Modernization of local public services in the Republic of Moldova

- Intervention area 2: Regional planning and programming -

Feasibility study for the project „Improving wastewater collection services in the town of Leova”

Final report

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Acronyms and abbreviations

ADA	Austrian Development Agency
AMAC	Association “Moldova Apa-Canal”
ANRE	National Agency for Energy Regulation
ASAD	Active Sludge Aeration Tanks
ATU	Autonomous Territorial Unit
BAU	Business as Usual
BOD	Biochemical Oxygen Demand
CBA	Cost-Benefit Analysis
CCTV	Closed-circuit television
CNAS	National Social Insurance House (Casa Națională de Asigurări Sociale)
COD	Chemical Oxygen Demand
CzDA	Czech Development Agency
DMA	District Metering Area (zone for active leakage control)
DR	Development Region
DRC	Development Region Centre
DRN	Development Region North
DRS	Development Region South
EBRD	European Bank for Reconstruction and Development
EIB	European Investment Bank
EIM	Environmental Impact Assessment
ENPV	Economic Net Present Value
ERR	Economic Rate of Return
ESA	Environmental and Social Assessment
EU	European Union
EUR	Euro- official currency of the European Union's member states
FFE	Foreign Funded Enterprises
FIDIC	Fédération Internationale des Ingénieurs Conseils (frz.) - International Federation of Consulting Engineers (engl.)
FNPV(C)	Financial Net Present Value of the Investment
FNPV(K)	Financial Net Present Value of the Capital
FOPIP	Financial and Operational Performance Improvement Programme
FRR(C)	Financial Rate of Return of the Investment
FRR(K)	Financial Rate of Return of the Capital
FS	Feasibility Study
GD	Government Decision
GDP	Gross Domestic Product
GIZ	German Development Cooperation through Deutsche Gesellschaft für Internationale Zusammenarbeit
GPS	Global Positioning System
HDPE	High-density polyethylene
IFA	International Financing Agency
IFI	International Financial Institution
IFO	Institute of Financial Operations
IIC	International Insurance Company
IMF	International Monetary Fund
IPE	Individual Private Enterprise
IRR	Internal rate of return
IWA	International Water Association
JSC	Joint Stock Company
KfW	Kreditanstalt für Wiederaufbau (KfW German Bank for Development)

LGA	Local Government Association
LIP	Long-Term Investment Programme
LPA	Local Public Administration
LT	Long term
Ltd.	Limited Liability Company
MBBR	Moving Bed Biofilm Reactor
MDL	Moldovan Lei
ME	Municipal Enterprise
MLPS	Modernization of Local Public Services
MoE	Ministry of Environment
MRDC	Ministry of Regional Development and Construction
MT	Medium term
MWWPS	Main Waste Water Pumping Station
n/a	Not available
n/f	Not functional
NBS	National Bureau of Statistics
NDS	National Development Strategy
NEF	National Ecological Fund
NFRD	National Fund for Regional Development
NHIC	National Health Insurance Company
NIF	Neighbourhood Investment Fund
NIS	Network Information System
NP	Nominal Pressure
NPV	Net present value
NRW	Non-Revenue Water
OD	Outside Diameter (of pipe)
PAAS	Water Supply and Sanitation Plan
PAI	Project Area of Influence
PE	Population Equivalent
PE60	Population Equivalent based on 60 g BOD/capita/day
PH	Phase
PIP	Priority Investment Programme/Plan
PIU	Project Implementation Unit
PP	Poly-propylene
PPC	Possible Project Concept
PPP	Public-Private Partnerships
PS/WPS/WSPS	Water (Supply) Pumping Station
PVC	Polyvinyl chloride
PWG	Project Working Group
Qdmax	Maximum daily dry weather flow
QDWF	Maximum hourly dry weather flow
QSWF	Maximum hourly storm water flow
RDA	Regional Development Agency
RDS	Regional Development Strategy
RM	Republic of Moldova
ROA	Return on Assets
ROC	Regional Operating Company
ROE	Return on Equity
RPP	Regional Planning and Programing
RSP	Regional Sector Programme
RtG	”Ready-to-go” Project

SCADA	Supervisory Control and Data Acquisition
SDI	State Design Institute
SEE	State Ecological Inspectorate
SEI	State Ecological Expertise
SGAP	Social and Gender Action Plan
SN	Sewerage network
SNiP	Norms and Rules in Construction
SoE	State-owned Enterprise
ST	Short term
TA	Technical Assistance
TC	Trading company
TP/WTP	Water Treatment Plant
USAID	United States Agency for International Development
VAT	Value-Added Tax
VPC	Viable Project Concept
WB	Word Bank
WDS	Water distribution networks
WSS	Water Supply and Sanitation
WT	Water Tower
WWPS	Waste Water Pumping Station
WWTP	Waste Water Treatment Plant

Glossary

The main definitions used in this document are following:

Aquifer – underground layer of rock or other types of geological layers with a porosity and permeability able to allow a significant flow of underground water or to capture significant quantities of underground water.

Water transmission main – a part of water supply system, comprising pipelines included between water intake and public transportation or distribution networks.

Agglomeration – an area where the population and/or economic activities are sufficiently concentrated for urban waste water to be collected and conducted to an urban waste water treatment plant or to a final discharge point *(definition according to Directive 91/271/EEC)*.

Water supply – overall activities and works carried out with the aim to capture treat, transport, store and distribute drinking water to the final consumers.

Raw water – Intake water before any treatment or use.

Water sold – authorised water consumption which is billed and generate revenue (also known as revenue water). It is equal to billed and metered water consumption plus the billed unmetered water consumption.

Non-revenue water (NRW) – is the difference between the total system input volumes of water and the billed authorized water consumption. The main problems faced by the public water utilities and LPAs is to reduce high levels of non-revenue water. High levels of non-revenue water reflects high volume of water lost through leakages (physical/real water losses), non-revenue water or properly unmetered water (apparent/commercial water losses) or both.

Drinking water –water intended for human consumption, to be used directly or indirectly, for a long period of time without affecting negatively the health, which is as follows:

- All water either in its original state or after treatment, intended for drinking, cooking, food preparation or other domestic purposes, regardless of its origin and whether it is supplied from a distribution network, from a tanker, or in bottles or containers;
- All water used in any food-production undertaking for the manufacture, processing, preservation or marketing of products or substances intended for human consumption, unless the Ministry of Health and Ministry of Agriculture and Food Industry approved the use of water for technological purposes, showing that water used do not affect the quality and wholesomeness of the food stuff in their ready to use condition/state;
- Water from local sources, such as wells, springs, etc., used for drinking, cooking meals or other domestic purposes.

Treated water – water that is intended for human consumption and use, considered to be free of toxic substances and pathogenic bacteria, cysts and viruses; good drinking water that has been or will be further treated in order to improve the aesthetic quality and/ or reducing the content of undesirable minerals and other substances known or unknown, by one or more water treatment processes on the site where it is used.

Surface water – still water and flow water having contact with the soil surface.

Storm water – is pure rainwater plus anything the rain carries along with it and snow melting.

Groundwater – waters below the soil surface, in the zone of saturation and in contact with the soil or the subsoil.

Industrial wastewater – any waste water which is discharged from premises used for carrying on any trade or industry, other than domestic wastewater and run-off rain water.

Domestic wastewater – waste water from residential settlements and services which originates predominantly from the human metabolism and from household activities (definition according to EU Directive 91/271/EEC).

Urban wastewater – means domestic waste water or the mixture of domestic waste water with industrial waste water and/or run-off rain water.

Wastewater –waters that come from domestic, social and economic activities, containing pollutants or residues, this water being adversely affected in quality by anthropogenic influence, the physical, chemical and bacteriological baseline being changed.

Water service connection – a segment of the public water supply network, which provides the link between the water distribution network and internal piping of the buildings.

Service connection – the realisation by the operator of public water supply and sewerage networks of a permanent connection of the consumer's water and / or sewage facility to public water supply and / or sewerage networks.

Water tower – an elevated structure supporting a water tank constructed at a height sufficient to pressurize a water supply system for the distribution of drinking water, and to provide emergency storage for fire protection. The water tower is composed of a metal, reinforced concrete or varied shape bricks reservoir (usual spherical one) and pillar for support.

Manhole – underground construction designed for the protection and access to the flow control valve for water, drain, ventilation, etc.

Concentration – mass-volume ratio of the total volume of wastewater discharged within a certain timeframe.

Pipeline – assembly of pipes, by means of which the water is transported.

Pressure pipe – rising pipe for transportation under pressure of water or wastewater.

P.E. (population equivalent) - means the organic biodegradable load having a five-day biochemical oxygen demand (BOD5) of 60 g of oxygen per day.

Consumer – person or organisation that uses water supply and wastewater services or commodities according to a contract with the operator.

Biochemical oxygen demand (BOD) – is the amount of dissolved oxygen needed (i. e., demanded) by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period or the concentration of dissolved oxygen, in the given conditions (t days at 20 degrees Celsius with or without nitrification inhibition) by biological oxidation of organic material and / or inorganic water.

Chemical oxygen demand (COD) – the concentration of the oxygen required to oxidize soluble and particulate organic matter in water.

Water quality indicators –pollutants values, based on scientific researches, developed and updated by competent national authority. The concentration criteria and recommended values, or narrative descriptions that should not be exceeded for a water body to protect aquatic life or human health.

Volume of water/water flow rate – is the volume of fluid which passes through cross-section pipe within a unit time.

Biological treatment – the biological treatment of wastewater using a biological process with a secondary settlement or another process, which complies with actual national standards.

Mechanical treatment – treatment of waste water by means of a physical process and/or chemical process, involving settlement of suspended solids or other processes in which the BOD_5 of the influent wastewater is reduced by at least 20%, and suspended solids at least 50%.

Tertiary treatment (advanced) – treatment process which results in a more advanced treatment than that obtained by mechanical and biological wastewater treatment or it is the additional process designed to improve the quality of purified water so that it can be discharged into the natural environment or re-used.

Septic tank – is an underground reservoir designed for wastewater obtained from a household. Bacteria from wastewater decompose organic waste and sludge deposits on the bottom of the tank. The effluent flows into the soil through the drainage channels.

Drinking water supplier – business entity, which supply drinking water to consumer on a centralised basis.

Spring – the place where the underground water, meeting the hydrogeological favourable conditions, is brought to the ground surface (if the water carrying permeable water bed which ends top-down at the ground level on an impermeable bed, the water bed can only reach the surface to form springs).

Underground dam – a watercourse (lake) embanked by a dam, levee, dam or other barrier. It is used for collecting and storing water to a future use.

Suspended solids (SS) – the concentration of solids in a liquid, usually determined by filtering or centrifuging and then drying under specified conditions.

Groundwater level – level under which the soil is saturated with water.

Real water consumption (specific water flow rate) – the volume of water consumed by one customer during 24 hours to meet the physiological and domestic needs under normal and exceptional operation conditions of the water supply system (l/c/d).

Sanitary and hygienic (quality) standards for drinking water – physical-chemical, microbiological and organoleptic indicators which drinking water must meet in order to endanger the health consumption; indicators are established in sanitations rules and standards approved by the Government.

Operator – a legal person operating and maintaining a public water supply and/or sanitation system providing the consumers with public water supply and/or sanitation services based on a direct contract.

Sludge - means residual sludge, whether treated or untreated, from urban waste water treatment plants.

Sludge dewatering - drying and sludge dewatering structure by removing water and evaporating it.

Apparent (water) losses/commercial losses - including all types of errors associated with consumer metering and data processing errors (meter reading and billing), plus unauthorized consumption (theft or illegal use).

Water loss - is a quantity of water, which leaks from installations or network because of poor tightness of pipe joints, emergencies and etc. Determinative factors are: pressure, deteriorated conduits, low quality of pipes materials and execution, soil characteristics, traffic loads, corrosion of pipelines (due to vagabond electric current), grade and type of measurement.

Real (water) losses/physical losses - involving leaks and spills from tanks/reservoirs, losses related to pipe connections up to counter and water transport and distribution pipes leaking up to the consumer's meter.

Water supply and sanitation program (WSSP) - is a document planning investments for the long term development of the water supply and sanitation infrastructure, worked out for a specific region, rayon or locality (municipality, city, locality, commune), so as to perfectly fit the existing systems as well as the funds and constraints related to the local water sources and the provisions of the law in force.

Water intake structure - all construction structures and facilities which serve for the introduction of the necessary volume of water in the water transmission main (abstracted from a river, lake, reservoir, etc.) with the purpose of water supply or irrigation.

Sewer connections – sewer collector provides the connection between the indoor consumer sewer facility and public sewer collector.

Water resources - sources of water that are useful or potentially useful including surface waters, ground water and atmospheric precipitations/rainfall which fell on the territory of the Republic of Moldova;

Sewerage network - a system of underground pipelines and additional structures collecting and transporting urban and/or industrial wastewater.

Water distribution network - created from pipelines, armature and other structures which supplies water to consumers. It is the most expensive facility/object, because of lengths, service works and water losses.

Underground water reservoir - storage of water volume needed to: compensate the consumption per hour, emergency reserves and reserves required for firefighting.

Water supply system – a set of constructions and sites, operating installations/facilities, and specific endowments, by which the water captured from a natural source is treated, transported, stored and distributed to the consumers based on a stable pressure, according to the quantity and quality norms in force.

Wastewater system – a number of structures and facilities, networks, pumping stations, wastewater treatment plants etc. by which the evacuation, transportation, treatment and disinfection of wastewater and sludge management is carried out. Treated and disinfected wastewater is discharged into a water stream or other natural water body.

Drilled or shallow well - underground water intake construction/structure, which main dimension is developed by vertical line, aiming to reach the ground water resources; structure or installation/facility used with the purpose to obtain groundwater from an aquifer for an advantageous use.

Water quality standard - concentrations/ maximum admissible values recommended or mandatory for chemicals and microorganisms in drinking water. These amounts are established for the water used by municipalities (provided by public water supply systems), industrial and agricultural enterprises, and entertainment areas.

Wastewater treatment plant - consisting of all wastewater treatment installations; their size and form varies according to the adopted methods of treatment; mechanical treatment consists in removing of suspended solids by physical processes from wastewater; the biological treatment uses the activities of microorganisms to oxidize and mineralize the organic substances in wastewater, which previously was subjected to a mechanical treatment;

Water pumping station - to ensure on demand the required pressure in the distribution network.

Wastewater pumping stations –the pumping stations to be provided and designed in cases when configuration of the relief does not give possibility to collect and transport wastewater gravitationally. In such cases wastewater is pumped by pressure pipelines.

Water treatment plant - used for enhancing the quality of raw water from the river to the water quality criteria necessary for human consumption.

Water supply source - water natural resource (surface water, groundwater, etc.) to be used (or could be used) with the purpose to abstract water in the water supply system.

Sludge Treatment - all stages of transformation of sludge with the purpose to be used or disposed which could include thickening, stabilizing, conditioning, thermal hydrolysis, dewatering, drying, disinfection, sludge incineration.

Pipe – unit/piece in the cylindrical form, hollow in interior, made of metal, plastic, etc. and used for the distribution and transport of water and wastewater.

Sanitary protection area – unique territory, which includes water sources, constructions and water supply installations/facilities, for water protection.organisation

Executive summary

Since 2010, the Modernization of Local Public Services Project (MLPS), acting on mutual agreement between Moldovan and German governments, has supported Moldovan Local PublicAuthorities (LPAs) in extending and modernising service provision in water supply and sanitation, solid waste management, regional and local roads, and energy efficiency of public buildings sectors.

The MLPS Project has the objective to improve the local public service delivery by local planning and programming, improving local public services infrastructure, capacity development of local public administration and local public service providers. As part of a major planning and programming programme, MLPS committed to facilitate the development of pipeline of feasible, cost-effective investment projects in the aforementioned sectors.

This Feasibility Study (FS) Report proposes a structured phasing of the **Priority Investment Programme (PIP)** and creating necessary conditions for further implementation of the PIP in **Leova Rayon**. The FS particularly focuses on implementation of the first phase of the PIP, covering period of 2015-2018 and further named **the Project**.

The PIP covers the area of the town Leova as well as Filipeni, Hanasenii Noi and Romanovca localities. The Project includes the town Leova only

Main beneficiaries of this study are the inhabitants from the above-mentioned localities, which will have access to improved Water Supply and Sanitation (WSS) services

Problem statement and Objective

The following major **problems** to be addressed in the feasibility study were identified during the preliminary project phases:

- Insufficient area coverage of the WSS services.
- Unsatisfactory levels of service, including:
  - Continuity of wastewater service. Some parts of the town suffer of often blockages of sewer mains, requiring continuous maintenance works;
  - Poor environmental conditions due to inadequately functioning wastewater treatment plant.
- As for the operational efficiency, the main problems encountered by the company are as follows:
  - Low pumping efficiency at the existing pumping facilities.
  - Low staff efficiency ratio, as a result of inefficient operation of facilities and overstaffing of the utility;
  - Poor asset management and lack of preventive maintenance, resulting in obsolete pipelines and facilities.

