zones supplied by each source
- distribution networks pressure zones (if the case)
- other
- ... .

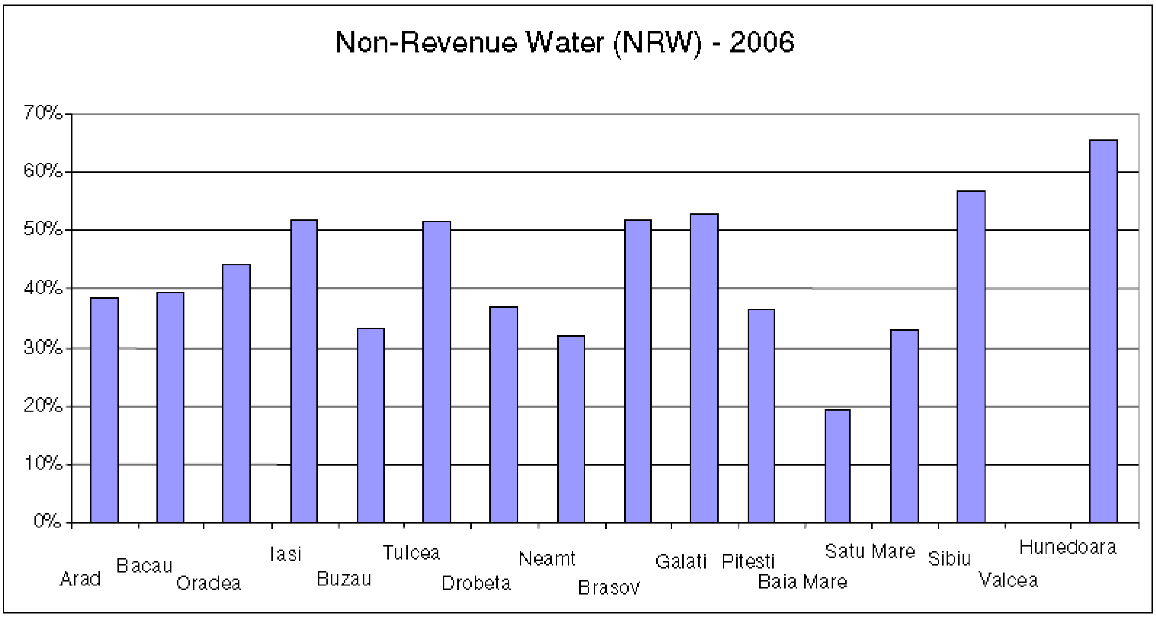
Other Data:
- hydraulic parameters e.g. delivery pressure at outlet of pump stations, elevation of gravity flow reservoirs (max and min water levels)
- data on annual volumes of water produced and sold
- available equipment for use in NRW reduction activities
- other
- ... .

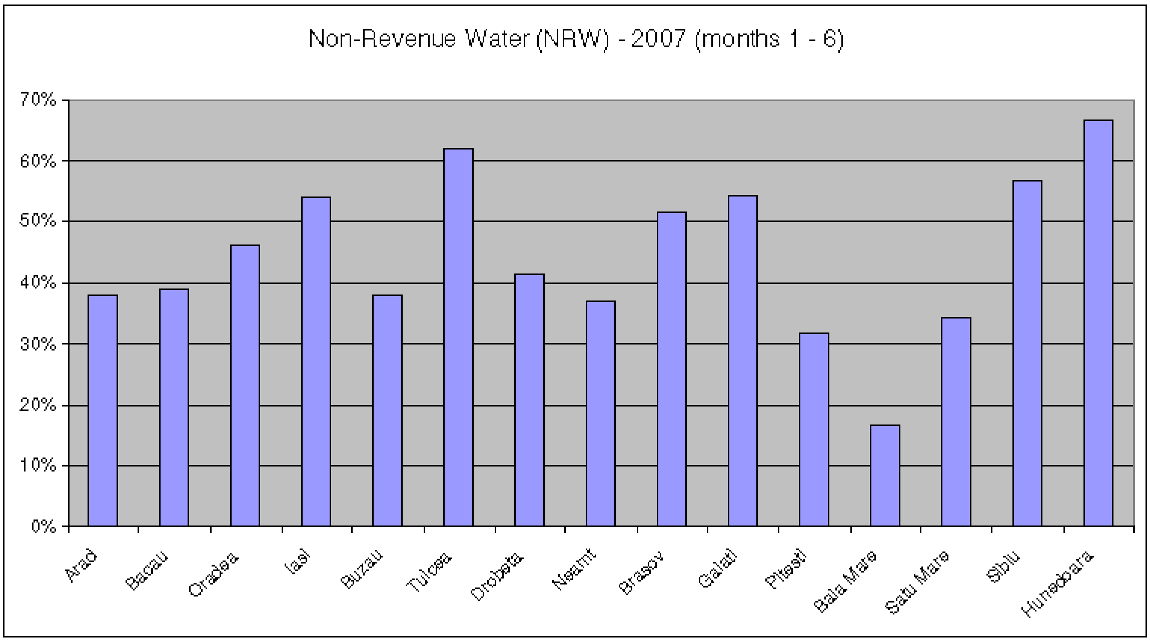
Annex 2 – Water Balance for each Locality and overall ROC

Include here the water balance for latest available one year period for all localities of the ROC as a baseline setoff values against which the future progress on NRW reduction can be measured.

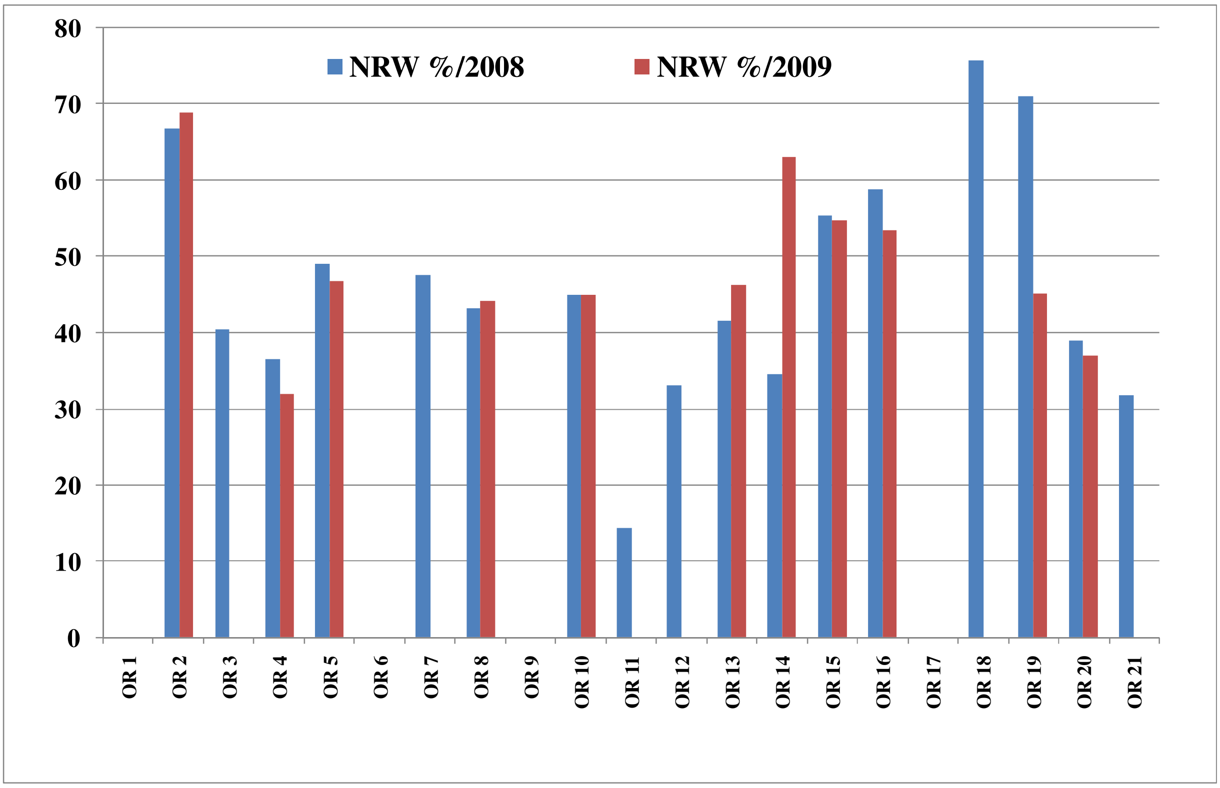
E.10 NRW Values for Some Romanian Utilities

E.10.1 FOPIP I operators, 2006 – 2007 (months 1 – 6)





E.10.2 FOPIP II operators, 2008 – 2009



E.11 Examples of calculated values for water loss indicators

E.11.1 Examples of Water Loss Indicator Values –Somes Water Company

The calculations of NRW, CARL, UARL, ILI, LKN and ELI are based on the water loss indicator formulae defined in the manual guidelines.

Initial data

Symbol	Unit	Cluj Napoca	Huedin	Gherla	Dej
QB	m3/yr	29369346	559679	2116800	1422710
QNB	m3/yr	0	0	0	0
QL	m3/yr	24029465	856375	1055050	1935290
QRL	m3/yr	22525754	804632	934307	1854506
QAL	m3/yr	1503710	51743	120744	80784
QSIV	m3/yr	53398810	1416054	3171850	3358000
QR	m3/yr	29369346	559679	2116800	1422710
Cn	nr	35718	2756	3539	5015
Ln	km	639	35.8	65.2	139.6
Lc	km	114.30	9.76	14.96	25.45
Pm	m	30.0	42.6	39.6	47.0
Qs	m3/yr	30873056	611422	2237544	1503494
T	Hours/day	24	24	24	24

Non-Revenue Water (NRW)

$NRW = [(Q_{SIV} – Q_R) / Q_{SIV}] \times 100$

	Cluj Napoca	Huedin	Gherla	Dej
NRW	45%	60%	33%	58%

Current Annual Real Losses (CARL)

$CARL = Q_{RL} / C_n$ (m3/yr/connection)

	Cluj Napoca	Huedin	Gherla	Dej
CARL (m3/yr/conn.)	630.7	292.0	264.0	369.8
CARL (lts/day/conn.)	1727.8	799.9	723.3	1013.1

Unavoidable Annual Real Losses (UARL)

$UARL = [(A \times L_n) + (B \times C_n) + (C \times L_c)]P_m$ (litres/day)

	Cluj Napoca	Huedin	Gherla	Dej
UARL (lt/day)	1288000	132000	173000	337000
UARL (lt/day/conn.)	36.1	47.8	49.0	67.2

Infrastructure Leakage Index (ILI)

ILI = CARL/UARL

	Cluj Napoca	Huedin	Gherla	Dej
ILI	47.9	16.7	14.8	15.1

Leakage per km of network (LKN)

$LKN = Q_{RL} / L_n$ (m3/yr/km)

	Cluj Napoca	Huedin	Gherla	Dej
LKN (m3/km/yr)	35252	22476	14330	13284
LKN (m3/km/day)	97	62	39	36

Economical Leakage Index (ELI)

ELI = EI x LI Where EI is a value 0.5, 1.0 or 1.5 depending on water treatment provided and the requirement for pumping into the network. LI is obtained through the relationship LI = LKN / 3600.

	Cluj Napoca	Huedin	Gherla	Dej
EI	1.0	1.0	1.0	1.0
LI	9.8	6.2	4.0	3.7
ELI	9.79	6.24	3.98	3.69

E.11.2 Examples of Water Loss Indicator Values – Company for Public Utilities Focsani

Initial data

Symbol	Unit	Focşani	Odobeşti	Adjud	Panciu	Mărăşeşti
QB	m3/yr	4782000	355347	456506	259644	261947
QNB	m3/yr	33000	3000	5600	3000	3000
QL	m3/yr	2183015	1042445	1244702	1060356	295053
QRL	m3/yr	1985012	1028053	1230054	1059816	390469
QAL	m3/yr	198003	14392	14648	540	4584
QSIV	m3/yr	6998015	1400792	1706808	1323000	660000
QR	m3/yr	4815000	358347	462106	262644	264947
Cn	nr	8416	2154	1233	2404	1185
Ln	km	168	29	24	39	23
Lc	km	40,31	12,92	7,40	14,42	7,11
Pm	m	15	12	12	12	12
Qs	m3/yr	5013003	372739	476754	265184	269531
T	Hours/day	24	24	24	24	24

Non-Revenue Water (NRW)

$NRW = [(Q_{SIV} – Q_R) / Q_{SIV}] \times 100$

Nr. crt.	Sisteme	NRW
1	Focşani	31,19
2	Odobeşti	74,42
3	Adjud	72,96
4	Panciu	80,15
5	Mărăşeşti	59,86

Current Annual Real Losses (CARL)

$CARL = Q_{RL} / C_n$ (m^3/yr/connection)

	Focşani	Odobeşti	Adjud	Panciu	Mărăşeşti
CARL (m3/yr/connection)	235,86	477,28	997,61	440,85	329,51
CARL (l/day/ connection)	646,19	1307,62	2733,18	1207,81	902,76

Unavoidable Annual Real Losses (UARL)

$UARL = [(A \times L_n) + (B \times C_n) + (C \times L_c)]P_m$ (l/day)

	Focşani	Odobeşti	Adjud	Panciu	Mărăşeşti
UARL (l/day)	161468,25	38523,0	24051	44785,5	18477
UARL (l/day/ connection)	19,18	17,88	19,50	18,62	15,59

Infrastructure Leakage Index (ILI)

ILI = ILI = CARL/UARL

	Focşani	Odobeşti	Adjud	Panciu	Mărăşeşti
ILI	33,69	73,13	140,16	64,86	57,90

Leakage per km of network (LKN)

LKN = Q_{RL} / L_n (m^3/yr/km)

	Focşani	Odobeşti	Adjud	Panciu	Mărăşeşti
LKN (m3/km/yr)	11815,55	35450,1	51252,25	27174.77	16976,91
LKN (m3/km/day)	32,37	97,12	140,417	75,27	46,51

Economical Leakage Index (ELI)

ELI = EI x LI, where EI is a value 0.5, 1.0 or 1.5 depending on water treatment provided and the requirement for pumping into the network. LI is obtained through the relationship LI = LKN / 3600.

	Focşani	Odobeşti	Adjud	Panciu	Mărăşeşti
EI	1	1	1	1	1
LI	3,28	9,84	14,31	7,54	4,71
ELI	3,28	9,84	14,31	7,54	4,71

No.	Systems	NRW	LKN	ILI	ELI
1	Focşani	31,19	11815,55	33,69	3,28
2	Odobeşti	74,42	35450,1	73,13	9,84
3	Adjud	72,93	51252,25	140,16	14,31
4	Panciu	80,15	27174,77	64,86	7,54
5	Mărăşeşti	59,86	16976,91	57,90	4,71

E.11.3 Examples of Water Loss Indicator Values – HARVIZ S.A. Miercurea Ciuc

Initial data

Symbol	Unitate	Miercurea Ciuc	Vlăhiţa*	Bălan*	Sânmartin	Frumoasa**
QB	m3/an	2,333,000	198,023	489,960	39,120	175,944
QNB	m3/an	112,700	86,955	0	4,500	12,246
QL	m3/an	1,857,827	632,712	722,040	13,809	14,760
QRL	m3/an	1,846,000	594,804	664,040	10,364	4,205
QAL	m3/an	11,827	37,908	58,000	3,445	10,555
QSIV	m3/an	4,303,527	947,690	1,212,000	57,429	202,950
QR	m3/an	2,445,700	284,978	489,960	43,620	188,190
Cn	nr	3,815	1372	339	515	810
Ln	km	85	37	11	15	22
Lc	km	30	10	2.7	4	4
Pm	m	35	60	30	30	30
Qs	m3/an	2,457,527	322,886	547,960	47,065	198,745
T	oră/zi	24	24	24	24	24

Symbol	Unitate	Tomeşti	Cârţa	Dăneşti	Mădăraş
QB	m3/an	44,881	22,776	12,324	19,800
QNB	m3/an	9,763	10,329	0	0
QL	m3/an	4,727	3,283	5,896	2,400
QRL	m3/an	1,165	1,100	5,184	1,500
QAL	m3/an	3,562	2,183	712	900
QSIV	m3/an	59,371	36,388	18,720	22,800
QR	m3/an	54,644	33,105	12,324	19,800
Cn	nr	259	55	146	173
Ln	km	25	12	12	9.2
Lc	km	0.6	0,11	1	1
Pm	m	30	30	30	30
Qs	m3/an	58.206	35,288	13,036	20,700
T	oră/zi	24	24	24	24

Non-Revenue Water (NRW)

NRW = [(Q_{SIV} – Q_R) / Q_{SIV}] x 100

	Miercurea Ciuc	Vlăhiţa	Bălan*	Sânmartin	Frumoasa
NRW	45.79%	69.93%	60%	31.88%	13.31%

	Tomeşti	Cârţa	Dăneşti	Mădăraş
NRW	24.41	37.41	34.17%	13.16%

* No data for 2009 for Balan City, only for 2008

Current Annual Real Losses (CARL)

CARL = Q_{RL} / C_n (m3/yr/connection)

	Miercurea Ciuc	Vlăhiţa	Bălan*	Sânmartin	Frumoasa
CARL (m3/yr/connection)	483.87	433.53	1.958.82	20.12	5.19
CARL (l/day/ connection)	1,325,69	1,187.75	5,366.63	55.12	14

	Tomeşti	Cârţa	Dăneşti	Mădăraş
CARL (m3/yr/connection)	4.49	20	35.5	8.67
CARL (l/day/ connection)	12.30	54.79	97.26	23.75

*data for 2008

Unavoidable Annual Real Losses (UARL)

UARL = [(A x L_n) + (B x C_n) + (C x Lc)]P_m (litri/zi)

	Miercurea Ciuc	Vlăhiţa	Bălan*	Sânmartin	Frumoasa
UARL (l/day)	186,591.65	120,816	21,468	23,460	34,320
UARL (l/day/ connection)	48.91	88.05	63.32	45.55	42.37

	Tomeşti	Cârţa	Dăneşti	Mădăraş
UARL (l/day)	20,166	7,882	10,734	9,870
UARL (l/day/connection)	77.86	143	73.52	57.05

*data for 2008

Infrastructure Leakage Index (ILI)

ILI = ILI = CARL/UARL

	Miercurea Ciuc	Vlăhiţa	Bălan*	Sânmartin	Frumoasa
ILI	27.1	13.48	0.09	0	0

	Tomeşti	Cârţa	Dăneşti	Mădăraş
ILI	0	0	0.003	0

Leakage per km of network (LKN)

LKN = Q_{RL} / L_n (m3/yr/km)

	Miercurea Ciuc	Vlăhiţa	Bălan*	Sânmartin	Frumoasa
LKN (m3/km/yr)	21,717.65	16,075.78	60,367	690.93	191.13
LKN (m3/km/day)	59.5	44.04	178.07	1.89	0.52

	Tomeşti	Cârţa	Dăneşti	Mădăraş
LKN (m3/km/yr)	46.6	91.6	432	163.04
LKN (m3/km/day)	0.12	0.24	1.18	0.44

Economical Leakage Index (ELI)

ELI = EI x LI

Where EI is a value 0.5, 1.0 or 1.5 depending on water treatment provided and the requirement for pumping into the network. LI is obtained through the relationship LI = LKN / 3600.

	Miercurea Ciuc	Vlăhiţa	Bălan*	Sânmartin	Frumoasa
EI	1	0.5	0.5	0.5	0.5
LI	6.03	4.46	16.76	0.19	0.53
ELI	6.03	2.23	8.38	0.09	0.265

	Tomeşti	Cârţa	Dăneşti	Mădăraş
EI	0.5	0.5	0.5	0.5
LI	0.01	0.2	0.12	0.04
ELI	0.006	0.01	0.06	0.02

Summary for HARVIZ S.A.

	City	NRW (%)		LKN		ILI		ELI	
1	Miercurea Ciuc	45.79	C5	21,717	C3	27	C3	6	C5
2	Vlăhiţa*	69.93	C5	16,076	C2	13	C2	2.23	C3
3	Bălan**	60%	C5	60,367	C5	0.09	C1	8.3	C5
4	Sânmartin	31.88	C4	690	C1	0	C1	0.19	C1
5	Frumoasa	13.31	C2	191	C1	0	C1	0	C1
6	Tomeşti	24.41	C3	46.6	C1	0	C1	0	C1
7	Cârţa	37.41	C4	91.6	C1	0	C1	0.01	C1
8	Dăneşti	34.17	C4	432	C1	0.003	C1	0.06	C1
9	Mădăraş	13.16	C2	163	C1	0	C1	0.02	C1
10	S.C. Harviz S.A.	43.68	C5	3,333	C1	3.86	C1	0.90	C1

E.12 Leakage condition assessment for water networks in Romania

E.12.1 Summary of network condition assessments – FOPIP I

The following information relates to water loss indicators in an audit carried out on 29 water networks in Romania

The water loss indicators and the condition assessments (C1 –C5) have been assessed in line with formulae and with the methodology explained in the guidelines.

	City	NRW		LKN		ILI		ELI		Overall Condition
CLUJ										
1	Cluj Napoca	45%	C5	35252	C4	47.91	C5	9.79	C5	C5
2	Huedin	60%	C5	22476	C3	16.74	C2	6.24	C5	C4
3	Gherla	33%	C4	14330	C2	14.76	C2	3.98	C5	C3
4	Dej	58%	C5	13284	C2	15.09	C2	3.69	C5	C4
5	Turda	57%	C5	32514	C4	43.28	C5	9.03	C5	C5
6	Campia Turzii	42%	C5	27881	C3	29.30	C3	7.74	C5	C4
GORJ										
7	Targu Jiu	36%	C4	33851	C4	47.86	C5	12.42	C5	C5
8	Rovinari	35%	C4	8762	C1	44.63	C5	3.89	C5	C4
9	Motru	31%	C4	6329	C1	42.44	C5	4.08	C5	C4
10	Bumbesti Jiu	24%	C3	5844	C1	2.91	C1	2.28	C3	C2
11	Targu Carbunesti	34%	C4	7538	C1	43.06	C5	16.57	C5	C4
12	Novaci	17%	C2	1188	C1	1.81	C1	0.46	C1	C1
13	Ticleni	35%	C4	8517	C1	10.88	C2	4.60	C5	C3
OLT										
14	Slatina	23%	C3	9155	C1	12.73	C2	3.81	C5	C3
15	Caracal	39%	C4	13817	C2	23.05	C3	5.76	C5	C4
16	Bals	36%	C4	8730	C1	20.59	C3	2.42	C2	C3
17	Corabia	49%	C5	4513	C1	4.34	C1	1.25	C2	C2
18	Scornicesti	31%	C4	7729	C1	46.39	C5	5.15	C5	C4
19	Draganesti	20%	C2	4647	C1	4.83	C1	1.72	C2	C2
20	Piatra	32%	C4	659	C1	1.45	C1	0.18	C1	C2
21	Potcoava	50%	C5	21009	C3	52.76	C5	5.84	C5	C5
Salaj										
22	Zalau	41%	C5	32747	C4	63.84	C5	9.10	C5	C5
23	Simleu Silvanei	34%	C4	13875	C2	13.07	C2	3.85	C5	C3
24	Cehu Silvanei	36%	C4	8175	C1	32.01	C4	9.08	C5	C4
25	Jibou	51%	C5	50573	C5	57.70	C5	14.15	C5	C5
Sibiu										
26	Medias	25%	C2	12822	C2	13.64	C2	3.55	C5	C3
27	Agnita	22%	C3	17418	C2	5.40	C1	4.22	C5	C3
28	Dumbraveni	12%	C2	713	C1	0.89	C1	0.29	C1	C1
29	Copsa Mica	25%	C3	6470	C1	11.44	C2	1.60	C2	C2

E.12.2 Summary of network condition assessments – FOPIP II

The following information relates to water loss indicators in an audit carried out on 73 water networks in Romania

The water loss indicators and the condition assessments (C1 –C5) have been assessed in line with formulae and with the methodology explained in the guidelines.

	City	NRW		LKN		ILI		ELI		Overall Condition
Bacau										
1	Bacau	51.7%	C5	48198	C5	51.45	C5	6.69	C5	C5
VRANCEA										
2	Focşani	31,19	C4	11815,55	C2	33,69	C4	3,28	C3	C4
3	Odobeşti	74,42	C5	35450,1	C4	73,13	C5	9,84	C5	C5
4	Adjud	72,96	C5	51252,25	C5	140,16	C5	14,31	C5	C5
5	Panciu	80,15	C5	27174,77	C3	64,86	C5	7,54	C5	C5
6	Mărăşeşti	59,86	C5	16976,91	C2	57,90	C5	4,71	C5	C5
BRAILA										
7	Braila	46	C5	16000	C2	29	C3	4.4	C5	C4
8	Judet Braila	42,09	C5	3.158,84	C1	4,55	C1	0,88	C1	C2
9	Sector Gropeni	25,27	C3	1.065,01	C1	1,87	C1	0,30	C1	C2
10	Sector Ianca	50,33	C5	6.007,09	C1	7,13	C1	1,67	C1	C2
11	Sector Movila Miresii	38,07	C4	2.247,5	C1	3,18	C1	0,62	C1	C2
PRAHOVA										
12	Azuga	49,32	C5	16136	C2	9,85	C1	4,48	C5	C3
13	Busteni	48,65	C5	12992	C2	9,78	C1	1,80	C2	C3
14	Sinaia	58,65	C5	31246	C4	38,23	C4	8,69	C5	C5
15	Comarnic	19,83	C2	1601	C1	1,36	C1	0,44	C1	C1
	Breaza	30,33	C4	2650	C1	3,8	C1	6,75	C5	C2
	Campina	40,56	C5	15967	C2	30,54	C4	6,65	C5	C4
	Baicoi	58,14	C5	11825	C2	23,19	C3	1,64	C2	C3
	Plopeni	37,90	C4	14836	C2	12,67	C2	4,12	C5	C3
	Mizil	49,04	C5	14774	C2	20,49	C3	4,1	C5	C4
	Urlati	25,91	C3	3452	C1	3,2	C1	0,96	C1	C2
	Slanic	59,97	C5	5752	C1	2,95	C1	1,59	C2	C2
	Dumbravesti	4,92	C1	157	C1	0,22	C1	0,02	C1	C1
	Fantanele	20,98	C3	210	C1	0,82	C1	0,06	C1	C2
	Vadu Sapat	13,50	C2	274	C1	0,46	C1	0,08	C1	C1
	Baltesti	22,01	C3	910	C1	1,52	C1	0,27	C1	C2
	Gornet	23,03	C3	957	C1	0,99	C1	0,27	C1	C2
	Stefesti	21,94	C3	1950	C1	1,78	C1	0,54	C1	C2
	Izvoarele	21,97	C3	1466	C1	1,19	C1	0,4	C1	C2
	Apostolache	31,70	C4	307	C1	1,05	C1	0,04	C1	C2
	Albesti Paleologu	39,56	C4	2695	C1	3,38	C1	0,75	C1	C2
	Baba Ana	28,71	C3	846	C1	1,71	C1	0,24	C1	C2
	Boldesti Gradistea	9,68	C1	69	C1	0,15	C1	0,019	C1	C1

City	NRW		LKN		ILI		ELI		Overall Condition
Draganesti	12,01	C2	225	C1	0,43	C1	0,06	C1	C1
Podenii Noi	1,99	C1	37	C1	0,06	C1	0,005	C1	C1
Poienarii Burchi	18,87	C2	404	C1	0,87	C1	0,11	C1	C1
Salciile	42,74	C5	1646	C1	2,96	C1	0,46	C1	C2
Sirna	30,67	C4	812	C1	1,8	C1	0,23	C1	C2
CARAS SEVERIN									
Moldova Noua	30,27	C4	3558,63	C1	65,72	C5	0,49	C1	C3
Oravita	77,35	C5	20545	C3	457,41	C5	5,7	C5	C5
Otelu Rosu	60,75	C5	39099	C5	572,22	C5	10,86	C5	C5
Resita	55,48	C5	52015	C5	695,42	C5	14,44	C5	C5
Caransebes	69,77	C5	61778,6	C5	729,72	C5	17,16	C5	C5
Anina	80,69	C5	14231	C2	284,05	C5	1,976	C2	C4
Baile Herculane	70,75	C5	28014	C3	633	C5	11,67	C5	C5
Bocsa	65,47	C5	17882	C2	248,85	C5	4,96	C5	C4
GORJ									
ROC Gorj	37	C4	15300	C2	2	C2	4	C5	C4
OLT									
ROC Olt	22.27	C3	6746	C1	12.15	C2	1.87	C2	C2
DAMBOVITA									
ROC	54.26	C5	13730	C2	17	C2	4	C5	C4
Targoviste	53.4	C5	16502	C2	23	C3	5	C5	C4
Pucioasa	50.5	C5	6371	C1	8	C1	2	C2	C2
Fieni	52.77	C5	5256	C1	6	C1	1	C2	C2
Moreni	58.95	C5	40974	C5	29	C3	6	C5	C5
Titu	54.26	C5	8818	C1	19	C2	2	C2	C3
Racari	51.61	C5	2825	C1	3	C1	1	C2	C2
Gaesti	52.02	C5	11817	C2	19	C2	3	C4	C3
TELEORMAN									
ROC	39.5	C4	15312	C2	1	C2	4	C5	C4
ALBA									
ROC	35	C4	8845.54	C1	2.29	C1	2.46	C3	C3
COVASNA									
ROC	39.3	C4	17726.8	C2	28	C3	7.3	C5	C4
HARGHITA									
Miercurea Ciuc	45.79	C5	21,717	C3	27	C3	6	C5	C4
Vlăhiţa*	69.93	C5	16,076	C2	13	C2	2.23	C3	C4
Bălan**	60	C5	60,367	C5	0.09	C1	8.3	C5	C5
Sânmartin	31.88	C4	690	C1	0	C1	0.19	C1	C2
Frumoasa	13.31	C2	191	C1	0	C1	0	C1	C2
Tomeşti	24.41	C3	46.6	C1	0	C1	0	C1	C2

City	NRW		LKN		ILI		ELI		Overall Condition
Cârţa	37.41	C4	91.6	C1	0	C1	0.01	C1	C2
Dăneşti	34.17	C4	432	C1	0.003	C1	0.06	C1	C2
Mădăraş	13.16	C2	163	C1	0	C1	0.02	C1	C1
S.C. Harviz S.A.	43.68	C5	3,333	C1	3.86	C1	0.90	C1	C2
MEDIAS									
ROC	51.92	C5	18176.2	C2	0.66	C1	7.57	C5	C4
TURDA									
Turda	51	C5	24.168,89	C3	27,90	C3	6,71	C5	C5
Campia Turzii	40	C5	20.504,95	C3	20,95	C3	5,69	C5	C5
VALEA JIULUI									
ROC	75.74	C5	29962.1	C3	36.85	C4	8.32	C5	C4

E.13 Results of NRW pilot study in Tasnad, Satu Mare

1. Introduction

Tasnad has a population of approximately 9000 and the water supply system comprises two pressure zones each fed from a recently refurbished pumping station. The higher pressure system contains a water tower that balances against a pumping station outlet pressure of 13.5 bar and the lower pressure system another water tower that balances against a pumping station outlet pressure of 7.5 bar. Each pressure zone supplies approximately half of the total population with the two major consumers of water, a thermal spa and a furniture factory being fed from the lower pressure system.

The water system was substantially installed during the 1970's and 80's. Leakage levels in the system are thought to be high.

The higher pressure system is considered suitable for the application of the pilot study.

2. Requirements

The following actions need to be undertaken, some of which can be carried out in parallel.

a. Establish a team to implement the project from existing resources, reporting to the Technical Director. The team should include technical staff and a network repair team.
b. Carry out a valve and hydrant survey to establish location and operability of the fittings. Replace any defective fittings identified.
c. Identify any additional valves (each water main should be capable of being isolated) and hydrants required.
d. Install additional valves and hydrants as necessary.
e. Install meter at pumping station (or check for accuracy if it exists). The meter needs to have a logging facility for data capture purposes.
f. Provide a level monitoring facility at the water tower on the higher pressure zone and check out valving arrangements for potential isolation.
g. Carry out property/population count for each main that can be isolated.

h. Install meters (not for charging purposes) on selected properties that are currently invoiced on the 'pausal' basis. Suggest 10 of different properties types or sizes. This will not be necessary if the metering programme is advanced.
i. Identify locations in the network where hydrant/valve/hydrant installations could be utilised for subsequent use of portable waste metering equipment.
j. Continue with meter installation/replacement programme.
k. Continue with monthly meter reading programme and identify suspect/defective meters for replacement.
l. Identify equipment needed for leakage reduction project – correlator/location equipment/listening equipment/portable flow measurement unit (laboratory) / pressure measuring equipment.
m. Take opportunities when carrying out repairs or installing fittings to assess condition of pipes and record – material, diameter, external and internal condition.
n. Install a number of check meters on service pipes in series to assess accuracy of older meters.

3. Benefits

- Reduced network losses.
- Better understanding of network operation.
- Minimum acceptable flow night-lines can be established.
- Early identification of network leakages.
- Objective policy can be defined for meter replacement.
- Demonstration of improved customer service through adopting a pro-active approach to leakage reduction.

4. Interim Results July 2007 – April 2008

- 320 out of 468 metered connections.
- Valve defects identified 21 out of 67, five were repaired
- June defective hydrants out of 17 identified, 3 were replaced
- We install two hydrants in the Campului Street
- 20 connections were changed, 2 of the blocks
- 20 connections were repaired
- 60 meters were replaced at properties already counted
- 60% of the network was verified using the mobile unit to detect losses from Satu Mare
- 7 meters at the wells were replaced
- 143 interventions - repairs were made on the network
- 24m transport network were replaced.
- 1150 m Campului Street distribution pipes were replaced, including replacement of 82 connections
- Sectioning valves were installed in the pilot area
- Check the pressure at the extremities of the network to verify the potential installation of pressure relief valves.
- 2 water meters installed at the exit of the pumping station
- Tasnad City Council approved funding in 2008 to replace pipelines of length 1900 m in pressure zone 1 and 2200 m in pressure zone 2.

E.14 Questionnaire for ROCs covering water and wastewater quality monitoring performance

1. For water and wastewater quality monitoring the company has the following facilities:

   a No facilities

b Separate water and wastewater laboratories
c A central laboratory for water and wastewater

2. Please fill in the following table, regarding your laboratory facilities (example):

No	**Location**	**Type of water**		**Suitability**					**Type of analysis**	
		Drinking Water	Waste Water	No quality control	*Health Ministry authorised	**Ministry of environment authorised	ISO 9000	ISO 17025	Process	Monitoring
1	DWTP Satu Mare	X			X			X	X	
2	WWTP Tirgu Lapus		X	X				X		
3	DWTP Tarlung	X	X		X	X	X		X	X
n										

*Only for drinking water laboratories
**Only for waste water laboratories

3. If you do not have a central laboratory for water and wastewater, do you intend to centralise your monitoring laboratories in the future?