The **objective** of the present feasibility study is the development of an affordable, least-cost and cost-effective phased investment programme for water and wastewater infrastructure to be rehabilitated and extended, as well as facilitation of regionalisation of the WSS services and inter-municipal cooperation with strong social and environmental benefits, as part of the implementation of the provisions of the WSS Regional Sector Plan and Water Supply and Sanitation Strategy (2014-2028).

- The proposed Priority Investment Programme (2015-2021) is expected to result in improved access to regional water supply and sanitation services for the Town of Leova, as well as the localities of Hanasenii Noi, Filipeni and Romanovca to contrib-ute to the achievement of the regional WSS sector development indicators on ac-cess to water supply and wastewater services. The aim of the PIP is to extend the coverage and connection rates of the population connected to wastewater services by 44% from 48% to 92% of coverage rate and by 26% from 31% to 57%of connection rate.
- The aim of the first phase -Project (2015-2018) for the town of Leova is to extend the access of the population to wastewater services by 12% from 70% to 82% of coverage rate and by 8% from 44% to 52% of connection rate.

Legal aspects:

Organisation

In the process of regulating and developing the water supply and wastewater sector the competences belong to the central public authorities, while the establishment, organisation and management of these services is the responsibility of local authorities and operators of public water supply and sanitation services.

The main sector policy document, *Strategy for Water Supply and Sanitation* (2014-2028) includes new approaches on structuring, financial planning and project identification, on which should be based sector development and institutional reforms in the sector in order to overcome excessive fragmentation through regionalisation.

"*Regionalisation*" is the main aspect of the development policy of the water supply and wastewater services sector. This policy aims to improve sector performance through better management and professionalism, and benefiting from economies of scale as well.regionalisation

Currently, the public water supply and wastewater services are organised and operated in the town of Leova only. The right and obligation to provide these services, including the management and operation of public water supply and wastewater systems, was granted to a sole existing operator - Joint Stock Company "Apa-Canal Leova" - under a delegated management contract of regional water supply and wastewater public services. In administrative-territorial units of Filipeni, Romanovca and Hanasenii Noi the centralised water supply service are not organised.

Following the national policy in the sector, and the positive aspects of regionalisation of water supply and wastewater public service internationally, it is recommended joint operation of the service and joint development of the projects related to its infrastructure. This policy was supported unanimously by the local authorities in all administrative units: Leova, Filipeni, Romanovca and Hanasenii Noi.

The institutional model of regionalisation of water supply and wastewater public services in Leova Rayon, developed under the current legislation, comprises two key elements: i) Regional Operator and ii) delegated management contract which regulates the relationship between regional operator and local authorities.

Regionalisation of water supply and wastewater services will involve the extension of service area in all localities included in the feasibility study, initially in the urban areas, and afterwards in the rural areas. The existing organisational structure of the joint stock company ‘Apa-Canal Leova’ will require significant changes in order to cover the increasing demands of expanding service area.

Technical aspects and investment programme:

The Investment Programme includes (i) short-term, (ii) medium-term and (iii) long-term measures. The short-term measures are referred to as Priority Investment Measures and are again sub-divided into two sub-phases as follows:

- Phase 1 – priority measures to be implemented until 2018
- Phase 2 – priority measures to implemented between 2018 and 2021 (depending on the availability of funds and the capacity of the implementing and operating agency this period might be extended).

Priority investment measures retained in Phase 1 are referred to as “The Project” for which further assessments have been carried out (Option Analysis, Financial Analysis, Environmental Assessment, etc.) in this study.

General:

The Investment Programme includes (i) short-term, (ii) medium-term and (iii) long-term measures. The short-term measures are referred to as Priority Investment Measures and are again sub-divided into two sub-phases as follows:

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Priority investment measures retained in Phase 1 are referred to as “The Project” for which further assessments have been carried out (Option Analysis, Financial Analysis, Environmental Assessment, etc.) in this study.

Investment framework:

Water Supply:

Currently there are about 10,352 inhabitants connected to the existing water supply system in the town of Leova, this is 95 % of the population in the town of Leova. Service is provided continuously and the water quality corresponds to the national drinking water standards. With support of an ongoing EBRD project part of the water supply network has been rehabilitated. Further optimization of network operation is proposed in a medium-term (after Phase2). These optimizations shall include continuous replacement of existing old pipeline sections, as well as the establishment of adequate system operation and control comprising pressure zoning, district metering and leakage monitoring with installation of permanent and temporary measure and control spots and work routines.

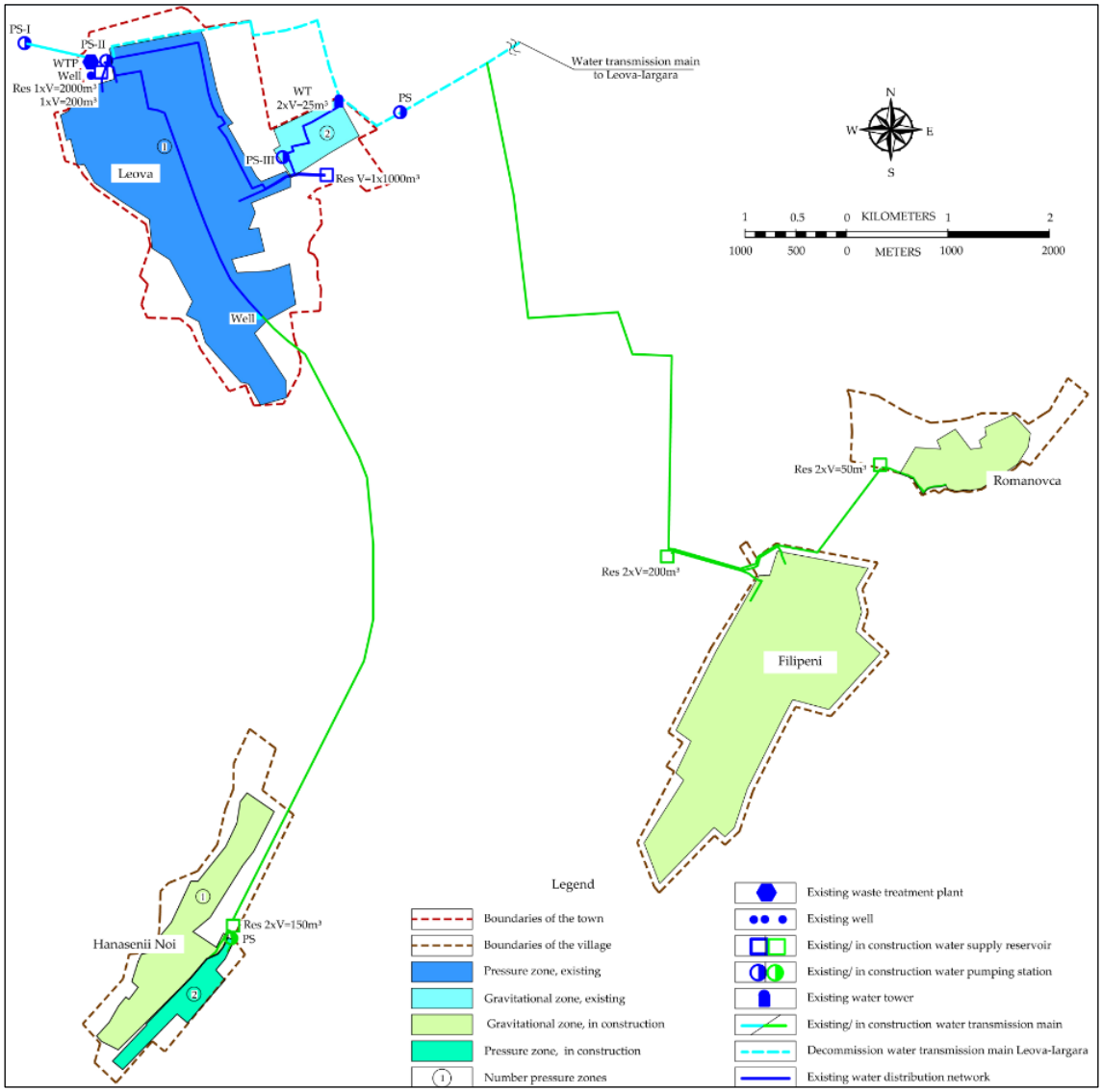
The localities Filipeni, Hanasenii Noi, and Romanovca in the vicinity of the town of Leova are currently not connected to the water supply system of Leova but JSC ‘Apa-Canal’ Leova envisages connecting these localities in the near future. Parts of the new water facilities are already installed; the completion of the systems is expected by 2018. The total current population in these localities amounts to 4,831.

The water source for the town of Leova and the three localities planned to be connected is the Pruth River. The available water quantity and the treatment capacities are in general sufficient to cover the projected water demand for the long-term. However, the water treatment plant needs a rehabilitation in the medium term or even replacement, depending on further plans of the rayon administration regarding enlargement of the

service area of the water supply system. The rehabilitation of the water treatment plant is intended to be funded by the German Regional Development Fund, administrated by the German Development Cooperation (GIZ), the detailed design is in process.

Considering the above, it is concluded that the water supply is ensured for the town of Leova and the neighbouring localities Filipeni, Hanasenii Noi, and Romanovca. Therefore no capital investments are foreseen within the framework of this study.

Figure 0-1: Scheme of the existing water supply system and the extensions in process for the town of Leova and the localities Filipeni, Hanasenii Noi, and Romanovca



Source: GIZ/MLPS

Wastewater:

Currently only the town of Leova is partly endowed with an existing wastewater system. Some 4,812 people are currently connected to the sewerage network (44 % connection rate). The collected wastewater is treated in the already quite outdated wastewater treatment plant (WWTP) in the town of Leova. The other localities in the study area, Filipeni, Hanasenii Noi, and Romanovca, do not have any centralized sanitation facilities.

It is proposed to extent the sewer system in the town of Leova and to increase the connection rate in in two steps to 61 % (6,463 population) by 2021[1]. Therefore, in Phase 1 an extension of the sewer network in Leova with a length of about 9.9 km is proposed. For Phase 2, further extension of the sewer network in Leova with a length of about 12.1 km is proposed.

For the localities Filipeni, Hanasenii Noi, and Romanovca individual wastewater systems are planned in Phase 2. This requires sewer systems with a length of all in of about 34.2 km, 3.9 km of pressure lines, 4 WWPS and 3 wastewater treatment plants in Phase 2. A thorough agglomeration study (proposed to be included in Phase 1 of this project) shall to be carried out for the entire rayon in order to assess which localities should get individual systems and which shall be connected to the WWTP Leova Town in the future.

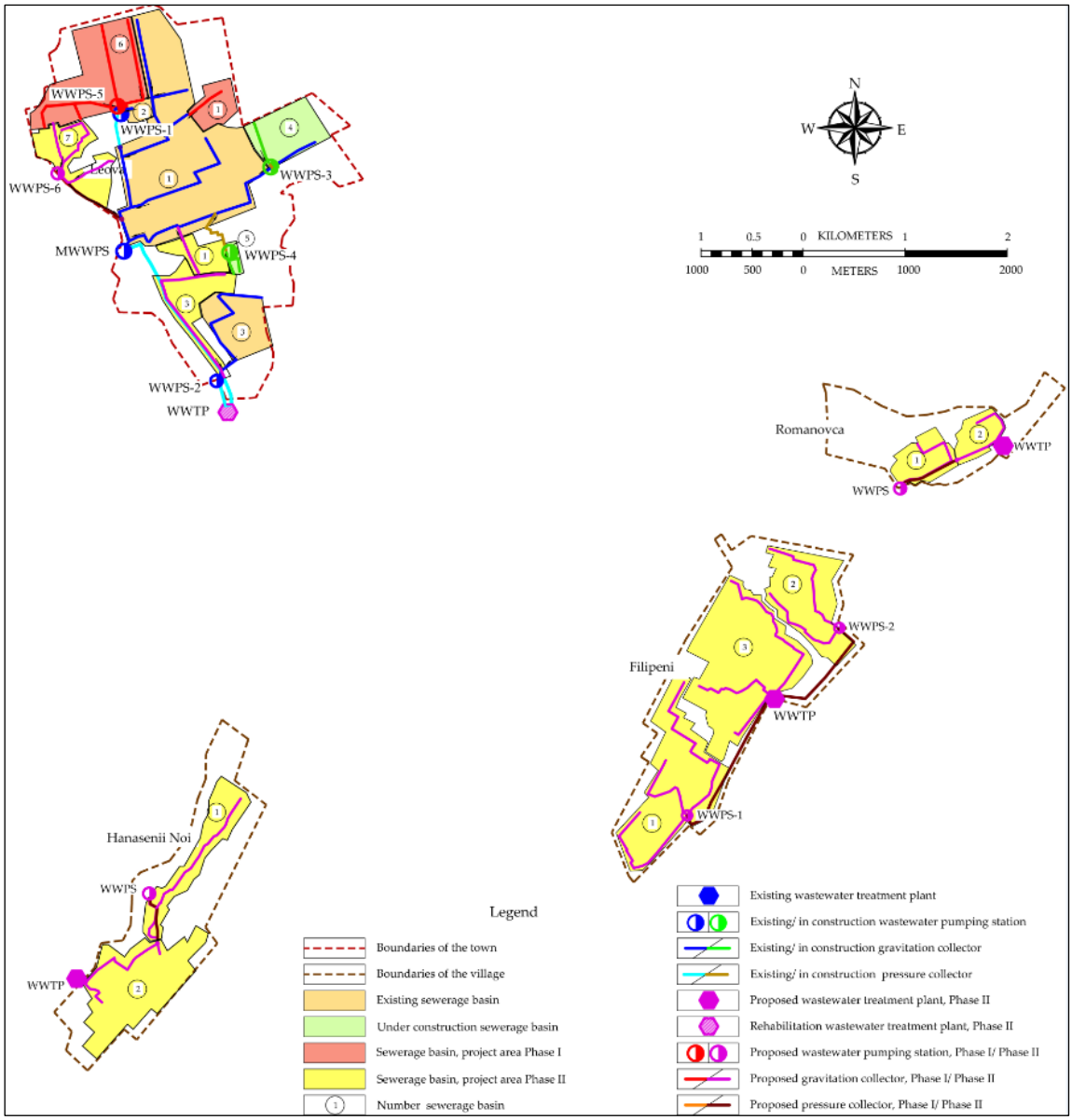
The wastewater load generated in the project area is projected to increase from currently 5,168 P.E. to 9,446 P.E. in 2021 and will then increase to 14,484 P.E. in 2045.

In the short term (until 2021), it is proposed to continue using the existing WWTP Leova which has sufficient capacity even for the long-term needs. However, the condition of the WWTP is poor and for the medium and long term (from 2021) a new WWTP for Leova (and neighbouring localities according the proposed analysis) is needed. This is included in the Phase 2 capital investments.

The design capacity of the future WWTP will depend on the above mentioned agglomeration analysis, depending on the number of localities to be connected to the WWTP in Leova the design capacity could be from 10,000 P.E. (only Leova town) up to 15,000 P.E. in 2045. In order to avoid overcapacities, a staged approach for developing the capacities of the WWTP in Leova is recommended.

[1] After implementation of Phase 2 of the proposed measures

Figure 0-2: Scheme of the existing sewer system and the proposed extensions of the sewer system in the town of Leova and the localities Filipeni, Hanasenii Noi, and Romanovca



Source: GIZ/MLPS

Priority investment plan

The proposed Priority Investment Plan for Phase 1 and Phase 2 including capital investments, equipment and technical assistance as well as the benefit of the proposed measures is presented in the table below. The total cost for the measures in Phase 1 amount to about 3.0 MEUR and 15,599 people will benefit from the proposed measures. The total costs for measures proposed in Phase 2 amount to about 18 MEUR and 15,475 people will benefit from the measures. The total project costs for Phase 1 and Phase 2 amount to 21 MEUR.

Table 0-1: Proposed investment measures Phase 1 ("The Project")

No	Measure	Costs [€]	Benefit
1	**Capital Investment**		
1.1	Extension of the sewer network in the town of Leova by 9,870 m and one wastewater pumping station in Leova	2,014,250	Wastewater coverage rate increased from 70 % to 82 % in the town of Leova (1,212 additional people served)
1.2	Equipment and Tools for operational performance improvement	200,000	Level of service and efficiency improvement for all people connected to the water supply and wastewater system (15,599 in 2018)
ST-1	**Sub-Total Capital Investment**	**2,214,250**	
2	Technical Assistance	565,710	Level of service and efficiency improvement for all people connected to the water supply and wastewater system (15,599 in 2018)
3	Contingencies (10 % of 1+2+3)	277,996	
GT-I	**Total Costs for Phase 1**	**3,057,956**	Additional 1,212 people will be served with sanitation. In total 15,599 people will benefit from the water supply and wastewater measures.