Yes
No

Comments: ____

4. What are your intentions regarding the improvement of the suitability of your laboratory facilities?

____

Drinking Water (DW)

5. Are your Drinking Water Monitoring Laboratory facilities adequate for the purpose in terms of space and environment requirements?

Yes
No

What problems do you face? ____

6. Do you intend to provide proper facilities for you DW monitoring laboratory in the future?

Yes
No

Comments: ____

7. Is your Drinking Water Monitoring Laboratory adequately equipped to perform all the analyses requested by the drinking water legislation and standards?

Yes
No

What kind of equipment is not available? ______________________________

8. Do you intend to purchase equipment for you DW monitoring laboratory in order to be able to perform all the analysis requested by the legislation?

Yes
No

Comments:

9. Is your Drinking Water Monitoring Laboratory adequately equipped with computer hardware and software to enable a good management of the laboratory activity?

Yes
No

Comments (including future intentions):

10. Please list the DW monitoring parameters analysis which you are not performing with respect to the drinking water legislation and standards:

11. Do you have arrangements with other laboratories for the analysis of the DW parameters which you cannot perform?

Yes
No

Comments (including if these laboratories are / are not authorised or are / are not accredited on 17025):

12. Are the DW monitoring analysis performed according to standard methods?

Yes
No

Comments:

13. Is you DW monitoring laboratory personnel adequate in terms of number and qualifications?

    Yes
    No

Comments:

14. If no, what are your intention regarding number and / or qualification of personnel?

15. Do you use in your DW monitoring laboratory standard methods for sampling according with the ISO 5667-2 standard?

    Yes
    No

Comments:

16. Do you have written procedures on DW regarding:

    Sampling (including location and conditions of sampling)
    Transport of samples
    Storage of samples
    Conservation of samples

17. Do you meet the minimum requirements for the DW monitoring location and frequency of sampling according to the legislation?

    Yes
    No

Comments:

18. Who is responsible within the company for the DW monitoring analysis results and how is the information used and disseminated?

19. Do you perform DW analysis when you receive complaints regarding the quality of the drinking water?

Yes
No

Comments: ____

20. Do you inform the consumer about the result of the analysis performed as a result of their complaint regardless of the result?

Yes
No

Comments: ____

21. Do you perform DW analysis after a network repair or a pipe replacement, before recomissioning?

Yes
No

Comments (including a list of the parameters analised): ____

22. Do you perform DW analysis for third parties based on a tariff?

Yes
No

Comments (including percentage from total analysis performed): ____

Waste Water (WW)

23. Are your Waste Water Monitoring Laboratory facilities adequate for the purpose in terms of space and environment requirements?

Yes
No

What problems do you face? ____

24. Do you intend to provide proper facilities for you WW monitoring laboratory in the future?

Yes
No

Comments: ____

25. Is your Waste Water Monitoring Laboratory adequately equipped to perform all the analyses requested by your discharge authorisation and/or legislation?

Yes
No

What kind of equipment is not available? ______________________________

26. Do you intend to purchase equipment for you WW monitoring laboratory in order to be able to perform all the analysis requested?

Yes
No

Comments:

27. Is your Waste Water Monitoring Laboratory adequately equipped with computer hardware and software to enable a good management of the laboratory activity?

Yes
No

Comments (including future intentions):

28. Please list the WW monitoring parameters analysis which you are not performing with respect to the waste water discharge authorisation and/or legislation:

29. Do you have arrangements with other laboratories for the analysis of the WW parameters which you cannot perform?

Yes
No

Comments (including if these laboratories are / are not authorised or are / are not accredited on 17025):

30. Are the WW monitoring analyses performed according to standard methods?

Yes
No

Comments:

31. Is your WW monitoring laboratory personnel adequate in terms of number and qualifications?

    Yes
    No

Comments:

32. If no, what are your intention regarding number and / or qualification of personnel?

33. Do you use in your WW monitoring laboratory standard methods for sampling according with the ISO 5667-2 standard?

    Yes
    No

Comments:

34. Do you have written procedures on WW regarding:

    Sampling (including location and conditions of sampling)
    Transport of samples
    Storage of samples
    Conservation of samples

35. Do you meet the minimum requirements for the WW monitoring location and frequency of sampling according to the requirements?

    Yes
    No

Comments:

36. Who is responsible within the company for the WW monitoring analysis results and how is the information disseminated?

37. Do you have an inventory and a monitoring programme (sampling and analysing the discharge waters) for the polluting industries discharging into the sewers in your area of operations?

    Yes
    No

Comments:

38. Do you have an inspection programme for detecting illegal connections or illegal discharges of polluter industries?

    Yes
    No

Comments:

39. Do you take any measures against the polluters?

    Yes
    No

Comments (including the indication of the measures taken):

40. Do you perform WW analysis for third parties based on a tariff?

    Yes
    No

Comments (including percentage from total analysis performed):

41. If you have any information which was not covered by this questionnaire, relevant for the subject which you would like to add:

42. Please indicate whether you need the support of the FOPIP Consultant and for which aspects.

E.15 Water and wastewater quality monitoring – current practices and recommendations for the operators in ISPA – FOPIP program

E.15.1 FOPIP 1 Findings

A. Quality monitoring questionnaire – contents and purpose

During the period January-February 2008, a questionnaire as presented in the previous Appendix was developed and circulated to all FOPIP I ROCs. A similar but simpler questionnaire was used for the FOPIP II ROCs during 2009. The purpose of the questionnaire was to extract information so that an initial assessment could be made of current practices relating to Quality Monitoring (QM) of water and wastewater activities.

The Questionnaire aimed, primarily, to identify:

- the adequacy of the water and wastewater monitoring laboratories of the Operators in terms of:
  - the quality of the results, the equipment, personnel and procedures;
  - observance of the legislation and standards currently in force;
- the need for further information and guidance to help the Operators improve their operation, prepare action plans and plan for the investments needed for this purpose.

By the means of the QM Questionnaire, the Consultant also intended to establish the support required by the Operators on monitoring activities, and, to raise awareness of the Operators included in FOPIP concerning the purposes and procedures relating to 'certification', 'accreditation', and 'authorization' of laboratories.

The Questionnaire was divided into the following main sections:

- general aspects concerning the adequacy of the laboratories from the point of view of ensuring the quality and future intentions;
- specific aspects of drinking water quality monitoring related to: facilities, equipment, personnel, procedures, and future intentions;
- specific aspects of wastewater quality monitoring: facilities, equipment, personnel, procedures, and future intentions;
- other information and requests.

A.1. Findings from the QM Questionnaire

Main Findings

Before presenting the Questionnaire's findings, the following clarifications should be made with respect to the proper use of the notions of 'certification', 'accreditation', and 'authorization':

Certification of a Management System means an acknowledgment of applying Management System Standards [e.g. the Quality Management Standard – ISO 9001 (QMS), the Environmental Management Standard – ISO 14001 (EMS), the Occupational Health and Safety Assessment Standard – ISO 18001 (OHSAS), or any combination of at least 2 standards in an Integrated Management System (IMS)]. This certification is given by an approved certifying body (ACB).

Laboratory accreditation refers to the implementation of the ISO 17025 Standards in a testing laboratory. The Romanian accreditation body of testing laboratories under the above-mentioned standard is RENAR.

Laboratory authorization means putting into effect specific requirements legislated by a central authority in the field, e.g the Ministry of Health, the Ministry of Environment.

Presented below are the main findings resulting from the initial assessment of the returns to the QM Questionnaire:

- In general, there are separate laboratories for drinking water and for wastewater;
- The location of the laboratories are within the water treatment plants and the wastewater treatment plants;
- At the level of the regional operators, in general there are adequately equipped drinking water and wastewater laboratories, that perform monitoring analyses for existing parameters; Laboratories will need further equipping to provide the ability to undertake a full suite of EU quality standards;
- The large operators are in the course of authorisation or already have laboratories authorised by the Ministry of Health (drinking water laboratories), respectively by the Ministry of Environment (wastewater laboratories). Some of them are accredited or in course of accreditation under ISO 17025.

Current Status of the FOPIP I Water Utilities (as reported October 2008)

We will present hereinafter the evaluation of the QM Questionnaire for all 13 water utilities which were envisaged.

General aspects concerning the adequacy of the laboratories for the point of view of ensuring the quality

For water and wastewater quality monitoring the WUs have in general separate water and wastewater laboratories: Neamt, Satu Mare, Rm. Valcea (Acvarim, Apavil), Pitesti, Galati, Brasov, Deva, Buzau, Drobeta (DW only), Baia Mare. Four WUs, namely those in Ramnicu Valcea (Apavil), Galati, Tulcea and Sibiu indicated they have central laboratories. Out of the 13 water companies which make the subject to our assessment, only four expressed the consideration to set up or continue the centralisation of laboratories for drinking water and wastewater: Apa-Canal 2000 Pitesti, Apavil Rm. Valcea, Apa Prod Deva, and Vital Baia Mare.

Galati WU specified that the laboratory within the WTP no. 2 in Galati, and the wastewater laboratory for physical-chemical analyses, also in Galati, only undertake monitoring analyses. But in general analyses are carried out for both monitoring and process purposes.

The large operators are in course of authorisation or already have laboratories authorised by the Ministry of Health (drinking water laboratories), respectively by the Ministry of Environment (wastewater laboratories). Some of them are accredited or in course of accreditation under ISO 17025.

The status of the authorization / accreditation of laboratories is presented in the table below:

#	Water Utility	Status of authorization/ accreditation of FOPIP I Laboratories (as reported October 2008)
1	APASERV Satu Mare	For the water treatment plant in Satu Mare, the laboratory is certified for ISO 9001 and they intend to also obtain authorization from the Ministry of Health. For the wastewater treatment plant, the laboratory is accredited under ISO 17025.
2	COMPANIA APA Brasov	For the water treatment plant in Brasov, the laboratory is accredited under ISO 17025 and is also authorised by the Ministry of Health.
3	AQUASERV Tulcea	For the water treatment plant in Tulcea, the laboratory is certified for ISO 9001 and also authorised by the Ministry of Health.
4	APA SERV	For the water treatment plant in Neamt, the laboratory is authorised by the Ministry of Health; it is

#	Water Utility	Status of authorization/ accreditation of FOPIP I Laboratories (as reported October 2008)
	Neamt	intended to accredit the laboratory under ISO 17025.
5	APA CANAL Sibiu	For the water treatment and wastewater treatment plants in Sibiu, the laboratories are certified for ISO 9001; the WTP laboratory is authorised by the Ministry of Health.
6	APA CANAL 2000 Pitesti	Both DW and WW laboratories have ISO 17025 accreditation. The DW laboratory is authorised by the Ministry of Health.
7	ACVARIM Rm. Valcea	The DW and WW laboratories of Ramnicu Vâlcea are certified under ISO 9001, and they intend to obtain a license from the Ministry of Health by the end of 2008 for the DW laboratory; the WW laboratory has RENAR accreditation under ISO 17025.
8	APAVIL Rm. Valcea	Except for the laboratory within the WTP Valea lui Stan of Brezoi, all laboratories have ISO 9001 accreditation. All the laboratories within the WWTPs have an authorisation from the Ministry of Environment. Only the laboratory within the WTP Valea lui Stan of Brezoi is authorised by the Ministry of Health and has an accreditation for ISO 17025.
9	RAM Buzau	Both the DW and the WW laboratories undergo the certification process of the Quality Managemnt (ISO 9001) and the accreditation process under ISO 17025. The DW laboratory is authorised by the Ministry of Health, and the WW laboratory will be re-authorised in 2008 by the Ministry of Environment.
10	SECOM Drobeta	The laboratory within the WTP Drobeta Turnu Severin is certified under ISO 9001 and is acccredited under ISO 17025.
11	APA PROD Deva	The laboratory within the WTP Santamarie Orlea is authorised by the Ministry of Health, is certified under ISO 9001 and is accredited under ISO 17025. The central laboratory for DW in Deva is in course of authorisation by the Ministry of Health and is accredited under ISO 9001. The laboratory within the WWTP Deva has limited endowment for the time being, and no authorisation/ accreditation so far.
12	VITAL Baia Mare	The laboratory within the WTP is authorised by the Ministry of Health and certified under ISO 9001. The laboratory within the WWTP is authorised by the Ministry of Environment and certified under ISO 9001.
13	APA CANAL Galati	No quality control. There is only an authorisation from Ministry of Health for the laboratory within the WTP no. 2 in Galati.

Laboratories Provisions

With regard to the adequacy for the purpose in terms of space and environmental requirements for laboratory faculties, the situation is as follows:

- Facilities for DW monitoring – 7 water utilities consider that their laboratory facilities for DW monitoring are adequate in terms of space and environmental requirements, namely: APA CANAL Galati, APA PROD Deva, SECOM Drobeta, APA CANAL 2000 Pitesti, COMPANIA APA Brasov, APA SERV Neamt, and AQUASERV Tulcea. The remaining 6 water utilities consider that they have deficiencies, especially in terms of space. APA CANAL Sibiu and ACVARIM Rm. Valcea referred to non-compliance with environment requirements, and RAM Buzau referred to that fact that no microbiological analyses can be performed.
- Facilities for WW monitoring – Only 4 water utilities consider their facilities adequate - APA CANAL 2000 Pitesti, COMPANIA APA Brasov, APA SERV Neamt and RAM Buzau. The majority (9 water utilities) answered negatively to this question. SECOM Drobeta currently does not have such facilities, and APA CANAL Sibiu referred to the inadequacy in terms of environment requirements.

In general, for most of the WUs, the laboratories are currently not fully equipped to undertake a full suite of analyses. The exact status of the future intentions for improving this is presented individually below for each water utility:

#	Water Utility	Intentions concerning the endowment of the FOPIP I laboratories (as reported in October 2008)
1	APASERV Satu Mare	Rehabilitate and equip both water and wastewater laboratories in Satu Mare through ISPA measures. They also intend to connect laboratory analysis to the IT network to improve data accessibility
2	COMPANIA APA Brasov	Rehabilitate and equip both water and wastewater laboratories in Brasov, both with laboratory equipments, and also software for managing the entire activity of the laboratory, especially the records
3	AQUASERV Tulcea	Rehabilitate and equip both water and wastewater laboratories through the SOP Environment financing
4	APA SERV Neamt	It is intended to rehabilitate and equip both water and wastewater laboratories in Neamt through ISPA measures; the provision with hardware and software for the DW monitoring laboratory will be made partially through ISPA, and partially with own funds; for the WW laboratory, it is considered necessary only to provide a connection to the Internet
5	APA CANAL Sibiu	Equip both water and wastewater laboratories in Sibiu through ISPA measures and also from own sources Software needed for DW and WW laboratories for data interpretation
6	APA CANAL 2000 Pitesti	Existing provision of equipment and computers (hardware) is considered adequate for DW and WW laboratories; it is intended to purchase and implement an IT system for Laboratory Management (LIMS)
7	ACVARIM Rm. Valcea	Equip the water laboratory in Ramnicu Valcea from own funds, already approved for 2008; and the wastewater laboratory through ISPA measure and own funds; The provision of computer hardware is considered adequate, but it is intended to purchase software for laboratory data processing
8	APAVIL Rm. Valcea	Equip both the DW and WW laboratories, also with computer hardware and software for laboratory data processing
9	RAM Buzau	Equip both DW and WW laboratories with laboratory equipments and also with IT equipments (beamer, laptop, printer…) and connection to Internet and Intranet
10	SECOM Drobeta	Modernise entirely the DW laboratory through ISPA project by the end of 2008. Considered, however, adequately equipped with computer hardware and software The WW laboratory will be set up and equipped adequately after the WWTP is built
11	APA PROD Deva	Equip the facilities for DW monitoring through own funds (Santamarie Orlea and Deva) and through ISPA (Hunedoara); IT equipment is considered adequate although some more computers will be purchased Equip the laboratories within the WWTPs in Deva and Hunedoara through ISPA
12	VITAL Baia Mare	Purchase devices, reagents and glassware necessary according to ISO 17025; also purchase additional hardware and modernise the current IT system for the laboratories within the WTP and the WWTP
13	APA CANAL Galati	Equip the facilities for DW monitoring with hardware and software. Currently these are adequately equipped for performing analyses Purchase equipment for determination of metals and dangerous substances – for the facilities for WW monitoring

Conformity of Analyses with Legislation and Standards

With regard to DW quality monitoring, in general, the water utilities indicated at least 2 or 3 analyses they do not perform according to the legislation/ standards. Some of the WUs indicated that they carry out a higher number of analyses, such as VITAL Baia Mare, which mentioned 3 microbiological analyses, and 22 chemical analyses. APAVIL Valcea mentioned the water radioactivity. Two water utilities – APA PROD

Deva and APA SERV Neamt – stated that the performed analyses comply with the current legislation and standards.

Concerning the WW quality monitoring, the situation is more or less similar. Not applicable for: APA CANAL Galati, AQUASERV Tulcea, SECOM Drobeta.

Arrangements with External Laboratories

The majority of the water utilities have arrangements currently with other laboratories (most of them accredited ISO 17025) to analyse the water and wastewater parameters that are outside the current capabilities of the existing laboratories. The exact situation for FOPIP I laboratories as reported in October 2008, is provided in the table below:

#	Water Utility	Arrangements - DW parameters	Arrangements - WW parameters
1	APASERV Satu Mare	Yes	Yes
2	COMPANIA APA Brasov	No	No
3	AQUASERV Tulcea	Yes	N/A
4	APA SERV Neamt	Yes	Yes
5	APA CANAL Sibiu	Yes	Yes
6	APA CANAL 2000 Pitesti	Yes	Yes
7	ACVARIM Rm. Valcea	No	Yes
8	APAVIL Rm. Valcea	Yes	No
9	RAM Buzau	Yes	No
10	SECOM Drobeta	Yes	N/A
11	APA PROD Deva	Yes	Yes
12	VITAL Baia Mare	Yes	Yes
13	APA CANAL Galati	No	Yes

Compliance of the Monitoring Analysis with Standard Methods

3. DW monitoring – 11 water utilities declared that the analyses are performed according to the standard methods. Only VITAL Baia Mare (regarding the microbiological analyses referred to above), and APA CANAL Sibiu (only partly) answered negatively to this question.

4. WW monitoring – all the water utilities indicated that standard methods are used.

Laboratory Personnel

In terms of number and qualifications of the personnel in the DW monitoring facilities, 7 water utilities indicated this is adequate; and 6 showed that the personnel are insufficient, although in general they are considered adequately qualified.

With regard to the personnel in the WW monitoring facilities, 6 water utilities indicated the establishment with qualified personnel is adequate; 3 water utilities declared inadequately trained staff; while the remainder specified that the laboratories were insufficiently staffed.

Generally, the insufficiency of personnel is related to the regionalisation process. In this case it will be necessary to recruit new staff and train them. The training is also needed for existing staff, considering the new techniques they have to deal with.

The situation of the adequacy of the personnel was as follows (as reported October2008):

#	Water Utility	Personnel in DW monitoring facilities	Personnel in WW monitoring facilities
1	APASERV Satu Mare	Insufficient following the regionalisation	Adequate
2	COMPANIA APA Brasov	Adequate	Adequate
3	AQUASERV Tulcea	Insufficient	Inadequate
4	APA SERV Neamt	Insufficient	Adequate
5	APA CANAL Sibiu	Adequate	Adequate
6	APA CANAL 2000 Pitesti	Adequate but on-going training needed	Adequate
7	ACVARIM Rm. Valcea	Adequate	Insufficient and further training needed for the new chemical analyses
8	APAVIL Rm. Valcea	Insufficient following the regionalisation	Inadequate
9	RAM Buzau	Insufficient	Insufficient
10	SECOM Drobeta	Adequate	Insufficient
11	APA PROD Deva	Adequate	Adequate
12	VITAL Baia Mare	Insufficient following the regionalisation	Inadequate
13	APA CANAL Galati	Adequate	Insufficient

Sampling

Another question referred to the use of standard sampling methods in accordance with the ISO 5667-2 standard. A number of 10 water utilities answered positively both as regarding DW and WW. 1 water utility – AQUASERV Tulcea – answered they do not use the mentioned standard.

Two water utilities – APA CANAL Galati and APA SERV Neamt – indicated a different standard for DW, respectively SR-2852/94 for the sampling, conservation, transport, storage, and identification of samples. This standard is not equivalent to ISO 5667-2:1991, since its scope only refers to drinking water and examines a limited number of quality characteristics.

APASERV Neamt indicated that for WW sampling they use the ISO 5667-2 standard.

The questionnaire inquired, as well, about the existence of written procedures for sampling (including location and conditions of sampling), transport, storage, and conservation of samples.

A number of 11 water utilities have written procedures on DW, 1 does not (AQUASERV Tulcea), and 1 is in course of elaborating them (APASERV Satu Mare).

10 water utilities have written procedures for WW, 2 do not have such procedures: AQUASERV Tulcea and APA CANAL Galati. For SECOM Drobeta the question is not applicable, since they currently do not have a wastewater treatment plant and the related laboratory.

The overview for all FOPIP I WUs as reportedOctober2008 is presented in the table below:

#	Water Utility	Written procedures on DW	Written procedures on WW
1	APASERV Satu Mare	No - in course of elaboration	Yes
2	COMPANIA APA Brasov	Yes	Yes
3	AQUASERV Tulcea	No	No
4	APA SERV Neamt	Yes (except for conservation, considered N/A)	Yes
5	APA CANAL Sibiu	Yes	Yes
6	APA CANAL 2000 Pitesti	Yes	Yes
7	ACVARIM Rm. Valcea	Yes	Yes
8	APAVIL Rm. Valcea	Yes	Yes
9	RAM Buzau	Yes	Yes
10	SECOM Drobeta	Yes	N/A
11	APA PROD Deva	Yes	Yes
12	VITAL Baia Mare	Yes (except for storage)	Yes
13	APA CANAL Galati	Yes	No

The last question concerning sampling referred to the compliance by the water utilities for the monitoring location and frequency of DW and WW sampling according to the requirements (legislation/ water permit/ monitoring programme agreed with the public health authority). Practically all water utilities answered positively, with the following remarks:

- APA CANAL Sibiu specifically indicated that they do not meet the requirement for DW sampling as regarding the bacteriology laboratory to be modernised through ISPA; this WU also emphasised the insufficient space for some determinations;
- SECOM Drobeta as previously shown does not have a WWTP.

Responsibility for Monitoring Analysis

One of the intentions of the questionnaire was to identify the responsibilities for the DW and WW monitoring analysis and the way that the information resulting is used and disseminated. The responsibility lies with the Chief of Laboratory – regarding the results of the monitoring analysis. The Chief of Laboratory liaises closely with the Chief of the WTP or WWTP who has responsibility for works compliance. The information cycle is in general the following: the laboratory submits the results to the company management, and subsequently sent to stakeholders such as: Water Authority, Environmental Protection Agency, Environmental Guard, and Public Health Directorate.

The overview of the answers to this question as reported in October 2008 is indicated below:

#	Water Utility	Responsibility for monitoring analysis and information cycle - DW	Responsibility for monitoring analysis and information cycle – WW
1	APASERV Satu Mare	Responsible persons: On behalf of the laboratory: the Chief of Laboratory On behalf of the company – Chief of Production, Quality, and Environment Unit. Information cycle: The results of the analyses are submitted daily by the laboratory to the company management At the beginning of each month the centralised results of the previous month are submitted to	Responsible persons: On behalf of the laboratory: the Chief of Laboratory On behalf of the company – Chief of Production, Quality, and Environment Unit. Information cycle: The results of the analyses are submitted daily by the laboratory to the company management At the beginning of each month the centralised

#	Water Utility	Responsibility for monitoring analysis and information cycle - DW	Responsibility for monitoring analysis and information cycle – WW
		the Production, Quality, and Environment Unit. The centralised results are endorsed by the company management and the information is sent to the Water Section in Satu Mare, Carei Section and Tasnad Section; and also to "Apele Romane" (Water Management System in Satu Mare, Water Directorate Crisuri Oradea), Environmental Protection Agency and Environmental Guard in Satu Mare.	results of the previous month are submitted to the Production, Quality, and Environment Unit. The centralised results are endorsed by the company management and the information is sent to the Water Section in Satu Mare, Carei Section and Tasnad Section; and also to "Apele Romane" (Water Management System in Satu Mare, Water Directorate Crisuri Oradea), Environmental Protection Agency and Environmental Guard in Satu Mare.
2	COMPANIA APA Brasov	Responsible persons: The accuracy of the laboratory results obtained following the analyses is endorsed by the Chief of Laboratory, Water Section is responsible of the concentration of the parameters, and of the quality of the distributed water.	Responsible persons: The accuracy of the laboratory results obtained following the analyses is endorsed by the Chief of Laboratory.
3	AQUASERV Tulcea	Responsible persons: Chief of Laboratory; Dispatcher Centre Officer; Chief of WTP; Environment Protection Responsible; Production Director	Responsible persons: Chief of Laboratory; Dispatcher Centre Officer; Environment Protection Responsible; Production Director
4	APA SERV Neamt	Responsible person: Chief of Laboratory Information cycle: The Chief of DW Laboratory informs the responsible persons (management, Water Section, etc.) in case the DW quality parameters are not observed.	Responsible person: Chief of Laboratory Information cycle: The Chief of Laboratory informs the WWTP Chief, Technical Department and company management.
5	APA CANAL Sibiu	Responsible person: Chief of Laboratory; the person responsible with the chemical analyses. Information cycle: Daily reporting by e-mail to the Public Health Authority of information concerning the quality monitoring of the distributed water and storage tanks.	Responsible person: Chief of Laboratory; responsible person with the WW chemical analyses. Information cycle: Weekly reporting to the Technical Director Monthly reporting to the General Director Reports submitted by the company management to the water authority: Water Management System (Sub-branch of Apele Romane).
6	APA CANAL 2000 Pitesti	Responsible persons: Chief of Laboratory Department, and Chief of the WTP Laboratory Information cycle: The information on the results of the monitoring analyses are submitted daily (for DW – outlets of the WTP), and through periodic reports (for the rest of samples collected according to the Monitoring Programme endorsed by the Public Health Authority).	Responsible persons: Chief of Laboratory Chief of Monitoring, Inspection, and Regulation Department.
7	ACVARIM Rm. Valcea	Responsible person: Chief of Laboratory Information cycle: The monitoring and measurement of the DW	Responsible person: Chief of Laboratory Information cycle: The laboratory submits monthly the

#	Water Utility	Responsibility for monitoring analysis and information cycle - DW	Responsibility for monitoring analysis and information cycle – WW
		distribution networks is achieved through the activity of the Dispatcher Centre and the WTP laboratory Process regulated by the procedure for the Integrated Management System The results of the analyses are communicated to management (General Director, Chief Engineer), to the Quality Management Office, customers, and stakeholders (Public Health Directorate, ANRSC, Water Directorate, Environmental Guard, etc.) The results are recorded in log books for each source and for the distribution network, respectively in the periodic reports issued by the WTP laboratory.	centralised situation of the daily quality WW indicators to the Water Quality Office and daily to the Chief of the WWTP The control and monitoring of the mechanical-biological treatment process are monitored by the WWTP laboratory The data, recorded in hard and electronic format, are managed by the Chief of Laboratory, and are communicated to the technical management of the WWTP, as well as to the General Director The WWTP laboratory submits to the Quality Management Office the monthly centralised situation of the data, in hard copy format, the physical-chemical monitoring analyses The data is recorded by the laboratory staff in the WW log book The Chief of Laboratory submits a monthly report to the Chief Engineer, Water-Sewerage Dept. Chief, and the Technical Dept. on the efficiency of the WWTP – discharge in Olt River, in order to communicate the monitored data/ indicators to the stakeholders and to the control bodies.
8	APAVIL Rm. Valcea	-	-
9	RAM Buzau	Responsible person: Chief of Laboratory Information cycle: Procedure on documents control	Responsible person: Chief of Laboratory Information cycle: is established through the Integrated Management System, through the system procedures.
10	SECOM Drobeta	Responsible person: Chief of Laboratory. The analysis laboratory is subordinated directly to the General Director. Information cycle: The results are submitted both to the General Director and the Chief of Water Catchment Station for use in the water treatment process.	-
11	APA PROD Deva	Responsible person: Chief of Laboratory Information cycle: The Chiefs of Laboratory inform the Chief of Quality-Environment Department on the DW monitoring results, and the eventual water quality problems The Chief of Quality-Environment Department informs the General Director on the water quality problems The Technical Director is informed of the eventual non-conformities of DW quality due to technical problems. Every month the DW monitoring results are sent to the Public Health Authority and the municipalities served.	Responsible person: Chief of Laboratory Information cycle: The Chiefs of Laboratory inform the Chief of Quality-Environment Department on the WW monitoring results The Chief of Quality-Environment Department informs the General Director on the wastewater quality problems The Technical Director is informed of the eventual non-conformities of treated WW due to technical problems. Every month the WW monitoring results are sent to 'Apele Romane' for the works operated.
12	VITAL Baia Mare	Responsible person: Chief of Laboratory Information cycle:	Responsible person: Chief of Laboratory Information cycle:

#	Water Utility	Responsibility for monitoring analysis and information cycle - DW	Responsibility for monitoring analysis and information cycle – WW
		Not defined in the procedures, but in general the results of the analyses are used by the Chiefs of Laboratory, Chief of Sections, senior management (for analysis and corrective action if necessary) – in order to comply with the delegation contract, regulation, legislation, etc.	Not defined in the procedures, but in general the results of the analyses are used by the Chiefs of Laboratory, Chief of Sections, senior management (for analysis and corrective action if necessary) – in order to comply with the delegation contract, regulation, legislation, etc.
13	APA CANAL Galati	Responsible person: Chief of Laboratory Information cycle: The Chief of Laboratory signs the analysis bulletins and submits them to the stakeholders.	Responsible person: Chief of Laboratory Information cycle: The Chief of Laboratory signs the analysis bulletins and submits them to the stakeholders.

Analysis for Third Parties

Another question intended to draw whether the water companies carry out DW/WW analysis for other organisations/ companies, against the payment of a tariff.

For DW, Neamt and Sibiu indicated 5% of all samples collected were for third parties, this figure was 10% for Drobeta but the remaining Utilities indicated very little activity in third party analyses. For the WW the corresponding percent is: 0.1% for Neamt, 5-6% for Sibiu and Satu Mare and 30% for Buzau.

10 WU's charge for third Party analyses for DW. The 3 that do not are VITAL Baia Mare, APAVIL Valcea, and AQUASERV Tulcea as they do not carry out analyses for third parties. 8 WU's charge for third party analyses for WW. The 5 that do not are SECOM Drobeta, VITAL Baia Mare, APAVIL Valcea, AQUASERV Tulcea, and APA PROD Deva.

Dealing with Complaints

The water utilities were asked whether they perform analyses of the drinking water upon receipt of complaints. All 13 water utilities answered positively to this question. The same 100% rate applies to the response concerning the communication of the results of the DW monitoring analyses. Some of the WUs gave more details about the means of information, i.e.:

1. By phone: APASERV Satu Mare, APA SERV Neamt, APA CANAL Sibiu;
2. Direct information to the customer and also through press releases, local media: VITAL Baia Mare;
3. Making available a copy of an analysis bulletin: COMPANIA APA Brasov, APA SERV Neamt (upon request), and APA CANAL Sibiu.

Performance of DW Analysis after Repairs/Replacement Works

All 13 water utilities perform DW analysis after a network repair or a pipe replacement, before re-comissioning.

Some of the companies (Brasov, Neamt) indicated that this is done at the request of the Water Department. APA CANAL Sibiu indicated that an analysis is carried out on the occasion of connecting pipes).

Usually, the analysed parameters, as indicated by the WUs include: turbidity, residual chlorine, pH, conductivity, bacteriological analysis, etc. APA SERV Neamt mentioned as usual practice only the analyses for turbidity and free residual chlorine.

Inventory, Monitoring and Inspection Programmes

The questionnaire envisaged, as well, to identify whether the WUs have an inventory and a monitoring programme (sampling and analysing the discharge waters) for the polluting industries discharging into the sewers in their area of operation; also whether they have an inspection programme for detecting illegal connections or illegal discharges of polluter industries.

7 water utilities declared they have both an inventory and monitoring programme, and an inspection programme.

4 water utilties have an inventory and monitoring programme, but not an inspection programme.

Only 2 water utilities have neither an inventory and monitoring programme, nor an inspection programme – AQUASERV Tulcea and APAVIL Ramnicu Valcea.

The overview as reported in October 2008 is presented in the table below:

#	Water Utility	Inventory & Monitoring Programme	Inspection Programme
1	APASERV Satu Mare	Yes	Yes
2	COMPANIA APA Brasov	Yes	Yes
3	AQUASERV Tulcea	No	No
4	APA SERV Neamt	Yes	No
5	APA CANAL Sibiu	Yes	Yes
6	APA CANAL 2000 Pitesti	Yes	Yes
7	ACVARIM Rm. Valcea	Yes	Yes
8	APAVIL Rm. Valcea	No	No
9	RAM Buzau	Yes	Yes
10	SECOM Drobeta	Yes	No
11	APA PROD Deva	Yes	No
12	VITAL Baia Mare	Yes	No
13	APA CANAL Galati	Yes	Yes

Concerning the application of the ‘polluter pays’ principle (payment of penalties for exceeding the maximum allowed values of the parameters), the situation is as follows: 10 water companies indicated they apply this principle, and 3 water companies answered negatively – they take no measures against the polluters. These latter companies are: SECOM Drobeta, APAVIL Valcea, and AQUASERV Tulcea.

Other Information

Only two water utilities indicated supplementary information to that already described in the previous sections, namely APA SERV Neamt declared they intend to obtain accreditation of the DW laboratory according to ISO 17025/2005, while APA CANAL 2000 Pitesti referred to a new microbiological laboratory, and future provisions with equipments planned in 2008.

The water utilities were requested to specify what kind of additional support they need in the future. Listed below is the type of support requested:

4. Monitoring indicators according to the treatment stages (Satu Mare);
5. Support in developing the procedures for drinking and wastewater analyses, microbiology (Tulcea);
6. Support in the development of an inspection programme for detecting illegal discharges of polluter industries;
7. Technical assistance, working visits, training (Buzau); and
8. Support for improving the activities (organisation, personnel, procedures, equipment provision) (Baia Mare).