Table 0-2: Proposed investment measures Phase 2

No	Measure	Costs [€]	Benefit
1	**Capital Investment**		
1.1	Extension of the sewer network in the town of Leova by 12,060 m, re-habilitation of 2,820 m, 1 WWPS and 1 WWTP in Leova	6,063,830	Wastewater coverage rate increased from 82 % to 98 % in the town of Leova (1,551 additional people served); Level of service and efficiency improvement for all people covered with sanitation in the town of Leova (10,363 in 2021); Improved environmental performance; compliance with effluent standards.
1.2	Construction of the sewer network in the localities of Filipeni, Hanasenii Noi, and Romanovca of 38,100 m, 4 WWPS and 3 WWTP in Leova	8,547,940	Wastewater coverage rate increased from 0 % to about 80 % in the three localities (3,894 additional people served); Level of service and efficiency improvement for all people covered with sanitation in the three localities (3,894 in 2021); Improved environmental performance; compliance with effluent standards.
ST-1	**Sub-Total Capital Investment**	**14,611,770**	
2	Technical Assistance	1,753,412	Level of service and efficiency improvement for all people connected to the water supply and wastewater system (15,475 in 2021)
3	Contingencies (10 % of 1+2)	1,636,518	
GT-II	**Total Costs for Phase 2**	**18,001,701**	Additional 5,445 people will be served with sanitation. In total 15,475 people will benefit from the water supply and wastewater measures.

Table 0-3: Summary of investment costs Phase 1 and 2

No	Component	Costs Phase 1	Costs Phase 2	Costs Phase 1 & 2
		EUR	EUR	EUR
1	Water supply and wastewater, capital investments			
1.1	Wastewater	2,014,250	14,611,770	16,626,020
1.2	Equipment and Tools for operational performance improvement (water supply and wastewater)	200,000		
ST-1	Sub-total capital investments Water Supply and Wastewater	2,214,250	14,611,770	16,826,020
2	Technical Assistance	565,710	1,753,412	2,319,122
3	Contingencies	277,996	1,636,518	1,914,514
Total	**Total Costs Phase 1 & 2**	**3,057,956**	**18,001,701**	**21,059,657**

Source: GIZ/MLPS

Financial aspects

The financial and economic analysis was developed using the incremental analysis, which considers the differences in the costs and benefits between two alternatives. It compares the project scenario with the baseline scenario without the project or Business as Usual (BAU) scenario, which means 'do-nothing'.

The financial and economic analysis is developed based on the macroeconomic assumptions which include the forecast of the principal macroeconomic figures such as: GDP per capita, the Real Wages increase, evolution of Electricity Prices etc.

In the period 2012-2014 the Operator generated losses from operating activities in two of the last three years, which reveals that the company encountered some cash liquidity difficulties. Thus, in 2012 the losses amounted to MDL 235.1 thousand and in 2014 – MDL 514.1 thousand. This reflects that the operator used the cash generated from depreciation to pay current liabilities, and no cash flow remains for investment purposes to rehabilitate and replace the fixed assets. As well, this reflects that the operator has no creditworthiness capacity at the moment.

The investment costs of the project are estimated to amount of MDL 63.54 million or EUR 3.06 million. It is planned that the project will be implemented during a period of 3 years. In the first year it is planned that the project will be implemented in proportion of 10 %, in the second year it is foreseen 50 % to be covered and in third year - 40%. The Summary of the investment costs are presented in the table below.

Table 0-4: Summary of the investment cost (MDL mil.)

Project investment outlays	2015 (MDL mil.)	2016 (MDL mil.)	2017 (MDL mil.)	Total (MDL mil.)
	10%	50%	40%	
Extension of sewer network	4.12	20.60	16.48	41.19
Wastewater pumping station	0.07	0.33	0.26	0.66
Equipment and Tools	0.42	2.08	1.66	4.16
Detailed design and procurement	0.55	2.76	2.21	5.52
Technical assistance, supervision and capacity development	0.62	3.12	2.49	6.23
Contingency	0.58	2.89	2.31	5.78
Total	**6.35**	**31.77**	**25.41**	**63.54**

Source: GIZ/MLPS

The total investment outlays will be financed by: domestic and international donors; national sources (national development funds, local and central budgets, water operator sources) and citizens contribution.

The donor contribution was estimated to be approximately 80.7% of the total investment costs, that constitutes about EUR 2.47 million, while the local sources' contribution is 19.3 %, which is about EUR 0.59 million.

In the development of the financial forecast of the project was used the weighted average tariff for providing services.

The proposed tariffs take into account the cost coverage principle and the tariff affordability level. The cost coverage principle means that the tariff should cover the operational costs and capital costs. The weighted average tariff for delivering water services is proposed to get increased slowly in time, beginning from medium tariff which is approximately 27.50 MDL/m3 and is projected to reach the value of about 35.50 MDL/m3 in 2045. During the construction period, when capital costs increase significantly and water sale is limited, it is proposed that tariff does not include depreciation costs. The total costs (the operational costs and depreciation cost) will be covered by the mentioned tariff beginning with the year 2024.

The weighted average tariff for rendering sanitation services will increase during the project implementation period from actual value of 20.05 MDL/m3 to 28.00 MDL/m3, and after that will decrease to approximately 15.00 MDL/m3, due to increase of volume of wastewater inflows. As well, the tariff for wastewater services will not include the full depreciation cost in the construction period (2017-2021). The total costs (the operational costs and depreciation cost) will be covered by the tariff beginning with the year 2022.

The tariff affordability rate in the whole period of the financial projections will be about 3.2 %, which indicates that it is within the limits of accepted affordability threshold of 4%.

The cash flow projections for the entire reference period (30 years) reveal that the cumulative cash flow at the end of each year is positive. This is the basic financial figure that indicates that the project is **financially sustainable**. During the period of 30 years the operator will be able to generate cumulative cash flow amounted to MDL 59.22 million, which could be used for investments purposes.

The net present value (NPV) of the investment project calculated at a 5% discount rate for a 30-years operating period is negative (MDL - 45.86 million), which emphasize that the project does not generate a return and is financially unprofitable. The economic net present value (ENPV) of the investment project calculated at a 5% discount rate is MDL 39.07 million. Such as, the value of ENPV is higher than zero this indicates that from a public perspective the investment project should be implemented.

Procurement Plan

In line with Moldova's policies and rules, the required public sector services and works contracts shall be awarded on the basis of open competitive tendering, which should assure a maximum of competition and transparency. The proposed procurement plan is presented in the table below.

Table 0-5: Procurement plan

No	Description	Estimated contract value[2], EUR	Contract type	Procurement methode
1	Design and Engineering for Phase I investments	292,281	Consulting services	Competitive
2	**Construction Works**: Extension of the sewer network in the town of Leova (sewer and WWPS)	2,215,675.00	Works	Open
3	**Supply of Equipment** for operational performance improvement	220,000	Supply of goods	Shopping
4	**Technical assistance**: Corporate Development Program, Stakeholder Participation Program Water Supply Network Analysis and Water Loss Reduction Programme, Medium to Long-term Sanitation Study	330,000	Consulting services	Competitive
GT	**Total Amount**	**3,057,956**		

Source: GIZ/MLPS

Project Implementation Plan

The implementation steps are based on having the funding arrangement concluded by end of 2015. The table below gives the project implementation plan for the proposed measures.

Table 0-6: Project Implementation plan – milestones

No	Item	Date
1	Contract award for consulting services	30.05.2016
2	Completion of consulting services	09.06.2019
3	Contract award for works contracts	31.03.2017
4	Completion of works contract	31.12.2017
5	End of Defects liability period	31.12.2018

Source: GIZ/MLPS

Environmental and social aspects

An Environmental Assessment (EA) was prepared in order to facilitate the implementation of the Project and to ensure that the envisaged Project objectives will comply with Moldova's environmental and social legislation, procedures and policies and international and EU conventions. In addition the EA Report addresses the environmental and social impacts, mitigation measures and management issues associated with the proposed objectives of the project.

According to the new law on environmental assessment (Law No. 86/29.05.2014 on Environmental Impact Assessment which is in force from beginning January 4, 2015) **none of the WSS objectives of the Project is subject to full scale EIA** on the national level.

For acquiring the environmental and construction permission it is required to prepare the documents for the SEE. This needs to be done in the design stage of the Project.

[2] Including Contingencies

An assessment of the social and gender aspects was undertaken for Straseni feasibility study in May 2015 and its findings were integrated in the respective report. Given the scope of the proposed study (“no regret” measures to improve service provision) and taking into account that social and gender needs and characteristics do not differ much from a town/study to another, the conclusions reached during the field visit in Straseni are also applied to Leova project. The tools applied in the field visit to Straseni were interviews with key stakeholders and focus groups disaggregated by gender with potential beneficiaries. Based on its findings a social and gender action plan was developed. The assessment of beneficiaries’ needs and priorities by gender shows that the men and women have different needs and patterns in using the water and sanitation facilities. Therefore, these discrepancies and gaps need to be taken into consideration in the development and implementation of the Project.

1 Introduction

1.1 Preliminary and background

Since 2010, the Modernization of Local Public Services (MLPS) Project, acting on mutual agreement between Moldovan and German governments, has supported Moldovan Local Public Administrations (LPAs) in extending and modernising service provision in water supply and sanitation, solid waste management, regional and local roads, and energy efficiency of public buildings sectors.

The MLPS Project has the objective to improve the local public service delivery through local sector planning and programming, improving local public services infrastructure, and capacity development of local public administration and public service providers. As part of a major planning and programming effort, MLPS has assisted Moldovan partners to develop a pipeline of feasible, cost-effective investment projects in the aforementioned sectors.

Currently, the Water Supply and Sanitation (WSS) sector is characterised by an inadequate mid-term financial planning and a lack of a coordinated systemic approach to the development of a pipeline of priority projects. In typical practice in Moldova, investment projects are often developed based on insufficient grounds, which leads to an increased risk to project sustainability. In order to address this situation, a Water Supply and Sanitation Regional Sector Programme (WSS RSP) was developed considering all relevant international, national and sector policy documents, with the intention of contributing to the implementation of the national Water Supply and Sanitation Strategy (2014-2028). The WSS RSP includes an analysis of the current situation in the sector in the development region, a set of sectoral targets to be achieved over the medium to long-term, an action plan that identifies barriers that must be addressed in the sector in order for the investments to have their full impact and for conditions to improve in the sector, and the process, methods and criteria for identification of priority investment projects that contribute to change in the sector and the achievement of sectoral targets.

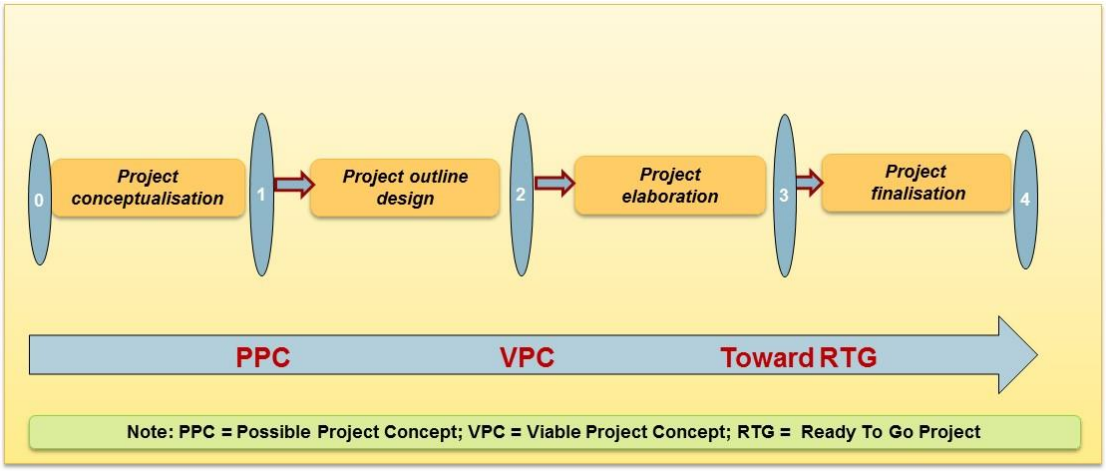
Based on the WSS sector development directions and criteria defined in the WSS RSP, a list of possible project concepts was defined for further project development.

1.2 Project Development Pathway

This feasibility study is an integral part of a comprehensive and systematic project identification and development process, defined and promoted by the Ministry of Regional Development and Construction (MRDC) as the Project Development Pathway (PDP). The Pathway Approach is the framework for implementation of the project pipeline, which, in turn, is the instrument used to carry out the investment component of the WSS Regional Sector Programmes.

The project pipeline is developed over five stages. If and when financing is identified, the project can be finalized and become ready for implementation (“Ready-to-Go”).

Figure 1-1: Project pipeline process in overview



More specifically, the five stages of project development in MLPS are as follows:

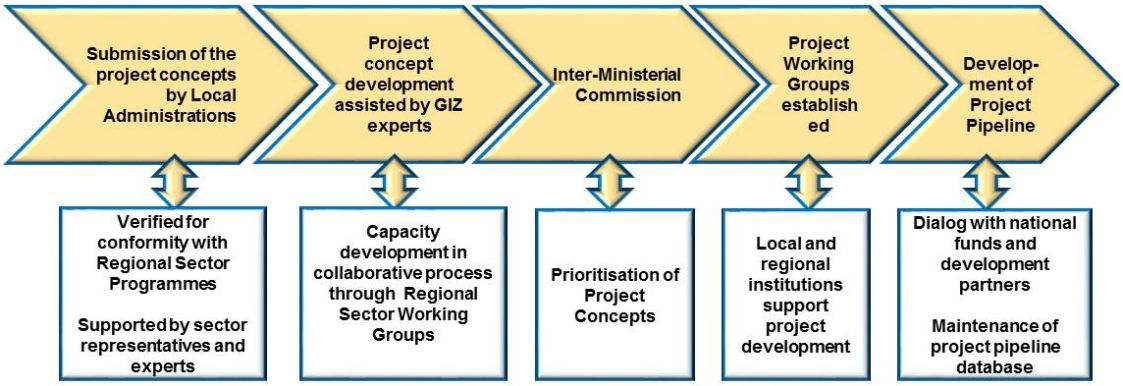
- **Stage 0 – Development of Regional Sector Programmes – Identification of Project Idea.**
  In each RSP, specific process, methods, and criteria by which possible projects are identified for their contribution to the targets set out in the RSP for the sector;
- **Stage 1 – Conceptualization (Possible Project Concept – PPC).**
  Possible project concepts are collected and screened for their compliance with and contribution to the targets of the RSP. Projects in this stage are termed "**Possible Project Concepts**";
- **Stage 2 – Project Outline Design (PPC to Viable Project Concept – VPC).**
  Project ideas that respond to a specific problem or set of problems are developed into possible project concepts and presented in brief reports outlining the objectives to be achieved by each project. Initial estimates for investment and operating costs are provided. Any potential barriers and risks to the development of the project are identified and assessed.
  Projects at the end of this stage are considered "Viable Project Concepts" and can be submitted to national and/or international agencies for further development and possible financing;
- **Stage 3 – Project Elaboration.**
  Subject to availability of financial resources for further development, projects that contribute to the achievement of sectoral targets are further developed with a feasibility study, conceptual design, and EIA, as appropriate.
  Projects at the end of this stage are termed "Viable Project Concepts at Pre-final Stage" and can be submitted to national and/or international agencies for finalization and possible financing;
- **Stage 4 – Project Finalisation.**
  For the projects that have some financing commitment in place, the remaining tasks related to preparation of tender dossier, including final technical design, can be completed. All issues related to permitting, land ownership/access must be concluded during this stage. The future organisational and institutional set-ups must be clear and agreed so that they are ready for implementation during the investment period.

Projects at the end of this stage are ready for implementation.

These stages are somewhat fluid and vary from sector to sector. During the first PDP stages, RDAs along with the WSS sector working group identified 45 ideas for possible project concepts, out of which 31 PPCs have been identified as responsive to the WSS Sector policy documents. Further on, due diligence studies were conducted for the identified PPCs, and Inter-ministerial Commission identified 12 projects as most compliant to commonly agreed WSS sector development criteria, as project economic efficiency, contribution to achievement of sector goals, scale of regionalisation etc. A preliminary **Priority Investment Programme** (*further PIP, Programme*), covering period of 2015-2021, for each PPC was approved by the Inter-Ministerial Committee and was further developed in the feasibility study phase (Stage 3).

This collaborative process through which projects are developed is conceptualized in the following figure.

Figure 1-2: Project development and implementation



This Feasibility Study (FS) Report constitutes the main output of Stage 3 of the PDP, proposing a structured phasing of the **Priority Investment Programme (PIP)** and creating necessary conditions for further implementation of the PIP in **Leova Rayon**. The FS particularly focuses on implementation of the first phase of the PIP, covering period of 2015-2018 and further named **the Project**.