Recommendations for the FOPIP I Operators (as reported October 2008)

In the following tables, issues and priorities for the near future for each of the WU's included in FOPIP are presented:

#	Water Utility	Next steps for improvement
1	APASERV Satu Mare	Fully equip and rehabilitate laboratories to enable them to undertake the full suite of water and wastewater analyses; Recruitment of additional staff with a higher education for the water laboratory; Train all staff in new procedural techniques; Finalise the preparation of procedures for sampling; Obtain the authorization from the Ministry of Health for the water laboratory; Develop a QM strategy based on this report.
2	COMPANIA APA Brasov	Fully equip and rehabilitate laboratories to enable them to undertake the full suite of water and wastewater analyses; Acquisition of a software package for laboratory activity management, particularly for records management; Develop a QM strategy based on this report.
3	AQUASERV Tulcea	Fully equip and rehabilitate laboratories to enable them to undertake the full suite of water and wastewater analyses; Recruitment of additional qualified staff for water and wastewater laboratories; Train all staff in new procedural techniques; Elaborate procedures for sampling; Obtain the authorization in the future from the Ministry of Environment for the waste water laboratory within the WWTP to be built in Sulina; Develop a QM strategy based on this report.
4	APA SERV Neamt	Fully equip and rehabilitate laboratories to enable them to undertake the full suite of water and wastewater analyses; Recruitment of additional staff with a higher education for the water laboratory; Train all staff in new procedural techniques; Purchase software for laboratory data processing, and for informing the population (by internet) on the quality of the water supplied; Obtain the ISO 17025 accreditation for the water laboratory; Develop a QM strategy based on this report.
5	APA CANAL Sibiu	Fully equip laboratories to enable them to undertake the full suite of water and wastewater analyses, through ISPA funding and also from own sources – for ensuring the safety of the personnel and a more complex water monitoring (determination of parasites), as well as for increasing the safety degree for reagents storage; Create the "no return path" circuit in the bacteriological laboratory; Procurement of software needed for DW and WW laboratories for data interpretation; Develop a QM strategy based on this report.

#	Water Utility	Next steps for improvement
6	APA CANAL 2000 Pitesti	Fully equip laboratories to enable them to undertake the full suite of water and wastewater analyses; Modernisation of the microbiological laboratory, create the “no return path” circuit in the bacteriological laboratory; move the storage area and set a library for the staff instead; Purchase and implementation of an IT system for Laboratory Management (LIMS); Train all staff in the new techniques; Develop a QM strategy based on this report.
7	ACVARIM Rm. Valcea	Fully equip laboratories to enable them to undertake the full suite of water and wastewater analyses; Recruitment of additional staff for the wastewater laboratory; Further training of the staff of the WW laboratory after purchasing of the chemical wastewater analysis kit; Obtain the authorization from the Ministry of Health for the water laboratory; Obtain RENAR accreditation for the wastewater laboratory; Develop a QM strategy based on this report.
8	APAVIL Rm. Valcea	Fully equip laboratories to enable them to undertake the full suite of water and wastewater analyses (including hardware and software); Recruitment of additional staff for both water and wastewater laboratories; Train on an on-going basis all staff in new procedural techniques; Set up a central laboratory for WW monitoring; Obtain accreditation ISO 17025 for most of the laboratories; Develop a QM strategy based on this report.
9	RAM Buzau	Elaborate projects aiming to reduce the costs for the analyses undertaken; Set up of 2 central laboratories for water and wastewater; Fully equip laboratories to enable them to undertake the full suite of water and wastewater analyses; Recruitment of additional staff for the water and wastewater laboratories; Train all staff in new procedural techniques; Obtain certification under ISO 9001 and accreditation under ISO 17025 for both water and wastewater laboratory; Obtain the re-authorization from the Ministry of Environment; Develop a QM strategy based on this report.
10	SECOM Drobeta	Fully equip laboratories to enable them to undertake the full suite of water and wastewater analyses (including hardware and software); Set up a WW laboratory within the WWTP to be built with ISPA financing; Extension of the existing DW monitoring laboratory also through ISPA (by the end of 2008); Recruitment of staff for the future WW laboratory; Train on an on-going basis all staff in new procedural techniques; Obtain the authorization from the Ministry of Health for the water laboratory; Develop a QM strategy based on this report.
11	APA PROD Deva	Continue to centralise the monitoring and fully equip central laboratories to enable them to undertake the full suite of water and wastewater analyses; Train on an on-going basis all staff in new procedural techniques; Obtain the authorization from the Ministry of Health for the central laboratory of Deva for DW; Elaborate an inspection programme for detecting illegal discharges of polluter industries; Develop a QM strategy based on this report.
12	VITAL Baia Mare	Fully equip and rehabilitate laboratories to enable them to undertake the full suite of water and wastewater analyses (including hardware, software and new IT system); Recruitment of additional staff with a higher education depending on the future needs (e.g., due to regionalisation);

#	Water Utility	Next steps for improvement
		Train all staff in new procedural techniques; Obtain accreditation ISO 17025 for both DW and WW laboratories; Reorganise the laboratories; Finalise the preparation of procedures for storage of samples (DW); Obtain the authorization from the Ministry of Health for the DW laboratory; Develop a QM strategy based on this report.
13	APA CANAL Galati	Fully equip and rehabilitate the WW laboratory to be able to undertake the full suite of wastewater analyses; Recruitment of a biologist for the DW laboratory and recruitment of additional laboratory workers for the WW laboratory; Train all staff in new procedural techniques; Obtain the ISO 17025 accreditation for laboratories; Develop a QM strategy based on this report.

E.15.2 Progress of FOPIP II ROCs in the ISO 17025 standard implementation and ROCs laboratories accreditation

An assessment of the status of implementation of ISO 17025 requirements in water and wastewater laboratories and of the accreditation status of the laboratories under the above-mentioned standard, was carried out based on an evaluation of the ROC responses to a FOPIP II QM Questionnaire.

The companies within the Regional Operator that were included in this assessment have been divided in 4 Groups, for which training workshops and follow up progress evaluation workshops were undertaken.

An overall finding, based on discussions and completion of the progress assessment on the ISO 17025 Standard Implementation for the accreditation of the testing laboratories, is that most of the ROCs will wait for the water and wastewater testing laboratories to be upgraded and fitted out through EU financed projects, and only afterwards they will allocate further financial resources to and concentrate on complying with the ISO 17025 requirements in order to obtain the laboratories accreditation from RENAR.

ROCs that participated in ISPA projects on WWTPs, and already have adequately equipped laboratories, considered more closely the implementation process of the ISO 17025 requirements for accreditation purposes.

A series of ROCs have certified their drinking water testing laboratories under the Ministry of Health requirements; others have also certified the wastewater testing laboratories under the Ministry of Health requirements.

The reporting covers the entire period of the FOPIP 2 Project, and uses the following periods as reference points for reporting purposes: November 2007 (commencement of the Project), June 2009, and December 2009 (estimated date for the completion of workshops and working meetings on water and wastewater quality monitoring).

The aggregative reporting Table was developed in order to provide the ROCs with an easy-to-use working tool, and to clearly and concisely present the progress made during the three periods considered and the related processes, important for implementation and accreditation of testing laboratories, namely:

- the documentation development process in compliance with the ISO 17025 Standard;
- the requirements of the Standard relating to the implementation process; and

- the accreditation / reaccreditation process per se.

Table B.1 shows the progress made with respect to in implementation of the ISO 17025 standard in laboratories of FOPIP II ROCs during the period November 2007 - December 2009.

Note: on Table B.1: The progress status is indicated as follows: the 'activity' box will be filled with an "X", followed by one or more "*", where additions are to be made; the latter are to be filled in the Observations/Comments column.

Table B.2 This table is a model form that could be used by the ROCs, in order to assess periodically (e.g. annually or biannually) progress in implementing the requirements of ISO 17025 and accredited testing laboratories.

The form can be used as a progress reporting model with respect to the accreditation status of the testing laboratories, and it could be used as a working document for evaluating the progress made in certain periods of time as might be required by the IDA. Further rows could be added to the document, if necessary, depending on the number of laboratories managed by a ROC.

Table B.1. Progress of FOPIP II ROCs in the implementation of ISO 17025 standard in laboratories

Group	Nr. Crt.	County	Reporting Date	ISO 17025 DOCUMENTATION DEVELOPMENT: Not started	Started	Advansed	Dissemination	ISO 17025 IMPLEMENTATION PROGRESS: Not started	Started	Advanced	Completed	ACCREDITATION / REACCREDITATION cf. ISO 17025: Under acccreditation	Accredited	Under reaccreditation	Reaccredited	Observations / Comments
Group 1	1	**BOTOSANI**	Nov. 2007	Training												
			Jun-09		X*											
			Dec-09		X*											Botosani X* 2 DW lab registerd with the Minitry of Health in 2006, registration doc was submitted in 2008, lab under upgrade
	2	**SUCEAVA**	Nov. 2007	X												
			Jun-09	X												
			Dec-09	X												
	3	**VASLUI**	Nov. 2007	No ROC												
			Jun-09	X	X some branches		X* only Barlad			X* only Barlad						
			Dec-09		X all branches			X		X* only Barlad						
	4	**VRANCEA**	Nov. 2007	No ROC												
			Jun-09			X* ph-ch with MoH										
			Dec-09			X* ph - ch with the MoH	X									
	5	**Bacau**	Nov. 2007	No ROC		X* Bacau with MoH	X* Bacau with MoH									
			Jun-09	No ROC		X* Bacau with MoH	X* Bacau with MoH									
			Dec-09	ROC probably set up		X* Bacau with MoH	X* with MoH, evaluation of the registrat-ion									

Group	Nr. Crt.	County	Reporting Date	ISO 17025 DOCUMENTATION DEVELOPMENT				ISO 17025 IMPLEMENTATION PROGRESS				ACCREDITATION / REACCREDITATION cf. ISO 17025				Observations / Comments
				Not started	Started	Advansed	Dissemination	Not started	Started	Advanced	Completed	Under acccreditation	Accredited	Under reaccreditation	Reaccredited	
Group 2	6	BRAILA	Nov. 2007													
			Jun-09				X* 17025, procure-ment procedure, training									
			Dec-09				X* finalise 17025 training, procedures develop-ment									
	7	CALARASI	Nov. 2007	X												
			Jun-09	X*, std approach dissem-ination												
			Dec-09		X											
	8	GIURGIU	Nov. 2007	X												
			Jun-09	X												
			Dec-09	X												
	9	IALOMITA	Nov. 2007													
			Jun-09													
			Dec-09													
	10	PRAHOVA	Nov. 2007													
			Jun-09		X		X* std ISO, procedures starting, training									
			Dec-09		X		X* std ISO, procedures strating, training									

Group	Nr. Crt.	County	Reporting Date	ISO 17025 DOCUMENTATION DEVELOPMENT				ISO 17025 IMPLEMENTATION PROGRESS				ACCREDITATION / REACCREDITATION cf. ISO 17025				Observations / Comments
				Not started	Started	Advansed	Dissemination	Not started	Started	Advanced	Completed	Under acccreditation	Accredited	Under reaccreditation	Reaccredited	
Group 3	11	**CARAS SEVERIN**	Nov. 2007													
			Jun-09			X	X			X						
			Dec-09			X	X			X						Lab approved by the MoH
	12	**DAMBOVITA**	Nov. 2007	OR not establish-ed												Only the Targoviste water and wastewater lab will be accredited
			Jun-09	ROC establish-ed												
			Dec-09			X	x		x			x				
	13	**GORJ**	Nov. 2007	existing												
			Jun-09		X											
			Dec-09			X partially		X								
	14	**OLT**	Nov. 2007	X												
			Jun-09	X												
			Dec-09		X											
	15	**TELEORMAN**	Nov. 2007	X												
			Jun-09	X												
			Dec-09	X*												

Group	Nr. Crt.	County	Reporting Date	ISO 17025 DOCUMENTATION DEVELOPMENT				ISO 17025 IMPLEMENTATION PROGRESS				ACCREDITATION / REACCREDITATION cf. ISO 17025				Observations / Comments
				Not started	Started	Advansed	Dissemination	Not started	Started	Advanced	Completed	Under acccreditation	Accredited	Under reaccreditation	Reaccredited	
Group 4	16	**ALBA**	Nov. 2007													
			Jun-09		X											
			Dec-09			X										
	17	**COVASNA**	Nov. 2007	No ROC												
			Jun-09	X ISO training												
			Dec-09	X												Sf Gh Apa' s DW lab is registered with the MoH since in 2006
	18	**HARGHITA**	Nov. 2007	X No OR												
			Jun-09	X OR under set-up												
			Dec-09	X Or under set-up												
	19	**MEDIAS (SIBIU)**	Nov. 2007	X era ROC												
			Jun-09			x partially										
			Dec-09			x	X partially		X							
	20	**TURDA (CLUJ)**	Nov. 2007													
			Jun-09			X	X		x							
			Dec-09						x							
	21	**VALEA JIULUI (HUNEDOARA)**	Nov. 2007	X												
			Jun-09	X												
			Dec-09	X												

Table B2. Model form for recording progress on implementing ISO 17025 in testing laboratories

The progress status is to be indicated as follows: the 'activity' box will be filled with an 'X', followed by one or more '', where additions are to be made; the latter are to be filled in the Observations/Comments column.*

Laboratory (name)	Reporting Date	ISO 17025 DOCUMENTION DEVELOPMENT				ISO 17025 IMPLEMETATION PROCESS				ACCREDIATION / REACCREDIATION cf. ISO 17025				Observations /Comments
		Not started	Started	Advanced	Dissemination	Not started	Started	Advanced	Completed	Under accreditation	Accredited	Under reaccreditation	Reaccredited	

E.16 Inquiry in Romanian Legislation Promoting the Kyoto Protocol

LEGISLATION

The existing legal framework in Romania in the field of climate change, for a unitary application of the UNFCCC and the Kyoto Protocol consists of:

- primary legislation including specific acts on climate change;
- general environmental regulations including climate change aspects;
- specific legislation related to energy, transports, agriculture, and waste.

The primary legislation contains mainly the multilateral environmental agreements in the field of climate change or in other related fields that were ratified by Romania and the strategies and action plans:

- Law No. 24/1994 ratifying the UN Framework Convention on Climate Change;
- Law No. 3/2001 ratifying the Kyoto Protocol to the UNFCCC;
- Governmental Decision No. 1275/1996 regarding the establishment and the functioning of the National Commission for Climate Change. The Commission promotes the necessary measures and actions for a unitary implementation of the UNFCCC's objectives;
- Governmental Decision No. 645/2005 regarding the approval of the National
- Strategy of Romania on Climate Change;
- Governmental Decision No. 1877/2005 regarding the approval of the National Action Plan of Romania on Climate Change;
- Law No. 111/1998 ratifying the UN Convention to Combat Desertification;
- Law No. 58/1994 ratifying the UN Convention on Biological Diversity;
- Law No. 84/1993 ratifying the UN Convention on the Protection of the Ozone Layer and the Montreal Protocol on Substances Depleting the Ozone Layer.

Regarding the general environmental regulations that include climate change aspects, Romania adopted the most important legal acts presented above:

- Governmental Decision 195/2005, approved and amended through Law no. 265/2006 regarding Environment Protection, contains a special chapter regarding atmosphere protection, climate change, conservation of the biodiversity and the general requirements concerning the environmental permit, and the control procedure, etc.
- Law No. 655/2001 on Atmosphere Protection - represents the framework atmosphere protection act aiming "to prevent, eliminate, limit deterioration and improve air quality, in order to avoid negative impacts on human health and the environment". The law required the establishment of the National System for Integrated Air Quality Assessment and Management (Governmental Decision No. 586/2004), coordinated by the Ministry of Environment and Water Management;
- Law No. 645/2002 regarding the integrated pollution prevention and control (transposing the EU IPPC Directive).

Climate change aspects are also presented in the Government Programme for the period 2005-2008 and in the Governmental Decisions for establishing and functioning of the Ministry of Environment and Water Management, the National Agency for Environmental Protection and the Regional Agencies for Environmental Protection.

Some specific legal acts related to energy, transports, agriculture, and waste include or refers to climate change aspects:

- Law No. 287/2002 regarding the establishment, organization and functioning of The Romanian Energy Efficiency Fund;
- Law No. 199/2000 regarding the efficient use of energy;
- Law No. 13/2007 regarding electric energy;
- Governmental Decision No. 443/2003 regarding the promotion of energy form renewable sources (transposing the EU Directive 2001/77/EC);
- Governmental Decision No. 349/2005 on land-filling of waste;
- Governmental Decision No. 541/2003 on limitation of emissions from large combustion plants (transposing the EU Directive 2001/80/EC)
- Law no. 46/2008 – The Forest Management Code.

A number of new legal acts and regulatory changes will result from the implementation of the National Action Plan on Climate Change in the period 2006- 2007, especially related to the EU Directive 2003/87/EC concerning the establishment of the EU Emissions Trading Scheme.

MEETING THE KYOTO PROTOCOL TARGET

The current level of GHG emissions is app. 50% below the Kyoto target. Even in a high economic growth scenario without any additional measures, it is very unlikely that emissions will increase above the level of the Kyoto Protocol's target before the end of the first commitment period (2012).

INCENTIVES FOR REDUCING CARBON EMISSIONS – EU EMISSION TRADING SCHEME (EU ETS DIRECTIVE 2003/87/EC)

Basis: Chapter 8 of the National Strategy on Climate Change (NSCC) 2005-2007

The Environmental Protection Law was amended in December 2005 by the Emergency Governmental Ordinance No. 195/2005 - contains a special chapter regarding atmosphere protection, climate change, emissions trading, national registry, national inventory and the general requirements concerning the environmental permit, and the control procedure, etc.

The National Action Plan on Climate Change in Romania (2005-2007) targets the adoption in 2006 of the primary legislation (i.e. governmental decision) and secondary legislation (guidelines for monitoring and reporting, internal accreditation procedure for verifiers), as well as of the National Allocation Plan.

Promote energy production from renewable sources

The renewable energy sector is one of the priority sectors for introducing policies and measures for GHG emission reduction (Chapter 9.3.2 of the NSCC).

Renewable energy is strongly promoted at the EU level as a key measure to reduce GHG emissions, although most of the measures are to be taken on the level of the Member States (MS). For renewable electricity production, Directive 2001/77/EC on the Promotion of Electricity from Renewable Energy Sources in the Internal Electricity Market is the most important regulation for renewable energy production.

The legal framework has been completed in Romanian by:
- GD no. 443/2003 on the promotion of energy form renewable sources, amended by GD no. 958/2005;
- GD no. 1535/2003 approving the Strategy for valorisation of RES;
- GD no. 890/2003 on the energy roadmap for Romania; and

- GD no. 1892/2004 establishing the promotion system for producing electrical power from renewable energy sources.

According to GD 443/2003 as amended, the target of the electrical power to be produced from RES within the national raw energy consumption is of 33%.

In order to encourage production of electrical power from renewable energy sources, GD no. 1892/2004 stipulates that mandatory quota-based system will be applied in combination with the tradable green certificates.

The provisions of GD 1892/2004 will only apply to the electrical power produced from the following RES: wind, sun, biomass, as well as to the hydro-electrical power produced in plants with a designed capacity lower than or equal to 10 MW, commissioned or modernised starting with 2004.

A system of Tradable Green Certificates (TGC) has been introduced in Romania. Nevertheless, many barriers still need to be overcome to exploit the potential:
- The tradable green certificates scheme is new.
- Local financing institutions have not been active in the renewable energy market and many potential project sponsors have low credit worthiness.
- Local market parties lack experience with renewable energy project development and financing (engineers, consultants, ESCOs etc.).
- The potential project opportunities are not well known.

The following actions will be implemented on the short term (National Action Plan on Climate Change):
- Romania will strengthen its participation in the Intelligent Energy for Europe Programme to support the development of renewable energy policies.
- Ministry of Economy and Commerce (MEC) will implement a capacity building project for market intermediaries and project developers with financial support from the IEE Programme. MEC will secure the required co-financing.
- MEC will evaluate the system of tradable green certificates by mid 2007.
- New financing mechanisms for renewable energy projects will be introduced, e.g. the proposal for a credit facility by the EBRD.

E.17 A guide on the implementation of the SR EN ISO/CEI 17025:2005 requirements, and laboratory accreditation

GENERAL

SR EN ISO/CEI 17025:2005 (General requirements for the competence of testing and calibration laboratories)	specifies the general requirements for the competence to carry out tests and/or calibrations, including sampling. covers testing and calibration performed using standard methods, non-standard methods, and laboratory-developed methods.
Normative references	ISO/CEI 17000, Conformity assessment - Vocabulary and general principles VIM, International vocabulary of basic and general terms in metrology

Brief description of the SR EN ISO/CEI 17025:2005 Standard

SR EN ISO 17025:2005 contains the following chapters, of which Chapters 4 and 5 are the main divisions addressing laboratory requirements:

1. Scope

2. Normative References
3. Terms and Definitions
4. Management Requirements
5. Technical Requirements.

Annex A. Nominal cross-reference to ISO 9001:2000

Annex B. Guidelines for establishing applications for specific fields.

If laboratories comply with the requirements of the ISO 17052 standard, they will operate a quality management system for their testing activities that also meets the principles of ISO 9001. Annex A of the ISO 17025 standard provides the nominal cross-references between the two.

MANAGEMENT REQUIREMENTS

4.1 Organization

4.2 Management system

4.3 Document control

4.4 Review of requests, tenders and contracts

4.5 Subcontracting of tests and calibrations

4.6. Purchasing services and supplies

4.7 Service to the customer

4.8 Complaints

4.9 Control of nonconforming testing and/or calibration work

4.10 Improvement

4.11 Corrective action

4.12 Preventive action

4.13 Control of records

4.14 Internal audits

4.15 Management reviews

TECHNICAL REQUIREMENTS

5.1 General

5.2 Personnel

5.3 Accommodation and environmental conditions

5.4 Test and calibration methods and method validation

5.5 Equipment

5.6 Measurement traceability

5.7 Sampling

5.8 Handling of test and calibration items

5.9 Assuring the quality of test and calibration results

5.10 Reporting the results

Conformity assessment consists of demonstrating compliance with the standard's requirements.

- Accreditation criteria are:
  - Juridico-administrative
  - Economic-financial
  - Competence
  - Assessment process
- Organization competence criteria:
  - Developed, documented and implemented management system that ensures fulfillment of all the requirements specified by ISO 17025 and other relevant guides.
  - Well-defined organizational structure that guarantees process-development in accordance with the ISO 17025 specifications.
  - Continuous improvement of the implemented management system during the accreditation validity period.
  - Well-defined procedures that certify valid and traceable results.
  - Compliance with national regulations addressing the activity of the laboratory.
  - Infrastructure that permits implementation of conformity-assessment procedures.

DOCUMENTS to be drawn up for the Standard's requirements implementation, and accreditation:

- Management requirements documents:
- Management manual
- Relevant organizational charts
- Job descriptions
- Policy statement
- Management's commitment
- Ethical code
- Decisions of deputies' appointment
- Customer satisfaction survey
- Complaints record
- Safety and access procedures
- Document control procedure
- Records control procedure
- Internal audit procedure and system review
- Corrective/preventive actions procedure
- Order review / activity planning procedure
- Records processing procedure
- Subcontractor evaluation procedure (where appropriate)
- Subcontracting procedure (where appropriate)
- Supplier evaluation procedure
- Purchasing procedure
- Purchased goods verification procedure
- Storage procedure and stock control
- Complaint resolution procedure
- Nonconforming testing work processing procedure
- Internal audit procedure

- Management review procedure

Technical requirements documents:
- Tests definition list
- Applicable available instructions list
- Work and safety instructions (sample, personnel, environment)
- Description of the site-specific requirements, and the monitoring method
- Personnel selection, evaluation and orientation training procedure
- Temporary or part-time personnel employment procedure
- Exemption procedure
- Instruction drafting procedure
- Testing procedures
- Method selection and validation procedure
- Measurement uncertainty estimation procedure
- Software procedures
- Data recording and storage procedures
- Equipment operation procedure
- Equipment transportation, verification, and off-site use procedure (where appropriate)
- Traceability assurance procedure
- Equipment calibration verification procedure
- Cross-reference and reporting procedure
- Sampling procedure
- Sample processing procedure
- Results quality control procedure

RENAR sets additional requirements on the accreditation of laboratories for water quality testing.

The water being classified as food, RENAR also imposes water quality tests and a series of specific requirements for the laboratory accreditation, which are briefly presented below:
- Reference to the national and European legislation.
- GD 458/2002, as completed by 311/2004, and subsequently amended
- Directive 98/83/EC on the quality of water intended for human consumption, modified by Regulation 1882/2003
- Water Framework Directive transposed by Law 107/1996, as subsequently modified and completed.

RENAR specific requirements for the accreditation of water quality testing laboratories regarding:
- Test methods and method validation
- Sampling
- Handling of test and calibration items
- Assuring the quality of test and calibration results
- Reporting the results.

Test Methods and Method Validation

All laboratories located in one water catchment area should use the same methods.

Sampling

Sampling of the initial representative sample should be documented, even where this is not the lab's responsibility.

Handling of Test and Calibration Items

The laboratory should document the identification and handling method of deviant samples (nonconforming due to sampling/packaging/conditioning/transportation), including the customer or authority notification method.

Assuring the Quality of Test and Calibration Results

The laboratory will document the internal control program with any specific RENAR references.

Where applicable, parameter control diagrams will be kept.

Reporting the Results

Drafting, validation/approval and transmission method of periodic reports (daily, weekly, monthly, annual, etc) should be documented.

Assessment process criteria:
- Assessment of the laboratory's competence will be based on applicable relevant standards and guides.
- Laboratory accreditation process is undertaken in compliance with the RENAR documentation.
- Accreditation and its maintenance are based on the evidenced competence criteria.
- Laboratory accreditation and its maintenance are conditioned by acceptance of the supervision conditions set by RENAR
- The laboratory will conform to the modifications of the RENAR accreditation specifications.

E.18 Outline for a water quality monitoring strategy

Drinking Water Quality Monitoring Strategy of

...................................*name of ROC*...

Prepared by:	Acknowledged by:
… … … … *name* … … … …	… … … … *name* … … … …
… … … … *position* … … … …	Director General
Date:	Date:

Document Reference Number:

CONTENTS

Introduction

Purpose of strategy

To assure coherent information at the level of different department and branches of ROC regarding the way the ROC management team:

- anticipates the impact of regionalization on the main requirements and specifications in terms of monitoring drinking water.
- will respond in due time to the need for change in departments such as development and drinking water quality monitoring.

How to apply the strategy

The main lines of the strategy can be use by the ROC as:

- an internal guide to show personnel of the ROC Departments and branches the actions planned to achieve an improved monitoring of water quality
- a contribution to the ROC's Business Plan
- a means to demonstrate to interested external parties that the management team of the ROC is perfectly aware of all aspects related to drinking water quality and therefore prepared a set of proposals meant to develop and increase future efficiency of the DW quality monitoring activities
- a starting point for Technical Assistance teams (future or present) to help plan further improvements to raw/drinking water quality.

The strategy should be updated from time to time to ensure correct and meaningful contributions to the ROC Business Plan.

List of reference documents on which the strategy is based

The water quality monitoring strategy needs to be used together with the Master Plan and the Feasibility Study (where the case) and is prepared based on:

- ROC analysis of the specific problems of water quality monitoring and the proposed solutions
- Relevant chapters to monitor water quality from the Quality Law 458/2002, completed and modified by the Law 311/2004 and from Order 88/20.03.2007;
- existing problems related to meeting the drinking water parameters as identified and established in the Master Plan and the Feasibility Study;
- investment proposals that will lead to an increase in the population served with drinking water, will improve existent actives and implement new ones.

At the present time, the .... ……………....*name of ROC*........ …….......................in the ….…….. *name of County* ………… includes the following main localities:

- ……………
- ……………
- ……………
- ……………

Raw/drinking water quality monitoring in the localities part of the ROC

Locality	Monitored element	Actual monitoring points (see annex B: 1, 2, 3, 4)	Future monitoring points (see annex B: 1, 2, 3, 4)	Observations
CITY X	Extraction			
	Raw water trunk line			
	Treatment plant			
	Reservoirs			
	Drinking water transport			
	Water distribution network			

Water quality monitoring procedures inside the distribution network

Locality	After water distribution interruption		After customers complains, regarding water quality	
	In present	In future	In present	In future
ORASUL X				

Monitor sludge quality from the water treatment plants

Locality	Collecting and storage methods	Sludge quality parameters	Frequency of analysis	Future development strategy

Action plan to improve raw/drinking water quality monitoring during the following years, planning process, responsible persons and estimated costs

Locality	Element	Actions	Year	Responsible person(position)	Estimated cost (EURO/RON)
City X	Extraction				
	Raw water trunk line				
	Treatment plant				
	Reservoirs				
	Drinking water transport				
	Water distribution network				

Actions to improve the water quality monitoring process from other documents: Master Plan, Feasibility Study, etc

Locality	Action (related to water quality monitoring)	Document	Estimated period (years)	Estimated costs (RON/EURO)

ANNEXES

Annex A

Water distribution system – short description

Locality	Element	Description	Observations on water quality

Locality	Element	Description	Observations on water quality

Analysis laboratories

Locality	Laboratories' position and equipment	Analysed parameters and method of saving data	ISO 17025 accreditation	Functioning problems	Future strategy

Using data from analysis documents

Locality	Extraction	Treatment/Chlorination plant	Distribution network

3.a) Monitor raw and drinking water quality – working document

STA...

Chief of laboratory.......................................

Data ....

The table can be used in A3 format to include all necessary data and observations/comments

*The table can be used as a **working document** to have a clear image of problems which may occur in the system on each parameter.*
Column nr. 10 can be used as a performance indicator for STA on each parameter. Also, column nr 3 can be used as a performance indicator for analytical laboratories; if the analysis method is the recommended one by law then the performances targets are achieved; on the contrary, the laboratory will have to improve its recommended method

Nr.	Parameters to be analysed	Product	Used/Recommended analysis method	Sampling area	Analysis frequency (nr samples / time unit)	Legal limit value*	Minimum determined value	Maximum determined value	Medium value	Nr of analysed samples / nr of samples in compliance with the norms (/ month, /trim. / year)	Observations
0	1	2	3	4	5	6	7	8	9	10	11
		Raw water		Sampling point P1	3/day	x		y	z	2000/1980	
		Raw water		Sampling point P2	....	...					
		Drinking water		Sampling point P3							
1	Cd	Water		.....							
2		Water									
		Water									
	Cu	Water									

Note. This table format can be used to monitor parameters of a single STA, or can be adapted in order to monitor parameters for all STA, or for all monitoring points of raw and drinking water, including transport pipes, reservoirs etc.
** Within the column "Parameters to be analyses" all parameters that ROC must monitor according to legislation in progress must be noted down. (HG 458/2002)*

3.b) Monitor quality of sludge produced in STA – working document

STA...

Chief of laboratory......................................

Data ....

The table can be used in A3 format in order to include all necessary data and comments

Nr.	Parameters to be analysed	Product	Used/Recommended analysis method	Sampling area	Analysis frequency (nr samples / time unit)	Legal limit value*	Minimum determined value	Maximum determined value	Medium value	Nr of analysed samples / nr of samples in compliance with the norms (/ month, /trim. / year)	Observations
0	1	2	3	4	5	6	7	8	9	10	11
1	Cd	Sludge		Sampling point P1	3/day	x		y	z	2000/1980	
		Sludge		Sampling point P2	....	...					
		Sludge		Sampling point P3							
		Sludge		.....							
		Sludge		……	…						
		Sludge		……							
		Sludge									
2	Cu	Sludge									
		Sludge									
		Sludge									

Note. This table format can be used to monitor the parameters of a single STA or can be adapted to monitor parameters for all STA

** Parameters from OM 344/2004*

Performance indicators (for ROC) relevant to drinking water quality monitoring

IP – drinking water	U.M.	Value
Proportion of population that receives water services	%	
Frequency of failures in the distribution network	nr/km/an	
Percent of replaced network/year	%/an	
NRW	%	
NRW/km/day	m^3/km/day	
Percent of analysis of drinking water that respects standards/year	%	
Annual complaints related to offered water services	#/an/ '000 customers	

E.19 Outline for a wastewater quality monitoring strategy

Wastewater Quality Monitoring Strategy of

...................................*name of ROC*..

Prepared by:	Acknowledged by:
… … … … *name* … … … …	… … … … *name* … … … …
… … … … *position* … … … …	Director General
Date:	Date:

Document Reference Number:

CONTENTS

- Introduction
- Monitoring the quality of wastewater in the localities of ROC
- Procedures for monitoring the quality of wastewater discharged to sewers by industrial and economical agents
- Applying the polluter pays principle and improved documentation for connections
- Monitoring sludge quality in treatment plants
- Action plan to improve wastewater quality monitoring
- Other actions to improve wastewater quality described in different studies (Master Plan, Feasibility Study, other projects, etc.)

Annexes

Annex A

- Description of the wastewater systems
- Laboratories
- How to use information from analysis documents;
  - Monitoring wastewater quality – working document
  - Monitoring quality of water treatment plant sludge – working document
- Performance indicators (for ROC)

Annex B – drawings

- General map of the county with localities of RO and treatment plants
- Diagrams of treatment plants at localities of the ROC – monitoring points

- Diagrams of wastewater networks in localities of the ROC – monitoring points / areas)

1. Introduction

Purpose of the strategy

To assure coherent information at the level of different department and branches of ROC regarding the way the ROC management team:
- anticipates the impact of regionalization on the main requirements and specifications in terms of monitoring wastewater.
- will respond in due time to the need for change in departments such as development and wastewater quality monitoring.

How to apply the strategy

The main lines of the strategy can be used by the ROC as:

- an internal guide to show personnel of the ROC Departments and branches the actions planned to achieve an improved monitoring of the wastewater quality
- a contribution to the ROC's Business Plan
- a means to demonstrate to interested external parties that the ROC management team is perfectly aware of all aspects related to collected and treated wastewater quality and has, therefore, prepared a set of proposals meant to develop and increase future efficiency of the wastewater quality monitoring activities
- a starting point for Technical Assistance teams (future or present) to help plan further improvements to wastewater collection, treatment and disposal and sludge management.

The strategy should be updated from time to time to ensure correct and meaningful contributions to the ROC Business Plan.

Observations
- This strategy refers to the existent situation and possible future investments relevant to:
  - evacuation of industrial wastewater into the ROC sewers;
  - raw sewage quality (according to NTPA 002) and treated wastewater for discharge to recipient water bodies (according to NTPA 001)
  - sewage collection and pumping, storage, treatment and sludge treatment.
- The monitoring of wastewater quality is done according to NTPA 002 and NTPA 001 and also regulations specific for each ROC.
- Technical Assistance teams should take into account the content of this strategy

List of reference documents on which the strategy is based

The wastewater and sludge quality monitoring strategy should be coordinated with the Master Plan and the Feasibility Study and it is based on:
- ROC analysis of specific problems regarding wastewater and sludge monitoring and proposed solutions
- Specific points from NTPA 001 and 002
- Articles and points from Order 88/20.03.2007, which relate to wastewater monitoring
- Existent problems relating to wastewater quality identified in the Master Plan, Feasibility Study, etc.

- Investment proposals to extend wastewater networks and rehabilitation of treatment plants, etc.

At the present time, the .... ……………....*name of ROC*....... …….....................in the ………. *name of County* ………… includes the following main localities:

- ……………
- ……………
- ……………
- ……………
- …………….