A Project Working Group (PWG), established by decision of the Rayonal Council and comprising members from the Regional Development Agency Centre (RDA South), the Leova Local Public Administration (LPA) and GIZ/MLPS experts, was instituted to facilitate and coordinate the process of preparation and agreeing this feasibility study, in particular the scope of the proposed project. The same PWG will endorse the study for approval by the Leova local council.

1.3 PIP Service Area

The programme area was defined using, but not limited to, the following key sector development criteria set in the WSS RSP:

- **Regionalisation and scale of the project** – Only rayon capitals with associated localities, as well as urban/rural agglomerations over 10,000 people were considered. The integrated approach to WSS services development requires development of both water and wastewater services. As part of the EU-Moldova Association Agreement, the Government of Moldova is committed to harmonize National legislation and implement the provisions of the EU Directives, including the Council Directive 91/271/EEC concerning urban wastewater treatment, requiring implementation of wastewater collection and treatment in the first place in locali-

ties over 15,000 people (10,000 in sensitive areas). Applying the logic of the integrated service, this condition for wastewater systems is extended over the water supply service as well;

- **Presence of source of treatable drinking water, including abstraction and treatment facilities**. Water quality is essential to consumers. Supplying customers with treated surface water is the prioritized strategic approach;
- **Presence of functioning wastewater collection systems with wastewater treatment facilities**. As stated, the requirement of the UWWT Directive shall be considered and the proposed PIP shall tend to contribution to (at least) partial achievement of the requirements;
- **Agreement between beneficiaries and a sustainable WSS operator**. The inter-municipal cooperation between the potential project beneficiaries is a key to successful regionalisation of services. The current legal framework enforces the local public administrations to adopt the most appropriate way of provision of WSS service in their respective localities, and therefore a strong willingness of the LPAs is required to organize a regionalized WSS service.

Also, one of the major WSS services development constraints identified in the WSS RSP is poor and inadequate operational capacity of the existing WSS companies. Taking into consideration current institutional and operational arrangements, the RSP recommended that strengthening of the operator's capacities within the existing service area shall be supported in the first place and in the short-term followed by extension of services, not exceeding double the size of the operator's existing service area. This was considered to prevent water operating companies from financial/operational/institutional collapse and set reasonable geographic boundaries for short-term regionalisation of the WSS services.

In Leova Rayon, a human agglomeration satisfying the WSS development criteria was identified in the area of the Rayon centre**, the Town of Leova**, with the following Local Public Administrations, which expressed their willingness to cooperate and benefit from regional WSS services under the PIP:

- Locality of **Hanasenii** Noi;
- Locality of **Filipeni**; and
- Locality of **Romanovca**.

The above mentioned localities form the PIP service area for development of the regionalised WSS services in the Rayon of Leova, which is expected to be gradually implemented in accordance with the proposed phasing of infrastructure investments during 2015-2021.

A number of investment projects are being implemented in the PIP localities, financed by South RDA and external official development assistance (ODA) partners, e.g. European Bank for Reconstruction and Development, etc. Therefore, the proposed PIP comes as a complementary part to the ongoing investments in the area, mostly **focusing on wastewater services**.

The first phase of the PIP (**the Project**) includes improvement of wastewater services in **the Town of Leova**.

This FS Report covers the entire PIP area, having particular attention on the first phase investment Project area. In the longer term, the project service area is to be extended,

with flexibility to include additional localities from the Leova Rayon and other neighbouring areas, where deemed technically and economically feasible.

1.4 Identified problems

The following major problems to be addressed in the feasibility study were identified during the preliminary project stages:

- Insufficient area coverage of the WSS services. Only the town of Leova benefits from water supply, while wastewater services are provided in a limited urban area;
- Unsatisfactory levels of service, including:
  - Continuity of wastewater service. Some parts of the town suffer of often blockages of sewer mains, requiring continuous maintenance works.
- Poor environmental conditions due to inadequately functioning wastewater treatment plant.

As for the operational efficiency, the main problems encountered by the company are, as follows:

- Low pumping efficiency at the existing pumping facilities;
- Low staff efficiency ratio, as a result of inefficient operation of facilities and overstaffing of the utility;
- Poor asset management and lack of preventive maintenance, resulting in obsolete pipelines and facilities.

Further sections of the feasibility study address the major problems identified in the preliminary stages and provide appropriate measures split into implementation phases.

1.5 Study objective

The objective of the present feasibility study is the development of an affordable and cost-effective phased investment programme for wastewater infrastructure to be rehabilitated and extended, as well as facilitation of regionalisation of the wastewater services and inter-municipal cooperation with strong social and environmental benefits, as part of the implementation of the provisions of the WSS Regional Sector Plan and Water Supply and Sanitation Strategy (2014-2028).

The proposed Priority Investment Programme (2015-2021) is expected to result in improved access to regional wastewater services for the Town of Leova, as well as the localities of Hanasenii Noi, Filipeni and Romanovca to contribute to the achievement of the regional WSS sector development indicators on access to wastewater services. The aim of the PIP is to extend the coverage and connection rates of the population connected to wastewater services by 44% from 48% to 92% of coverage rate and by 26% from 31% to 57% of connection rate. Also, other major effect of the PIP is the rehabilitation and improvement of existing wastewater services for 13% of population connected.

The aim of the first phase (the Project, 2015-2018) for the town of Leova is to extend the access of the population to wastewater services by 12% from 70% to 82% of coverage rate and by 8% from 44% to 52% of connection rate.

Table 1-1: Main service indicators

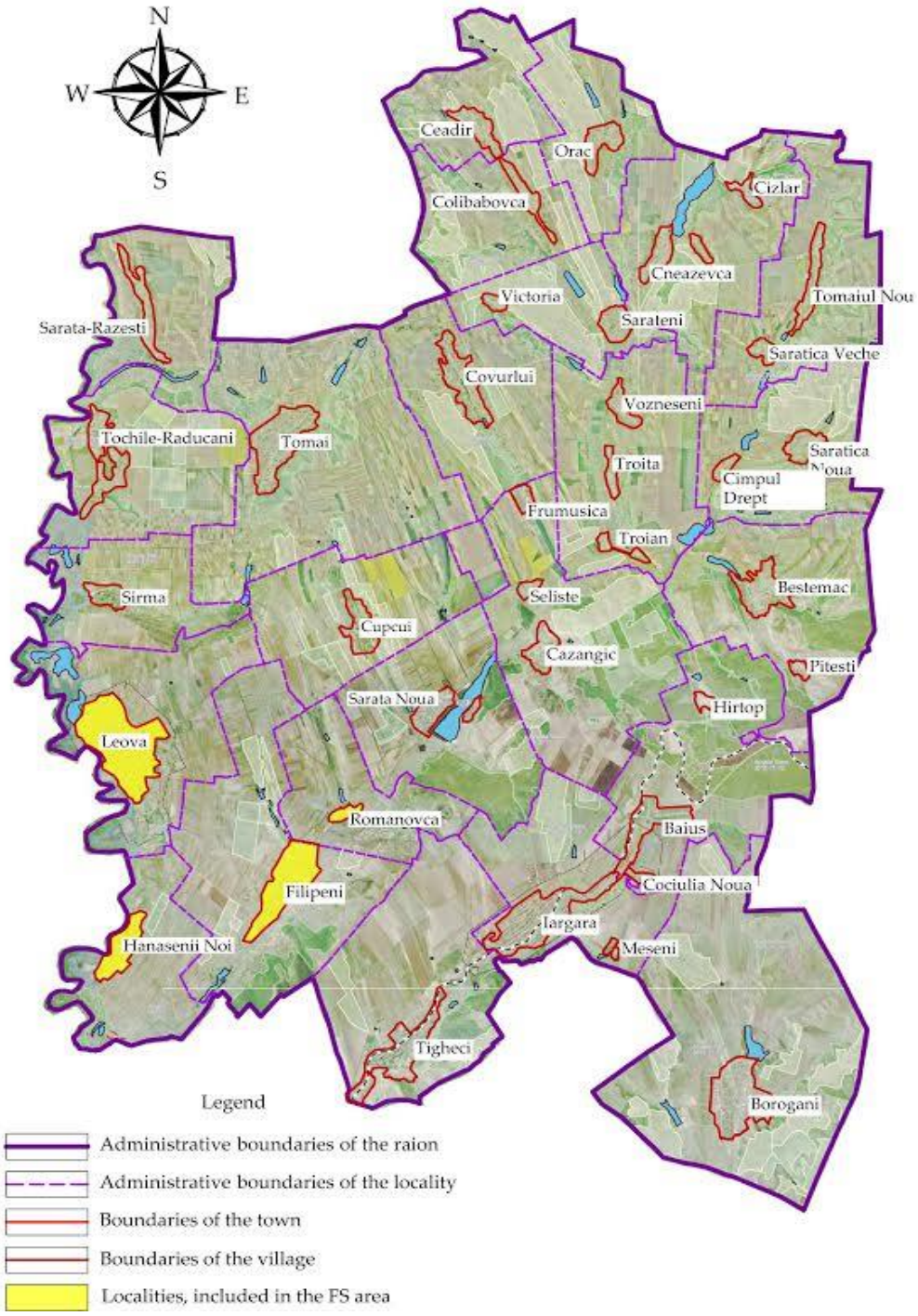
Indicator	Current connection rate	The first phase Project (2015-2018)		The second phase (2018-2021)		Priority Investment Programme (2015-2021)	
		Rehabilitation	Extension	Rehabilitation	Extension	Improve-provement	After PIP
Share of population directly benefitted from the rehabilitated and extended wastewater services							
Urban	44%	0%	8%	13%	9%	30%	61%
Rural	0%	0%	0%	0%	48%	48%	48%
Continuity of water service (hours/day)	24					24	24
Number of beneficiary localities covered by regional WSS services (urban/rural)	0/0	1/0	1/0	1/3	1/3		
Number of sustainable regional WSS operators instituted	0	1	1	1	1		

2 Socio-economic aspects

2.1 Coverage area

This feasibility study covers the area that includes the territory of the town of Leova and the localities Hanasenii Noi, Filipeni and Romanovca, as shown in Figure 2-1.

Figure 2-1: Map of the FS localities



Source: www.google.com/maps/place

2.1.1 Geographical conditions of the coverage area

Leova Rayon is situated in the South-Western part of the Republic of Moldova, on the left bank of the Prut River – the State border to Romania, and also borders the following Rayons: Hincesti to the North, Cimislia and Gagauzia to the South, Cantemir to the East and Romania (Vaslui County) to the West. The Rayon centre is the town of Leova.

Leova Rayon covers an area of about 775 km^2.

Table 2-1: Population and area of the localities covered in this feasibility study

N	Name of FS localities	Population	Area [km^2]
1	Leova	10,900	0.56
2	Hanasenii Noi	1,075	0.12
3	Filipeni	3,200	2.91
4	Romanovca	556	0.30
Total		**15,731**	**3.83**

Source: GIZ/MLPS

Leova Rayon comprises 40 localities, of which two towns (Leova and Iargara), 24 communes and 14 localities.

The town of Leova is situated in the South-Western part of the Republic of Moldova, on the left bank of the Prut River at a distance of 100 km from the city of Chisinau, bordering with Hanasenii Noi, Romanovca, Filipeni, Cupcui and Sirma localities.

The area of town of Leova is 563 ha, and additionally it has allocated 2,322 ha of agricultural land, including:

- Arable lands – 1,571 ha;
- Multi-annual crops – 234.9 ha;
- Grasslands and pasturelands – 516.9 ha.

The water resources of the town are formed by the Prut River and ponds with a total area of 54.15 ha.

The natural reserve ‘Lebada Alba’ situated North-West from Leova, in close proximity to the Prut River, is an aquatic ecosystem with an area of 30 ha.

The Hanasenii Noi locality and commune with the same name are situated at a distance of about 10 km from the town of Leova and 107 km from the municipality of Chisinau; it borders the Leova, Filipeni and Nicolaevca localities. Hanasenii Noi locality has an area of about 0.12 km^2, with a perimeter of 1.85 km. The Hanasenii Noi commune comprises the Hanasenii Noi and Nicolaevca localities.

The Filipeni locality and commune with the same name is situated at a distance of about 8 km from the town of Leova and 92 km from the municipality of Chisinau and borders the Leova, Hanasenii Noi, Romanovca, Tigheci and Iargara localities. The Filipeni locality has an area of about 2.91 km^2 (including agricultural land) with a perimeter of 11.02 km.

The Romanovca locality and commune with the same name is situated at a distance of about 12 km from the town of Leova and 87 km from the municipality of Chisinau, and borders the Leova, Filipeni, Iargara, Sarata Noua and Cupcui localities. Romanovca locality has an area of about 0.30 km^2, with a perimeter of 2.87 km.

2.2 Relief and climate conditions

The relief of the Leova Rayon is specific for the hilly-undulating plain of Southern Moldova. The elements of the relief are very homogeneous and exposed on the narrow river beds which extend in general from North to South, slopes with different inclination, long and deep ravines; the amplitude ranges from 50-230 m, the lowest being placed in the meadow of Prut and Sarata rivers.

The main natural resources of the Rayon are forests, rivers and ponds. Underground natural resources include deposits of sand, clay, loam, bentonite, and mineral waters. Two sand quarries are functional with a total area of 3.6 ha, of which 2 ha are situated outside of Sarat-Razesi locality and 1.6 ha outside of Hanasenii Noi locality. The Forestry Fund occupies 13.3% of the Rayon territory with an average stand age of 32-45 years.

The climate of Leova Rayon is temperate - continental. Summers are long and warm, while winter is mild, the average temperature over the year of about 8-9°C. Precipitation varies between 450 and 550 mm.

The soil freezing depth is 0.8 m and seismicity is 7-8 degrees.

2.3 Socio-economic data

The total number of inhabitants of Leova Rayon is 53,200 persons, of which an urban population of about 15.6 thousand and rural population of about 37.6 thousand. Accordingly, the population density is 69.5 persons per 1 km^2.

The ethnical structure of Leova Rayon is as follows: Moldovans - 44,144 persons or 86.46%; Bulgarians - 3,803 persons or 7.45%; Ukrainians - 1,245 persons or 2.44%; Russians - 1,170 persons or 2.29%; Gagauzians - 430 persons or 0.84%; Romany / Gypsies - 105 persons or 0.21%; and others.

The most recent vital statistics for the Rayon are provided in the following table.

Table 2-2: Vital Statistics of Leova Rayon for 2014, persons

	Born	Deceased	Natural Growth
Leova Rayon	632	621	11
Leova Town	111	105	6
Rural Localities	480	455	25

Source: National Bureau of Statistics, 2015, www.statistica.md

The **Town of Leova** is an administrative and commercial centre of Leova Rayon, with total population of 10,900 inhabitants, of which men - 5,727 persons and women - 5,173 persons.

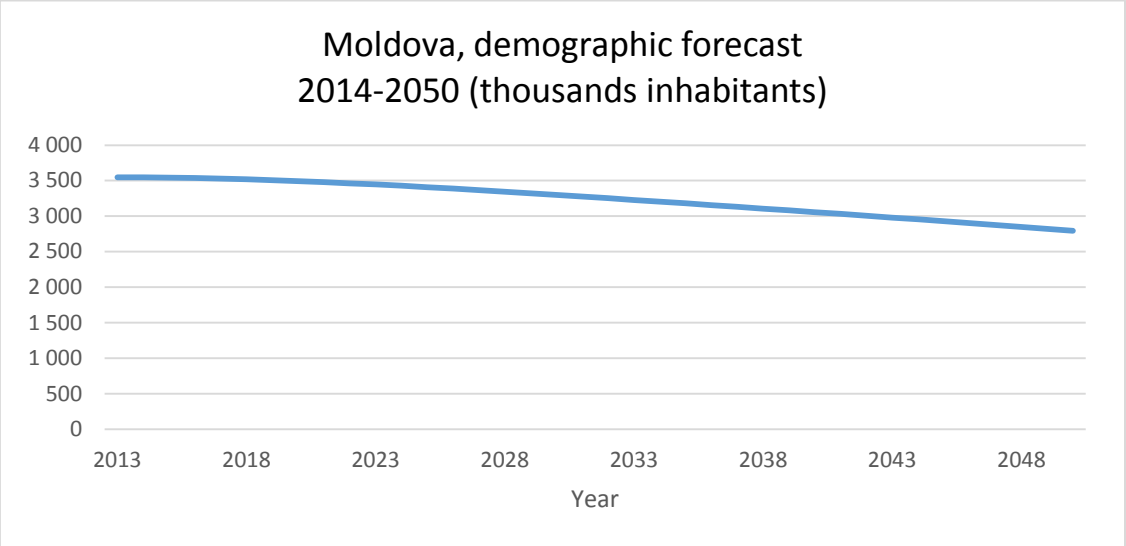
2.4 Population

Immediately upon gaining its independence in 1991, the Republic of Moldova faced economic hardships that severely affected demographic indicators. The main factors affecting demography are outmigration for economic reasons and a decline in the birth rate. These trends began with the military conflict in Transnistria in 1992, which prompted a wave of emigration from Moldova toward Russia and Ukraine, followed by migration towards current European Union Member States (mainly Italy, Poland, and Romania). These trends were exacerbated during the Russian financial crisis in 1998. The total outflow of emigrants comprises 17.3% of the total population residing in Moldova in 1991, with some estimates reaching 25% (circa 1 million). For the purpose of

this feasibility study, the authors considered as a baseline the prognosis of United Nations, which indicates a negative population growth as depicted in the figure below.