Wastewater quality monitoring in the localities of the ROC

Locality	Monitored element	Actual monitoring points (see annex B: 1, 2, 3, 4)	Future monitoring points (see annex B: 1, 2, 3, 4)	Observations
CITY X	Wastewater network			
	Wastewater pumping plants			
	Wastewater treatment plant			
	Evacuation points of wastewater without treatment into recipient water bodies			

Procedures for monitoring the quality of wastewater discharged to sewers by industrial and economical agents

Locality	Economic (industrial) agent	Actual Monitoring point Actual Monitoring frequency	Future monitoring procedure

Applying the polluter pays principle and improved documentation for connections

Locality	After accidental pollution		At the request for a new connection	
	In present	In future	In present	In future
CITY X				

Monitoring sludge quality in treatment plants

Locality	Collecting and storage methods	Sludge quality parameters	Frequency of analysis	Future development strategy

Locality	Collecting and storage methods	Sludge quality parameters	Frequency of analysis	Future development strategy

Action plan to improve wastewater quality monitoring during the following years, planning process, responsible persons and estimated costs

Locality	Element	Actions	Year	Responsible person (position)	Estimated cost (EURO/RON)
CITY X	Wastewater network				
	Wastewater pumping plants				
	Treatment plant				
	Evacuation points of wastewater without treatment in the emissary				

Action plan to improve wastewater quality monitoring

Locality	Action (related to water quality monitoring)	Document	Estimated period (years)	Estimated costs (RON/EURO)

ANNEXES

Annex A

Wastewater system – short description

Locality	Element	Description	Observations on wastewater quality

Analysis laboratories

Locality	Laboratories' position and equipment	Analyzed parameters and method of saving data	ISO 17025 accreditation	Functioning problems	Future strategy

Using data from analysis documents

Locality	Wastewater network	Treatment plant

3.a) Monitor wastewater quality –working document

SEAU...

Chief of laboratory.....................................

Date.......................................

The table can be used in A3 format to include all necessary data and observations/comments

*The table can be used as a **working document** to have a clear image of problems which may occur in the system on each parameter. Column nr 10 can be used as a performance indicator for SEAU on each parameter. Column nr 3 also can be used as a performance indicator for analytical laboratories; if the analysis method is the recommended one by law then the performances targets are achieved; on the contrary, the laboratory will have to improve its recommended method*

Nr.	Parameters to be analyzed	Product	Used / Recommended analysis method	Sampling point / area	Analysis frequency (nr samples / time unit)	Legal limit value*	Minimum determined value	Maximum determined value	Medium value	Nr of analysed samples / nr of samples in compliance with the norms (per month / trim. / year)	Observations
0	1	2	3	4	5	6	7	8	9	10	11
1	Cd	Wastewater		Point P1	3/day	x		y	z	2000/1980	
		Wastewater		Point P2	....	...					
		Wastewater		Point P3							
		Wastewater		.....							
2	Cu	Wastewater									
		Wastewater									
		Wastewater									

Note. This table format can be used to monitor parameters of a single WWTP, or can be adapted in order to monitor parameters for all WWTPs, or for all monitoring points of raw wastewater, including from the wastewater network. Systematic exceeding in some points in the wastewater network can indicate a potential polluting economical agent that has to be more carefully monitored

** Within the column "Parameters to be analyses" all parameters that ROC must monitor according to legislation in progress must be noted down. (NTPA 002 or NTPA 001)*

3.b) Monitor quality of sludge produced in SEAU – working document

SEAU...

Chief of laboratory......................................

Date ....

The table can be used in A3 format to include all necessary data and observations/comments

*The table can be used as a **working document** to have a clear image of problems which may occur in the system on each parameter. Column nr 10 can be used as a performance indicator for SEAU on each parameter. Column nr 3 also can be used as a performance indicator for analytical laboratories; if the analysis method is the recommended one by law then the performances targets are achieved; on the contrary, the laboratory will have to improve its recommended method*

Nr.	Parameters to be analysed	Product	Used / Recommended analysis method	Sampling area	Analysis frequency (nr samples / time unit)	Legal limit value*	Minimum determined value	Maximum determined value	Medium value	Nr of analysed samples / nr of samples in compliance with the norms (/ month / trim / year)	Observations
0	1	2	3	4	5	6	7	8	9	10	11
		Sludge		Point P1	3/day	x		y	z	2000/1980	
		Sludge		Point P2	....	...					
		Sludge		Point P3							
		Sludge		.....							
1	Cd	Sludge		……	…						
		Sludge		……							
		Sludge									
2		Sludge									
		Sludge									
		Sludge									
	Cu										

Note. This table format can be used to monitor parameters of a single SEAU, or can be adapted in order to monitor parameters for all SEAU of COR

**Parameters from OM 344/2004*

****

Performances indicators(for ROC) relevant to wastewater quality monitoring

IP – wastewater	U.M.	Value
Proportion of population that receives wastewater services	%	
Frequency of failures in the wastewater network	nr/km/year	
Percent of replaced network/year	%/year	
Percent of collected wastewater treated primarily	%	
Percent of collected wastewater treated secondary	%	
Percent of analysis of wastewater that respects NTPA 002/year	%	
Percent of analysis of wastewater that respects NTPA 001/year	%	
Annual complaints related to offered wastewater services	#/an/ '000 customers	

E.20 Guide on EIA and Risk Evaluation

The scope of this Appendix responds to the requirements of the FOPIP 2 Terms of Reference and to the needs expressed by the ROCs for guidance on obtaining the agreements and licences necessary to gain access to investment funds, or in preparing correctly the customary EIA requirements, documents and mass-media announcements. The Appendix includes guidance on the following main aspects of environmental impact assessments:

- Section 1 : A general introduction on the purpose of the guide, the FOPIP 2 Consultant's approach to preparing the guide, and aspects of environmental risks and the associated responsibilities of the ROC and ROC personnel.
- Section 2: Guide regarding the Environment Impact Assessment (EIA) Procedure – to comply with the latest changes in legislation made during 2009 – for the release of an Environmental Agreement necessary when building or extending wastewater and drinking water infrastructure works.
- Section 3: EIA Guide applicable during construction works for treatment or wastewater treatment plants.
- Section 4: EIA Guide relating to the operational life of water treatment plants (WTP) and wastewater treatment plants (WWTP).
- Section 5: Risk Management.

For details, please see the electronic version of this Appendix.

E.21 Guide on systems for improving efficiency of O&M functions

This section of the Manual has been developed for the FOPIP 2 project with a view to help in the implementation of the technical action plans.

For details, see the electronic version of this Appendix.

E.22 Guide on equipment maintenance strategy

This section of the Manual has been developed for the FOPIP 2 project with a view to help in the implementation of the technical action plans.

For details, see the electronic version of this Appendix.

E.23 Guide on O&M Costs Optimisation

This section of the Manual has been developed for the FOPIP 2 project with a view to help in the implementation of the technical action plans.

For details, see the electronic version of this Appendix.

E.24 Outline Strategy for Energy Management

....

(name of ROC)

STRATEGY FOR ENERGY MANAGEMENT

Strategy prepared by: **Strategy approved by:**

Date

CONTENTS

Summary of Efficient Energy Strategy

Issues to be resolved:

The need to improve the efficiency of energy use in order to (a) support the objectives of the transformation of the former local utilities into a regional water and wastewater operating company (ROC) and (b) help mitigate the impacts of increased use of energy for wastewater treatment and potential energy prices increases.

Background to the issues:

The Government's expectation on regionalisation and use of capital investment in the municipal water sector, using Cohesion Funds, is for ROCs to optimise the performance of the operations and quality of supplied services by using joint resources and facilities. Planned investments for water and wastewater treatment plants and for expansion of water and sewerage networks will increase energy use. Therefore our ROC needs to take action to eliminate inefficient use of energy on all of the Company's sites throughout the localities of the ROC.

Increasing the efficiency of energy use also will contribute towards strengthening the financial position of our Company.

Solution (approach):

We will re-assess the ways in which we use energy, identify ways in which energy use could be made more efficient, and prioritise actions and investments accordingly. For electrical energy we will, where appropriate, consider options for: changes to tariff regime; reducing volumes of water produced and wastewater collected; distribution system pressure zones; adjusting operating procedures to minimise use of electricity (especially during high tariff rate periods); ensuring high energy efficiency of all new or rehabilitated assets; increasing use of automation. We will regularly monitor, analyse and report on energy use and expand the training of our personnel on energy efficiency. Where practical and feasible, ways for recovering energy will be adopted e.g. from sludge treatment, mini-hydro, etc. We will also consider ways to reduce costs for other energy use e.g. heating and ventilation in buildings, and transport.

This strategy presents in relation to energy use, the main issues presently faced by the ROC, our proposed approach and methodologies for improving the efficiency of energy use across the Company and our plan of actions for achieving improved energy use in future.

Implementation plan: Refer to Section 5

1. Introduction

Purpose of this Strategy

The purpose of this strategy is to help our Company to (a) prepare a ROC-wide planning framework on how energy use shall in future become more efficient throughout the Company.

The strategy is also intended to help inform our internal departments and branches about how the Company's management team:

- anticipates the impacts of regionalisation on overall use of energy in the Company
- recognises the need for more efficient energy use
- will respond in due time to the anticipated increases in energy use after investments are made in new and upgraded water and wastewater treatment plants, for expansion of water and sewerage networks, and other improvements.

Ways to Use the Strategy

The efficient energy use strategy can serve our Company as:

- an internal guide showing the actions planned to achieve required improvements in energy use
- a basis for contribution to the Company's Business Plan, which in due time will need to be reviewed and amended to reflect activities included in this strategy and approved by the ADI
- a means for demonstrating to interested external organisations that the Company's management team:
  - is fully aware of modern energy management methods and
  - has therefore prepared a set of proposals on improving the efficiency of energy use throughout all the localities of the ROC
- a basis for obtaining the approval of ADI to our energy efficiency plans.

Co-ordination of Efficient Energy Use Strategy with the Company's other Operation and Maintenance Strategies

Energy management forms a part of the Company's overall operation and maintenance procedures. Therefore this strategy is linked to and has to be co-ordinated with other O&M functions and associated plans including:

- asset management
- NRW reduction
- equipment maintenance
- cost optimisation
- transport, workshops and stores
- other ….

Documents used as a Basis for this Strategy

- Delegation Contract
- Company's Rules of Service, prepared in accordance with ANRSC Ordinance # 88

- Other regulations e.g. fire, dangerous chemicals, pressure vessels, electrical appliances, etc … …
- The Company's asset management plan and procedures
- Procedures of management systems e.g.: QMS (ISO 9001:2008), EMS (ISO 14001:2004), OHSAS (ISO 18001:2008), Laboratories (ISO 17025:2005)
- Procedures for emergency planning
- Operation and maintenance manuals
- Feasibility Study and future investment plans (if / when the case)
- Relevant strategies of the Company
- Other …

2. Present Energy Management Procedures used by the Company

At present, the Company provides water and wastewater services to the following main localities:

- locality X …
- etc …

Energy management procedures presently used by the Company at the above localities are summarised in Annex 1. A preliminary assessment of energy use at the main installations at localities throughout the ROC is shown in Annex 2. The assessment of energy use is indicative. The present organisation chart for energy management is shown in Annex 3.

3. Summary of Main Energy Use Issues

The main issues that have impacts at present on the ability of the Company to improve energy efficiency throughout the localities of the ROC are summarised in the table below.

Energy Use Topic	Factors	Issues / Comments
Relative cost of electrical energy consumption	Proportion of overall water and wastewater operating costs (%)	
Electrical energy consumption	Main points of energy use	
	Specific energy use (kWh/m^3)	
	Etc. …	
Age and condition of main existing electricity consuming equipment installations at each locality of the ROC	Refer to asset management system	
	Etc. …	
Capacity vs. duty requirements of main electricity consuming equipment installations at each locality of the ROC	Extent of over-sizing (if known)	
	Etc. …	
Technical information on main electricity consuming equipment installations at each locality of the ROC	Available documents	
	Variations	
	Etc. …	

Energy Use Topic	Factors	Issues / Comments
Future planned changes in high electrical energy consumption	New / rehabilitated wastewater treatment plants	
	Etc. New / rehabilitated water treatment plants …	
	New / rehabilitated sources	
	New / rehabilitated pump stations	
	Etc.	
Electricity tariff regimes used	Tariffs used	
	Etc. …	
Operating instructions for optimising electrical energy use at localities of the ROC	Available documents	
	Variations in procedures	
	Etc. …	
Previous energy studies	Date, scope	
	Conclusions	
	Etc. …	
Other …		
	Etc. …	

Could be a SWOT analysis

4. Future Development of Efficient Energy Use

The main directions of our proposed approach to improving the efficiency of energy use are summarised below.

Development of an efficient energy use strategy will be carried out at our Company Headquarters in cooperation with the branch organisations at localities throughout the ROC.

We will form and energy management team with well defined terns of reference and scope of work. Energy use at all sites[18] within the ROC will be assessed.

Our approach will involve the following main aspects:

- Work at the Company management team:
  - establish an energy management team
  - determine if and when additional resources will be required to carry out the energy management work.
  - evaluate the results of work by the energy management team

[18] Sites = WTPs, WWTPs, water and wastewater pump stations, reservoirs, overflows, buildings, workshops (machinery / equipment repairs, vehicles, meters) etc.

- organise information campaigns to inform our customers about energy issues
- seek approval of ADI for the action plan on efficient energy use
- plan for funding and implementation of approved efficient energy use actions.

- Work by the energy management team:
  - monitor and analyse electricity consumption (energy technical audit)
  - identify improvements to operating procedures that could reduce electrical energy use (generally low-cost actions)
  - propose investment opportunities for electrical energy efficiency improvements (higher cost actions)
  - propose other energy cost reduction options including heating and ventilation of buildings, transport, energy recovery, etc.
  - estimate the potential cost savings of energy efficiency improvements
  - propose and justify priority projects for energy efficiency improvements
  - prepare regular reports on energy efficiency improvements and priority project proposals for appraisal and approval.

Our action plan for improvement of energy efficiency across the Company is shown in the following section.

Action Plan on Efficient Energy Use (energy use reduction plan)

Note: The cost relating to the all actions will be in the financial previsions from the Business Plan. Deadlines depends by internal resources allocated (staff and budget – where is necessary)

Location	Actions	Resources	Cost	Deadline	Responsible person(s)
Headquarters	General:				
	Nominate a manager (e.g. from within the technical department) to be responsible for organising and taking responsibility for energy management within the Company, and nominate personnel from within the organisation to assist with carrying out energy management functions (i.e. form an energy management team)				
	Plan and provide training of personnel in energy management				
	Assess capabilities and capacity of Company personnel to undertake energy management and determine if additional resources are required (e.g. by recruiting into the Company or by commissioning specialist contractor, etc.)				
	Plan, evaluate and use results of work carried out and reported by the energy management team				
	Organise information campaigns to inform our customers about:				
	(a) the forecast impacts on our tariffs that will occur as a result of increased energy consumption after commissioning of investments in wastewater treatment, water treatment and expansion of the water and				

Location	Actions	Resources	Cost	Deadline	Responsible person(s)
	wastewater service areas				
	(b) Company efforts to increase energy efficiency				
	Etc. …				
	Monitoring & Analysis of Electricity Consumption:				
	Organise improved procedures for monitoring and analysis of energy consumption (electricity, heating, fuel)				
	Estimate specific energy use19 (including use of SCADA where available)				
	Benchmark specific energy use with other ROCs and prepare an initial approximate assessment of potential for energy savings				
	Prepare results on analysis of energy use and preliminary estimate of potential savings (i.e. energy audit results)				
	Etc. …				
	Identify Improvements to Operating Procedures that could Reduce Electrical Energy Use:				
	Review and determine of optimal electricity supply tariff is used for each site.				
	Repeat review if / when electricity supplier tariffs change				
	Assess possibility to purchase electricity from other reliable supplier (e.g. local industry with surplus power generation capacity, etc.)				
	Determine if practical opportunities exist to reduce electricity consumption e.g. minimise energy use during periods of high tariffs, fill reservoirs outside high tariff periods,				
	Check pump stations to ensure valves and correctly set open or closed (avoid pumps operating against closed / part closed valves or in a continuous, open valve loop)				
	Optimise filter backwash frequency (might require water treatment process and chemical dosing review)				

[19] Specific energy use (kWh/m³) = Total electrical energy consumption per year (kWh) (ΣE) divided by volume of water billed per year (Qby) (= ΣE p/ Qby). Note: special note needs to be taken if large quantity of technical water is supplied.

Location	Actions	Resources	Cost	Deadline	Responsible person(s)
	Optimise aeration stages of wastewater treatment				
	Organise joint working of energy management team with the Company's NRW reduction group to help determine potential energy savings that could be achieved through leakage reduction, etc.				
	Etc. …				
	Investment Opportunities for Electrical Energy Efficiency Improvements:				
	Design and install power factor correction equipment (where appropriate)				
	Trim diameter of impellers of over-capacity pumps (where appropriate)				
	Provide frequency converter(s) for pump and blower sets (where appropriate)				
	Review and improve motor starters (where appropriate)				
	Replace over-sized pump / motor sets with correct size sets (where appropriate)				
	Implement further use of SCADA / automation (where appropriate)				
	Etc. …				
	Heating of Buildings (space and water):				
	Improve thermal insulation				
	Adjust thermostats and other controls to avoid extreme temperatures (space / water heating and cooling) and inefficient ventilation				
	Fuel use for Vehicles:				
	Maintain vehicles in good working order				
	Optimise work schedules and use of vehicles to avoid unnecessary journeys				
	Reporting on Energy Management:				
	Agree scope and content of quarterly and annual reports on energy management				
	Agree performance indicators for energy efficiency and methods of calculation for sites, localities and for ROC overall				
	Estimate cost and potential value for each potential energy saving option				
	Establish priorities for implementation				

Location	Actions	Resources	Cost	Deadline	Responsible person(s)
	of potential energy saving options				
	Propose implementation schedule for selected priority energy saving options				
	Prepare and publish quarterly and annual reports with justified energy saving proposals and energy efficiency indicator values				
	Etc. …				
	Implementation:				
	Develop roll-out plan for implementation of approved energy saving initiatives throughout the main sites of the ROC, including:				
	- select priority sites for energy efficiency improvements				
	- prepare inputs required to inform clients of anticipated cost impacts of future increases in electrical energy consumption and energy saving measures proposed by the Company				
	- estimate resources requirements				
	- establish training requirements				
	- prepare time frame for completion				
	Etc. …				
	Reporting on Energy Management:				
	Agree scope and content of quarterly and annual reports on energy management				
	Agree performance indicators for energy efficiency and methods of calculation for sites, localities and for ROC overall				
	Prepare and publish quarterly and annual reports and indicator values				
TOWN X	Report to headquarters on each site regarding:				
	- technical information on main equipment with high electrical energy use				
	- monthly and annual energy use at present for each site				
	- tariffs in use				
	- daily operating routines for equipment with high electrical energy use				
	- reservoir filling routines				
	- other …				

Location	Actions	Resources	Cost	Deadline	Responsible person(s)
	Etc. …				
TOWN Y	Etc. …				
Etc.					

ANNEX 1 SUMMARY OF PRESENT ENERGY MANAGEMENT PROCEDURES

ANNEX 2 PRESENT ENERGY USE THROUGHOUT THE ROC

ANNEX 3 PRESENT ORGANISATION CHART FOR ENERGY MANAGEMENT

E.25 FOPIP ROC Performance

E.25.1 FOPIP I Performance Indicator Values

The information on FOPIP I ROC performance values was mainly based on the year 2007 and the first half year of 2008. Financial information for 2006 was available and is also shown where deemed useful. The definitions are detailed in Chapter 4 of this Manual.

The following sections present tables for:
- Operational performance indicators
- Managerial performance indicators
- Financial performance indicators
- Performance indicators for continuity and asset management

A. Operational performance indicators

1. Water quality compliance (percent)

	2007	2008 (6 months)
Satu Mare city	100	100
Satu Mare – Carei	97	94
Satu Mare Tasnad	100	100
Baia Mare	99.24	99.29
Brasov	95	90
Hunedoara - Orlea	100	100
Huedoara - Hunedoara	100	100
Hunedoara – Brad	100	100
Hunedoara – Geoagiu	100	100
Hunedoara - Ilia	100	100
Hunedoara – Certej	100	100

	2007	2008 (6 months)
Drobeta	98	98
Galati	100	99
Neamt – zone	99	100
Neamt – Bicaz	100	100
Neamt – communes	75	62
Pitesti	99	99
Ramnicu Valcea	91	92
Valcea – Bradisor	99	100
Valcea – Brezoi	100	100
Valcea – Govara	92	83
Valcea – Frincesti	92	100
Valcea – Olanesti	-	99
Valcea - Calimanesti	-	99
Sibiu	95	95
Tulcea	84	82
Buzau	100	100

2. Wastewater quality compliance (percent)

	2007	2008 (6 months)
Satu Mare - city	100	100
Satu Mare - Carei	100	100
Satu Mare - Tasnad	100	100
Baia Mare	98.07	96.45
Brasov	60	55
Huedoara - Orlea	90	88
Hunedoara - Hunedoara	100	100
Hunedoara - Brad	93	93
Hunedoara - Geoagiu	89	88
Hunedoara - Ilia	96	87
Hunedoara - Certej	100	100
Drobeta	97	98
Galati	60	47
Pitesti	98	95
Ramnicu Valcea	60	76
Valcea - Govora	67	76
Valcea - Babeni	75	67
Valcea – Brezoi	82	85
Valcea – Olanesti	-	70
Valcea - Calimanesti	-	62
Sibiu	96	94
Tulcea	50	50
Buzau	100	100

3. Water consumption (litre per capita per day)

	2007	2008 (6 months)
Satu Mare - city	101	108
Satu Mare - Carei	65	77
Satu Mare - Tasnad	51	71
Hunedoara - Orlea	126	123
Hunedoara - Hunedoara	120	117
Hunedoara - Brad	106	100
Hunedoara - Geoagiu	76	63
Hunedoara - Ilia	48	44
Hunedoara - Certej	88	75
Neamt - zonal system	108	103
Neamt - Bicaz	104	102
Neamt - Stefan	56	48
Neamt - Bodesti	79	65
Neamt - Raucesti	68	48
Neamt - Pastraveni	68	59
Neamt - Sabaoani	52	25
Neamt - Tamaseni	54	52
Neamt - Horia	55	44
Pitesti	116	1`05
Baia Mare	145	131
Brasov	107	106
Drobeta	118	118
Galati	135	127
Ramnicu Valcea	130	116
Valcea - Brezoi	96	90
Valcea - Govora	123	103
Valcea - Babeni	84	77
Valcea - Calimanesti	-	54
Valcea - Olanesti	-	93
Valcea - Bujoreni	75	63
Valcea - Daesti	61	48
Valcea - Pausesti	-	52
Sibiu	132	104
Tulcea	-	85
Buzau	105	110

4. Non-Revenue Water (NRW) (percent)

	2007	2008 (6 months)
Satu Mare - city	32	31
Satu Mare - Carei	63	61
Satu Mare - Tasnad	54	57
Baia Mare	19	26

	2007	2008 (6 months)
Hunedoara - Orlea	52	51
Hunedoara - Hunedoara	69	69
Hunedoara - Brad	43	43
Hunedoara - Geoagiu	48	48
Hunedoara - Ilia	50	50
Hunedoara - Certej	80	80
Neamt - zonal system	43	56
Neamt - Bicaz	29	30
Neamt - Stefan	27	20
Neamt - Bodesti	19	25
Neamt - Raucesti	35	38
Neamt - Pastraveni	32	35
Neamt - Sabaoani	20	44
Neamt - Tamaseni	36	33
Neamt - Horia	54	60
Pitesti	31	34
Brasov	47	45
Drobeta	43	47
Galati	50	46
Ramnicu Valcea	33	34
Valcea - Brezoi	40	40
Valcea - Govora	30	30
Valcea - Babeni	35	35
Valcea - Calimanesti	-	25
Valcea - Olanesti	-	30
Valcea - Bujoreni	5	5
Valcea - Daesti	10	10
Valcea - Pausesti	-	50
Sibiu	47	57
Tulcea	-	51
Tulcea - Macin	-	81
Tulcea - Sulina	-	60
Buzau	40	34

B. Managerial performance indicators

1. Population connected to water supply network (percent)

	2007	2008 (6 months)
Satu Mare - city	98	98
Satu Mare - Carei	80	80
Satu Mare - Tasnad	100	100
Baia Mare	90	90
Hunedoara - Orlea	88	89
Hunedoara - Hunedoara	92	95
Hunedoara - Brad	68	69
Hunedoara - Geoagiu	34	35
Hunedoara - Ilia	66	66
Hunedoara - Certej	30	32
Neamt - zonal system	78	78
Neamt - Bicaz	69	70
Neamt - Stefan	16	18
Neamt - Bodesti	22	23
Neamt - Raucesti	11	12
Neamt - Pastraveni	8	9
Neamt - Sabaoani	34	36
Neamt - Tamaseni	24	26
Neamt - Horia	4	5
Pitesti	95	96
Brasov	98	98
Drobeta	97	97
Galati	100	100
Ramnicu Valcea	97	98
Valcea - Brezoi	76	77
Valcea - Govora	81	82
Valcea - Babeni	52	52
Valcea - Calimanesti	-	95
Valcea - Olanesti	-	53
Valcea - Bujoreni	95	98
Valcea - Daesti	96	97
Valcea - Pausesti	-	95
Sibiu	100	100
Tulcea	-	95
Tulcea - Macin	-	64
Tulcea - Sulina	-	74
Buzau	95	95

2. Population connected to wastewater network (percent)

	2007	2008 (6 months)
Satu Mare - city	94	94
Satu Mare - Carei	71	71
Satu Mare - Tasnad	30	30
Baia Mare	77	77
Hunedoara - Orlea	76	76
Hunedoara - Hunedoara	76	76
Hunedoara - Brad	50	50
Hunedoara - Geoagiu	8	8
Hunedoara - Ilia	21	21
Hunedoara - Certej	26	27
Neamt - zonal system	59	59
Neamt - Bicaz	50	50
Pitesti	78	80
Brasov	96	96
Drobeta	87	87
Galati	96	96
Ramnicu Valcea	79	79
Valcea - Brezoi	51	51
Valcea - Govora	43	43
Valcea - Babeni	25	25
Valcea - Calimanesti	-	52
Valcea - Olanesti	-	43
Sibiu	88	88
Tulcea	-	68
Tulcea - Macin	-	31
Tulcea - Sulina	-	30
Tucea - Isaccea	-	18
Buzau	92	92

3. Level of metering (percent)

	2007	2008 (6 months)
Satu Mare - city	100	100
Satu Mare - Carei	97	71
Satu Mare - Tasnad	30	30
Baia Mare	97	98
Hunedoara - Orlea	93	94
Hunedoara - Hunedoara	65	69
Hunedoara - Brad	96	96
Hunedoara - Geoagiu	99	99
Hunedoara - Ilia	89	89
Hunedoara - Certej	66	70

	2007	2008 (6 months)
Neamt - zonal system	96	96
Neamt - Bicaz	86	86
Neamt - Stefan	99	99
Neamt - Bodesti	100	100
Neamt - Raucesti	100	100
Neamt - Pastraveni	100	100
Neamt - Sabaoani	100	100
Neamt - Tamaseni	100	100
Neamt - Horia	100	100
Pitesti	76	78
Brasov	85	89
Drobeta	65	66
Galati	99	100
Ramnicu Valcea	96	97
Valcea - Brezoi	44	45
Valcea - Govora	92	92
Valcea - Babeni	74	74
Valcea - Calimanesti	-	79
Valcea - Olanesti	-	66
Valcea - Bujoreni	98	99
Valcea - Daesti	100	100
Valcea - Pausesti	-	100
Sibiu	92	93
Tulcea	-	90
Tulcea - Macin	-	70
Tulcea - Sulina	-	65
Tulcea - Isaccea	-	68
Buzau	57	58

4. Population served per employee (persons)

	2007	2008 (6 months)
Satu Mare - city	386	386
Satu Mare - Carei	311	311
Satu Mare - Tasnad	262	262
Baia Mare	282	279
Hunedoara - Orlea	239	240
Hunedoara - Hunedoara	288	299
Hunedoara - Brad	190	188
Hunedoara - Geoagiu	114	118
Hunedoara - Ilia	246	246
Hunedoara - Certej	150	171
Neamt - zonal system	435	453
Pitesti	315	336

	2007	2008 (6 months)
Brasov	424	423
Drobeta	423	424
Galati	285	288
Ramnicu Valcea	377	277
Valcea - Brezoi	103	140
Sibiu	352	352
Tulcea	403	384

C. Financial performance indicators

1. Gross profit margin (percent)

	2006	2007	2008 (6 months)
Satu Mare	27	28	29
Baia Mare	22	23	23
Brasov	23	25	30
Deva	6	5	10
Drobeta Turnu Severin	23	36	36
Galati	1	9	12
Neamt	23	26	25
Pitesti	22	16	18
Ramnicu Valcea	11	19	2
Valcea (county)	21	18	12
Sibiu	36	32	32
Tulcea	9	4	5
Buzau	-	-	14

2. Days receivables

	2006	2007	2008 (6 months)
Satu Mare	2.4	2.6	1.0
Baia Mare	1.6	1.3	4.9
Brasov	1.8	1.4	1.7
Deva	1.5	1.1	0.9
Drobeta Turnu Severin	1.7	1.3	3.4
Galati	0.7	0.8	0.7
Neamt	4.4	5.6	5.7
Pitesti	0.6	0.8	0.5
Ramnicu Valcea	1.1	2.2	4.2
Valcea (county)	1.8	1.7	1.2
Sibiu	3.0	2.8	3.6
Tulcea	2.4	1.2	1.7
Buzau	-	-	0.6

3. Days payable - customers

	2006	2007	2008 (6 months)
Satu Mare	79	71	81
Baia Mare	51	52	57
Brasov	128	122	118
Deva	75	72	88
Drobeta Turnu Severin	77	62	54
Galati	111	101	218
Neamt	94	91	97
Pitesti	44	43	39
Ramnicu Valcea	65	65	58
Valcea (county)	106	81	57
Sibiu	59	65	66
Tulcea	89	85	86
Buzau	-	-	49

4. Days payables - suppliers

	2006	2007	2008 (6 months)
Satu Mare	40	21	25
Baia Mare	9	13	14
Brasov	21	19	14
Deva	100	117	49
Drobeta Turnu Severin	41	21	22
Galati	151	137	122
Neamt	27	27	28
Pitesti	23	20	19
Ramnicu Valcea	38	54	19
Valcea (county)	46	31	29
Sibiu	25	81	79
Tulcea	24	45	-
Buzau	-	-	26

5. Total debts/total assets (percent)

	2006	2007	2008 (6 months)
Satu Mare	29	28	43
Baia Mare	34	29	8
Brasov	24	23	21
Deva	74	63	20
Drobeta Turnu Severin	45	56	68
Galati	132	72	62
Neamt	3	19	17
Pitesti	24	20	27
Ramnicu Valcea	38	37	12
Valcea (county)	16	12	17
Sibiu	38	47	38

	2006	2007	2008 (6 months)
Tulcea	13	16	55
Buzau	-	-	14

6. Tariff water 2007 & 2008 (LEI/m3)

	2007	2008 (6 months)
Satu Mare	1.63	1.63
Baia Mare	1.28	1.47
Brasov	1.38	1.47
Deva	1.32	1.45
Drobeta Turnu Severin	1.82	2.18
Galati	1.81	1.99
Neamt	1.43	1.74
Pitesti	1.65	1.76
Ramnicu Valcea	1.79	2.15
Valcea (county)	0.45	0.59
Sibiu	1.48	1.58
Tulcea	1.62	1.74
Buzau	-	1.66

7. Tariff wastewater 2007 & 2008 (LEI/m3)

	2007	2008 (6 months)
Satu Mare	0.87	0.87
Baia Mare	0.65	0.75
Brasov	0.55	0.69
Deva	0.26	0.29
Drobeta Turnu Severin	0.20	0.24
Galati	0.39	0.42
Neamt	0.97	0.98
Pitesti	1.40	1.58
Ramnicu Valcea	0.33	0.41
Valcea (county)	0.66	0.65
Sibiu	0.68	0.71
Tulcea	0.68	0.66
Buzau	-	0.70

8. Total investments

	2007	2008 (6 months)
Satu Mare	31,5	30.4
Baia Mare	6.8	8.1
Brasov	18	15
Deva	45	20
Drobeta Turnu Severin	2	1
Galati	12	3

	2007	2008 (6 months)
Neamt	16	14
Pitesti	9	7
Ramnicu Valcea	9	3
Valcea (county)	1	0
Sibiu	23	17
Tulcea	-	0
Buzau	-	-

D. Performance indicators for continuity and asset management

1. Percentage of water network replaced per year

	2007	2008 (6 months)
Satu Mare - city	1.5	3.2
Satu Mare - Tasnad	-	1.3
Baia Mare	5.0	0
Brasov	22.0	0
Hunedoara - Orlea	38.6	1.3
Hunedoara - Hunedoara	0.8	0
Drobeta TS	1.0	0.3
Neamt - zonal system	2.3	1.8
Neamt – Bicaz	0	0
Pitesti	3.9	4.7
Ramnicu Valcea	9.9	3.9
Valcea - Brezoi	0.5	0
Valcea - Govora	0	1.2
Valcea - Babeni	2.4	0.8
Valcea - Calimanesti	-	0.8
Sibiu	19.3	1.4
Buzau	11.9	11.5

2. Percentage of wastewater network replaced per year

	2007	2008 (6 months)
Satu Mare - city	0.2	1.8
Satu Mare - Carei	0	1.1
Satu Mare - Tasnad	1.2	0.1
Baia Mare	0.3	0
Hunedoara - Orlea	2.0	0.8
Hunedoara - Hunedoara	0.8	0
Hunedoara - Geoagiu	0.1	0
Drobeta TS	0.5	0.1
Neamt - Dumbrava	0	0.1
Pitesti	1.4	1.9
Ramnicu Valcea	0.5	0.2

	2007	2008 (6 months)
Sibiu	2.7	0
Buzau	7.8	5.0

3. Number of repairs per km of water network per year

	2007	2008 (6 months)
Satu Mare - city	10.61	16.99
Satu Mare - Carei	5.55	9.65
Satu Mare - Tasnad	6.06	17.84
Baia Mare	3.20	0.54
Hunedoara - Orlea	1.86	0.84
Hunedoara - Hunedoara	0.43	0.13
Hunedoara - Brad	8.09	4.75
Hunedoara - Geoagiu	7	3
Hunedoara - Ilia	1.37	0.64
Hunedoara - Certej	6	2.5
Neamt - zonal system	1.21	0.61
Neamt - Bicaz	3.72	1.87
Neamt - Stefan	0.21	0.27
Neamt - Bodesti	0.28	0.47
Neamt - Raucesti	0.22	0.44
Neamt - Pastraveni	0.37	0.56
Neamt - Sabaoani	0.61	0.91
Neamt - Tamaseni	0.86	0.47
Neamt - Horia	0	0.35
Neamt - Cordun	0	0
Neamt - Bara	0	0
Pitesti	3.98	2.14
Brasov	4.67	2.25
Drobeta	5.04	1.81
Ramnicu Valcea	0.34	0.21
Valcea - Brezoi	0.94	0.65
Valcea - Govora	1.63	0.83
Valcea - Babeni	1.85	0.43
Valcea - Calimanesti	-	0.26
Valcea - Olanesti	-	0.47
Valcea - Bujoreni	0.08	0.12
Valcea - Daesti	0.36	0.12
Valcea - Pausesti	-	0
Sibiu	-	-
Tulcea	4.3	1.7
Buzau	3.37	0.74

4. Number of repairs per km of wastewater network per year

	2007	2008 (6 months)
Satu Mare - city	1.21	0.72
Satu Mare - Carei	1.22	1.01
Satu Mare - Tasnad	2.65	2.91
Baia Mare	-	0.23
Hunedoara - Orlea	1.35	0.87
Hunedoara - Hunedoara	3.93	9.44
Hunedoara - Brad	-	-
Hunedoara - Geoagiu	1.2	0.6
Hunedoara - Ilia	8.25	5.75
Hunedoara - Certej	6.67	3.33
Neamt - zonal system	0.75	-
Neamt - Bicaz	0.4	0.27
Neamt - Roznov	0.36	0.18
Neamt - Savinesti	0.13	0
Neamt - Dumbrava	0.75	0
Pitesti	6.5	3.58
Brasov	0.10	0.04
Drobeta	17.15	8.18
Ramnicu Valcea	0.05	0.02
Valcea - Brezoi	0.77	0.26
Valcea - Govora	0.66	0.22
Valcea - Babeni	0.63	0.25
Valcea - Calimanesti	-	0.35
Valcea - Olanesti	-	0.60
Sibiu	1.29	0.51
Tulcea	-	-
Buzau	46.57	11.41

E.25.2 FOPIP II Performance Indicator Values

Forms for Technical Input Data and Indicator Outputs for FOPIP II ROCs:

The following tables, extracted from a working spreadsheet, show the performance data input form and the performance indicator output form that were provide to the FOPIP II operators and used during the FOPIP II training activities on performance efficiency measurement and efficiency improvement.