The scenario for demographic evolution is derived from the UNDP prognosis for the country up to the year of 2050.

Figure 2-2: United Nations Development Programme population forecast for Moldova



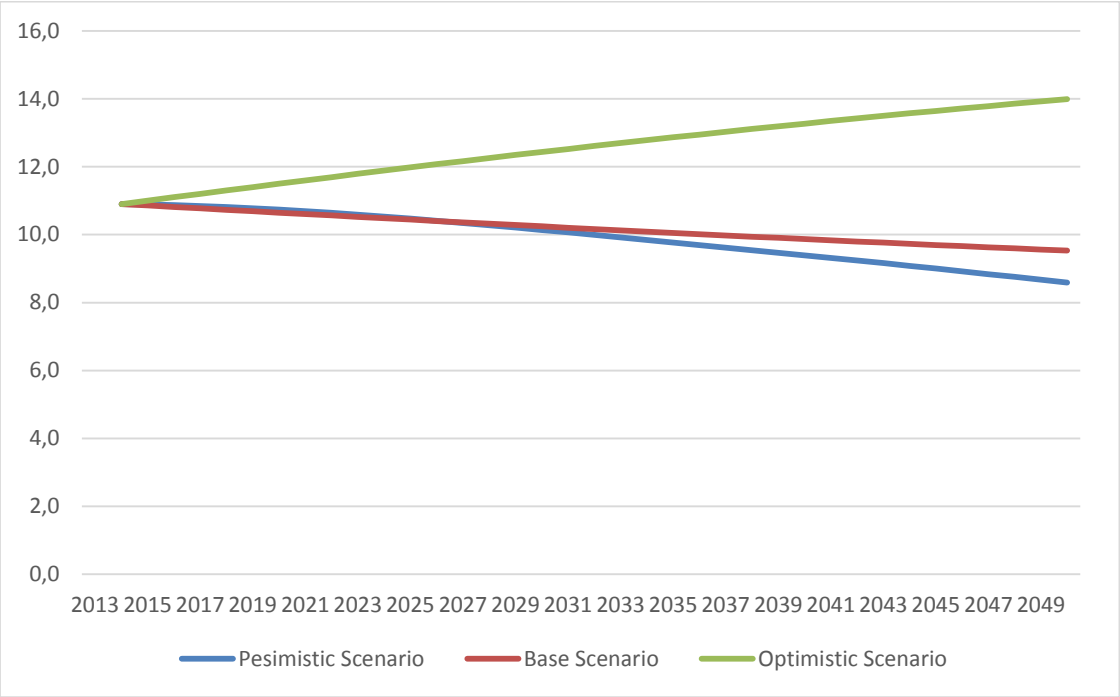
Source: UNDP, World Population prospects, 2013, internet: esa.un.org/wpp/

The feasibility study considers that the same national trend will apply uniformly to each rayon population.

Furthermore, the evolution of the demography for the rayons was compared to the evolution of the demography of the urban centres of the respective rayons for the last 10 years. Based on that, the internal migration rural-urban was calculated and three scenarios were derived:

- No internal migration: The rayon population and the rayon centre population follow the same national demographic trend (pessimistic scenario);
- The average migration of the last 10 years for each respective rayon for rural-urban migration (base scenario);
- The maximum migration rate from all the past 10 years for each respective rayon (optimistic scenario).

Figure 2-3: Population forecast for town of Leova, 2014-2050

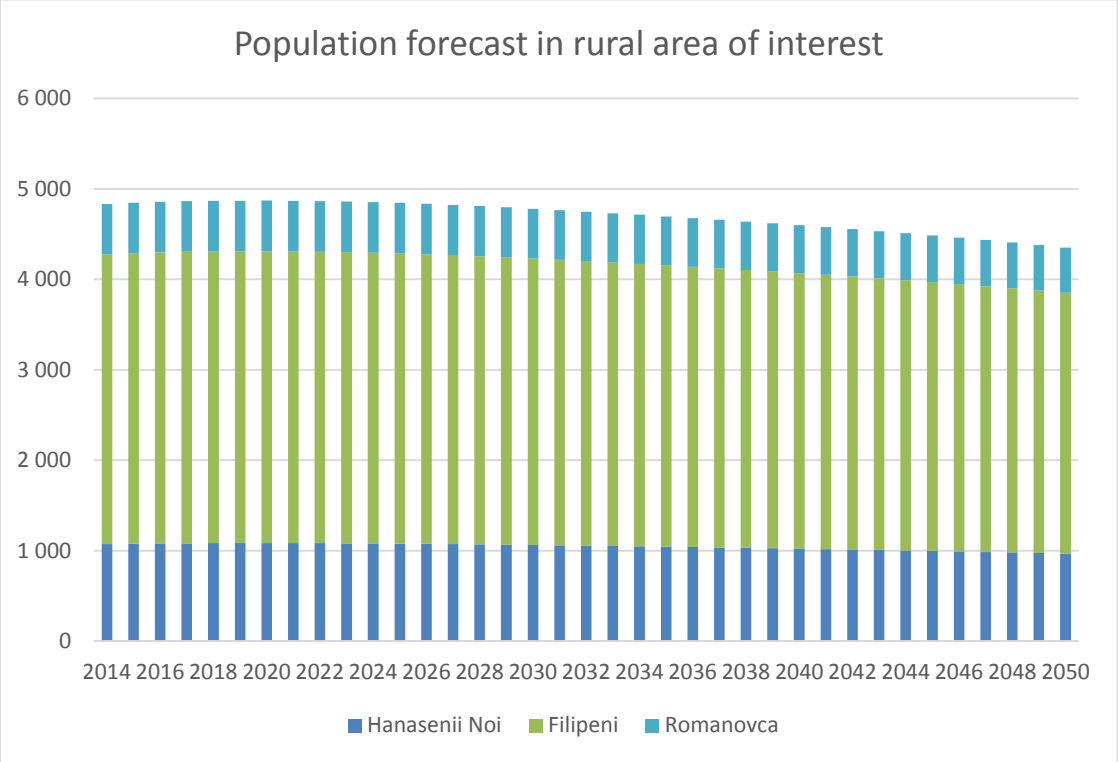


Source: GIZ/MLPS forecast

Further in this feasibility study (year 2015, with the expectancy that the detailed design year will be executed in 2016), the population forecast uses the base scenario. In conclusion, it is expected that the population of the town of Leova will slightly decrease (from 10,900 in 2014 to 9,529 in 2050) almost at the same rate as the national population, current migration being the main factor affecting the demography.

In regard to rural population, the population forecast to year 2050 reflects the national declining trend, as well as the rural-urban migration. The area of interest of the project includes three localities: Hanasenii Noi (current population 1075, forecasted to decrease to 969 inhabitants by 2050), Filipeni (current population 3200, forecasted to decrease to 2883 inhabitants by 2050) and Romanovca (current population 556, forecasted to decrease to 501 inhabitants by 2050). As it can be seen from the figure below, it is assumed that the rural population will decline at a moderate rate.

Figure 2-4: Population forecast for rural areas covered by the feasibility study, 2014-2050



Source: GIZ/MLPS

2.5 Employment

Currently the employment opportunities are limited in the town of Leova. Large and medium industrial enterprises, such as Interdepartmental Construction Association, dairy factory, aromatic and essential oils plant, and the Leova mechanical plant were closed 15 years ago, the market being presently dominated by small and medium private companies which provide the large majority of jobs, the leading positions being 'Leovin' JSC, 'Universcoop Leova' and 'Extravie' Ltd.

The unemployment rate of 3.7% in 2014 in the town of Leova is slightly smaller than average of Moldova (3.9% for 2014). During 2011 - 2014 the unemployment rate has steadily declined.

Table 2-3: Unemployment rate in the town of Leova (%)

Year	2011	2012	2013	2014
Town of Leova	3.95	3.74	3.82	3.7

Source: Economic Department, Leova Rayon Council

Table 2-4: Number of active population in the town of Leova

Year	2011	2012	2013	2014
Town of Leova	7,438	7,424	7,385	7,459

Source: Economic Department, Leova Rayon Council

Table 2-5: Number of the unemployed persons in the town of Leova

Year	2011	2012	2013	2014
Town of Leova	294	278	282	276

Source: Economic Department, Leova Rayon Council

The largest employers are presented in the table below. The number of employers in the industrial sector decreased considerably in the past two decades, on the market prevailing now the companies which deal with services provision and trade. However, there is a potential for improvement of the current situation regarding the job creation based on the geographical location of the Leova Rayon and its LPA involvement in several cross-border cooperation projects.

Table 2-6: Main employing companies in the town of Leova

Company name	Company profile
'Leovin' JSC	Industry (wine making)
'Universcoop Leova'	Industry (bakery) / trade
'Litoral' Ltd	Trade
'Extravie' Ltd	Industry (textile)
SP 'Vladimir Ciobanu'	Industry (meat processing)
'Modern Construct' Ltd	Industry (construction)
'Apa - Canal Leova' JSC	Water supply and sanitation services
Municipal Enterprise 'Salubr Leova'	Solid waste disposal services
SP 'Severin Cojocaru'	Industry (bakery)
'Biotercom Service Leova' Ltd	Heating supply service

Source: Economic Department, Leova Rayon Council

2.6 Affordability

Affordability refers to the ability or willingness of household customers to pay for water supply and wastewater services. The typical measure of affordability is the ability to pay for services, as measured using a threshold percentage of household income devoted to paying for the cost of the water supply and sanitation services.

Therefore, the required information to estimate household affordability is disposable household income (typically, this is measured average household income; a better measure, however, is to examine various household income groups, such as in quintiles from lowest income to highest), average per capita water consumption, and unit cost per unit of consumption.

For the current analysis, average household income for Development Region South was used, based on available statistical data only (without taking into account additional income from the "grey economy" or remittances from abroad). The official income data for 2015 were adjusted according to the income forecasts of the Moldovan government.

The evolution of the average household disposable income is shown in the table below.

Table 2-7: Evolution of the average household disposable income[3]

Disposable income (MDL), forecast				
Region	**2012**	**2013**	**2014**	**2015**
North	1,412.60	1,572.60	1,653.56	1,738.69
Centre	1,317.20	1,437.90	1,511.93	1,589.76
South	1,247.20	1,419.10	1,492.16	1,568.98

Source: National Bureau of Statistics, 2015, www.statistica.md

After 2015, household income is assumed to growth by 4% per year in real terms.

According to the National Bureau of Statistics, the average household income in Moldova in 1st quarter was 1,768.23 MDL/person/month (Quarterly bulletin, I, 2015) while in the South region it was 1,568.98 MDL/person/month.

The average bill for water and sewage, taking into account the average consumption of 60 litres per capita per day (lcd) and the current price in Leova of 25.81 MDL / m^3, can be estimated as follows:

- 0.060 m^3/d x 30 days x 25.81 MDL / m^3 = 46.46 MDL.

Comparing this figure to the average household income of 1,568.98 MDL, the affordability ratio reaches 2.96%. The United Nations Development Programme has recommended a 3% affordability limit, the Organisation for Economic Co-operation and Development (OECD) 4% for poor families in Eastern Europe, Caucasus, and Central Asian countries, and the Asian Development Bank 5%. Taking into account the mentioned above, it can be stated that the population can support a slight increase in tariffs, as a result of the newly proposed infrastructure investments.

[3] Per capita and per region (MDL)

3 Legal and institutional framework

3.1 The legislative framework regulating water supply and wastewater services sector

3.1.1 European legislation on water supply and wastewater services

The water sector is one of the most regulated areas in the EU, in order to ensure the careful use of water resources and to minimize adverse impacts of water production and consumption on water quality.

Directive 2000/60/EC establishing a framework for Community action in the field of water is a keystone in the history of water policies in Europe. It establishes a common framework for sustainable and integrated management of all water bodies and requires that all impact factors and economic implications as well to be considered. Waters in the European Union are under increasing pressure, given the continued growth in demand for good quality water in sufficient quantities for a range of uses. The aim of this Directive is to protect and improve water quality by providing rules for stopping the deterioration of all water bodies in the European Union and achieve "good status" of rivers, lakes and groundwater in Europe.

Another regulation in the European Union, intended to protect human health by establishing strict standards for drinking water quality, is Directive 98/83/EC on the quality of water intended for human consumption, which amends Directive 80/778/EEC of 15 July 1980. The objectives of the Directive are to protect public health from the effects of any type of contamination of drinking water by ensuring quality. In order to ensure those the Directive requires the establishment of a program of measures to improve water quality. Member States have to monitor drinking water quality and take the necessary measures to ensure compliance with the standards.

In turn, the wastewater produced by the population and industry is an important source of pollution that can affect the quality of drinking and bathing waters, hampering the achievement of goals set out by Water Framework Directive.

Directive 91/271/EEC concerning urban wastewater treatment aims to protect surface waters, including those from the coastal territories, by regulating collection and treatment of urban wastewater and discharge of the biodegradable industrial wastewater (coming mainly from the agri-food industry). The Directive is often considered expensive, but proposes solutions to overcome these challenges that mean tremendous benefits for our health and the environment. Like other legislative acts of EU regarding water, the Directive provides clear and binding targets, while being very flexible in the means of achieving them. The Directive allows alternative solutions and encourages innovation, concerning both wastewater collection and treatment.

3.1.2 Transposition and implementation of the community environmental acquis

By signing the Association Agreement, the Republic of Moldova committed to implement the relevant environmental legislation of the European Union (including that regarding water quality and resources management) into its national legal system by adopting or changing national legislation, regulations and procedures.

The Republic of Moldova has to align national legislation with community environmental acquis in terms (3-8 years from the entry into force, starting September 1, 2014) and conditions listed in Annex XI Chapter 16 (Environment) of the Association Agreement Republic of Moldova - European Union[4].

Fulfilment of the assumed obligations started with the adoption of Government Decision no. 808 of 10.07.2014 regarding the approval of the National Action Plan for the implementation of the Association Agreement Moldova - European Union in 2014-2016.

These measures concern in particular the following tasks: Completing the process of developing a mechanism to implement the Water Law; initiating assessment of the situation in the field of urban wastewater collection and treatment and identifying sensitive and less sensitive areas; drafting law on drinking water quality in accordance with Directive 98/83/EC on the quality of water intended for human consumption, as amended by Regulation (EC) no. 1882/2003; drafting Government Decision on the approval of sanitary regulations for small drinking water systems; and drafting Government Decision on the approval of sanitary regulations for drinking water quality monitoring.

Given these ambitious goals, Moldova has started to transpose and implement the Directives of the European Parliament and the European Council into Moldovan legislation by adopting the following legislation and regulations:

- Water Law no. 272 of 12.23.2011 is partially harmonised with Council Directive no. 91/271/ EEC of 21 May 1991 on urban wastewater treatment and no. 91/676 EEC of 12 December 1991 on waters protection against pollution caused by nitrates from agricultural sources, with European Parliament and Council Directives no. 2000/60/EC of 23 October 2000 on establishing a framework for the Community action in the field of water policy; no. 2006/7/EC of 15 February 2006 concerning the management of bathing water quality; no. 2007/60/EC of 23 October 2007 on the assessment and management of flood risks; no. 2008/105/EC of 16 December 2008 on environmental quality standards in the field of water, creates the legal framework, necessary for water management, protection and use;
- Regulations on requirements for wastewater collection, treatment and discharge into the sewage system and/or in water receiving bodies for urban and rural areas, approved by Government Decision no. 950 of 11.25.2013, partially transposes the provisions of Council Directive. 91/271/EEC of 21 May 1991 on urban wastewater treatment;
- Regulations on conditions for wastewater discharge into water receiving bodies, approved by Government Decision no. 802 of 10.09.2013, transposes art. 2 and 3 of Directive 2009/90/EC of Commission of 31 July 2009 on establishing, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, technical specifications for chemical analysis and monitoring of water status; Annex III of Directive 91/271/EC of 21 May 1991 of Council regarding urban waste water treatment; Annex VIII of Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water.

[4] www.parlament.md

3.1.3 National legislation for water supply and wastewater public services

The legal and normative framework in force which governs water supply and wastewater services sector, although harmonised only to a small extent with European legislation, represents the legal basis for the establishment, organisation, management, financing and monitoring of the functioning of these services.

The legal regulation of decentralised water supply and wastewater services is not a subject to a single legislative act, these being reflected in many laws and regulations, which are listed in Annex 3.