Form for water supply technical data input:

ORAS / LOCALITY			
Nr / No	DATE DE INTRARE PENTRU APA POTABILA	Unitate / Unit	An / Year
1	Populatia totala a orasului / Total population of the locality	#	
2	Lungimea totala a strazilor localitatii / Total length of the locality streets	km	
	APA POTABILA / DRINKING WATER		
3	Productia totala / Total water production	m³/an : m³/yr	
4	Pierderi in productie / Loses in water production	m³/an : m³/yr	
5	# persoane carora li se furnizeaza apa / No of persons supplied with water	#	
6	Vol vandut catre locuinte (case + blocuri) / Volume of water sold to the houses	m³/an : m³/yr	
7	Vol vandut catre industrie / Volume of water sold to the industry	m³/an : m³/yr	
8	Vol vandut catre ag.comerciali / Volume of water sold to the commercial agents	m³/an : m³/yr	
9	Vol vandut catre altii / Volume of water sold to the others	m³/an : m³/yr	
10	Total vol vandut catre consumatori / Total volume sold to the consumers	m³/an : m³/yr	-
11	Vol vandut & contorizat - Case / Volume sold & metered - Houses	m³/an : m³/yr	
12	Vol vandut & contorizat - Blocuri / Volume sold & metered - Blocks	m³/an : m³/yr	
13	Vol vandut & contorizat - Industrie / Volume sold & metered - Industry	m³/an : m³/yr	
14	Vol vandut & contorizat - Ag. comerciali / Volume sold & metered - Commercial ag.	m³/an : m³/yr	
15	Vol vandut & contorizat - altii / Volume sold & metered - Others	m³/an : m³/yr	
16	Total vol apa vanduta & contorizata / Total water volume sold & metered	m³/an : m³/yr	-
17	Numarul de avarii ale conductelor de alimentare cu apa / Damages on pipes	#/an : #/year	
18	Lungimea retelei de alimentare cu apa potabila / Length of the network	km	
19	Lungimea retelei de apa inlocuite pe an / Length of replaced network/year	km/an	
20	Personal sectie apa / Personnel	#	
21	Bransamente la case / Connections for houses	#	
22	Bransamente la blocuri / Connections for blocks	#	
23	Bransamente la industrie / Connections for industry	#	
24	Bransamente la altii / Connections for others	#	
25	Total bransamente / Total connections	#	-
26	Numar de bransamente contorizate	#	
27	Numarul total de analize pe an / Total number of analyses/year	#	
28	Numarul total de analize conforme pe an / Total number of analyses according with the legislation/year	#	
29	Costuri totale de operare / Total costs of operation	RON/an : RON/year	
30	Total venituri / Total income	RON/an : RON/year	
31	Total electricitate folosita / Total used electricity	kWh/an : kWh/year	
32	Cost total cu electricitatea / Total cost with electricity	RON/an : RON/year	
33	Total cost forta de munca / Total labor cost	RON/an : RON/year	
34	Nr de locuitori facturati / No. of billed persons	#	

Form for technical data input – wastewater collection and treatment:

Nr / No	DATE DE INTRARE PENTRU APA UZATA	Unitate / Unit	An / Year
34	# persoane racordate la reteaua de canalizare / Population connected to wastewater network	#	
35	Vol colectat de la locuinte / Volume collected from houses	m³/an : m³/yr	
36	Vol colectat de la industrie / Volume collected from industry	m³/an : m³/yr	
37	Vol colectat de la ag. comerciali / Volume collected from commercial agents	m³/an : m³/yr	
38	Vol colectat de la altii / Volume collected from others	m³/an : m³/yr	
39	Volum total colectat / Total volume collected	m³/an : m³/yr	-
40	Volumul de apa uzata tratat primar / Volume of wastewater primary treated	m³/an : m³/yr	
41	Volumul de apa uzata tratat secundar / Volume of wastewater secondary treated	m³/an : m³/yr	
42	Volumul de apa uzata tratat tertiar / Volume of wastewater tertiary treated	m³/an : m³/yr	
43	Total volum tratat (descarcat in efluent) / Total treated volume (discharged in river)	m³/an : m³/yr	
44	Numarul de avarii ale retelei de canalizare / Breaking or clogging	#	
45	Lungimea retelei de canalizare / Length of the wastewater network	km	
46	Lungimea retelei de canalizare inlocuite pe an / Length of the replaced network/year	km/an	
47	Personal sectie canalizare / Personnel	#	
48	Racordari la case / Connections for houses	#	
49	Racordari la blocuri / Connections for blocks	#	
50	Racordari la industrie / Connections for industry	#	
51	Racordari la agenti comerciali / Connections for economical agents	#	
52	Racordari la altii / Connections for others	#	
53	Total racordari / Total connections	#	-
54	Numarul total de analize pe an / Total number of analyses/year	#	
55	Numarul total de analize conforme pe an / Total number of analyses according with the legislation/year	#	
56	Costuri totale de operare / Total costs of operation	RON/an : RON/year	
57	Total venituri / Total income	RON/an : RON/year	
58	Total electricitate folosita / Total used electricity	kWh/an : kWh/year	
59	Cost total cu electricitatea / Total cost with electricity	RON/an : RON/year	
60	Total cost forta de munca / Total labor cost	RON/an : RON/year	
61	Nr de locuitori facturati / No. of billed persons	#	

Forms for technical indicator output – water supply and wastewater collection / treatment:

INDICATORI DE PERFORMANTA PENTRU APA POTABILA		Unitate / Unit	An / Year
	Consum si productie de apa / Water consomption & production		
1	Procentul de populatie conectata la reteaua de apa / Percent of population connecting to the water supply network	%	
2	Acoperirea cu retele de alimentare cu apa / Coverage with water supply network	%	
3	Consum casnic / Residential consumption	l/loc/zi : l/loc/day	
4	Consum industrial ca % din total / Industrial consumption as % of total	%	
5	Consum comercial ca % din total / Commercial consumption as % of total	%	
6	Alte consumuri ca % din total / Other consumption as % of total	%	
7	Energie consumata pe m³ de apa produsa / Energy consumed per m3 water produced	kWh/m³	
	Apa care nu aduce venituri (NRW)		
8	NRW (Total)	%	
9	NRW/km/zi / NRW/km/day	m³/km/zi : m³/km/day	
	Performanta conductelor din retea / Pipe Network Performance		
10	Sparturi de conducte pe lungimea conductei / Pipe breaks on pipe length	#/km/an : #/km/year	
11	Procent de retea inlocuita / Percent of network replaced	%/an : %/year	
12	Contorizare / Metering	%	
13	Vol contorizat vs Vol vandut / Vol metered vs vol sold	%	
	Costuri si personal / Cost and Staffing		
14	Populatie deservita pe angajat / Staff per consumers supplied	#	
	Calitatea apei potabile furnizata / Quality of the drinking water supplied		
15	Procentul de analize conforme pe an / Perecent of the analyses according with the legislations/year	%	
	Performanta financiara / Financial performance (Billing and Collection)		
16	Cost cu forta de munca vs cost operare / Labor costs vs operating costs	rata : rate	
17	Cost cu electricitatea vs cost de operare / Electricity cost vs operating cost	rata : rate	
18	Cost unitar de operare - apa / Unit operational cost - water	RON/m³	

INDICATORI DE PERFORMANTA PENTRU APA UZATA		Unitate / Unit	An / Year
	Cantitati si epurare / Quantity and Treatment		
1	Procentul de populatie conectata la reteaua de canalizare /Percent of population connecting to the wastwater network	%	
2	Acoperirea cu retele de canalizare / Coverage with wastewater network	%	
3	Cantitatea de ape uzate de la case / Residential wastewater contribution	l/loc/zi : l/loc/day	
4	Cantitatea de ape uzate de la industrie ca % din total / Industrial wastewater contributions % of total	%	
5	Cantitatea de ape uzate de la ag. comerciali ca % din total / Commercial wastewater contribution as % of total	%	
6	Cantitati de la alte parti ca % din total / Other wastewater contribution as % of total	%	
7	Energie consumata pe m³ de apa uzata epurata / Energy consumed per m³ wastewater treated	kWh/m³	
	Performanta conductelor din retea / Pipe Network Performance		
8	Infundari de conducte pe lungimea conductei / Pipe blockages on pipe length	#/km/an : #/km/year	
9	Procent de retea inlocuita / Percent of pipe replaced	%/an : %/year	
	Calitate apa uzata/ Quality of the wastewater		
10	Procentul de analize conforme pe an / Perecent of the analyses according with the legislations/year	%	
11	Procentul de apa uzata tratata primar / Percent of wastewater primary treated	%	
12	Procentul de apa uzata tratata secundar / Percent of wastewater secondary treated	%	
13	Procentul de apa uzata tratata tertiar / Percent of wastewater tertiary treated	%	
	Cost si personal / Cost and Staffing		
14	Populatie deservita pe angajat / Staff per consumers served	#	
	Performanta financiara / Financial Performance		
15	Cost cu forta de munca vs cost operare / Labor costs vs operating costs	rata : rate	
16	Cost cu electricitatea vs cost de operare / Electricity cost vs operating cost	rata : rate	
17	Cost unitar de operare - apa uzata / Unit operational cost - wastewater	RON/m³	

<u>Tables of Technical Performance Indicator Values for FOPIP II ROCs:</u>

The values of performance indicators as reported by the FOPIP II operators for years 2008 and 2009 are shown in the following tables.

In the longer-term each operator could could track the values of the indicators for their ROC, comparing them year-on-year, to help identify significant changes in the operator's performance.

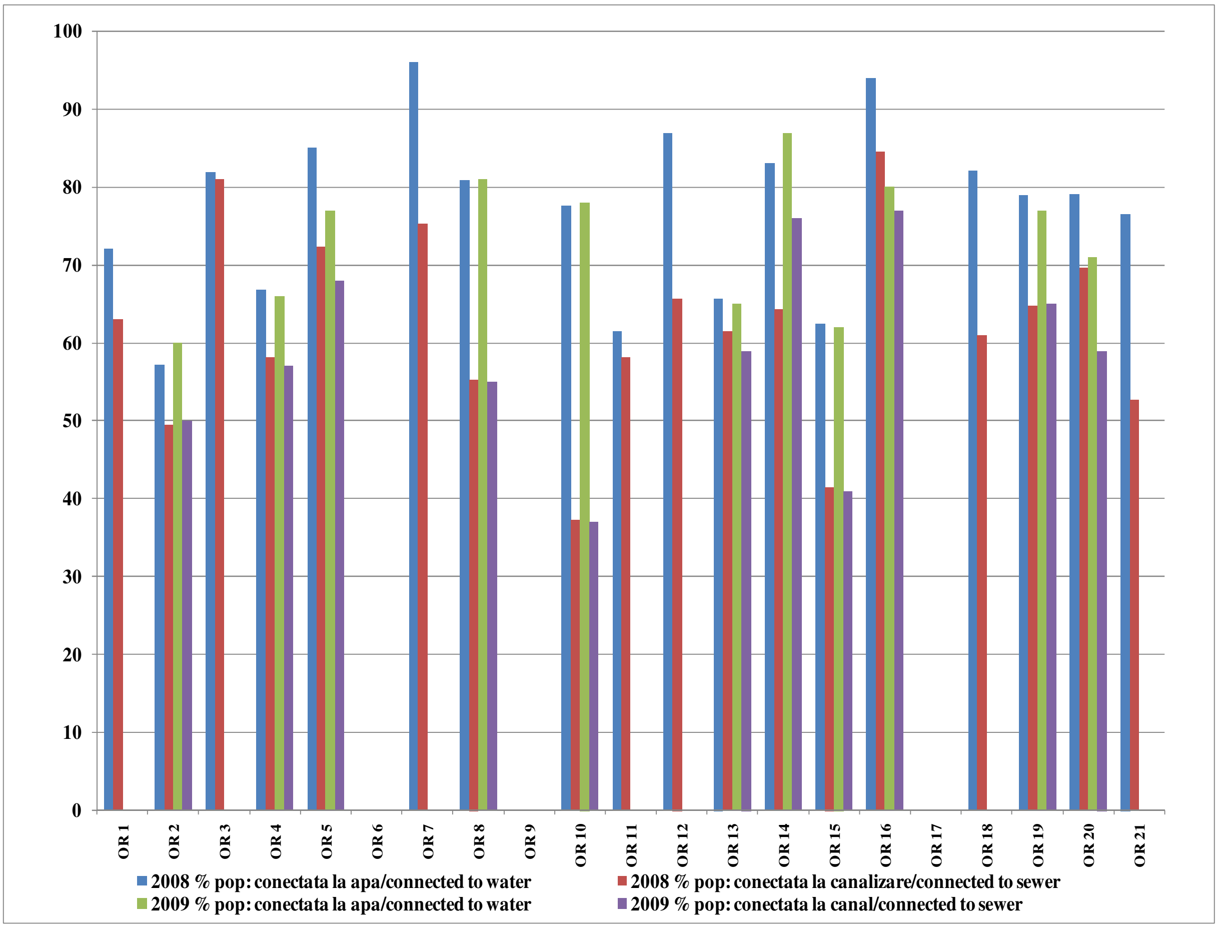
The values shown below are not necessarily suitable for this purpose becuase at many ROCs during year 2009 there have been changes, for example in relation to (a) improvements in data managment and analysis (b) improvements in the ROC's internal procedures for calculating the values of the indicators (c) new localities have been incorporated into some ROCs.

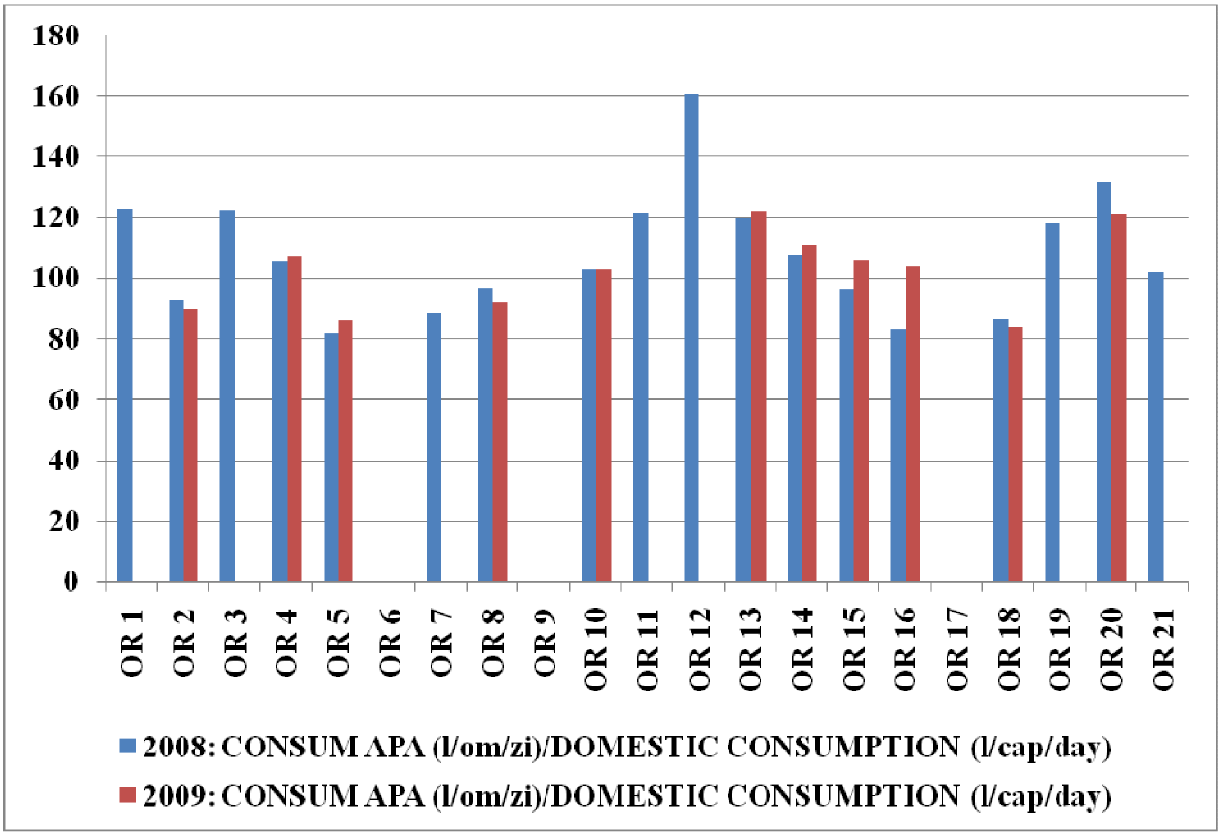
		GRUP/GROUP 1										GRUP/GROUP 2									
		OR 1		OR 2		OR 3		OR 4		OR 5		OR 6		OR 7		OR 8		OR 9		OR 10	
	APA /WATER	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
	Consum si productie de apa/Consumption and water production																				
1	Procentul de populatie conectata la reteaua de apa / Percent of population connected to the water supply network	72		57	60	82		67	66	85	77			96		81	81			78	78
2	Consum casnic / Residential consumption	123		93	90	123		105	107	82	86			89		96	92			103	103
3	Consum industrial ca % din total / Industrial consumption as % of total	40		11	8	10		0	24	39	32			3		3	4			6	6
4	Consum comercial ca % din total / Commercial consumption as % of total	0		14	12	27		31	9	2				39		15	11			25	25
5	Alte consumuri ca % din total / Other consumption as % of total	10		14	14	0		9	0	1				0		16	15			10	10
6	Energie consumata pe m³ de apa produsa / Energy used/m3 water produced	1.48		0.19	0.06	0.48		1.00	1.08	0.39	0.18			0.34		0.53	0.52			0.53	0.53
	Apa care nu aduce venituri (NRW)																				
7	NRW (total - %)	0		67	69	40		37	32	49	47			48		43	44			45	45
8	NRW/km/zi / NRW/km/day	0		44	40	59		33	24	59	45			33		0	33			26	26
	Performanta conductelor din retea / Pipe Network Performance																				
9	Avarii ale retelei de distributie pe lungime / Pipe breaks on pipe length	0.00		1.14	1.17	2.40		7.05	4.30	8.23	5.11			1.71		0.00	2.00			5.89	5.90
10	Procent de retea inlocuita / Percent of network replaced	0.00		0.01	0.04	0.00		0.01	0.01	0.02	1.10			0.01		0.05	1.10			0.01	0.90
11	Contorizare / Metering	0		0	92	94		0	80	0	75			78		0	82			0	72
12	Vol contorizat vs Vol vandut / Vol metered vs vol sold	76		91	93	100		94	95	68	93			98		87	90			70	70
	Costuri si personal / Cost and Staffing																				
13	Populatie deservita pe angajat / Staff per consumers supplied	42		284	306	404		273	271	599	422			631		435	460			423	423
	Performanta financiara / Financial performance (Billing and Collection)																				
14	Cost cu forta de munca vs cost operare / Labor costs vs operating costs	0.47		0.34	0.32	34.47		0.52	0.58	0.24	0.29			0.37		0.51	0.58			0.49	0.49
15	Cost cu electricitatea vs cost de operare / Electricity cost vs operating cost	0.26		0.10	0.09	49.56		0.20	0.18	0.19	0.32			0.16		0.26	0.27			0.16	0.16
16	Cost unitar de operare - apa / Unit operational cost - water	1.87		0.85	1.06	0.00		1.43	1.86	0.97	0.87			0.70		0.85	0.89			1.07	1.07
	APA UZATA / WASTEWATER																				
	Cantitati si epurare / Quantity and Treatment																				
1	Procentul de populatie conectata la reteaua de canalizare / Percent of population connected to the wastewater network	63		50	50	81		58	57	72	68			75		55	55			37	37
2	Cantitatea de ape uzate de la case / Residential wastewater contribution	130		84	93	112		108	111	71	63			116		85	83			106	106
3	Apa uzata de la industrie ca % din total / Industrial wastewater contributions % of total	37		14	7	14		31	39	60	50			0		3	5			10	10
4	Apa uzata de la ag. comerciali ca % din total / Commercial wastewater contribution as % of total	2		17	20	32		18	9	3				43		17	14			32	32
5	Alte cantitati ca % din total / Other wastewater contribution as % of total	18		23	22	0		7	0	1				0		19	18			13	13
6	Energie consumata/m³ de apa uzata epurata / Energy used/m³ wastewater treated	0.38		0.06	0.05	0.09		0.42	0.49	0.07	0.05			0.02		0.28	0.27			0.03	0.03
	Performanta conductelor din retea / Pipe Network Performance																				
7	Avarii ale retelei de canalizare pe lungime / Pipe blockages on pipe length	0.00		5.48	4.55	10.82		3.52	2.90	6.81	0.91			16.04		0.01	9.13			10.05	10.05
8	Procent de retea inlocuita / Percent of pipe replaced	0.00		0.00	0.02	0.02		0.00	0.00	0.00	0.00			0.00		0.00	0.00			0.01	0.70
	Cost si personal / Cost and Staffing																				
9	Populatie deservita pe angajat / Staff per consumers served	56		1150	1100	734		482	448	1094	2000			1767		617	545			1076	1076
	Performanta financiara / Financial Performance																				
10	Cost cu forta de munca vs cost operare / Labor costs vs operating costs	0.64		0.35	0.38	50.78		0.61	0.65	0.36	0.31			0.35		0.63	0.73			0.72	0.72
11	Cost cu electricitatea vs cost de operare / Electricity cost vs operating cost	0.12		0.06	0.06	51.16		0.16	0.13	0.07	0.08			0.03		0.17	0.11			0.03	0.03
12	Cost unitar de operare - apa uzata / Unit operational cost - wastewater	0.86		0.98	0.26	0.00		0.86	1.10	0.62	0.75			0.34		0.93	0.97			0.32	0.32

		GRUP/GROUP 3										GRUP/GROUP 4											
		OR 11		OR 12		OR 13		OR 14		OR 15		OR 16		OR 17		OR 18		OR 19		OR 20		OR 21	
	APA /WATER	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
	Consum si productie de apa/Consumption and water production																						
1	Procentul de populatie conectata la reteaua de apa / Percent of population connected to the water supply network	61		87		66	65	83	87	62	62	94	80			82	87	79	77	79	71	77	
2	Consum casnic / Residential consumption	121		161		120	122	108	111	96	106	83	104			87	84	118	24	132	121	102	
3	Consum industrial ca % din total / Industrial consumption as % of total	14		16		23	5		0	17	15	32	5			27	3	0	0	19	17	32	
4	Consum comercial ca % din total / Commercial consumption as % of total	0		6		12	30	46	45	9	5	0	22			0	21	25	40	19	11	10	
5	Alte consumuri ca % din total / Other consumption as % of total	18		18		7	0		0	1	5	0	0			0	0	10	16	0	12	10	
6	Energie consumata pe m³ de apa produsa / Energy used/m3 water produced	1.03		0.20		0.76	0.58	0.50	0.34	0.44	0.44	0.57	0.57			0.05	0.06	0.02	0.35	`	0.42	0.07	
	Apa care nu aduce venituri (NRW)																						
7	NRW (total - %)	14		33		42	46	35	63	55	55	59	53			76	74	71	45	39	37	32	
8	NRW/km/zi / NRW/km/day	12		44		42	42	36	175	44	46	77	59			140	123	127	13	54	43	26	
	Performanta conductelor din retea / Pipe Network Performance																						
9	Avarii ale retelei de distributie pe lungime / Pipe breaks on pipe length	6.01		0.88		3.57	2.50	3.96	8.80	3.80	40.00	3.15	3.50			2.41	0.00	0.19	0.20	1.27	4.70	0.62	
10	Procent de retea inlocuita / Percent of network replaced	0.00		0.00		0.00	4.00	0.00	0.00	0.00	0.20	0.00	0.10			0.02	0.00	0.01	12.70	0.01	0.70	0.06	
11	Contorizare / Metering	87				0	75	88	60	86	89	0	81			0	88	0	86	0	86	0	
12	Vol contorizat vs Vol vandut / Vol metered vs vol sold	98		38.7		91	73	88	94	92	92	85	86			92	95	7	100	100	90	95	
	Costuri si personal / Cost and Staffing																						
13	Populatie deservita pe angajat / Staff per consumers supplied	532		382		259	289	289	274	561	593	363	274			228	255	1202	942	352	372	283	
	Performanta financiara / Financial performance (Billing and Collection)																						
14	Cost cu forta de munca vs cost operare / Labor costs vs operating costs	0.29		60.00		0.60	0.60	0.51	0.60	0.41		0.50	0.61			0.41	0.97	1.29	0.91	0.55	0.52	0.40	
15	Cost cu electricitatea vs cost de operare / Electricity cost vs operating cost	0.23		13.00		0.41	0.24	0.13	0.14	0.23		0.15	0.15			0.02	0.06	0.34	0.19	0.16	0.15	0.03	
16	Cost unitar de operare - apa / Unit operational cost - water	1.99				0.70	0.94	1.12	0.79	0.70		1.16	1.24			0.94	0.43	0.03	0.72	0.96	1.04	1.07	
	APA UZATA / WASTEWATER																						
	Cantitati si epurare / Quantity and Treatment																						
1	Procentul de populatie conectata la reteaua de canalizare / Percent of population connected to the wastewater network	58		66		61	59	64	76	41	41	85	77			61	60	65	65	70	59	53	
2	Cantitatea de ape uzate de la case / Residential wastewater contribution	126		164		98	104	121	123	94	100	66	78			83	99	113	8	139	125	100	
3	Apa uzata de la industrie ca % din total / Industrial wastewater contributions % of total	37		12		26	20		0	52	50	33	3			30	9	0	0	25	23	14	
4	Apa uzata de la ag. comerciali ca % din total / Commercial wastewater contribution as % of total	0		6		13	20	42	40	6	8	0	39			0	29	36	39	25	14	16	
5	Alte cantitati ca % din total / Other wastewater contribution as % of total	20		0		16	13		0	1	2	0	0			0	0	10	12	0	14	21	
6	Energie consumata/m³ de apa uzata epurata / Energy used/m³ wastewater treated	0.11		0.03		0.22	0.13	0.01	0.00	0.08	0.09	0.38	0.08			0.03	0.08	0.08	0.85	0.33	0.30	0.08	
	Performanta conductelor din retea / Pipe Network Performance																						
7	Avarii ale retelei de canalizare pe lungime / Pipe blockages on pipe length	14.39		24.13		5.85	2.79	11.89	19.57	23.66	26.11	4.32	34.88			8.23	0.10	0.98	0.41	26.25	19.03	4.13	
8	Procent de retea inlocuita / Percent of pipe replaced	0.00		0.00		0.00	2.10	0.00	0.00	0.00	0.00	0.00	0.10			0.00	0.30	0.01	1.00	0.01	0.00	0.03	
	Cost si personal / Cost and Staffing																						
9	Populatie deservita pe angajat / Staff per consumers served	1878				909	447	664	758	713	726	1023	712			1400	1400	2408	1346	478	548	795	
	Performanta financiara / Financial Performance																						
10	Cost cu forta de munca vs cost operare / Labor costs vs operating costs	0.36		12.00		0.80	0.67	0.71	0.76	0.54		0.57	0.45			0.42	0.99	1.16	0.00	0.61	0.59	0.63	
11	Cost cu electricitatea vs cost de operare / Electricity cost vs operating cost	0.11		6.00		0.10	0.10	0.02	0.02	0.09		0.04	0.02			0.03	0.24	0.25	0.15	0.11	0.10	0.05	
12	Cost unitar de operare - apa uzata / Unit operational cost - wastewater	0.35				0.54	0.75	0.49	0.60	0.48		1.14	1.35			1.07	0.34	0.07	1.90	0.97	1.05	0.61	

Technical Performance Indicator Graphs:

A selection of performance indicator values from the above tables is shown in the following graphs.




180
160
140
120
100
80
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20
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OR 1
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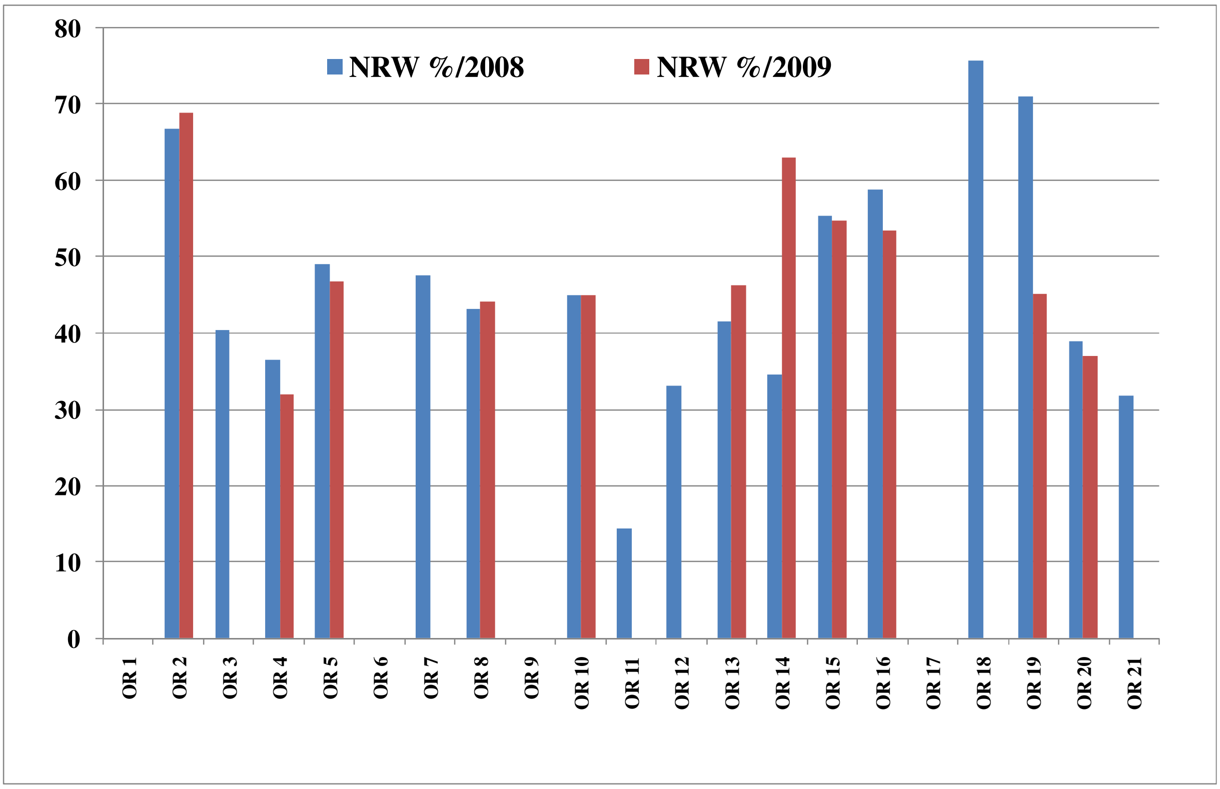
OR 21
2008: CONSUM APA (l/om/zi)/DOMESTIC CONSUMPTION (l/cap/day)
2009: CONSUM APA (l/om/zi)/DOMESTIC CONSUMPTION (l/cap/day)