However, the framework act for this sector is the Law on water supply and wastewater public services no. 303 of December 13, 2013, which defines the legal framework for the establishment, organisation, management, regulation and monitoring of the functioning of the public service on raw and drinking water supply; public service on wastewater and industrial and domestic wastewater treatment in terms of accessibility, availability, reliability, continuity, competitiveness, transparency, compliance with quality, security and environmental protection.

The new law regulates public authorities (central and local public administrations) competences in water supply and wastewater services sector; the establishment of the National Agency for Energy.

Regulation as the regulator in water supply and wastewater services sector; service management, where local authorities can opt either for direct management or for delegated management; delegated management contract on water supply and wastewater services provision, as the only legal act that can establish rights and obligations of the parties; terms for delegating services provision based on public tender organised under the law; operator licensing under conditions of competition; endorsement and approval of tariffs for this service etc.

Adoption of Law 303 of 13 December 2013 started the process of amendment of the existing legislation, which is to be followed by putting into practice these regulations.

3.2 Administrative framework

3.2.1 At national level

The Ministry of Environment, Ministry of Regional Development and Construction, Ministry of Health and Ministry of Finance and State Chancellery with are competent authorities in the regulation and development of the water supply and wastewater services sector.

The Ministry of Environment is the main state institution, responsible for the development of national policies, legislative and regulatory framework and the subsequent implementation of the provisions of the policy documents, including the programming and implementation of investment needed in water supply and wastewater infrastructure. Additionally, the Ministry of Environment manages the National Ecological Fund.

The Ministry of Regional Development and Construction is responsible for the planning and development of water supply and sanitation at regional level and substantially involved in planning and infrastructure development through the three Regional Development Agencies. Additionally, the Ministry of Construction and Regional Development administers the National Fund for Regional Development. Together with the national Ecological Fund, these funds are the most important sources of national funding in the water supply and wastewater services sector.

The Ministry of Health oversees the population's health and sets up priorities related to public health; promote provisions regarding health aspects into all public policies and supports their effective implementation in other sectors to maximise health gains. The Ministry of Health establishes and monitors all aspects of water quality in the field of water supply and wastewater services sector.

The Agency 'Apele Moldovei' under the Ministry of Environment is charged with implementing national policy in water management, hydro-reclamation and water supply and wastewater services sector.

The Agency for Geology and Mineral Resources under the Ministry of Environment is responsible for implementing state policy on geological research, and use and protection of soil and groundwater. Hydrogeological Expedition "EHGeoM" is under the Agency for Geology and Mineral Resources, providing services related to drilling artesian wells.

The National Agency for Energy Regulation is the regulator of water supply and wastewater services in terms of approving regulations and the tariffs for these services, giving licenses to the operators working in the field of energy supply and monitoring its activity.

At the national level, there are two main non-governmental associations, namely Water Operators Association of Republic of Moldova 'Moldova Apa-Canal' and the Congress of Local Authorities in Moldova.

Data on water supply and wastewater services sector are regularly collected and processed by the National Bureau of Statistics.

Moreover, it should be noted that besides the competent authorities indicated above, a series of other authorities play, directly or through their subsidiaries, more or less significant role in the monitoring and supervision of the water supply and wastewater services sector. These are, in particular:

3.2.2 At local level

In Republic of Moldova, the local government is organised on two levels: level 2 is the rayon public authorities, while the level 1 is the public authorities in towns and localities. The water supply and wastewater public services are set up, organised and managed under the direction, coordination, supervision and responsibility of local public administrations of level 1, represented by local councils, as deliberative authorities, and mayors as executive authorities.

About 35 operators in Moldova provide water supply and wastewater services in urban areas, with the legal form of joint-stock companies or municipal enterprises. Of these, seven can be considered as regional operators, because they provide water supply and wastewater services in towns and neighbouring administrative-territorial units. In rural areas, services are provided either by local authorities, under the direct management or by sole proprietorships, limited liability companies or water user associations, under delegated management

3.3 National policies in water supply and wastewater services sector

Up to 2013, there was essentially no planning in the WSS sector at national, regional and local level. Since then, a new sectoral strategy and regional sector programmes have been completed. Thus, the development of water supply and wastewater services sector is based on its principal document which is Water Supply and Sanitation Strategy (2014-2028) and other development policies of the Republic of Moldova, including

the National Regional Development Strategy (2013-2015). This framework aims to improve national policies and harmonise the legal framework with the community acquis and European standards. The National Regional Development Strategy sets out a number of directions of water supply and wastewater services sector development, including national targets for achieving the Millennium Development Goals.

The Water Supply and Sanitation Strategy has new approaches for structuring, financial planning and project identification, on which sector development should be based.

The strategy proposed institutional reforms of the sector, including a new authority as sector regulator - the National Agency for Energy Regulation which would be responsible to develop pricing and regulating policy for operators based on performance indicators.

The strategy also states the need to develop inter-municipal cooperation in the development and provision of water supply and wastewater services by regional operators. Services provision can be ensured by means of public services delegated management contract concluded between local authorities and regional operator, before the implementation of investment projects in infrastructure.

'Regionalisation' is a key aspect of development policy in water supply and wastewater services sector. This policy aims to improve sector performance through better management and economies of scale.

Regionalisation of water supply and wastewater services, which intends to overcome excessive fragmentation of the sector, is aimed at concentrating water supply and wastewater services around strong regional operators, set up and developed by merging local operators.

Thus, it is foreseen that municipal enterprises will be reorganised into commercial companies and will extend the water supply and wastewater services area to other administrative-territorial units, with the aim of becoming economically viable regional operators.

The Strategy also places emphasis on the need to prepare Water Supply and Sanitation Development Plans (equivalent to so-called Master Plans) and feasibility studies in order to attract investments in the sector. Actions indicated in the Strategy will require a major financial commitment that goes beyond the national sources that are available.

In 2014, the Regional Development Councils from North, Centre and South approved Regional Sector Programmes (RSP) in the WSS sector. The RSP is an operational tool that links local and regional priorities with the national strategy within the WSS sector. Based on an analysis of the current situation in the respective region and national sectoral targets, the RSP provides the process, methods and criteria by which priority projects are identified for further development and implementation.

3.4 Organisation of water supply and wastewater services in the administrative-territorial units covered in feasibility study

3.4.1 Organisation and management of water supply and wastewater services

As stated, this study covers the town of Leova, the locality of Filipeni, the locality of Romanovca and the commune of Hanasenii Noi with its localities Hanasenii Noi and Nicolaevca.

To date, in the town of Leova has organised water supply and wastewater services, organised and managed under the leadership, coordination, control and responsibility of

the Leova Local Public Administrations, represented by the Leova Local Council as deliberative authority, and Leova mayor's office, as executive authority.

The Joint Stock Company 'Apa-Canal' Leova, hereinafter JSC 'Apa-Canal' Leova, is the sole operator of water supply and wastewater public services within the town of Leova. As part of project of the European Bank for Reconstruction and Development, it was assessed whether the town of Leova and the JSC 'Apa-Canal' Leova had creditworthiness to incur debt in the form of a loan. The reorganisation of municipal enterprise providing services within the town of Leova into a joint stock company was stipulated as a condition for such a loan. Currently, the Leova Local Council is the majority shareholder of this business enterprise.

A management contract on regional water supply and wastewater services, concluded between the Leova Local Council and JSC 'Apa-Canal' Leova in 2011, sets out the rights and responsibilities of the parties in the provision of these public services and the operation of the systems related to such services.

There are no centralised water supply systems in the localities of Filipeni, Romanovca and commune of Hanasenii Noi.

The tariffs for water supply and wastewater services are approved by the local council, in accordance with legislation in force.

3.4.2 Ownership

Public water and wastewater systems, including all technological and functional structures covering entire technologic cycle from raw water abstraction to discharge of treated wastewater into receiving body, are the property of Leova administrative-territorial unit.

Leova Local Council has delegated the management and operation rights of the water supply and wastewater systems to the JSC 'Apa-Canal' Leova.

There are no water supply systems owned by individuals or private legal entities.

3.5 Organisation and management of the JSC 'Apa – Canal' Leova

JSC 'Apa – Canal' Leova was reorganised by decision of the local public administration and shall carry out activities for an unspecified period of time starting with the date of registration by State Registration Chamber.

The company has a Manager, who is responsible for coordination of all company activities and conducting regular coordination with mayor's office, being personally responsible to the company's board for meeting the performance indicators.

Five subordinated units and one specialist report directly to the manager:

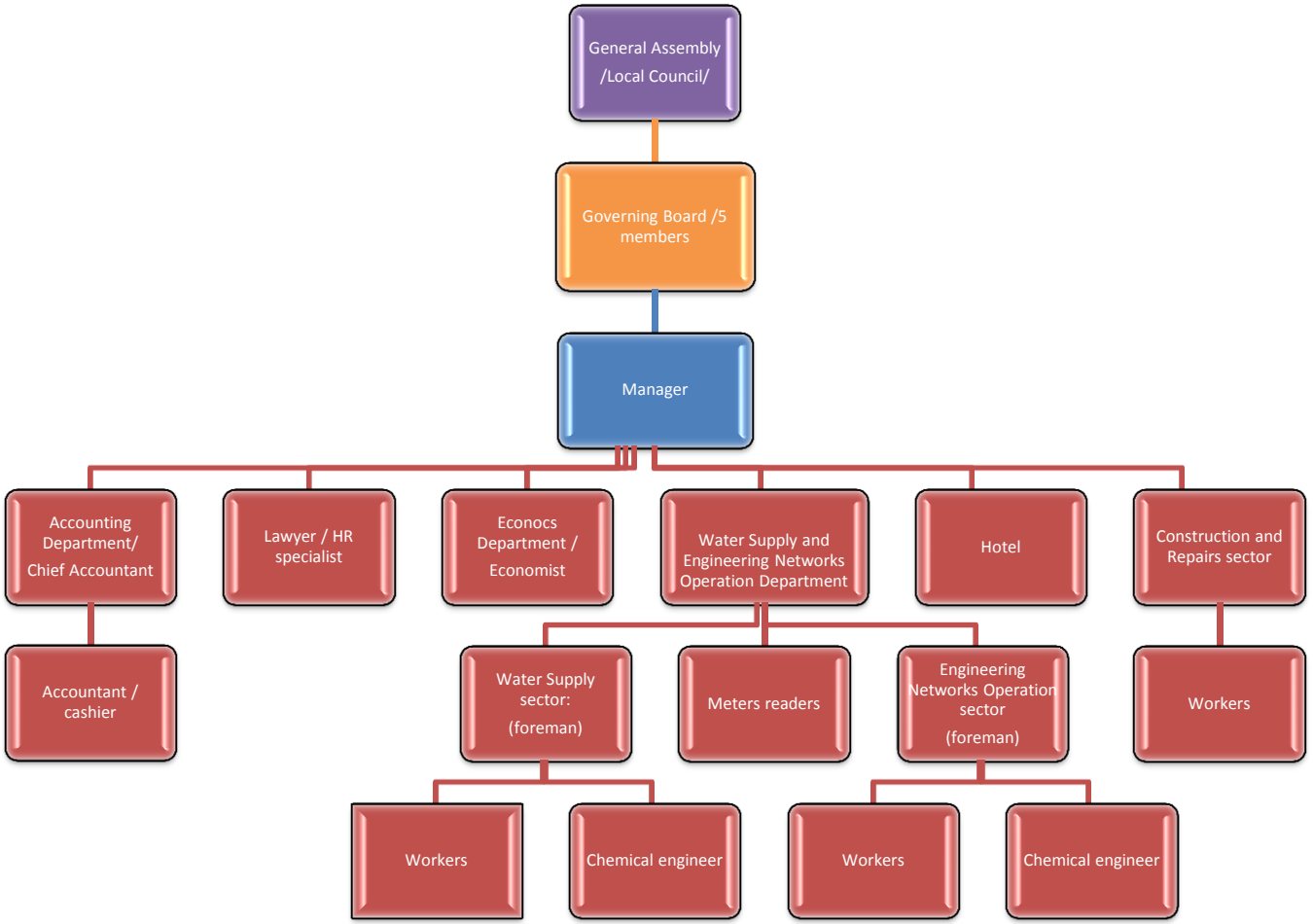
- Water Supply and Engineering Networks Operation Department;
- Accounting Department;
- Economics Department;
- Lawyer/Human Resources Officer;
- Construction and Repairs Sector;
- Company' Hotel.

The most important unit of the company, the Water Supply and Engineering Networks Operation Department (which also provides services to the household customers) includes:

- Water Supply Sector;
- Evidence and control Sector;
- Operation of engineering systems sector (WWTP and wastewater networks also are parts of this sector).

The organisational structure of the JSC ’Apa – Canal’ Leova is showed below:

Figure 3-1: JSC 'Apa – Canal' Leova. Organisation chart



Sourse: JSC 'Apa – Canal' Leova

3.6 Company staff and training needs

The organisational structure of the company includes 68 positions (according to the staff list) and actual 66 employees. The actual number of employees within the company enables compliance with the actual schedule and workload.

Thus, the occupancy rate within the company is high at 97%, while the staff turnover rate is low at 3% over the past four years.

The years of service at the company of the technical and financial staff shows a stable situation. The overwhelming majority of staff members (65 or 98% of the total) have from 10 to 20 years of employment in the position, with an average of 15 years. Two key persons in the company (the company manager and the head of 'Water Supply and Engineering Networks Operation / WSENO Department) have higher educations in water supply and sanitation, with work experience in the company of 18 and 27 years, respectively, and the relevant qualification for their duties. In general, 9% of the staff has a higher education, 12% - specialised secondary education; the rest have graduated from vocational schools.

Company management reports that it experiences difficulties in finding specialists and workers with the proper skills for the specificities of the WSS sector. This is due to the lack of skilled local labour in the town and neighbouring localities.

The JSC 'Apa–Canal' Leova does not have any strategic or planning document that includes a set of measures designed to increase staff capacities.

The table below lists the main topics that should be addressed in a human resources training programme, as identified during field visits to the utility and discussions with its management.

Table 3-1: JSC 'Apa–Canal' Leova staff training needs

Training topic	Beneficiary
Strategic planning	Manager; head of WSENO Department; economist
Investment planning and analysis of investment projects	Manager; head of WSENO Department; heads of departments; economist; chief accountant
Human resources planning and development	Manager; head of human resources department; economist
Performance indicators and staff motivation	Manager; head of WSENO Department; heads of departments; head of human resources department
Customer service management, public relations	Meters readers
Tariffs and costs calculation	Economist; chief accountant; meter readers
Financial planning	Accounting department employees
Management and maintenance of equipment	Head of WSENO Department; heads of the related departments
Wastewater treatment and sludge management	Head of WSENO Department; heads of the related departments
Water supply and wastewater networks management	Head of WSENO Department; heads of the related departments
Energy management in water supply and wastewater systems operation	Head of WSENO Department; heads of relevant departments
Quality management in water supply and wastewater systems operation	Head of WSENO Department; heads of relevant departments
Meter checking and reading	Meters readers
Job retraining on 'Operation of water supply and wastewater systems', specialty 'Intervention and reconstruction works'	Plumbers/operators
Project management	Manager; head of WSENO Department
Legislative aspects and standards in water supply and sanitation	Manager; head of WSENO Department; lawyer

Training topic	Beneficiary
Economic analysis in the field of water supply and sanitation	Economist; accounting department employees
Integrated accounting software use	Accounting department employees
Drawing up reports (statements) and annual financial statements regarding income tax	Economist
International Financial Reporting Standards	Economist
Cost management control and management reporting	Economist

Sourse: JSC 'Apa – Canal' Leova

4 Technical aspects – existing situation

4.1 General information

The assessment of the existing water supply and sanitation situation in the town of Leova and localities (Hanasenii Noi, Filipeni and Romanovca) has been conducted by the GIZ/MLPS experts in collaboration with members of Project Working Group (PWG). For assessment of existing situation, the necessary information was obtained from the following sources:

- Water supply and wastewater questionnaire prepared and distributed by GIZ/MLPS experts, and completed by Local Public Administrations (LPAs) and the water utilities;
- Project Working Group (PWG) meetings;
- Site visits conducted by GIZ/MLPS experts to verify the collected information and to inspect the existing water supply and sewerage facilities;
- Available pre-feasibility and feasibility studies, existing and implemented technical designs, topographic surveys (site plans) related to water supply and sewerage infrastructure indicating existing WSS facilities, as provided by the PWG.

4.2 Water supply and wastewater service area

Both water supply and wastewater services in the town of Leova are provided by a single operator – the JSC "Apa-Canal" Leova. There are no centralised water supply and wastewater systems in the localities of Hanasenii Noi, Filipeni and Romanovca. General information about service area of localities included in the feasibility study is provided in Table 4-1.