NRW %/2008
NRW %/2009
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20
30
40
50
60
70
80
OR 1
OR 2
OR 3
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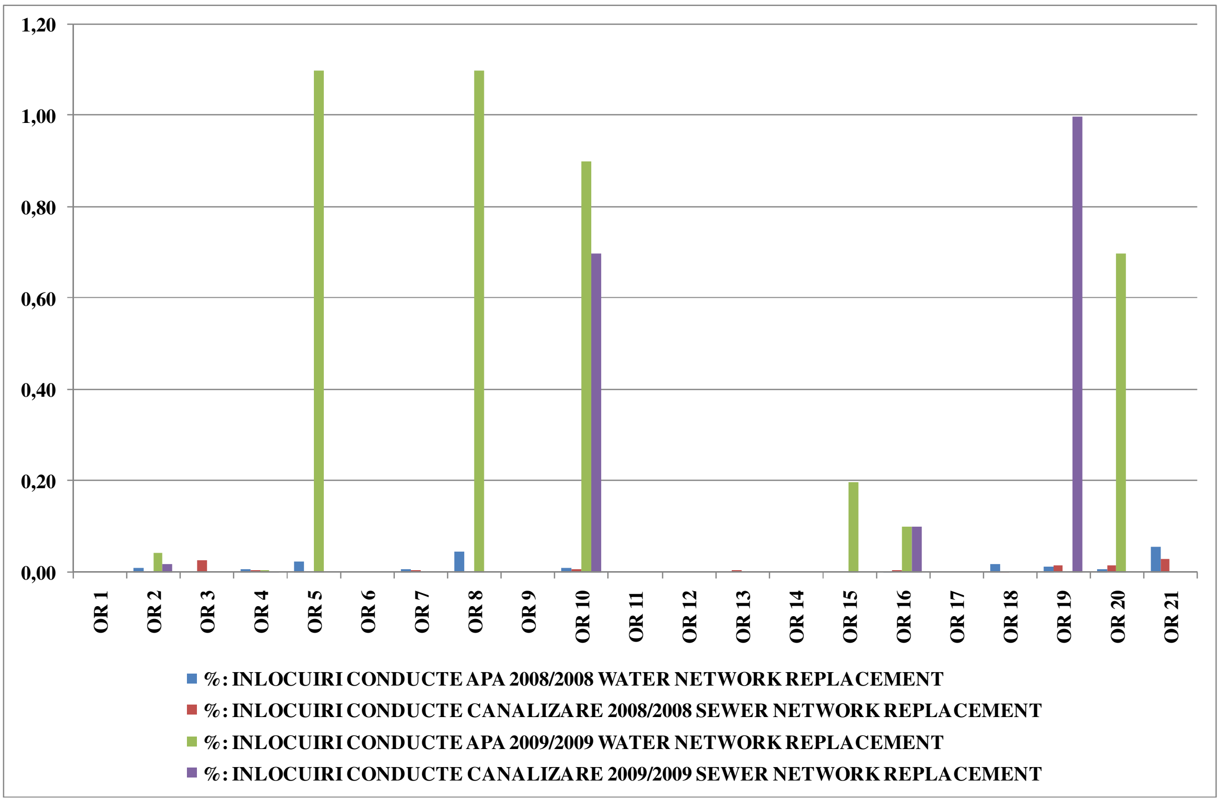
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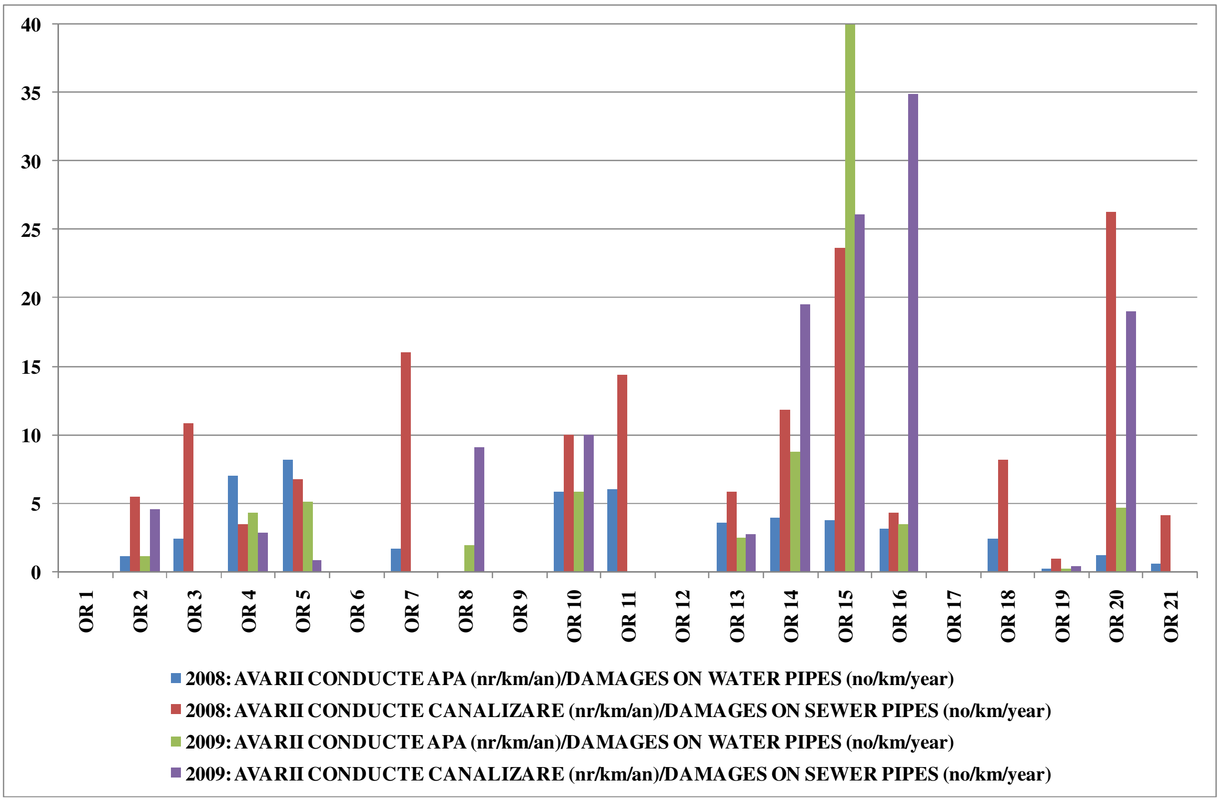
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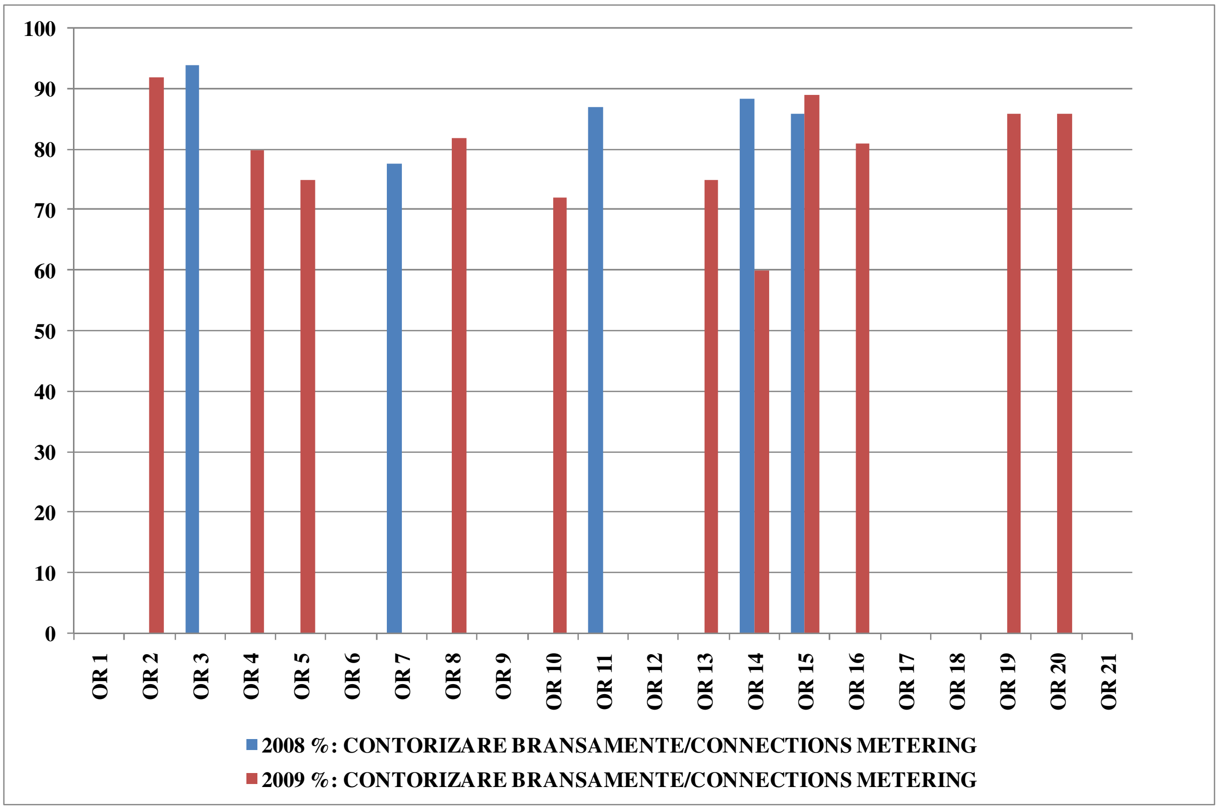
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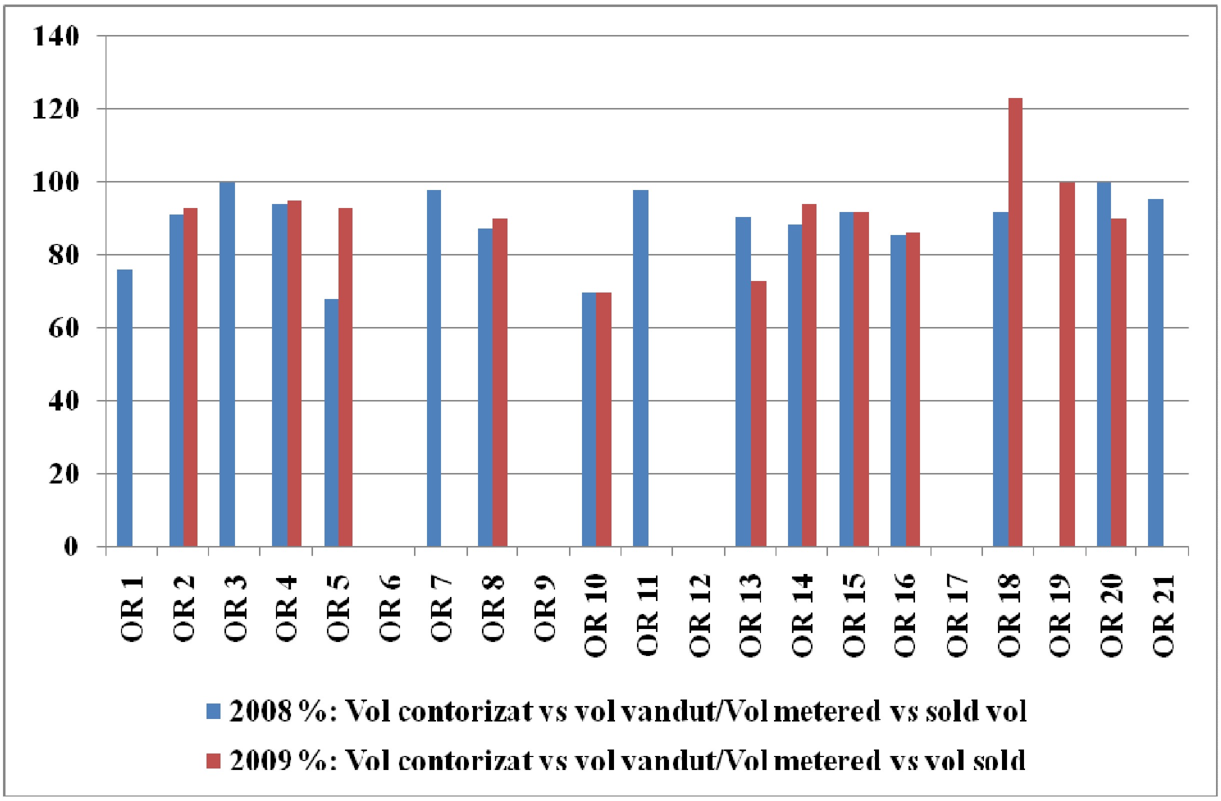
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E.26 Guidance Note on Customer Surveys

These guidelines aim to support a Regional Operating Company (ROC) to plan, design and carry out a survey of customer's opinions.They provides information on:

- customer surveys and other ways of assessing opinions and attitude of customers towards the ROC and the water and wastewater services it provides
- purpose of customer surveys
- use of surveys in a ROC and the planning of a survey (including sampling, question design, interviewing, overall survey design, financial management of surveys)
- examples of survey types and questions
- suggestions on the content of a ROC strategy for customer surveys.

This section of the Manual has been developed for FOPIP 2 project. For details, see the electronic version of this Appendix.

E.27 Outline ROC Strategy on Customer Surveys

Customers Survey Opinions strategy

ROC..

CONTENTS

Introduction

Strategy purpose

- To establish the right way for the ROC in order to obtain relevant information from the customers about how they see the services provided;
- To determine the manner in which this information can be used to improve service level offered;
- To established how it can improve the communication between ROC and the clients.

ROC general policy related to Customers Survey Opinions

- ROC is aware that is bound to take into account customer opinions regarding water supply and wastewater collection services provided ;

- ROC will continue to identify effective ways, in terms of cost, to get useful information from the clients. From these it could be:
  - Use the information already available;
  - Analysis of customer complaints and the information that they provided;
  - Annual surveys on customer opinions related to water and sewerage services provided;
  - Use of information from the analysis of opinions surveys to plan the future services and infrastructure improvements;
  - Monitor the future change of opinions of the clients regarding services provided
- ROC will report findings on survey results within the ADI Business Plan and a summary of clients;
- ROC Staff will become familiar with the Clients Survey Opinions Strategy

Use of Strategy

Main points from the Strategy could be used by the ROC, like an:
- internal guide which established the planning actions to improve the customer survey opinions activity;
- model to elaborate a questions set to obtain customers opinions regarding level of services provided by the ROC;
- contribution to the ROC Business Plan;
- a base to demonstrate to the external parts (clients, Regulatory Bodies, etc) that the ROC Management Team is interested and take care about the customer opinions regarding services provided

Information and documents used to elaborate this Strategy

Customer Survey Opinions Strategy will be used together with other existing internal documents (procedures already approved and certificated – if is the case – for the MIS or other ISO Standards) elaborated for this kind of activity and it is established, based on:
- Regulation of Internal Order (established according with ANRSC, Ordinul 88/2007);
- Existing problems on this activity;
- Previous actions made for the same purpose (if the case);
- Some documents – similar strategies elaborated by the other ROC's and existing information regarding customer survey opinions activity

Currently the ROC .... from .... County is made of the following main localities:……………………………………………..

Customer Opinions Survey in localities part of the ROC

Locality	Present procedures on Customer Opinions Survey
TOWN X	

Present responsible persons for data collect and using data mode

Locality	Responsible (function)	Data "way"	Using data mode
TOWN X			

Actions Plan to improve the Customer Opinions Survey activity in the next years, responsible persons and estimated costs

Locality	Action	Year	Responsible (function)	Estimated Cost (RON/EURO)
ROC Headquarters				
Town X				
Town Y				

Strategy elaborated by: Strategy approved by:

.... (name) ....

.... (function) ROC General Manager

.... (data)

APPENDIX 1:

PRESENT QUESTIONAR USED BY THE ROC IN CUSTOMER OPINIONS SURVEY

Where this document exist a copy will be attached

Appendix F. Appendices to Chapter 9

F.1 Guidelines for the use of the financial model

These guidelines have been developed as part of FOPIP 2 project. They consisted of brief instructions and explanations regarding the population of the FM as well as the consolidation and interpretation of FM results.

For details, see the electronic version of this Appendix.

F.2 Guidelines on financial planning

These guidelines have been developed as part of FOPIP 2 project. They consisted of brief instructions regarding the development of a 3-year financial plan for each ROC. They also provided a template wherein ROC-specific information could be inserted and interpreted accordingly.

For details, see the electronic version of this Appendix.

F.3 Guidelines on cost analysis

F.3.1 ABC method concept

These guidelines have been developed as part of FOPIP 2 project. They constitute a brief introduction to the ABC method, including a study case.

For details, see the electronic version of this Appendix.

F.3.2 ABC model guidelines

These guidelines have been developed as part of FOPIP 2 project. They consist of practical instructions with regard to the use of the ABC model, provided in Appendix F.4.1 below.

For details, see the electronic version of this Appendix.

F.3.3 Cost analysis guidelines

These guidelines have been developed as part of FOPIP 2 project. They consist of practical instructions with regard to the use of the cost analysis model, provided in Appendix F.4.2 below.

For details, see the electronic version of this Appendix.

F.4 Financial models and spreadsheets

F.4.1 ABC method model

This Excel model was developed as part of FOPIP 2 project. It is intented to be used in conjunction with the document provided in Appendix F.3.2.

For details, see the electronic version of this Appendix.

F.4.2 Cost analysis model

This Excel model was developed as part of FOPIP 2 project. It is intented to be used in conjunction with the document provided in Appendix F.3.3.

For details, see the electronic version of this Appendix.

F.4.3 ABC method study case

This document has been developed as part of FOPIP2 project and it is meant to be a practical example of the methods and instructions provided in Appendices F.3.1 and F.4.1.

For details, see the electronic version of this Appendix.

F.5 Active cash management in conditions of financial uncertainty

This document has been developed as part of FOPIP2 project in order to provide guidelines for the project ROCs with a view to improving their management of cash.

For details, see the electronic version of this Appendix.

F.6 Guide for tariff setting, adjustment and approval

These Guidelines have been provided by FOPIP 2 Consultant in response to the identified need for Regional Operating Companies (ROCs) and other parties involved in establishing tariffs to have some guidance towards their setting, adjustment and approval.

Main aspects approached in this document:
- basis of tariff calculation
- concession fee
- cost of water losses
- MRD fund
- charging for stormwater collection and treatment
- charging municipalities & county councils
- charging for highways
- charging for domestic run-offs
- frequency of tariff adjustment
- types of tariff & their effect on the management of the business
- approval mechanism
- a.o.

For details, see the electronic version of this Appendix.

F.7 Loan comparison table

This complex Excel model has been developed as part of FOPIP2 project in order to provide the future beneficiaries of EU-financed projects with an in-depth look at the loan mechanisms and their service.

For details, see the electronic version of this Appendix.

Appendix G. Appendices to Chapter 10

G.1 Stakeholder analysis

This document was developed as part of FOPIP 1 project. For details, see the electronic version of this Appendix.

G.2 Strengthening the PR function

This document was developed as part of FOPIP 1 project. For details, see the electronic version of this Appendix.

G.3 Guidelines on revenue collection

These guidelines were developed as part of FOPIP 1 project. For details, see the electronic version of this Appendix.

G.4 Guidelines on one-stop shop concept

These guidelines were developed as part of FOPIP 1 project. For details, see the electronic version of this Appendix.

G.5 Guidelines on website information – general

These guidelines were developed as part of FOPIP 1 project. For details, see the electronic version of this Appendix.

G.6 Guidelines on water quality information as rendered on the water company's website

These guidelines were developed as part of FOPIP 1 project. For details, see the electronic version of this Appendix.

G.7 Guidelines on complaints analysis

These guidelines were developed as part of FOPIP 1 project. For details, see the electronic version of this Appendix.

G.8 Guide to the Development of a Stakeholder Analysis

Stakeholders are people or organizations who either are affected by the business in general, or by business objectives or by projects. They can "make or break" the success of the business, the business objectives or the projects. They may be winners or losers, included or excluded from decision-making, users of results, or participants in the process. Stakeholder analysis is the identification of key stakeholders of a business or business objectives or projects, an assessment of their interests and the ways in which these interests may impact upon the business in general or the business objectives or projects.

Stakeholder analysis is performed in two phases using the following tools:

- The stakeholder table for phase 1
- The stakeholder matrix for phase 2

Phase 1

The purpose of the phase 1 is to identify and generate a complete image of each stakeholder of the water company. The easiest way to do that is to fill in the stakeholder table:

Stakeholder	Type	Interest	Impact	Attitude	Importance	Influence
(1)	(2)	(3)	(4)	(5)	(6)	(7)

In order to complete the stakeholder table, the following steps must be followed:

Step 1 – Identify and list the key stakeholders of the water company. The most frequently used method for doing that is brainstorming. Details on how to perform a brainstorming can be found in Appendix X – Guidelines for Business Planning. Fill in column (1) of the table with the stakeholder list derived from the brainstorming exercise.

Step 2 – Divide the stakeholders into the following types:
- *Primary stakeholders* (P) those directly affected by the water company activities (i.e. beneficiaries for a project, customers for a business)
- *Secondary stakeholders* (S) those indirectly affected by the water company activities (i.e. local authorities for a project, IDA for a water and wastewater business)
- *Interested stakeholders* (I) those directly involved, but not directly affected by the water company activities (i.e. work contractors in a project, suppliers for a business)

Fill in column (2) of the table with the type code. P,S,I?

Step 3 – Define the basis on which they hold a stake (their "interest"). You can do that by finding answers to the questions: "Why is he a stakeholders?", "What are his interests?" for each identified stakeholder. Note that one stakeholder may have more than one interest in the water company and it is not uncommon that some of these interests are in conflict one with another. If you cannot find an answer to the questions, it means that the identified stakeholder is in fact not a stakeholder because he has no interest in the water company. Fill in column (3) of the table with the interests of each stakeholder.

Step 4 – Identify each stakeholder's relationship with the company's activity, meaning that you should determine the impact of the water company's activity on them, how they are affected and if that has a positive (+), negative (-), positive and negative (+/-) or unknown (?) effect on them. You should answer to the question "How the water company's activity is impacting on each identified interest?" Again, no effect means they are not stakeholders! Fill in column (4) of the table with the impact code for each interest. + - +/- ?

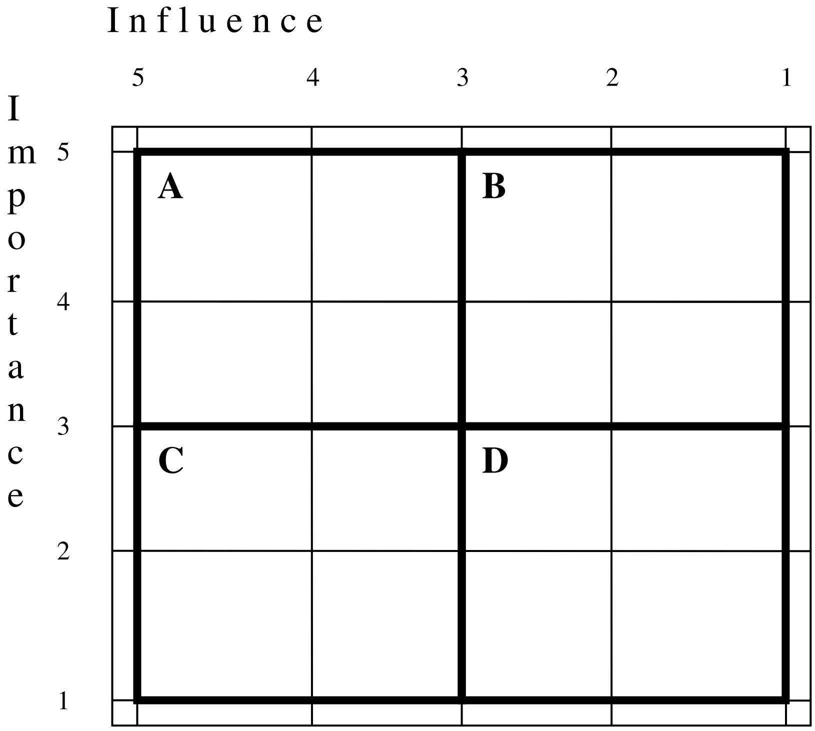
Step 5 – Analyse the attitude of each identified stakeholder towards the water company (level of support). You should determine if a particular stakeholder has a favourable (F), Neutral (N) or Unfavourable (U) attitude towards the water company. In general this is in line with the identified effect over them, but not necessarily. A negative impact upon one of the interests of the stakeholder in the water company is likely to influence that stakeholder in having an unfavourable attitude if he is aware of it. Note that for each stakeholder you should assess one type of attitude. Fill in column (5) of the table with the attitude code for each stakeholder. F, N, U ?

Step 6 – Analyse stakeholder importance to the water company, meaning the priority granted by the water company to the stakeholder in order to satisfy its needs and interests. Asses the relative importance of each stakeholder with respect to the others on a scale - for example - from 1 to 5, where 1 is minimum importance and 5 is maximum importance. When assessing the importance, think of how much each stakeholder has to lose or gain. Fill in column (6) of the table with a mark from 1 to 5 reflecting the importance.

Step 7 – Analyse each stakeholder power (influence) over the matter, meaning the power which a stakeholder has on the water company and how much can the stakeholders persuade or determine others in taking a decision or in taking actions. Assess the relative influence of each stakeholder with respect to the others on the same scale from 1 to 5, where 1 is minimum influence and 5 is maximum influence. When assessing the influence, think of how much each stakeholder can make or break the success. Fill in column (7) of the table with a mark from 1 to 5 reflecting the influence.

Phase 2

The purpose of the phase two is to group the stakeholders according importance and influence into four groups with similar characteristics, for which similar strategies can be developed. The easiest way to do that is using the stakeholder matrix:



Step 8 – Represent graphically each stakeholder based on the marks obtained for importance and influence in the matrix. Each stakeholder will be represented by a dot with two co-ordinates: importance on the vertical axes and influence on the horizontal one. You will notice that the stakeholders will concentrate into the four quadrants, A, B, C and D.

Step 9 – You will notice that there are stakeholders who are marked with 3 at one or both characteristics (importance / influence) who are at the border of two or four quadrants. You should decide in which quadrant you will place that stakeholder, taking into account its characteristics. Note that you should always treat the media as having a high risk factor, so you should place them in quadrant C.

Step 10 – Interpretation of the quadrants is as follows:

- *Group A* – stakeholders having a high importance and high influence who stand to lose or gain significantly from water company activity and whose actions can affect significantly the company's ability to meet its objectives. Usually your company shareowners representatives and your delegation contract counterparts will be in this quadrant. With group A stakeholders you should:
  - build and maintain good relationships
  - take care that their interests are fully represented
  - keep them informed
  - use personalised communication
  - lobby for their support
- *Group B* – stakeholders having a high importance and low influence who stand to lose or gain significantly from the company, but whose actions cannot affect significantly the company's ability to meet its objectives. They are in general large groups or communities. With group B stakeholders you should:
  - take care that their interests are fully represented

  - inform them periodically
  - use mass communication
  - perform public consultations
  - conduct socio – cultural surveys to appraise the impact on them
- *Group C* – stakeholders with a low importance and high influence who do not stand to lose or gain significantly from the company but whose actions can affect significantly the company's ability to meet its objectives. These are are in general individuals, organisations and institutions which are a source of risk due to their high influence on the water company. With group C stakeholders you should:
  - monitor them constantly
  - be prepared to manage the risk
  - keep them informed
  - use formalised communication (reports)
  - establish steering comities
- *Group D* – stakeholders with a low importance and low influence who do not stand to lose or gain significantly from the water company and whose actions cannot affect significantly the water company's ability to meet its objectives. With group D stakeholders you should ensure:
  - low level of monitoring
  - low level of informing
  - undifferentiated mass communication

In terms of public relations strategies, after performing a stakeholder analysis, a water company should have a better understanding of:
- Whom to involve and attract in the "coalition"
- What roles they can and should play and when
- With whom should be relationships built
- Who should be informed, when and how
- Who should be consulted, when and how
- Who can create problems and how should they be managed
- What communication strategies are suited for each of them

If the stakeholder analysis is performed for customer relation purposes, in terms of customer relations strategies, a water company should understand better:
- How to address better different customer needs in terms of service and customer relations
- Who should be given special attention and why
- Who can create problems and how should they be managed
- Who should be informed, when and how

G.9 Guidance on Public Relations

1. Introduction

Many people perceive public relations as something immoral, thus having a negative meaning. Their perception is that PR is about people behind closed doors developing clever strategies to convince the public that what's wrong is right. Some see public relations professionals as manipulators of the public mind, rather than conveyors of truth. In truth, it is often used to minimize negative perceptions and accentuate a positive interpretation of events. However, PR can be used also as a tool for positive change, because it can help focus attention on a community issues and create an environment of constructive collaboration. Like the American sociologist Daniel J. Boorstin said: "Some are born great, some achieve greatness, and some hire public relations officers."

This guideline reviews the need for formal Public Relations policy and strategy and explains the implications of adopting them upon a ROC. A model policy and a strategy content for consideration is attached.

2. What is Public Relations ?

Public relations is the act of conveying information in an attempt to influence perceptions. PR involves informing, influencing and motivating people to respond favourably to the business and to the message the company wishes to communicate. Public Relations can be seen as company's voice in the outside world and involves an on-going, continuous process of creating and maintaining the business's public image. It is not about deceiving or "spinning" negative news, it is about attempting to influence perceptions which is not inherently wrong. The notion is one of the application of a clear and consistent message in public and private settings in an effort to create an environment where progress can be made and solutions found.

According to The Chartered Institute of Public Relations (CIPR), "Public Relations is about reputation – the result of what you do, what you say and what others say about you. PR is the discipline which looks after reputation, with the aim of earning understanding and support and influencing opinion and behaviour…. It is the planned and sustained effort to establish and maintain goodwill and mutual understanding between an organisation and its publics."

3. What is a Public Relations Policy ?

A Public Relations policy outlines **what** a ROC aims to achieve over the next years in terms of its relations with its stakeholders, helping an organisation to systemize its future communication activities. An organisation is only as strong as its reputation, so the PR policy expresses the guiding principles to develop a good relationship with the company's stakeholders, in the attempt to preserve and enhance its strength**.** Public relations policy takes the form of a formal statement agreed by the top management of the ROC, about a set of basic principles and long-term goals necessary to manage company's reputation.

4. What is a Public Relations Strategy ?

A PR strategy outlines the current stakeholders' management and **how** this will be developed by the ROC to ensure the achievement of the PR policy. The PR strategy takes the form of a formal document, approved and supported by the top management of a ROC. The time horizon of a PR strategy is 5 to 10 years, providing to everybody clear guidance on the ultimate direction of stakeholders management.

All short-term objectives and plans should be aligned with the PR strategy, enabling the ROC to achieve its longer-term goals.

5. Why having Public Relations policy and strategy is important?

Since an organisation is only as strong as its reputation and the PR function is about managing that reputation, the answer to the above question is obvious. Having a PR policy and strategy is important in order to build a ROC with a strong reputation and a good public image to gain support of its stakeholders.

But how can a strong reputation help a ROC and why the support of the stakeholders is necessary?

Strong reputation can help a ROC to gain stakeholders' respect towards a company providing essential services, can make them understand that these services are not for granted and can change their following attitudes:

- lack of concern for any problems confronting their water provider
- little appreciation of their water and wastewater service
- general dissatisfaction
- resistance to changes, particularly relating to tariffs or the basis of charging
- intolerance of below-standard service levels
- reduced willingness to pay as customers
- lack of support and / or adverse reactions for initiatives and activities of public interest and benefit
- degenerations of conflicting situations in lose – lose or lose (ROC) – win (stakeholder) solutions

Strong reputation can help the ROC to save costs by *earning* unsolicited media coverage of positive nature not only of negative nature and can help the ROC to comment on negative stories *before* they are published or aired.

On a smaller scale, PR policy and strategy will complement the overall business plan of an organisation. Business planning is about setting organisations objectives and PR can help achieve these objectives by creating an environment where stakeholders with competing interests can communicate and forge an agreement amicably, thus saving time and effort and reducing blockages.

To ensure maximum benefit, through PR activities all the communications of an organisation should be intensified, focused and managed. Where there is little interaction between a ROC and its stakeholders, often the relationship is characterised by lack of understanding and apathy if not adversity. In general, stakeholders need to have ready access to information relevant for their interest in the water company together with information that explains about ROC's general performance, about the problems that a water enterprise is facing and how it is proposing to overcome these. So PR is ultimately about enterprise communication working in the benefit of the enterprise.

6. What are the implications of having a Customer Relations Policy and Strategy ?

When deciding to develop a PR policy and strategy, the ROC will take advantage of the following opportunities:

- Build "intangible values" such as trust, understanding, awareness, reputation, credibility by understanding and influencing the stakeholders
- Create a positive image of a "new" ROC, a professional business, investing wisely, that protects the environment and permanently pre-occupied to improve the water and wastewater provided services
- Provide a focus for external communications on subjects that are of interest to the general population
- Enable Romania's water businesses to achieve common European standards
- Anticipate and influence future customer demands and expectations through focused communication
- Improve the public perception (company image) and consequently the willingness of customers to pay for the water and wastewater bills
- Highlight environmental issues not associated by customers with the provision of their water services
- Gain stakeholders' support for the implementation of the business plan objectives

By building a PR policy and strategy, the ROC has similar opportunities as for developing a Customer Relations policy and strategy. That is because customers are one of the most important stakeholders one company has, so from this point of view, the customers are both subject for customer relations and public relations. To differentiate between those two fields, it can be said that if customer relations deals with the individual customer, public relations deal with the customers as a group.

In the same time the ROCs will face the following challenges besides the positive outcomes:

- Earning unquantifiable "intangible values" may incur additional costs very well quantified
- Company's communication about itself has to be congruent with company's appearance (i.e. now point in talking about how much the company cares about keeping the water clean and showing dirty intervention vehicles)
- Striving to create a positive image can easily degenerate in exaggerate praise which can have an opposite effect

In order to be successful, ROC must among other things to:

- Rely on the strong support from all the members of the top management
- Allocate clearly PR responsibilities to a single "voice" speaking for the company, in order to promote consistency in company's message and image
- Pay attention to things that customers see regularly that relate the ROC to its work such as condition of vehicles and buildings, stile of "papers" (letters, bills), physical appearance and behavior of the employees

7. Steps to develop a Public Relations Policy

PR policy is about the top management deciding on what the company wants to achieve on medium term regarding PR. As for any other policy, the starting point is company's mission and vision.

- Start from the corporate mission and vision and identify and define what is the image the company wants to show (desired identity) and the values it stands for
- Define what your company will achieve by having a good public image (besides flattering your top managers ego)
- Identify how the PR can positively impact on the business in general and on the commercial functions in particular, especially customer relations
- Debate and agree on principles and the rules for the communications activities in normal situations and crisis situations
- Formulate and put on paper what you agreed on
- Assign responsibility for policy implementation and commit yourselves as top managers to support the responsible person

There is no standard format for a PR policy. It can be a simple general statement like:

"The Irish Universities Quality Board (IUQB) was formed to play a leading role in developing and fostering a coherent culture of quality in all the activities of the universities in line with the highest international standards. As part of its core activities, it must communicate to its stakeholders its drive for excellence and commitment to quality assurance in developing and sustaining excellence. The IUQB achieves this by organising conferences, seminars and workshops; promoting and supporting collaboration between higher educational institutions; publishing reports and good practice guides; maintaining a website of useful information; conducting research and liaising with appropriate governmental bodies and other national and international organisations. Good communication is vital for achieving these aims and objectives."

To which communication principles can be added such as:

"…guiding principles:

- Communication processes must be accessible, clear and known to all stakeholders
- Wherever possible, communication must be purposeful and timely
- Wherever possible, communication must be open and transparent
- In general, IUQB information will be available on an open basis, and only in exceptional cases (e.g. to preserve confidentiality), is it not made available;
- Communication is a two way process. It is not just a question of messages being passed down to members; interactive communications are equally important;
- Effective communication increasingly depends on information systems, content and presentation of information and a language style which is easily understood, accessible, robust and reliable;
- IUQB must communicate effectively within itself and with the community which it serves;
- Decision making and organisational structures will support effective communication wherever possible by, for example, ensuring clear accountability for outcomes."

In other cases organisations decide to elaborate a more comprehensive policy, including clear and detailed communications rules. Such an elaborate example is in Annex A, the York College Press, Media & Public Relations Policy

A model of a PR Policy for a water utility is given in Annex B.