Table 4-1: General information about FS localities

N°	Locality	Population	Current situation and ongoing activities - water supply	Population served by centralised water supply service		Current situation and ongoing activities - wastewater	Population served by centralised wastewater service	
				Covered	Connected		Covered	Connected
1.	Leova	10,900	The coverage area of water supply system is about 100%. The connection rate is about 95%.	10,900	10,352	The coverage area of wastewater system is about 70%. The connection rate is about 44%.	7,600	4,812
2.	Hanasenii Noi	1,075	No water supply system	0	0	No centralised wastewater system	0	0
3.	Filipeni	3,200	No water supply system	0	0	No centralised wastewater system	0	0
4.	Romanovca	556	No water supply system	0	0	No centralised wastewater system	0	0

Source: LPA Leova, JSC "Apa-Canal" Leova, LPA Hanasenii Noi Commune, LPA Filipeni and LPA Romanovca

General information about public institutions in the feasibility study localities is provided in Table 4-2.

Detailed information about public institutions in the town of Leova and localities of Hanasenii Noi, Filipeni and Romanovca is provided in Annex 4.

Table 4-2: Public institutions in the feasibility study localities

No.	Locality/Public institution name	No. of institutions	Pupils/ children/ places/beds	No. of employees	Connected to water supply system	Connected to centralised wastewater system
1.	Leova					
	Kindergartens	2	416	70	yes	yes
	Schools	5	1,477	274	yes	yes
	Healthcare institutions	2	190	385	yes	yes
2.	Hanasenii Noi	3	123	29	n/a	n/a
3.	Filipeni	4	808	107	n/a	n/a
4.	Romanovca	3	72	9	n/a	n/a

Source: LPA Leova, JSC „Apa-Canal" Leova, LPA Hanasenii Noi Commune, LPA Filipeni and LPA Romanovca

The business entities in the feasibility study localities are listed in table below (Table 4-3). More detailed information on business entities from town of Leova is provided in Annex 4.

Table 4-3: Business entities in the feasibility study localities

No.	Locality/Type of business entity	No. of business entities	No. of employees	Connected to water supply system	Connected to centralised wastewater system
1.	Leova				
	Commerce	9	198	yes	yes
	Hotel services	1	4	yes	yes
2.	Hanasenii Noi	3	5	n/a	n/a
3.	Filipeni	11	50	n/a	n/a
4.	Romanovca	2	5	n/a	n/a

Source: LPA Leova, JSC "Apa-Canal" Leova, LPA Hanasenii Noi Commune, LPA Filipeni and LPA Romanovca

4.3 Water supply system

4.3.1 Water supply system in the town of Leova

Water is supplied 24 hours/day in the town of Leova. Water supply services are provided to about 10,352 consumers out of 10,900 inhabitants (95% water supply connection rate).

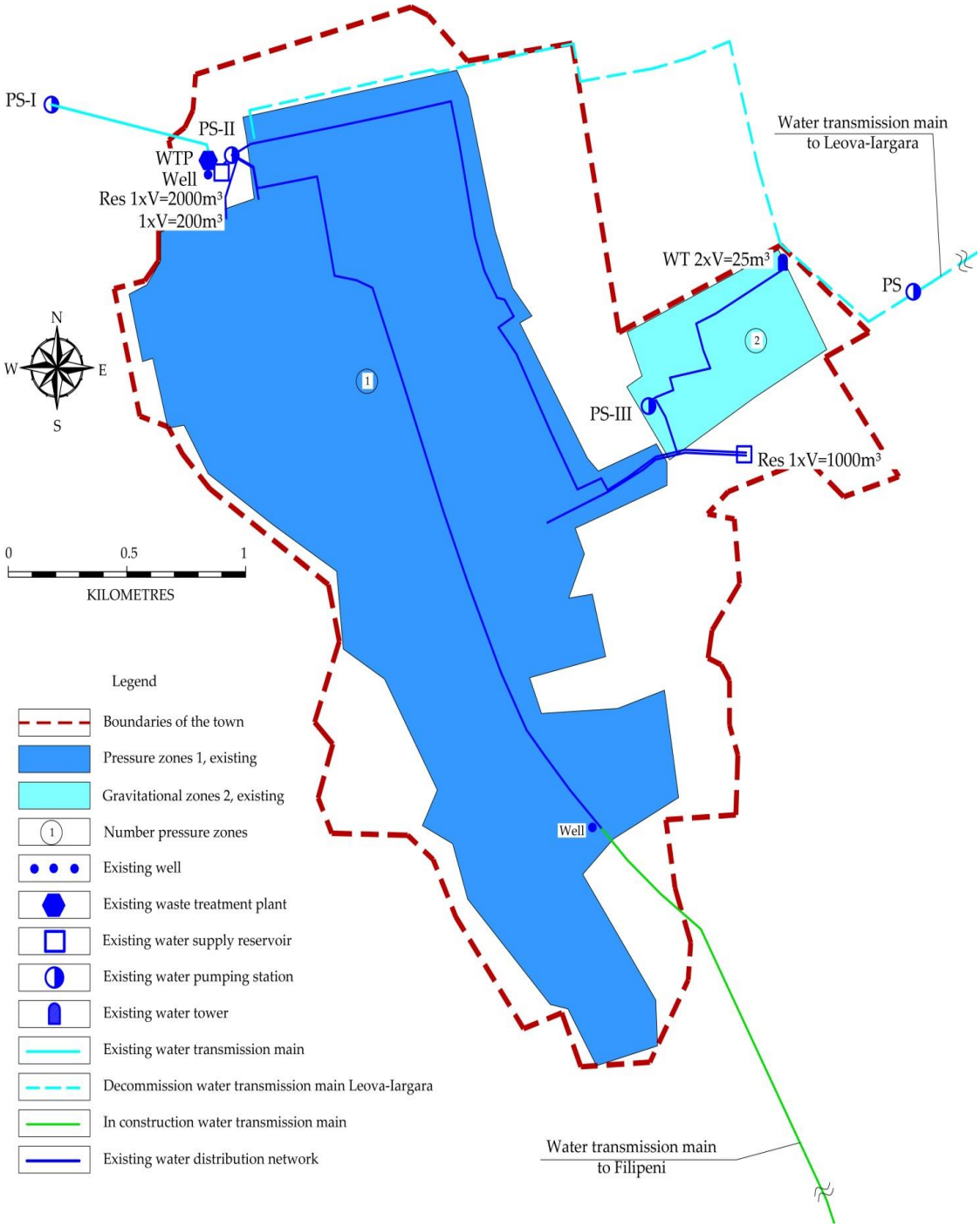
The water supply system in the town of Leova represents a hydro-technical system and comprises the following key components:

- Water source (water intake from the Prut River);

- Transportation of water, from water intake to the treatment plant and further from treatment plant to the distribution network (raw and drinking water transmission main);
- First level pumping station (PS-I);
- Water treatment plant, to improve the water quality, so as to be acceptable to consumers;
- Underground water reservoirs, designed for the storage of a volume of water necessary in such cases as following: water reserve in case of network failure, compensation of hourly consumption and water reserve necessary for firefighting purposes;
- Second level pumping station (PS-II), to ensure the required pressure in the water distribution network;
- Looped water distribution network, combined with branched one;
- Third level pumping station (PS-III), for increasing the water pressure in the Roza Moldovei district;
- Service tank with a volume of 1,000 m^3.

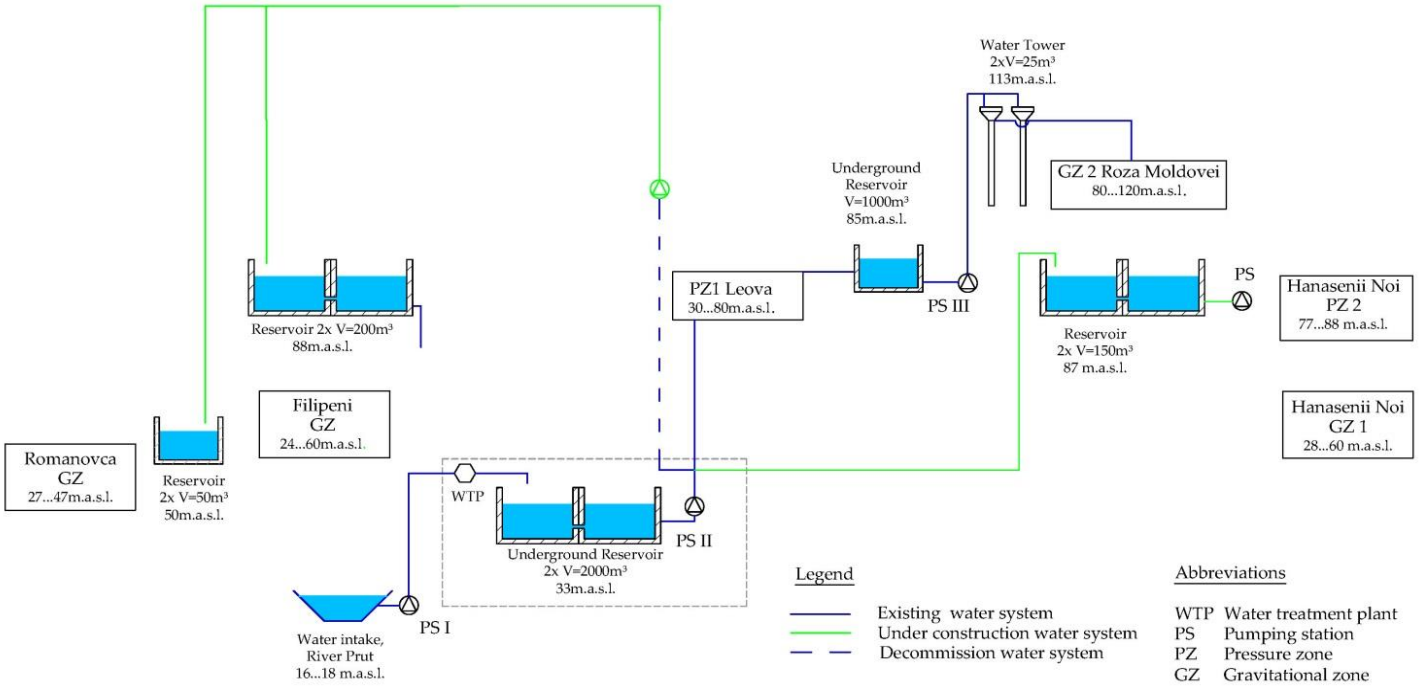
The existing water supply system in the town of Leova is represented in Figure 4-1. More detailed information about the water supply system in the town of Leova is provided in Annex 11.

Figure 4-1: Scheme of water supply of the town of Leova



Source: JSC „Apa-Canal" Leova, GIZ/MLPS

Figure 4-2: Technological scheme of water supply system in the town of Leova



Source: GIZ/MLPS

4.3.1.1 Water source. Water abstraction

Water in the town of Leova is supplied from surface water – the Prut River. The surface water abstraction is carried out at the water intake located at about 4 km to North-West from the town's central area; the intake was put into operation in 1967.

According to the obtained data, the quality of the raw water (Prut River) complies with the actual standards of the Republic of Moldova (Government Decision no. 934 of 15.08.2007 on the establishment of Automated Information System "State register of natural mineral water, drinking water and bottled non-alcoholic beverages"). The analysis of the raw and drinking water quality provided by the JSC „Apa-Canal" Leova, is presented in Table 4-4.

Table 4-4: Water quality indicators (01 September 2015)

No.	Indicator	Unit	Max. concentration acc. to G.D. No 934	Raw water concentration	Drinking water concentration
1.	Smell	degree	acceptable to consumers	2	Acceptable to consumers
2.	Taste	degree	acceptable to consumers		Acceptable to consumers
3.	Colour	degree	acceptable to consumers	73.15	Acceptable to consumers
4.	Hydrogen Index pH		≥ 6.5 ≤9.5	7.5	6.5
5.	Turbidity	degree	5		1.7
6.	Ammonia NH_4	mg/l	0.5		0.28
7.	Nitrites (NO_2)	mg/l	0.5		0.03
8.	Nitrates (NO_3)	mg/l	50		5.17
9.	Total hardness	moles/m^3	5 German degree	7.1	4.7
10.	Total soluble dry sediment	mg/l	1,500	700	550
11.	Chlorine	mg/l	250		28.5
12.	Sulphates	mg/l	250		102.87
13.	Iron	mg/l	0.3		0.1

Source: JSC „Apa-Canal" Leova

4.3.1.2 Water pumping stations, first level (PS-I)

The raw water is pumped to the treatment plant by the first level pumping station (PS-I) via two (2) siphon steel pipelines (one is in operation, and the other is standby) with a diameter of 400 mm each.

The technical parameters of raw water transmission main are presented in Table 4-5. The main technical data of the existing pumping station (PS-I) are provided in the Table 4-6.

Table 4-5: Main technical parameters of the raw water transmission main

No.	Type of water transmission main	Material	Diameter (mm)	Length (m)
1.	Raw water transmission main – 2 pcs	Steel	400	600
Total				**1,200**

Source: JSC „Apa-Canal" Leova

Table 4-6: Main technical parameters of the first level pumping station (PS-I)

No.	PS name	Year of installation	Pump type	Pump flow rate (m^3/h)	Head (m)	Pump power (kW)	Pump energy specific consumption [kwh/m³]
1.	PS-I	1967	OMEGA 320/40	320	40	50	0.16
			K 90/35	90	22	31	

Source: JSC „Apa-Canal" Leova

4.3.1.3 Water treatment facilities

The water treatment plant was put into operation in 1967, with a design capacity of 8,064 m³/day.

Water treatment process includes: coagulation, sedimentation of solids, filtration and disinfection.

The water treatment plant technological scheme includes the following components:

- Vertical truncated mixers (two (2) units);
- Floating settlers (two (2) units);
- Fast filters (eight (8) units);
- Chlorination plant;
- Reagent building;
- Two (2) drinking water underground reservoirs, one with a capacity of 2,000 m^3 and the other with a capacity of 200 m^3;
- Administrative building; boiler room; warehouse and workshop; auxiliary buildings and structures.

The water from surface sources is generally turbid due to high concentration of suspension solids and colloids. These substances have specific weight very close to weight of water and basically they remain suspended for a long period of time. In order to be supplied, it is necessary to clarify the water. For this purpose, while the water is not in motion or is moving at a very low velocity, the natural settling mechanism of suspended solids in the water is used. The settling of suspended solids is caused by gravity and the velocity of their descent is constant due to the viscosity of water. This phenomenon is called settling or decanting process and is performed in special facilities called settlers.

In order to improve the settling process of surface water, aluminium sulphate $Al_2 (SO_4)$ 3 is introduced as a coagulant, which allows fine particles to accumulate into increasingly larger flakes, which then settle by free fall, together with non-coagulated particles. The coagulation process considerably reduces the turbidity, suspended solids and water colour. Also, in the flakes accumulation and sedimentation phases, a partial involvement of organic compound and bacteria contained in raw water.

The coagulant injection into the raw water is performed in the vertical truncated mixers (two (2) units), from which further the raw water mixed with reagent is transported by gravity to the floating settlers (two (2) units).

In the settling process, a high clarification degree of water cannot be accomplished in order to meet required drinking water quality. To achieve a complete water clarification it is necessary to perform the water filtering through a filter layer, usually a sand layer.

The removal of suspensions from water is carried out through filters, which are classified according to the filtration velocity: slow filters, fast filters and ultra-fast filters.

The water clarified in the above mentioned settlers is transported through open fast filters (eight (8) units), based on gravel and quartz sand.

The clarification of water through the settling and filtration processes reduces the bacterial concentration in water, but not sufficiently for consumption. An additional disinfection process is needed to ensure the bacteriological quality of drinking water. A chlorine solution is used for water disinfection, which mainly aims to ensure antibacterial protection in the water distribution network of the town of Leova up to the consumers as well as the oxidation of organic compound and minerals in the water.

A chlorination unit is used for disinfection of water delivered to customers and is installed at the treatment plant building situated in the town of Leova. Since 2015, the disinfection of water is carried out using sodium hypochlorite injection.

The technological scheme of a chlorination plant includes following components:

- Chlorine containers;
- Remote vacuum chlorinator;
- Ejector, for mixture of chlorine gas with water to generate the chlorine solution;
- Injector, for mixture of chlorine solution with treated water.

The existing facilities and structures for water treatment have a high degree of wear.

The treated water is stored in two (2) drinking water underground reservoirs with a capacity of 2,000 m^3 and 200 m^3, previously being disinfected. The main parameters of the existing drinking water underground reservoirs are provided in Table 4-9.

4.3.1.4 Drinking water transmission main

The drinking water stored in the underground reservoirs installed on the treatment plant area, is delivered into distribution network located in the town of Leova, by the second level pumping station (PS –II), through two (2) water transmission pipelines of cast iron with a diameter of 300 mm and high-density polyethylene (HDPE) with a diameter of 250 mm.

The main technical parameters of drinking water transmission main are presented in Table 4-7.