8. Steps to Develop a PR Strategy

The PR policy is about what the company wants in terms of public relations and the PR strategy is how the company will achieve what it wants. For that, all short-term proposals must be aligned with the directions set through the strategy. In order to develop a ROC PR strategy, it is important to find answers to a few questions such as:

- *"Where are you now?"* ROC should capture and analyse company's "personality" (real identity), research and define the image of the company in the eye of the public (perceived identity)
- *"Where do you want to be?"* ROC's PR policy states the desired identity congruent with company's mission and vision. The ROC should identify and analyse the differences between desired, real and perceived identities in order to be able to determine the desired stakeholders' attitudes to be addressed through messages.
- *"To whom are you going to talk (audiences)?"* The ROC should identify its stakeholders, their interest in the business and their influence on the business. In other words, the ROC should develop a stakeholders' analysis and group the stakeholders into target categories and should prioritise them to gain communication efficiency and effectiveness. A guidance note for a stakeholders analysis is in Annex C
- *"What do you want them to do and why do you want them to do it?"* The ROC should define for each stakeholder group what are the desired attitudes or actions and why are those attitudes or actions needed. For doing that, the ROC should take into account what it wants to achieve (mission, vision, policies and strategies, business plan etc.) and analyse where and why and from whom of the stakeholders is needed support, or whom of the stakeholders might hamper things from happening.
- *"What are you going to say to them (messages)?".* The ROC should determine for each identified issue, the important stakeholders groups and formulate messages for each of them. For a message to be effective, it has to link the desired attitude or action to the stakeholders group interest, because as any others, stakeholders are moved by their interests. If an interest of the stakeholder group can be positively linked to what the ROC wants, it is likely that the stakeholder group will act or will have the desired attitude. For a message to be efficient, it has to be simple and short and repeated more times.
- *"Where are you going to reach them?".* The answer to this question is relevant for choosing the channels and the means of communication, so it is an important question to be answered. The

efficiency of the communication (and consequently costs) depends on it. For each target stakeholder group, the ROC should determine where in space are the stakeholders and what are the channels and the means that can more likely get the message to them.

- *"When are you going to reach them?".* Timing is very important to get both effectiveness and efficiency. ROC should determine the best timing depending on the identified channels and means of communication and depending on different other events. Things like: newspaper are read by more people in week-end or if there is more interesting event going on it is no point to make a press conference, should be taken into account.
- *"Which techniques (methods) are you going to use?".* Answering this question properly, will bring more efficiency in passing the message to the target stakeholder group. Depending on the group, different methods might be more likely to impact more. Messages sent through a website will probably not reach the target group "local councillors" which have to approve a new tariff.
- *"How much are you going to spend?"* The ROC should decide on the PR budgetary limits in order to set priorities wisely and to chose the most efficient and effective messages, means, channels, method, timing etc.
- *"How did you do?"* . The answer to this question gives the ROC the measure of its PR function performance. It is about targeted performance indicators for the PR objectives, set in advance, monitored and measured. They can measure outputs (ex. Number of leaflets distributed to the customers), or effects (number of positive unsolicited press releases).

Besides answering to these questions, a PR strategy should tell how the ROC is organising itself for the PR function.

There is no standard content of a PR Strategy, but all the elements discussed above should find their place in it. The strategy should give to the management and staff clear guidance on the ultimate direction of customer service. Annex D is including a proposed content of such a document.

Annex A

PRESS, MEDIA & PUBLIC RELATIONS POLICY

1. Introduction

The power of the media and the role that it plays in terms of influencing public opinion and perception cannot be underestimated.

If the college is to maximise the benefits of the media for its own advantage, shaping a positive image amongst the college's publics and protecting the interests of the college community, it is essential that we adopt a managed approach to all public and media relations activities.

In the first instance, therefore, all such press/media/pr activity is to be routed via the Public Relations Officer or the Marketing & Communications Manager to ensure a consistent corporate approach is adopted. The college's spokespeople are identified in section 2.9.

At the same time as developing a managed approach to public/ media relations, it is intended to create an environment that supports staff and students to be forthcoming with positive newsworthy stories. This will be achieved by raising awareness of *atrium*, the college's in-house magazine and through the objectives of this policy document.

The press, media & public relations policy can be found on the intranet in the staff area under 'marketing'.

2.1 Mission Statement

To be the leading provider of high quality education and training in the City of York and surrounding area. This will be achieved through working in partnerships with individuals and organisations to raise expectations, fulfill potential and ensure a confident, economically and socially inclusive community.

2.2. Risk Management

This policy aims to support the college's activities in relation to the following risk: problems arising from adverse local, regional or national publicity.

2.3 Relevant Corporate Objectives to which the Policy relates

Partnership/The Wider Community: The college will work in partnership as appropriate to achieve its own objectives and to contribute to the economic and social well-being of the wider community.

2.4 Purpose of the Policy

This document sits alongside the Annual Marketing & Communications Plan which, through promotion of college services and activities, seeks to enhance the college's reputation across the wider community.

The purpose of this policy is to provide clear guidance & direction to all college staff regarding public and media relations. The paper covers:

- background to the importance of the media for the college
- key objectives for press, media and public relations
- key college personnel responsible for press, media and public relations
- how to deal with the media
- crisis management
- college media targets & performance indicators

2.5 Links to Other College Policies

College Business Continuity Plan

2. 6 Policy Details

It is essential that the college continues to develop both a pro-active as well as a re-active relationship with the media and also with the college's stakeholders/publics.

> **Proactive** College targets the media for coverage of a newsworthy item. Or, the college has a formal communication (eg: a focus group) with a specific stakeholder group.
>
> **Reactive** College will respond to a request from the media for a comment regarding a particular issue or event. Or the college will respond to a complaint/ comment by a specific stakeholder.

The objectives for both categories of media/public relations are the same, ie: enhancing and building the reputation of the organisation with the wider community.

2.6 i To support the marketing of learner/client recruitment:

- raise the college's profile and its brands among the local, regional, national and international populations.
- publicise all college initiatives and new developments; such as college recruitment activities; teaching and learning quality achievements; individual and generic student successes; results & achievements; college events.
- to positively affect the opinion and perception, attitudes and behavior of a variety of groups including non-traditional and reluctant learners/users of the college and stakeholder groups.

2.6 ii To maintain and strengthen the college's profile in the local, regional, national and international communities in support of the college mission statement and corporate objectives:

- promote an enhanced image of the college among potential learners, customers and employers
- promote the college systematically to be:
  - a leading provider of high quality education & training,

- a source of well-qualified, successful learners who reach their full potential within an inclusive learning environment
- a major contributor to the economic and social well-being of the wider community.

2.6 iii To manage and maintain external & internal public and media relations for the benefit of the college

External Public and Media Relations:

- work in partnership with AoC Media team to take full advantage of joint PR opportunities
- continue to develop high quality coverage in local, regional, national, international and specialist publications, as well as radio and TV
- counter negative media coverage, by careful planning and provision of positive stories about college/student services
- organise and manage specific editorial visits to the college in order to address local, regional and national education and training issues
- to continue to build effective working relationships with local journalists, radio presenters and broadcasting organisations.

Internal Media Relations:

- to convince staff of the critical importance of media coverage to the college's positioning in the community
- to address internal audiences eg staff and governors
- to support and encourage all staff across the organisation to find positive stories for media coverage
- to ensure that the management of all newsworthy stories is channeled through the Marketing & Communications Team
- to raise awareness amongst staff of the role of the Public Relations Officer.

2.7 Date of Policy Review

December 2008 (and thereafter every 3 years)

2.8 Action Plan to Complement Policy

The following targets have been set by the Marketing & Communications Team, against which to monitor the success and effectiveness of the strategy:

i To achieve, on average, media coverage for at least one item a week

ii To attain positive national coverage via all media at least once per year

ie: TV, national papers; specialist journal; radio.

iii To pro-actively seek stories that cover 80% of college curriculum and service teams in 2007/8, rising to 90% in 2008/9.

iv To ensure that all brands and target customer groups receive coverage each academic year.

v To maintain a press cuttings service and ensure that relevant articles are circulated and displayed appropriately around college. Press copies are circulated monthly, to all Governors. A new electronic monitoring service is in progress, starting January 2008.

vi To ensure that the college website is regularly updated with press stories.

vii To communicate with the Schools and Colleges Liaison Officers to forward press releases, where appropriate, to interested parties for secondary marketing purposes eg: secondary schools of students covered in media.

2.9 Additional Supporting Information

To those with newsworthy stories

Any members of staff who have a success story or item of interest for the press / media please contact, in the first instance:

Public Relations Officer ext 228

If not available, contact:

Marketing & Communications Manager ext 310

Marketing Officer/Marketing & PR Asst. ext 229

Head of Learner Services ext 383

Marketing & Communications will write the press release, including quotes from appropriate parties, arrange a photograph if required, and liaise with the media contact to complete the activity.

To those receiving unsolicited calls from the media:

Any members of staff who receive an unexpected call, should ascertain, where possible:

- the name of the caller
- publication or broadcast organisation they represent
- the issue about which they are calling

The call should then be routed immediately through to:

Public Relations Officer (ext 228) or

Marketing & Communications Manager (ext 310) or

Head of Central Learner Services (ext 383)

Staff are strongly advised to be careful not to say anything ‘off the record’ (even if the reporter guarantees that it will be). If the afore mentioned personnel are unavailable, assure the caller that a member of the Marketing & Communications Team will call them back. All callers and call times should be logged.

Spokespeople for the college:

As a general rule, in relation to **corporate, strategic and community matters**, only the Principal or SMT members should act as a spokesperson. Other curriculum and cross-college managers are nominated spokespeople for their areas of expertise, and will be contacted should a quote be required.

Crisis Management

In the event of a major issue of public concern arising out of a significant incident affecting the college, an appropriate response team will be convened to deal with media relations, and formulate an internal and external strategy please refer to the college's Business Continuity Plan - Prepared Response. For further details of strategy please refer to the Association of Colleges "Handling Public Difficulties: Best Practice Guide". This guide is available from the Marketing & Communications team.

Jill Sissons

Public Relations Officer

December 2007

Annex B

PR Policy

As a public services supplier, our company and its programs, activities and plans are of special interest to the public. Our company is accountable to all its stakeholder for its actions and this can only be achieved through effective two-way communications. Accountability relies upon a genuine understanding of the company's policies and the services it provides. Good communication is crucially important in conveying information to the community so the company must maintain positive, constructive stakeholders relations and work with them to increase public awareness of the services provided by the company and to explain the reasons for particular policies and priorities. It is important to present the company both accurately and in the best possible light. When information is released, every effort must be made to avoid misunderstanding, misinterpretation, or confusion. Once a misconception takes root, it is always difficult and often impossible to make full correction.

In addition our company is committed to:
- Honesty – we will never knowingly mislead the stakeholders, media or staff on an issue or news story.
- Transparency – we promote openness and accessibility in our dealings with the stakeholders in general and the media in particular, whilst complying with the law and maintaining confidentiality when appropriate.
- Balance – information provided will be objective, balanced, accurate, informative and timely.
- Clarity – all communications will be expressed in a plain and a clear manner.

Annex C

Guidance Note: STAKEHOLDER ANALYSIS

1. Stakeholders are people or organizations who either

(a) stand to be affected by the business in general, business objectives or projects

or

(b) could "make or break" the success of business, business objectives or projects.

They may be winners or losers, included or excluded from decision-making, users of results, participants in the process.

2. Stakeholder analysis is the identification of a business or business objectives' key stakeholders, an assessment of their interests in the business or business objectives and the ways in which these interests may affect the business or business objectives.

3. The reason for doing a stakeholder analysis is to help you identify:
- which individuals or organizations to include in your "coalition" (although its composition may evolve in time or during business objectives or projects design and implementation)
- what roles they should play and at which stage

- who to build and nurture relationships with
- who to inform and consult about the business, business objectives or projects

It will also help you to justify these decisions.

4. There are many ways of preparing this analysis. For the purpose of the Concept Note, both the “coalition” and other (external) stakeholders should be considered. The four tables (see below) based on those stakeholders judged to be of high priority should be completed.

5. These tables are regarded as working documents. As the work progresses, stakeholders and/or relationships may change. The development of the business, business objectives or projects will require further development of the preliminary analysis, including an examination of relationships.

6. It is necessary to be as specific as possible in naming stakeholders but also realistic. “NGO” is too vague and it is not expected to be possible, nor relevant, to connect for example with all existing NGOs. Also, it may be useful to consider sub-groups at times, for example, particular departments or sections within organizations, or “design department personnel” or “water distribution department personnel” rather than just “personnel”.

7. Probably the initial list of stakeholders will be very long. For practical reasons, it is better to prioritize the most relevant ones before carrying out the analysis. It is sometimes difficult to identify “key stakeholders” in one step. One method to use, is to first brainstorm a list and then position them on a matrix (see below) which indicates relative importance to, and influence on, the business, business objectives or projects. Then it is possible to consider which stakeholders to present in the tables.

8. The matrix should be kept as part of business, business objectives or projects documentation. It will be useful for developing the PR plan and can also act as a monitoring tool during implementation.

Matrix for prioritizing key stakeholders:

This matrix can be used to prioritize which stakeholders are the most important to consider – and indeed involve – in a business, business objectives or projects. First, brainstorm a list of stakeholders by identifying:

- Who stands to lose or gain significantly from the business or business objectives? (Importance)
- Whose actions could potentially affect the business or business objectives’ success? (Influence)

Each one should be positioned at the appropriate point between the axes. “Importance”, along the x axis, means the degree to which a stakeholder stands to lose or gain from the business, business objectives or projects. “Influence”, along the y axis, refers to the relative ability of a stakeholder to affect the success of the business, business objectives or projects.

	High influence	Low Influence
High Importance	Box A Stakeholders who stand to lose or gain significantly from the business, business objectives or projects AND whose actions can affect the business, business objectives or projects’ ability to meet its objectives	Box B Stakeholders who stand to lose or gain significantly from the business, business objectives or projects, BUT whose actions cannot affect the business, business objectives or projects’ ability to meet its objectives

	High influence	Low Influence
	The business, business objectives or projects need to ensure that their interests are fully represented in the "coalition". Overall impact will require good relationships to be developed with these stakeholders.	The business, business objectives or projects need to ensure that their interests are fully represented in the "coalition".
Low Importance	Box C Stakeholders whose actions can affect the business, business objectives or projects' ability to meet its objectives, BUT who do not stand to lose or gain much from the it They may be a source of risk; it is needed to explore means of monitoring and managing that risk.	Box D Stakeholders who do not stand to lose or gain much from the business, business objectives or projects AND whose actions cannot affect the business, business objectives or projects' ability to meet its objectives They may require limited monitoring or informing of progress but are of low priority. They are unlikely to be the subject of business, business objectives or projects activities or involved in business, business objectives or projects management.

Those positioned in Box D are not key stakeholders and they can be effectively ignored in business development, business objectives or projects design and implementation.

Those in Box A are the most important stakeholders and their interests should be represented on the "coalition".

Likewise the interests of the strongest stakeholders in Box B should be represented on the "coalition".

Probably it will be good to build and nurture relationships with the most influential stakeholders in Box C, to "keep them on board".

When filling in the tables, only the most important stakeholders from boxes A, B and C should be considered ("key stakeholders")

Depending on the PR objectives, communication plans, messages, means, channels, methods will be different for each quadrant, depending on stakeholders' influence, importance and interest.

Annex D

Content of the PR Strategy

Mission, Vision

Public Relations Policy

1. Introduction (short presentation of the ROC)

2. Analysis of the ROC stakeholders their importance and influence on the business (opportunities and threats)

2.1. Stakeholders' matrix (analysis and positioning)

2.2. High importance and high influence quadrant stakeholders current approach (list / attitudes / objectives / communication messages, channels, methods)

2.3. High importance and low influence quadrant stakeholders current approach (list / attitudes / objectives / communication messages, channels, methods)

2.4. Low importance and high influence quadrant stakeholders current approach (list / attitudes / objectives / communication messages, channels, methods)

2.5. Low importance and low influence quadrant stakeholders current approach (list / attitudes / objectives / communication messages, channels, methods)

3. Analysis of the public relations current practices (strong points, weak points)

3.1. Currently organising for public relations (structure / procedures)

3.2. People facing the stakeholders (PR officer(s) / other personnel / skills / competences / attitudes)

3.3. Current situation of the company image (real identity / perceived identity / gap to desired identity determined by company culture, structure, personnel, objectives, purpose)

3.4. Corporate current external PR (objectives / communication plans / messages / channels / methods / budget / crisis communication)

3.5. Corporate current internal PR (objectives / communication plans / messages / channels / methods / budget / crisis communication)

3.6. PR PIs – current situation

4. Preferred way of achieving policy goals

4.1. Organising for public relations (Structure for Public Relations / procedures)

4.2. People issues (PR officer "institution" / selecting the right people / training and skills development)

4.3. Corporate image (desired identity objectives and ways for achievement for: company culture, company structure, company personnel, company objectives, company purpose)

4.4. Stakeholders management (desired attitudes or actions from stakeholders groups / messages / methods)

4.5. External communication, media and media management (including crisis management)

4.6. Internal communication (including crisis management)

4.7. Improved PR PIs

5. Strategy responsibilities, performance measurement, monitoring and periodic review

6. Specific short term objectives (including PR budget)

7. Short term action plans

8. Short term communication plans

G.10 Guidance on Customer Relations

1. Introduction

This guideline reviews the need for formal Customer Relations Policies and Strategies and explains the implications of adopting them upon a ROC. A model policy and a strategy content for consideration is attached.

2. What is Customer Relations ?

Customer Relations is about the ways in which a company communicates and deals with its existing customers. Customer Relations is a theme that runs through everything a company does. A service such as water supply or wastewater services cannot be seen or touched, only experienced and it is up to all employees of a company to make the customer feel comfortable.

3. What is a Customer Relation Policy ?

A Customer Relations Policy outlines **what** a ROC aims to achieve over the next years in terms of its relations with customers. A Customer Relation Policy takes the form of a formal statement adopted by a company, regarding the dominant values reflected in the way it wants to deal with its customers. It is a set of basic principles formulated and enforced by the top management of an organisation, to direct and limit its actions in pursuit of long-term goals. The Customer Relation Policy verbalises key messages that clarify for the customers and for the ROC staff members, what are the guiding principles for the way the utility organises itself and its staff, to develop a good relationship with its customers when they need help. From this point of view, customer relations is similar to “after sales” services, when customer service is about “core business” which is delivery (“sales”) of water and wastewater services and related processes (billing, repairing etc). GOOD CUSTOMER RELATIONS WILL NOT COMPENSATE BAD CUSTOMER SERVICES.

4. What is a Customer Relation Strategy ?

A Customer Relations Strategy outlines the current customer service provision and **how** this will be developed by the ROC to ensure the achievement of the Customer Relations Policy. The Customer Relations Strategy takes the form of a formal document, approved and supported by the top management of a ROC, describing the way the company plans to achieve the goals from the Customer Relation Policy. It is the alternative chosen to make happen the desired future. The time horizon of a Customer Relations Strategy is 5 to 10 years, giving to management and staff clear guidance on the ultimate direction of customer service.

The Customer Relations Strategy is a long-term vision of the future and all short-term objectives and plans aligned with it, enabling the ROC to achieve its longer-term goals. In this respect there is a need to properly co-ordinate activities related to customer service and facilitate co-operation between the relevant departments and branches of a utility.

5. Why having Customer Relations Policy and Strategy is important?

Customer Relations Policy and Strategy are important for preventing adverse customers' reactions due to utility services running behind customers' expectations.

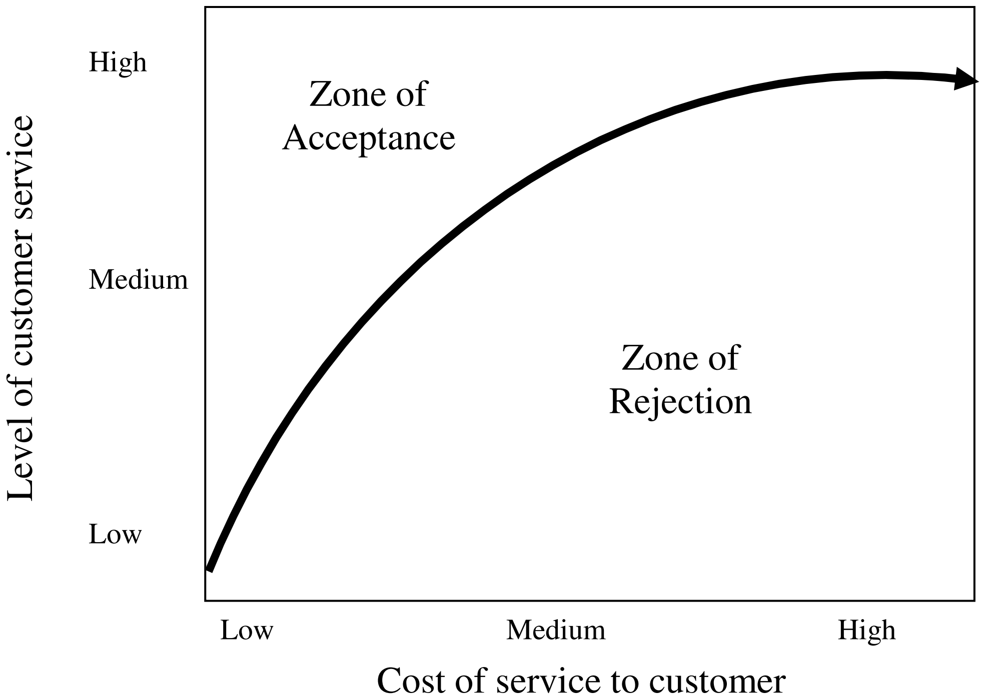
The public utilities were historically institutions attracting little customer attention. Normally controlled by municipality or by government, their tariffs were raised annually to cover operational costs failing to provide adequate financing for capital investment. The water sector has been considered as a municipal public service provider and the tariffs were often so low that the water sector could be regarded as providing a *social* rather than a *public* service. Water sector focused on technical and engineering issues and paid little attention to the customers since customers had little interest in the utility.

Partly due to the "consumer revolution", by the late 1980's European utilities came under increasing pressure from the public for greater accountability and improved service, enhanced by the fact that due to their monopoly position, the element of customer choice was absent. In the same time, the policy of levying tariffs on a full cost recovery basis, had the effect that customers were expected to pay much more for their water services, so normally customers were expecting high levels of service. Similar processes are undergoing now in Romania.

The modern customer expects value for money and good "customer care", but one should have in mind that provision of basic utility facilities does not make a difference, since customers take this absolutely for granted. They *expect* everything to work when they turn on the tap or flush the toilet and give little or no thought or credit to the company providing the service, so the only way left is:

Good customer service	+	Acceptable cost	=	Value for money

The quality of the customer service provided, associated with the cost or price of the service to the customer produces a non-linear curve:



To avoid the movement of a significant number of customers into the Zone of Rejection, any increases in the cost of service to the customer, must be accompanied by even greater increases in the level of customer service provided. Thus Customer Relations Policy and Strategy have a great importance in avoiding adverse customer reactions, because they can deliver corresponding service improvements.

Running behind the demands of the customers generates hardening of customer attitudes towards the utility which suffers the effects of lack of customer confidence. Short term actions can help in overcoming customers generated problems, but can be costly or ineffective if they are not in line with a longer term strategy.

A utility can chose between “do nothing” and become a victim to circumstances which will eventually enforce change on them, or be proactive and initiate their own change process to develop customer focus and become a “customer care champion”. Good customer relations will gain the support of the customers (including paying their bills in a timely manner) and will contribute to the long-term success and survival of the company.

6. What are the implications of having a Customer Relations Policy and Strategy ?

Deciding to go for the change and develop a Customer Relation Policy and Strategy, will enable the regional operator to take advantage of the following opportunities:

- enable Romania’s water businesses to achieve common European standards
- anticipate and influence future customer demands and expectations
- improve the public perception and consequently the willingness of customers to pay bills
- provide a strong focus for internal and external communications
- highlight environmental issues not associated by customers with the provision of their water services

- create framework to align all shorter-term initiatives and organisational changes
- increase the staff motivation
- reduce costs as the approach to customer service is more standardised

In the same time the ROCs will face the following challenges besides the positive outcomes:
- focus on customer service should not replace the current emphasis on technical, engineering and financial issues
- “customer” term must be broadened to refer to all users of the utility’s services, and not only to those customers that are directly billed
- strategy must be enough flexible to make a corresponding change, if over time is no longer in line with the evolving customer expectations
- improving customer service may incur additional costs which will certainly be offset by savings, but these two financial elements may not necessarily be achieved in the same timeframe
- organisational changes and optimisations are an inevitable result of the implementation of such a strategy

To secure success, the ROC must have:
- strong support from all the members of the top management
- co-operation and co-ordination between all departments involved directly or indirectly in customer activities
- regular reinforcement of the focus on customer service and customer relationships to all employees
- willingness to investigate any customer service failures and take immediate corrective action
- setting of improvement targets for key customer relations issues
- monitoring of performance, including corrective action where necessary
- a formal annual market research procedure to be carried out, on customer expectations

7. Steps to develop a Customer Relations Policy

Defining the Customer Relations Policy is the first step in inducing a cultural change within a utility which decides to put the customer in the center of its preoccupations and overcome its status from “customer dissatisfaction victim” to “customer care champion”. Policy is first of all about taking a “political” decision at top management level of a company about what the company wants to achieve on medium term regarding customer relations, so:
- Start from the corporate mission and vision and identify and what they state about customers, the quality of the services delivered, efficiency and other relevant aspects
- Take the “customer shoes” and try to identify your company treats and how would you like to be treated by your company as a customer (customer needs)
- Take your “top managers shoes” and identify what your company needs from the customers
- Debate on the company values and how they match with the way your company satisfies the client’s needs
- Consider your customer services and your customer relations services performance indicators (PIs) and try to define you target PIs for a medium term horizon (you can use as target the levels reached by successful European water companies)
- Identify how a “client comes first” policy can and will positively impact on your company’ needs (improving efficiency, quality of services, environmental aspects and employee satisfaction)
- Get a consensus at top managerial level that “client comes first” approach is the right approach in line with company mission, vision and values
- Debate and agree on the principles that derive from above, values you promote, standards you would like to achieve

- Formulate and put on paper what you agreed on
- Commit yourselves as top managers to support strongly the focus on customer services and customer relations services to all employees
- Communicate the Customer Relation Policy to your employees

Customer relations Policy can be anything from one statement such as:

“It is our policy to provide customers with the best possible service. Employees are expected to treat members of the public in a courteous, respectful manner at all times.” (Hernando County Florida)

Or something more developed including corporate values such as:

“Service:

To meet expectations by consistently contributing to the satisfaction and well-being of customers, staff and colleagues in a passionate, courteous and knowledgeable manner.

Professionalism:

To take pride in what we do by providing the highest level of service to everyone we encounter.

Integrity:

To consistently act honorably and above reproach and ensure that we keep the promises that we make.

Respect:

To maintain a high regard for our staff, colleagues and customers in our daily engagements.

Integration:

To maintain one voice to stakeholders through a shared understanding of vision, values and goals, to ensure the smooth co-ordination of activities across functions and channels.

Team work:

To actively engage the spirit of co-operation to ensure we remain a team that always works through collective leadership and effective communication.” (City of Johannesburg)

Or additionally including standards for customer care, if the company has already a history in operating Customer Relation Systems, such as:

“POLICY STATEMENT
TDSi aims to set clear standards of service and to regularly review and improve its performance TDSi’s resources will be used effectively and efficiently in order to provide the highest standard of service to all customers.
TDSi will openly provide clear information about its services, which will be easily accessible to everyone who needs them. All enquiries and complaints will be dealt with in a prompt manner. Present and potential

customers of TDSi will be consulted with, and their views will be used to continually improve the service provided.

STANDARDS FOR CUSTOMER CARE

Responding to correspondence

TDSi will answer all correspondence from the public – including letters, faxes and emails – in a fast and clear manner.

Targets: *To answer all correspondence within 2 working days.*
To use your corporate signature at all times.
To use the email auto response when out of the office stating an alternative colleague's contact details for urgent enquiries.
To use the corporate recommended font (Arial 11pt or 12pt) at all times and the TDSi "Access Everywhere" logo where necessary.
To use corporate templates for letters, faxes, quotes etc.
No original documentation should be emailed; instead it should be converted to .PDF format before emailing.

Appointments

Members of staff will see visitors punctually when an appointment has been made at the office or at an external venue. If no appointment has been made, members of staff will see visitors as promptly as is reasonably possible.

Targets: *To see visitors within 5 minutes of any appointment that has been made.*
Maximum length of time a person without an appointment should have to wait before they see a representative of TDSi is 5 minutes.
At external meetings members of staff should arrive 10 minutes early, dressed appropriately.
All employees should carry company identification at all times.

Answering telephone calls

Each department will answer telephone calls in a fast and professional manner.

Targets: *To answer calls to designated telephone enquiry points within 5 rings.*
When transferring calls, ensure that the TDSi member of Staff is available to accept the call and if not that they call back within 30 minutes.
To record your daily voicemail message informing callers of your itinerary for the day.

Complaints procedures

TDSi will publicise their complaints procedure for the service it provides and promptly deal with any complaints received.

Targets: *To publicise the complaints procedure on the TDSi website, and have complaints procedure documents available for inspection and delivery to customers.*
To respond to a customer within 24 hours and explain to the customer how the complaint will be dealt with.
To keep the customer appraised weekly on the status of their complaint if the investigation/resolution of the complaint is likely to take more than 1 week."

A model of a Customer Relations Policy for a water utility is given in Annex A.

8. Steps to Develop a Customer Relations Strategy

If the Customer Relations Policy is about what the company wants, The Customer Relations Strategy is the way the company will achieve what it wants. It is like having a journey plan (road map), how to go from point A where the company is now from Customer Relations Services point of view, to point B defined by the company's Customer Relations Policy, in a certain time interval. The strategy document will act as the master plan against which all short-term proposals must be aligned. It is needed for allowing proper co-ordination of activities relating to customer service and customer relations service, and for facilitating cooperation between all the relevant departments and branches in order to achieve the desired customer related objectives Following steps should be followed to develop such a strategy:

- Analyse your company's current position regarding Customer Relations Services and regarding Customer Services. Use KPIs for Customer Relations Services and Customer Services. Identify and describe your end-to-end business processes.
- Identify and define your customer categories (segments) according to their needs. In order to establish customer relations strategies and standards, it is necessary to define the various classes of customers who have an interest in the water services of you utility (i.e. residential, commercial, public etc.). Make a distinction between the "legal customer" (the physical or legal entity you have a written contract to deliver services) and the "real customer" (actual users of the water facilities – whether or not you bill them directly for this service). Customer relations are about the "real customer".
- The approach for different type of segments that should be considered is "mass customisation approach" – service requirements likely to be similar, "individual service delivery" – some ICI which generate a larger water consumption and are the most sensitive group for service quality and "key accounts" - larger customers, some of whom may have very specific requirements for their water and wastewater services (special water quality needs to facilitate production or other processes etc.)
- Determine your customer categories (segments) needs. This means researching customers' requirements and expectations. All too often their needs are overlooked, which leads to the second largest reason for implementation failure. When measuring client satisfaction include: (1) Whether your clients' expectations are consistent across and within the different client segments; (2) Whether your client expectations are realistic given the organization's ability to meet these expectations. It will be important to examine your client satisfaction across all client segments over time and document findings.
- Document how your Customer Service standards (CS PIs) and Customer Relations Service standards (CRS PIs) relate to your client's expectations and requirements. Identify how the end-to-end processes flow match the expectations of the customers. Differentiate between what your customers really want and what you think they want. Do not make assumptions about what your clients want. This leads to the creation of internally focused objectives that generally result in client dissatisfaction.
- The performance will be measured by your success in meeting the established PIs standards. The objective is to achieve the targets in the established number of years. To reach these standards, it is recommended to prepare a schedule of targets for each year and action plans which will draw your organisation year-by-year towards the ultimate standards. The actual performance will be measured at the end of each year and compared with the targets set for that particular year. Any adverse variance will be investigated and corrective action initiated.
- Assess and decide in your strategy on the most suitable way of organising the activity in terms of structure for delivering the Customer Relations services, between consolidation of all customer-related activities within one location, or distribution of customer-related activities across various offices and locations. Annex B is presenting the advantages and disadvantages of both type of structure for consideration. Distributed customer relations activities represent a valid option, however, establishing a specialized department to manage the end-to-end processes[20] is desirable due to its multiple advantages.

[20] End-to-end processes are those business processes triggered by the client which end at the client (i.e. services requests, complain handling etc.). An end-to-end process has a single objective but, where the process passes through several different functions or departments, it may become disrupted by conflicting functional objectives. They also often cross functional boundaries and, if each functional manager does not apply the same priority to the process activities, unnecessary delays can occur. Equally, over a period of time, the activities within the process can become distorted or unnecessary work can take place. Also, if the activities are not regularly checked back against the required output, and the output itself it not checked back against customer requirements, it is not unusual for the process to gradually fail in meeting the needs of customers.

- Whatever its scale, Customer Relations have three dimensions: People 50%, Processes 30% and Technology 20%. Selecting the right people is a must which has to be considered since customer relations is a stressful environment and not all employees will feel comfortable dealing with customers face-to-face, or feel able to deal with a customer on the telephone. Employees who are not suitable need to be identified at an early stage and if new staff is recruited it is important to assess their ability to deal with a number of different situations. To ensure that the employees dealing directly with customers have the skills necessary to enable them to deliver an exceptional customer service, specific training in customer service techniques should be a part of your strategy. Also remember that employees dealing directly with the customers are not only those from the Customer Realtions Department, but all the employees who come in contact with a customer (meter readers, maintenance people etc.)
- Identified customer needs will be used to re-engineer end-to-end and related business processes. Needs analysis will reveal a gap between the organisation's current capabilities and processes and customer expectations. Gap has not only to be bridged but also implemented in a manner that is seamless to the customers. This means that in the vast majority of cases customer-facing processes will need to be reorganised or rethought Habitual methods of working may have to be changed so do not underestimate the “we've always done it this way” syndrome. Decide on the principles of process re-engineering and on the change management strategies
- Technology to be used will have to be defined in conjunction with processes and organising. The technical systems will have to incorporate workflow capabilities for sending service requests automatically and monitor progress, besides customer details and history and logging of customer enquiries, requests or complaints. Customer relations people and “back office” people will use the systems.
- As an element of your strategy, identify the critical success factors for your Customer Relations Services which will directly contribute to your corporate critical success factors by minimising the cost of customer service operations and by influencing the customers’ willingness to pay. This, in turn, will contribute to the financing of the required improvements to the water and wastewater systems
- Establish responsibilities at all levels and the person accountable for the succes of your strategy.
- The Customer Relations Strategy will be reviewed each year and will be amended where appropriate to take into account changes in customer views and current levels of performance against Customer Service Standards and customer Relations Standards.
- Develop short term action plans. A detailed action plan will be produced each year. The first action plan will concentrate primarily on establishing the framework for delivery of Customer Relations Service improvements. Subsequent action plans for future years will build.

There is no standard content of a Customer Relations Strategy, but all the elements discussed above should find their place in it. The strategy should give to the management and staff clear guidance on the ultimate direction of customer service. Annex C is including a proposed content of such a document.

Annex A - Customer Relations Policy

Our vision is to be a provider of water and wastewater services which our customers may confidently rely on. The levels of service we provide, their availability and quality in our vision will become comparable to the best European operators, provided that the tariffs for the services will be sufficient to ensure efficient operation and environmentally sound development of water and wastewater sector in our supply area and our staff motivation.

We will achieve these by delivering good customer service at affordable prices and by becoming a supplier of quality services that "listens" to its customers. For us, customer comes first!

The values that our company will ensure all our employees observe when dealing with customers are:

- We will gain the trust of our customers by treating them honestly and with respect
- We will meet all regulatory requirements with our water and wastewater services
- We will deliver a reliable service to our customers and honour our promises at all times
- We will provide prompt and efficient answers to all customer requests based on sound knowledge and relevant information
- We will ensure that our employees are courteous to customers at all times and make a real effort to understand their problems
- We will make it easy for customers to get in touch with us
- We will provide a professional service to our customers which is reflected in both the attitude and appearance of all our employees
- We will monitor the views of our customers, provide them with information on the standards of service that we aim to achieve, and report back regularly on our performance

The standards of customer services and of customer relation services we aim on a 5 years horizon are:

Water and wastewater quality	100% compliance with Romanian regulations
Water supply pressure	2 meters head at customer's tap
Availability	24 hours a day, 7 days a week
Meter accuracy checks	5 days
Response time for attendance to fault complaints	
- water or wastewater supply fault	Normally within 12 hours
- Others	Normally within 24 hours
Notice of planned suspension of water supply	2-days' advance notice to all affected customers
or wastewater services	
Duration of any suspension of water supply	Restoration within 12 hours (water supply)

or wastewater services (planned or emergency)	Restoration within 4 hours (wastewater)
Suspension of water supply exceeding 12 hours	An alternative water source will be made
(planned or emergency)	available to all affected customers
New application for water/sewerage connection	Approval within 14 days (subject to submission of correct documentation)
Revised contract application	Revised contract completed within 7 days
Change of customer details	2 days
Water service bills	
- Accuracy	100% accurate
- Timing	Issued within 5 days of meter reading
Reply to written requests or complaints	
- Interim reply	5 days
- Full response	15 days
Telephone response	10 rings
Accessibility	Emergencies: 24 hours a day, 365 days a year
	Non-emergencies: 8am – 6pm, weekdays

Annex B - Key advantages/disadvantages of consolidated vs. distributed Customer Relations Services

CONSOLIDATED	DISTRIBUTED
ADVANTAGES	
Customer related activities are grouped together and have a single line management	Workload is spread over several departments
Improves effectiveness, efficiency, performance monitoring and control	Easier to “blame” another department for failures of any kind
Optimises expenditure on IT and communications equipment and software	The traditional municipal utility structure can be maintained, so employees will feel more comfortable
“Black holes” between departments and/or activities are minimised	
Flexible due to concentrated multiskilled manpower	
Concentrated multiskilled staff increase accessibility for the customer	
“Ownership” of customer issues	
DISADVANTAGES	
Relocation of some staff and/or facilities might be necessary	Multiple line management generate no focus on customer service
Staff might feel threatened by the change	Processes have to be very well defined and executed to improve efficiency and effectiveness
May involve additional costs due to office set-up	Investment in distributed IT equipment, software and data communications network is significant
	Specialised manpower is dispersed, affecting accessibility for the customer
	Specialised staff, little opportunity for employees to multi-skill to improve flexibility
	No “ownership” of customer issues

Annex C - Content of the Customer Relations Strategy

Mission, Vision

Customer Relations Policy

1. Introduction (short presentation of the ROC)

2. Analysis of the current customer relations practices (strong points, weak points)

3.7. Currently organising for customer relations (structure / procedures)

3.8. People facing the customers (skills / competences / attitudes)

3.9. Current situation of the end-to-end processes (requests for services / complaints / billing queries / customer contract management / exchange of information)

3.10. Technology supporting customers relations

3.11. Customer Services KPIs

3.12. Customer Relations Services KPIs

3. Analysis of the ROC customers and the way they impact on the business

2.6. Legal customers (Domestic customers / Commercial, industrial, institutional (ICI))

2.7. Real or end customers (Domestic customers, including owners associations case / ICI end customers such as: domestic customers at work, school children, hospital patients, tourists etc.)

2.8. Customers segments and current practices (Mass customisation / Individual service delivery / Key account management)

2.9. Customer needs and satisfaction - current situation (Client feed-back / Annual surveys)

4. Preferred way of achieving policy goals

2.1. Organising for customer relations (Structure for delivery of Customer Relations Services / Customer Relations Centre / Front office - Back office relations)

2.2. People issues (Selecting the right people / Providing the correct working environment / Training / Involvement / Communication / Obtaining employee feedback)

2.3. Processes issues (General business processes optimisation / End-to-end process optimisation / Processes in the Customer Relations Centre)

2.4. Technology issues (Contact channels / Computer systems / Telephone systems / Facilities)

2.5. Improved Customer Services KPIs

2.6. Improved Customer Relations Services KPIs

5. Strategy responsibilities, performance measurement, monitoring and periodic review Periodic review

6. Specific short term objectives

7. Short term action plans

G.11 Model for a ROC's PR strategy

This document has been developed as part of FOPIP 2 project with a view to providing a practical example to the guidelines reprdoduced in Appendix G8.

During FOPIP 2 project implementation, the ROCs used this template in developing their own PR strategies.

For details regarding the contents of this model, see the electronic version of this Appendix.

G.12 Model for a ROC's CR strategy

This document has been developed as part of FOPIP 2 project with a view to providing a practical example to the guidelines reprdoduced in Appendix G9.

During FOPIP 2 project implementation, the ROCs used this template in developing their own CR strategies.

For details regarding the contents of this model, see the electronic version of this Appendix.

G.13 Guidelines on developing a communication plan

This document has been developed as part of FOPIP 2 project with a view to providing the necessary background, instructions and practical examples (in the form of a model) for the ROC's own development of their communication plans.

The template was used by the ROCs in the development of their PR strategies.

For details regarding the guidelines and model, see the electronic version of this Appendix.

G.14 Guidelines on the analysis of end-to-end processes

This document has been developed as part of FOPIP 2 project with a view to providing the necessary background, instructions and practical examples for the ROC's own analysis of their end-to-end processes.

The information here was used by the ROC's in the development of their CR strategies as well as their business plans.

For details, see the electronic version of this Appendix.

G.15 Guidance on Meter Reading, Billing and Revenue Collection

1. Introduction

This guiding document has the purpose to support the water companies in becoming more efficient and effective in one of the most important process engaged: the meter reading, billing and revenue collection. The importance of this process is crucial not only for the water company, but for the customer as well, so from this point of view, meter reading, billing and collection is transformed into a role that is far more significant than merely a financial mechanism as it was seen a few years before.

In order to appreciate the changing role of the meter reading, billing and collection activity, it is important to recognise that whilst the water company may perceive this function solely as a means of maximising its income, to the customer it is an essential element of the customer service they require from their water service provider. Their perception of the performance of the water company will be damaged just as much by inadequacies or inequities in meter reading, billing and collection as by underperformance of the actual water supply or wastewater services. Consequently, meter reading, billing and revenue collection, while securing the adequate cash flow for the company, should also become a customer oriented process as the other processes which directly or indirectly is affecting the customers.

Many Romanian water companies still have "traditional" policies regarding meter reading, billing and revenue collection while modern technologies, methods and services are available and while customer needs had evolved. Revising these policies is necessary in order to introduce better and more modern procedures and to implement more effective, efficient and convenient systems and methods.

2. Why is Necessary to Have a Metering, Billing and Revenue Collection Policy?

What are the elements through which the water company will increase its efficiency and effectiveness in terms of meter reading, billing and revenue collection should be expresses in a company policy. A few reasons from commercial and financial point of view for which the existence of such a policy is extremely important are:

- Meter reading, billing and revenue collection are the main cash source of the company. Any problems encountered in these areas, can cause problems in the day to day company operations, due to insufficient revenues and/or cash flow
- Metering and all associated activities (checking, repairing, reading etc.), billing and revenue collection are processes that use significant resources in terms of logistics, staff, equipment and others, thus generating significant costs for the water company. Any cost control and reduction measures in these areas, will improve the cash flow by preventing cash to be drained out from the company.
- Meter reading, billing and revenue collection are opportunities for the company to interact regularly with its customers. In the process, the company can collect valuable feed-back from the clients who can be used to improve services and customer relations.
- Meter reading, billing and revenue collection are elements of the customer services, so the way they are dealt by the company will have an important impact on company image. Efficiency and effectiveness in the process will be decisive if the customers will regard the water company as a modern and efficient company or not.
- Meter reading, billing and revenue collection can be supported by newly available advanced systems, technologies and methods (i.e. bank systems are gradually replacing cash transactions) with increased efficiency and effectiveness and more adapted to customer needs. Usage of these can bring benefits both to customers and water companies.
- Customers' preferences and habits are constantly evolving and changing together with their life style, so they are not always at home when the water company wants to do something at their premises, or also do not have time to visit the water company for all kind of things. Constantly evolving systems, methods and technologies are adapted to fit new customer needs and can help the water company to keep up with the changes.
- Water companies are regionalizing, are increasing their scale of operations and have to find solutions for meter reading, billing and revenue collection systems for the various particular situations that may occur while applying unified principles and standardized procedures and practices.

When deciding on a metering policy, since customer metering is only one aspect of the problem, the water company has to take into account besides commercial and financial principles, other operational and maintenance principles related metering. Some commercial principles to be considered in metering policy regarding customer metering are detailed in Annex A.

Every couple of years, the water companies have to review if their policies and their metering, meter reading, billing and revenue collection systems are still adequate to the modern demands and possibilities. In other words, review is needed because the best solution five years ago may be completely obsolete next year (customers, technology and the water company itself are changing).

3. Steps to Develop a Metering, Billing and Revenue Collection Policy

Metering, billing and revenue collection policy has to be congruent with the customer relations policy, since meter reading, billing and revenue collection are part of customer services. In developing the policy, the following steps are recommended:

- Read your customer relations policy if you have one, if you do not have one develop one
- Try to identify what are your company practices in terms of metering, billing and revenue collection and how it fits your preferences and behavior (customer needs) and to other customer segments

- Identify what would be better for your company in terms of cash flow
- Identify available systems, methods and technologies, how modern is you company with respect to the latest developments and how this matches with the desired image of your company (see your PR policy for this)
- Formulate and put on paper what you agreed on

There is no standard format for such a policy. What is important is that the policy statement is simple and understandable for those who will develop and analyze options for policy implementation. For example, such a policy statement dealing with metering only from commercial point of view might be:

“Metering, billing and revenue collection are processes that use important resources and impact significantly on our customers, so our metering, billing and collection policy is to develop and implement such systems and to use such methods and technologies that can provide our company with the necessary cash in time to sustain our business and can best satisfy customers needs and preferences related to these activities. We will do this by taking into account that systems, methods, technologies and customers’ habits change overtime and that the preferred alternative to achieve our policy has to be feasible from business and from company’s staff point of view”

A comprehensive metering policy has to deal with other metering than customer metering as well.

4. What are the Alternatives (Strategies) to be Considered?

As in any other situation when a policy is implemented, there are more alternatives (strategies) to do that. The company has to identify them and decide which is the best option under the existing circumstances. Alternatives discussed under the present document, cover only processes directly related to company’s cash flow aspects, namely: meter reading, billing and revenue collection.

4.1. Meter reading

Meter reading is about determining the volume of water used which is the base for issuing the customer bill for both water and wastewater services, since wastewater is determined as a percentage from the used potable water. In our approach, meter reading is about collecting and registering data from the customers into a computer system. From this point of view, it is obvious that there is a process phase which is “on site” at customers’ premises (data reading) and another one which is “in the office” (data entry).

4.1.1. Data reading

When we are talking about data reading on customer site, we have to take into account three things:
- The reading cycle (the frequency of reading the water meters)
- The reading technology
- The reading agent

Reading cycles or reading pattern will heavily impact on the cost of the whole process because it is labour intensive and happens on site in the whole supply area which is getting bigger and bigger together with the regionalisation process. So reducing the number of meter readings per financial year would mean a proportional reduction of costs, since every meter reading cycle is a cost trigger. The water company should consider the fact that meter reading cycle can be different from billing cycle and collection cycle, so a reduction in the meter reading frequency will not necessarily affect the billing and collection cycles.

Monthly reading patterns are common for the Romanian water industry, but the water company should analyse the feasibility of different reading patterns for different customer segments. For example, the water consumption of the domestic customers or of the majority of small and medium businesses or some institutions varies very little from one month to another, so a quarterly, half yearly or yearly reading can be taken into account. Billing for these types of customers if the billing cycle is different, can be done on an estimate determined statistically and the actual water use can be corrected when the meter is read. On the other hand, large businesses or businesses with seasonal or large variations in water consumption, or certain institutions which do not have a stable monthly water consumption (i.e. schools), might require different reading patterns. What should be kept in mind is that in determining the most advantageous reading pattern for the company, customer segmentation according to their water usage habits is important.

One important disadvantage of reducing the frequency of the readings is the reduced frequency of collecting other types of technical information from customer premises, such as the condition of connection, connection chamber, meter, inner installation etc.. For example, if the customer has a break on its inner installation and he is not aware of it, the water meter registers the leakage as an extra consumption which can sometimes be significant and for which the customer has to pay. If the reading cycle is quarterly instead of monthly, the customer will have to pay a huge bill. So the measures of reducing the reading frequency have to be accompanied by a good communication with the customers who will have to be educated to be more responsible regarding the maintenance and repair of their property. Also the customers should be encouraged to initiate communications with the water company if they notice any problems on the supplier side, or if there are changes in their consumption patterns etc.

Reading technology is totally dependant on the type of the water meter installed on the customer premises, and can be:

- Simple mechanical water meter which the most used and least expensive needs access at the customer premises in the meter chamber and data is collected by direct reading the meter index. Collected data (meter index) is registered on site either on paper (on meter cards or reading registers), or electronically in hand held devices which have a data base with the water meters assigned to one reading person, by the person doing the reading. Accessibility of the water meter is the key issue which depends on the presence of the customer if the meter chamber is on customer property. Access problems might occur due to inconvenient time of the reading (customer is at work too when the meter readers are working), aggressive dogs, water in the water meter chamber etc.. Probability to have data errors is higher due to physical conditions affecting the human eye, such as insufficient light in the water chamber, to big distance between the eye and the meter, reading in angle due to the mounting position of the meter etc.
- Water meters with remote data transmission capabilities (available on the Romanian market too) are less used due to their higher price and data is collected by radio reading of the meter index. The collected data is registered on site automatically in an electronic data base. This type of reading has the advantage of not requiring direct access to customer premises. The water meter is sending a radio signal to a receiver when asked for by it, usually mounted in a car which is driven through the street. The main advantages of this reading method is that it can be done quickly that the classical one, can be done at any time (even at night) whether the customer is at home or not, does not need access on customer premises and the accuracy of the data collected is higher due to the absence of the human error in the data collection chain. This type of water meter reading is an off line data collection system. If the water company has a significant water consumer (in terms of volume used), an on line system might be considered for it, when consumption data is transmitted on line to the water company dispatcher unit by telemetry.
- Water meters integrated into a pre-paid system are even less used than the remote reading water meters and in this case, data collection for billing and revenue collection purposes is not necessary (the water is paid upfront). The principle of such a system is that the customer buys “debit” or “units” on a

card, units which are electronically loaded on the card. The card is inserted into the meter and the customer has water as long as the "debit" or the "units" are not consumed. There is no information that this type of system is used by a water company in Romania.

Reading agent is about who is doing the reading of the water meters. There are more alternatives from which a water company can chose:

- Water meter readers full time employed by the water company are the most used reading agents in Romania. The main disadvantage they have is that their workload is not equally spread overtime (i.e. during winter when temperatures are very low and opening the water meter chamber is not recommended) and in the "low season" the company has to bare the same personnel costs. The advantage is that as skilled personnel they can collect when reading technical data about the condition of the connection and its component parts for maintenance purposes. Also, being full time employed by the company gives them a higher motivation to collect accurate data form site.
- Water meter readers part time employed by the water company are less used as reading agents, but have the advantage that they are paid only when they have work to do, so the personnel costs of the company are lower. They might be not so motivated in collecting accurate data (including technical) as the full time employees and their skills might be not as developed.
- Another utility company (i.e. electricity or gas) when is doing its own reading or any specialised company may be the reading agent by outsourcing the meter reading activity. In this case, the water company costs might be even lower, so in this case the reduction in costs with personnel should be higher than the increase in third parties costs. The disadvantage of this method is that the water company has less direct control over the reading process, the control is only indirect through contractual provisions, so the water company has to take a higher risk. Also, it is less feasible to ask for technical data collection in the same time.
- The customer itself might be the reading agent for the water company if they get proper and clear instructions on how to do it. Besides instructing the customers, the water company has to provide communication channels for the customers for submitting the readings, such as telephone, e-mail, letter, dedicated page on company's web site or a dedicated person at company's cash office or customer relations centre. In this case, the risk regarding data accuracy taken by the water company is even higher than by outsourcing, because if by outsourcing the reading is done by an independent party, the customer is an interested party on who the company has no control. The main advantage is that is the least expensive method.
- The water company can use a combination of reading agents between customers and water meter readers to gain more control over the reading process for some higher costs. For example if the reading cycle is yearly, the water company might instead billing on an estimate bill on customer readings and once an year bill on own meter readers readings to balance the potential irregularities.

4.1.2. Data entry

In our approach, data entry is about:

- introducing
- checking
- validating

the data collected and registered on site into the computer system for billing purposes. This is a process which is happening in the company offices where access to a computer is ensured.

Introducing data in the computer system can be done by operators or automatically, depending on the reading technology.

- If the data is registered on site on paper it has to be introduced in the computer system by an operator which means additional workforce and additional time. Human factor is also an additional source of data errors when transferring data on paper into the billing data base.
- If data is registered electronically in a hand held device, in a portable computer by remote reading or in a desk top computer by telemetry, data only has to be transferred automatically into the billing data base. Since the data transfer is automated, human error cannot affect the accuracy of data and the transfer is done easy and quickly.

Also, the regionalised water company having offices in more locations, should take into account if the data is introduced into the computer system de-centralised or centralised.

- De-centralised data entry means that the data is introduced at the offices from the area where it was collected, so no raw data transport and the data entry cycle is shorter. On the other hand, in each local office has to have computer operators to entry the data which can have an uneven workload
- Centralised data entry can bring economies of scale by balancing the workload of the computer operators, so by using less employees is a more efficient method. If the reading agent is the customer or yearly readings with own meter readers, centralised data entry is by far more efficient.

Checking the entered data has to be done to identify errors in data entry. How the data is checked depends on the way the data was introduced in the computer system. If the data was transferred automatically from a portable device, the data check should be done also automatically by the transfer program. The most common method is through CRC (Cyclical Redundancy Checking) algorithms. If the data was entered manually by computer operators, the following options are to be considered:

- Full data check which can be done either by the same person introducing the data (might be less efficient because the same person might be not so thorough, or might do unwillingly the same error again) or by a different person. Full data check means that each introduced index is once again read and verified with the data registered on site on paper. It is labour intensive so it generates additional costs for errors which statistically represent 2 -3 % of the billing data and it cannot guarantee that all the errors are identified and corrected.
- Sample data check, which means that a part of the data is checked based on sampling with a reasonable error margin, by the same person who introduced the data or by a different person. It is not so labour intensive as the full data check and can provide fair results.

If data introduction is de-centralised and data check (either full or sample) is done by a different person than the person who introduced the data, the question of doing it in a de-centralised or a centralised manner is raised again. The same arguments for taking a decision are valid as for data introduction.

Validating the data has to be done to verify if the entered data is in a valid range, while data check verifies if the data was transferred as such from one registration support (paper or portable device) to the billing data base. Data validation can be done automatically through the data entry program, manually by the person introducing or checking the data and noticing an abnormal data range, or the combination of two. The “out of range” identified data, have to be checked for accuracy on the whole collecting, registering and transmission chain. The following general validation criteria can be taken into account:

- Consumption should be a positive value (currently read index should be higher than the previous read index)
- Consumption higher or lower with 10% than the statistical average consumption of the property are out of range and should be checked for accuracy
- Consumption is congruent with the number of persons inhabiting the property for domestic customers, so consumptions with 10% higher or lower than the number of persons times per capita consumption should be checked for accuracy

There are also special consumers for which there can be special validation criteria, for example in the case of schools, such a special criteria is that in the holidays there should be practically no water consumption.

4.2. Billing

Billing is in our approach the process of determining the cost of the water used and of notifying the customers about his payment obligations to the water company. From this point of view, there are three main process phases to talk about:

- Bill preparation
- Bill printing
- Bill distribution

4.2.1. Bill preparation

When talking about bill preparation, we have to take into account that computer technology had totally replaced the manual process of bill calculation. After data entry into the billing data base, (including checking and validation) the computer software will calculate the volume used, will apply the tariff and will finally calculate the bill for the individual customer. That means that bill preparation has very limited human involvement and this is not for doing the calculations, but for process control and managing the billing system. The following aspects have to be discussed when discussing about bill preparation:

- The billing cycle
- The billing system management

Billing cycle or billing pattern does not have to be the same as the meter reading pattern given the possibility to bill based on consumption estimates. The most common billing cycle used by the Romanian water companies is the monthly billing. When establishing the preferred billing pattern, the water company should take into account that every billing cycle is a cost trigger on one hand and a payment trigger on the other hand. So billing cycle has a double impact on the company's cash flow, both on cash input and cash output. When deciding on the billing cycle, ideally the cost of issuing one bill (preparation, printing, distribution) should be compared with the value of the bill and the customers should be segmented accordingly. For example, in rural areas with low water consumption due to alternative sources and different habits than in urban areas, quarterly or even half year billing cycles can be considered.

When deciding on the billing cycle, other aspects should be also taken into account:

- One is the magnitude of the bill with respect to the payment capacity (affordability) of the domestic customer, since the bill is a payment trigger. For example in rural areas where the household income is lower than in urban areas, a bill issued at three months can be over the household affordability level in the month of issue, which might cause payment problems.
- Another one is the cash necessities of the company. There are certain periods in a fiscal year when the cash necessity is higher (i.e. when debt service has to be paid, December when the water companies pay Christmas bonuses to the employees etc.). If the billing cycle does not have a monthly pattern, when defining it these aspects should be taken into account.

Billing system management and process control is confronted with the decision to have it done centralised or de-centralised. System management can be centralised only if the water company has an integrated billing software and one billing data base, which can be accessed by more workstations which are physically in different locations. If such a thing does not exist, billing system management has to be done locally. The main disadvantage is that it requires expertise difficult to find in the smaller towns and it is not a full time task.

If an integrated billing software exists, the system management should be done centrally. In this case, the various work stations are linked to one main system. Such a system can provide a more secure environment for bills preparation, direct links with the main accounting systems (general ledger) and professional workforce at regional level to do the job.

4.2.2. Bill printing

Bill printing is including the following activities:
- Printing
- Enveloping
- Sorting for distribution

Printing requires specialised high speed equipment at least for printing and preferably for enveloping and sorting also in preparation of bill distribution. ***Enveloping*** and ***sorting*** can also be done manually, but it is extremely labour intensive, so using the specialised equipment for these operations is recommended. Since purchasing these equipments requires significant capital expenditures, it is obvious that centralised bill printing is more advantageous because otherwise equipment has to be purchased for each location. In a central location, also security and expertise are easier to ensure.

Also the following alternatives have to be considered:
- Bill printing, enveloping and sorting by water company own personnel involves expensive equipment purchase by the water company. Also equipment maintenance can be a significant issue and associated cost. On the other hand, the company has more control over the printing process, but in the same time has to have dedicated personnel for the job.
- Outsourced bill printing, enveloping and sorting to a specialised company. The main advantage of outsourcing this activity is the absence of the capital expenditure and the running cost of the activity might be lower than having it done internally, due to scale economies that such a specialised company is capable of.

4.2.3. Bill distribution

Bill distribution is about the way the issued bill reaches the individual customer. There are very many ways of doing the bill distribution, each one with its pros and cons such as:
- Distribution through water company’s own personnel or direct distribution is to be considered with two alternatives. One is distribution through the water meter readers at the moment of reading the water meter (which can be done in the case that the meter reading cycle is the same with the billing cycle) or separately on another visit (which can be done for same or different reading and billing cycles). The other one is distribution through other personnel dedicated to bills delivery (and alternatively cash directly with the same occasion). Direct distribution in both alternatives is one of the most used method by the Romanian water companies. It is very labour intensive and if coupled with meter reading or cashing has the same disadvantages related to customer presence and access to customer premises as meter reading with own meter readers. If it is not coupled with the meter reading or cashing, does not need customer presence or access on the property.
- Distribution through specialised distributors such as postal services and courier services by outsourcing the activity. In this case, the water company has no control over the distribution process in the case of postal services or indirect control through the contract in the case of courier services, but the costs of the distribution are directly identifiable. Outsourced distribution is worthwhile if the costs are lower than with direct distribution, which is in general the case. Also in general, courier services are less expensive

than postal services because courier services are on a competitive market and postal services have a price regulated by the state.

- Distribution through the customer who collects its bill from the company offices is an alternative which is not at all recommended although has the lowest cost and most of the customers might pay immediately the bill when they collect it. It is not recommended because the water company has no control over the distribution process. The customer might forget to collect and consequently pay the bill and if he does not, the bill can be collected only in the working hours when the most of the customers works too.
- Joint distribution with another utility company (i.e. electricity, gas) if the companies join forces and issue only one bill. The system is more used in western European countries. The companies share the costs and can support each other in all related activities such as meter reading, bill printing and revenue collection (i.e. disconnection is easier to be done for electricity for example than for water)
- Electronic billing is relatively new in Romania has the advantages of low cost and high speed. Its issue is regulated by the Law 260/2007 regarding commercial transactions through electronic means, Law 455/2001 regarding electronic signature, Law 451/2004 regarding the temporal maker and Decision 888/2008 of the ANRC. The disadvantage of electronic billing is that only the domestic customers having computers with Internet access can be billed like this (in general ICI customers have computers with Internet access). Also as electronic bill issuer the water company has to be a registered entity at the Ministry of Finance and its billing system has to be homologated by the ANRCTI (National Regulatory Authority for Communications and Information Technology). In the same time the electronic bill issuer has to pay a monthly fee for an electronic signature and temporal marker provider since a bill is a fiscal document which has to be issued under control.

4.3. Revenue Collection

Revenue collection is the ultimate purpose of the meter reading and billing processes. It provided the water company with the necessary cash for its activities. Since billing is the trigger for the revenue collection, the revenue collection cycle is in general the same with the billing cycle. The cycle might be different if the customer pays in advance or if he pays in more monthly instalments before or after the bill is issued. There are more ways of collecting the cash, such as:

- Revenue collection by water company’s own personnel either on site by field personnel (meter readers, field cashiers) or at the company’s cash office. Field cashing or door to door collection is not recommended due to high costs, the fact that the customer might not be at home or have money when visited and due to safety risks for the company’s personnel. Payments at company’s cash office (offices) can be done by cash or POS transactions. This type of payment requires travel to company’s offices during opening hours (not always suited for the customer) and sometimes queuing and involves the risk of manipulating cash. Both methods have the advantage of direct interaction with the customer and direct cash input control by the company. The company will have to deposit most of the cash at the bank, since the majority of its transactions are through its bank account. The water company will have to bare all the financial costs associated to the transactions.
- Revenue collection through post offices has the advantage of having the most developed network of payment points even in rural areas, opening hours can be more extended as water company’s opening hours and the system’s security not water company’s responsibility. The reconciliation of the bill is off line, there is no interaction with the customer and the company will bare the commission fee of cashing through this method, but the overall cost should be lower than cashing directly.
- Revenue collection through banks can take the form of cash payments at the bank, through bank transfer (classical or Internet banking), through bank’s ATMs. There are also other banking instruments through which payments can be made, but are less spread, such as direct debit (the customer mandates the bank to pay his bill at the date of payment directly from his account) or standing order (the customer gives authorization to the water company to directly debit his bank account for the water bill).

Cash payment at the bank is similar to cash payment at the postal office, except the fact that bank offices are not as wide spread as postal offices. Payments through bank transfer (classical or Internet banking), direct debit or standing order, are similar to cash payments, but have the advantage that the financial costs of the transactions are not bared by the water company and are safer since there is no cash around. ATM's have the advantage of being practically everywhere, opened 24 / 7 and the disadvantage that cost of the transaction is with the water company.

- Revenue collection through payments at commercial stores (supermarkets, hypermarkets), gas stations etc. have the advantage of longer opening hours and the fact that they are anyhow visited by the customer for shopping or fuelling, so it might be convenient for him to take the opportunity and pay his water bill. It might be necessary to provide guidance to the personnel of these cash points, the water company will have to pay a commission fee to the commercial agent and reconciliation of the bill is necessary since the transaction is off line.
- Revenue collection through other utility companies (in case of common meter reading and billing or only common billing), or through specialised revenue collection companies (might be the same or different companies as those for outsourced meter reading and / or billing). In this case, the utility or the specialised company, collects the revenues for the water company and the water company pays a fee (in general per bill) for the outsourced service. The water company has an advantage if the effectiveness and the efficiency of the revenue collection by outsourcing this activity are higher than by keeping it internally. The main disadvantage is that the water company has no direct control on how the revenue collection company is dealing with its customers, only an indirect control through the revenue collection contract.
- Another revenue collection method through specialised companies, is factoring. Through factoring, the water company "sells" its bills to a factoring company for a part of their value. Since the revenues for the biggest part of the bills can be easily collected by the water company for 100% of their value, factoring is typically a revenue collection method for outstanding bills. The disadvantage of the method is the fact that only a part of the revenues are collected (smaller and smaller as the factored bills are older and older). The advantage of the method is that through it, the water company gets a part of the cash which otherwise could not have been collected, either because is prescript or would mean laborious and costly legal procedures, for clients who cannot pay.

Except direct cashing through field cashiers or cash offices, the other methods are forms of outsourcing the revenue collection, on a more limited or extended scale.

5. Alternatives (Strategies) Analysis

As discussed in the previous chapters, there are more ways to deal with meter reading, billing and revenue collection in terms of systems, methods and technologies. After defining its policy, the water company should decide how far is from it and which is the best alternative to implement it. To do that, the current situation and the alternatives should be analysed in order to estimate their feasibility and benefits before taking the decision. A water company should do such a study every couple of years, since these processes are of such a high importance for the company and for the customers.

The following aspects should be taken into account:

- The customer relations policy and strategy, the PR policy and strategy and the meter reading, billing and revenue collection policy, together with the customer services PIs and customer relations PIs.
- Social opportunities and threats starting from customers' segmentation based on life style, needs, preferences and behavior determined from customer surveys, complaints analysis and customer feed - back as well as national trends. Different customer segments will have different characteristics with respect to water consumption or payment. Segments like: domestic / industrial / commercial /

institutional, urban / rural, active / retired, relative constant consumption / fluctuating consumption etc. should be established if they are relevant for the meter reading, billing and revenue collection processes.

- Technological opportunities and threats in terms of available technologies and systems for metering, billing and revenue collection: what is happening in the world and in the country regarding meters and metering, billing and revenue collection, with particular attention to banking systems, financial transfers, electronic transfers, internet banking etc..
- The strengths and weaknesses of the current meter reading, billing and revenue collection system, methods and technologies, together with the technical aspects related to connections and meters installed in the distribution system.
- Alternative meter reading, billing and revenue collection systems, methods and technologies: concepts, existing experiences, advantages, disadvantages. Systems used by others utility providers should also be investigated for process benchmarking purposes.
- Feasibility of different alternatives from the water company point of view in terms of internal changes in processes, procedures and structure, if and how change management can help
- Feasibility of different alternatives in terms of resources they need (financial, human etc.) and what is available in the company.
- Cost benefit analysis of the feasible alternatives identified.
- Internal changes and main implementation aspects of the feasible alternatives.

6. Preferred Option

For selecting the preferred option to be implemented, the water company should take a decision based on some relevant criteria on which the feasible alternatives should be ranked against. Also, the water company should formulate the change objectives in line with the meter reading, billing and revenue collection policy. The following criteria may be considered:

- Overall cost of the system for 5 years until revision, composed from set up costs plus 5 x operating costs
- Effectiveness of the system from cash flow point of view (matching with company's cash flow needs, clarity and easiness for the customer using the payment system)
- System's safety and system's perceived safety (safety of the customers, safety of company's staff and safety of the transaction, customer and staff perception about safety)
- Convenience for the customer (limited disturbance, safety perception, adequacy to customer's habits, limited waiting time, flexibility of the system, alternatives for each process step to better fit customer's preferences etc.)
- Congruence with the desired image of the company (modern, traditional, reliable etc.)
- Speed of the cash transaction and speed of information both from client and company point of view (simultaneous immediate transaction and information, immediate information and delayed transaction, immediate transaction and delayed information, simultaneous delayed transaction and information)
- How adequate and unitary is the system in the whole supply area (urban / rural, small and medium towns / big towns)
- How long is the suppliers' technical support for the implemented system
- Customer relations opportunities (communication opportunities for customer / company)
- System acceptance (by company's staff / customers)
- System understanding (by company's staff / customers)
- System reliability and accountability (timely, correctly, entirely reflection of transactions and customer accounts)

In order to rank the alternatives, the water company should also decide upfront if all the criteria have the same importance or not. The best ranked alternative should be the preferred option.

7. Important Aspects in Implementation

After deciding on the preferred option, the water company should develop a more detailed implementation plan, including activities, responsibilities assigned and necessary resources. The company should also not forget a few important additional aspects, such as:

- Any change is implemented might affect the whole chain of processes (changing in the billing system might generate changes in the revenue collection system). Adjustments at the customer and billing data base might also be necessary and depending on the situation might necessitate considerable investments in hardware, software and communication.
- Introduction of various revenue collection channels will generate communication between the central data base and the banks, various water company's cash offices and different commercial entities cashing for the water company which have to be managed.
- As a consequence of modifications in the meter reading, billing and collection systems, the services supply regulation and / or the services contract might have to be amended, amendments which might need regulator's approval.
- An important activity which neglected can generate failure in new systems implementation is communication with the customers and with the staff about the changes in the existing procedures. Where the customers have more alternatives, the requirements, advantages and disadvantages for the customers should be clearly announced. Leaflets, media, websites and communication on bills are means of communication which can be successfully used. A communication plan as part of the PR plan should be designed.
- Training of the personnel who have customer tasks in the new procedures, methods and technologies should not be forgotten
- The consequences of changes in meter reading, billing and revenue collection systems over the organization should be mapped. Consequences should also be mapped with other water company's objectives on which might impact.
- To help on customer adopting different methods (self reading, payment through bank etc.), incentives or discouraging measures can be implemented as part of the implementation process

Changes will not immediately and entirely be accepted by all of the customers. Some of them may very late or never accept the changes and continue to stick to the old methods, so the water company should realized that an innovation or change will not immediately be accepted of be a success. This is why communication and other marketing instruments are very important.

Annex A - Commercial principles for metering policy regarding customer meters:

- To improve transparency and confidence of the customer, 100% metering is envisaged
- To improve relations with the end customer and revenue collection, preferably customer metering will target the metering of the end user and will facilitate individual disconnection
- To facilitate the meter reading by both staff and customers, the connection chamber will be designed and executed accordingly
- To minimize apparent losses, properly dimensioning the meters is necessary together with a minimum B class accuracy
- To better capture the consumption of the customers with large variations in water consumption, combined meters are preferred
- To minimize maintenance costs, the commercial meters producers range and types will be limited.