Table 4-7: Technical parameters of drinking water transmission main

No.	Type of water transmission main	Pipe material	Diameter (mm)	Length (m)
1.	Drinking water transmission main	Cast iron	300	3,000
2.	Drinking water transmission main	HDPE	250	
	Total			**3,000**

Source: JSC „Apa-Canal" Leova

4.3.1.5 Water pumping stations

Due to the relief in the town of Leova, the water distribution system includes an underground service tank. During the maximum hourly water demand, the distribution network is supplied from the second level pumping station (PS-II) as well from the underground service tank. During the hourly minimum water demand, the distribution network is supplied only from the second level pumping station (PS-II).

Also, a part of the water volume from the underground service tank, by the third level pumping station (PS-III), is pumped into the water tower with a vat volume of 25 m^3, from which it is distributed by gravity into the distribution network located in the Roza Moldovei district.

The nominal parameters of water pumping stations are presented in Table 4-8.

Table 4-8: Nominal parameters of water pumping stations

No.	PS name	Year of installation	Type	Flow rate (m^3/h)	Head (m)	Power (kW)	Energy specific consumption [kwh/m^3]
1.	PS-II	1967	OMEGA 320/60	320	60	75	0.23
			WILO Tip Helix V 3 pcs	90	50	30	0.33
2.	PS-III	1973	K 90/35	90	35	18	0.20

Source: JSC „Apa-Canal" Leova

4.3.1.6 Water storage facilities

The main technical data on the existing underground reservoirs are provided in Table 4-9.

Table 4-9: Main technical parameters of the existing underground water reservoirs

No.	PS name/Location	Year of construction	Type of reservoir	Capacity (m^3)	Quantity, no. of chambers	Condition
1.	PS-II, Cogalniceanu str.	2012	rectangular	2,000	1	satisfactory
2.	PS-II, Cogalniceanu str.	1967	cylindrical	200	1	unsatisfactory
3.	The service tank, Independentei str.	1975	cylindrical	1,000	1	unsatisfactory

Source: JSC „Apa-Canal" Leova

4.3.1.7 Water distribution network

The water distribution network consists of cast iron, steel, asbestos-cement and high density polyethylene (HDPE) pipes with diameters of between 63 mm and 400 mm. The total length of water distribution network is about 41,600 m.

Main technical parameters of water distribution network are provided in Table 4-10.

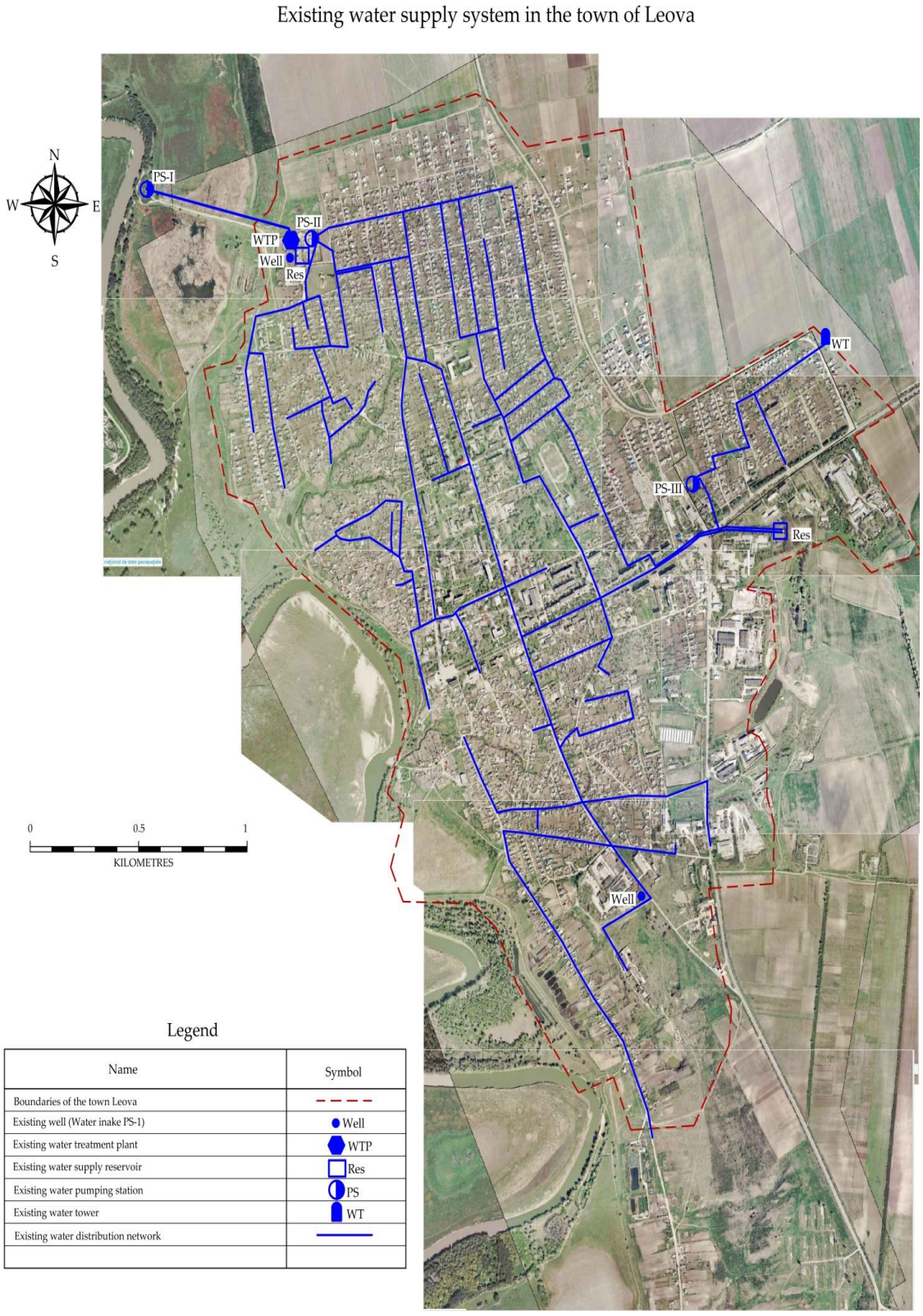
Table 4-10: Main technical parameters of water distribution network

N.	Mate-rial	Length (m) / diameter (mm)								Length (m)	Pipe age (years	Total length (m)
		400	300	250	200	150	100	90	63			
1.	Cast iron		2,000	7,210		2,500	12,400			24,110	40	41,600
2.	Steel	650		3,500	550	1,050	1,600			7,350	40	
3.	Asbes bes-tos-ce-ment			800						800	40	
4.	HDPE							2,460	6,880	9,340	10	

Source: JSC „Apa-Canal" Leova

The water distribution network in the town of Leova is provided in Figure 4-3. More detailed information about water distribution network is provided in Annex 11.

Figure 4-3: Water distribution network in the town of Leova



Source: www.geoportal.md, JSC „Apa-Canal" Leova, GIZ/MLPS

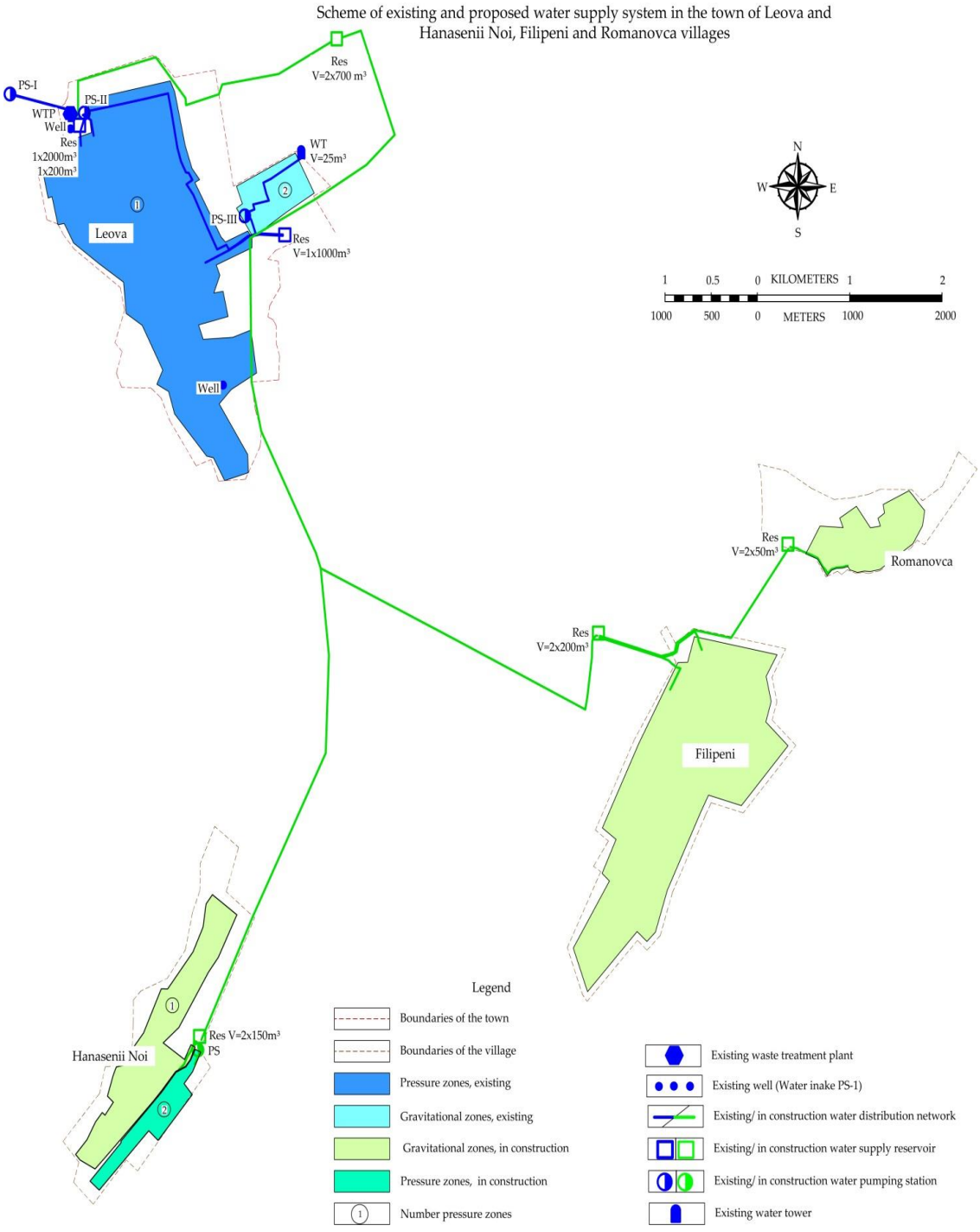
4.3.2 Water supply system in Hanasenii Noi, Filipeni and Romanovca localities

There is no centralised water supply system in the localities of Hanasenii Noi, Filipeni and Romanovca. The inhabitants of these localities are supplied from individual shallow wells.

At the time of the site visits conducted by the GIZ/MLPS experts, the construction-installation works of the drinking water transmission main up to the drinking water reservoirs situated in Filipeni, Romanovca and Hanasenii Noi localities has been completed within the “Construction of Water Transmission Pipeline Leova-Hanasenii Noi-Filipeni-Romanovca” project.

The scheme of water supply systems in Filipeni, Romanovca and Hanasenii Noi localities is provided in Figure 4-4. More detailed information regarding water supply systems in Filipeni, Romanovca and Hanasenii Noi localities is provided in Annex 11.

Figure 4-4: The scheme of water supply systems[5]



Source: JSC „Apa-Canal" Leova, GIZ/MLPS

[5] In Hanasenii Noi, Filipeni and Romanovca villages

4.4 Water balance

The data necessary for water balance calculation were provided by the municipal enterprise JSC „Apa-Canal" Leova and included the following details: monthly volumes of the abstracted raw water, monthly volumes of water sold to domestic customers, monthly volumes of water sold to public institutions and business entities.

Following the real water consumption, the non-revenue water rate for water supply system of Leova was determined.

4.4.1 The monthly volume of abstracted raw water

According to the information provided by the JSC „Apa-Canal" Leova, the monthly volume of the abstracted raw water is determined according to the pumping time of raw water, pump capacity installed at first level pumping station (PS-I) and the season of the year.

4.4.2 Water consumption

The water demand per month is the monthly volume of water sold to domestic customers, to public institutions and business entities.

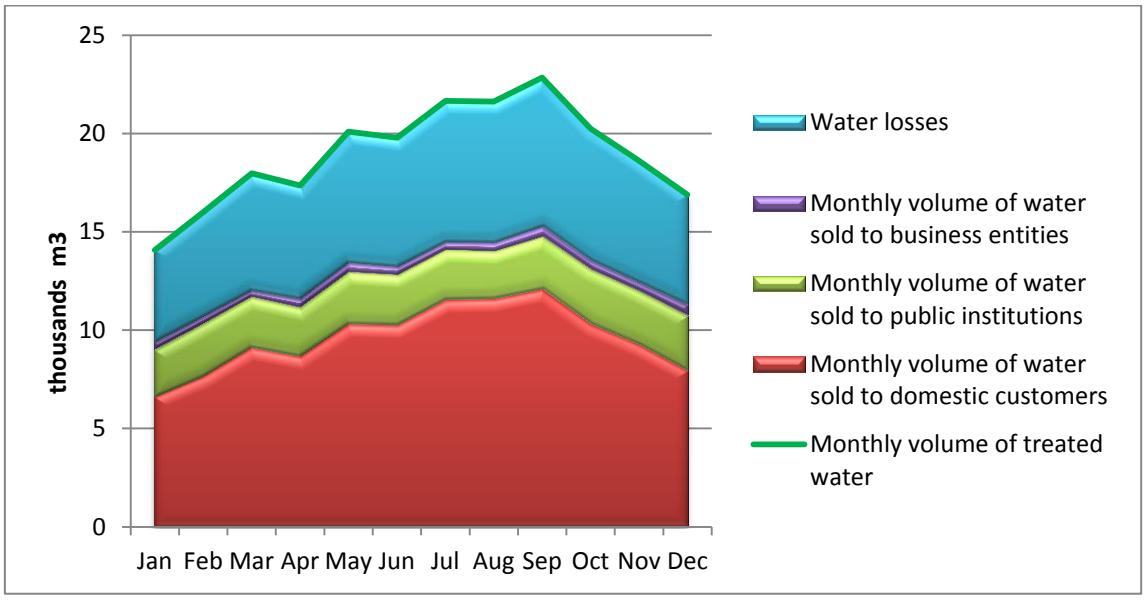
Operational indicators for 2014, presented by JSC "Apa-Canal" Leova, are provided in Table 4-11.

Table 4-11: Operational indicators for 2014

No.	Month	Monthly volume of the abstracted raw water (m^3)	Monthly volume of treated water (m^3)	Monthly volume of water sold to domestic customers (m^3)	Monthly volume of water sold to public institutions (m^3)	Monthly volume of water sold to business entities (m^3)
1.	January	14,068	14,068	6,633	2,398	374
2.	February	16,003	16,003	7,672	2,668	358
3.	March	17,972	17,972	9,139	2,568	307
4.	April	17,361	17,361	8,679	2,504	423
5.	May	20,092	20,092	10,329	2,635	468
6.	June	19,785	19,785	10,265	2,555	406
7.	July	21,663	21,663	11,548	2,533	401
8.	August	21,617	21,617	11,596	2,404	451
9.	September	22,845	22,845	12,086	2,669	517
10.	October	20,235	20,235	10,315	2,770	443
11.	November	18,619	18,619	9,279	2,708	431
12.	December	16,882	16,882	7,958	2,793	533
	Total	**227,142**	**227,142**	**115,499**	**31,205**	**5,112**

Source: JSC „Apa-Canal" Leova

Figure 4-5: Operational indicators



Source: JSC „Apa-Canal" Leova, GIZ/MLPS

4.4.3 Real water consumption

The real water consumption is the volume of water consumed by one customer during 24 hours to meet the physiological and domestic needs under normal operation conditions of the water supply system (l/c/d). The real water consumption for customers is the ratio of daily water sold by the utility divided by the number of consumers (domestic, public institutions and business entities), as provided in Table 4-12.

Table 4-12: The real water consumption

No.	Indicator	Unit of measurement	Year		
			2012	2013	2014
1.	Number of domestic customers	pers.	10,200	10,200	10,352
2.	The annual of abstracted raw water	m³	310,603	237,140	227,142
3.	Total water sold by the utility, of which: • Domestic consumers • Public institutions and business entities	m³	310,603	237,140	227,142
4.	Real water consumption (based on annual billed water)	m³ m³ m³	180,746 144,719 36,027	153,531 120,363 33,168	151,816 115,499 36,317
5.	Real water consumption (based on daily sold water)	l/c/d	49	41	40
6.	Real water consumption (based on daily water sold to domestic consumers)	l/c/d	39	32	31

Source: JSC „Apa-Canal" Leova, GIZ/MLPS

4.4.4 Non-revenue water (NRW)

Annual non-revenue water is the difference between the annual volume of abstracted raw water and annual water invoiced by the utility.

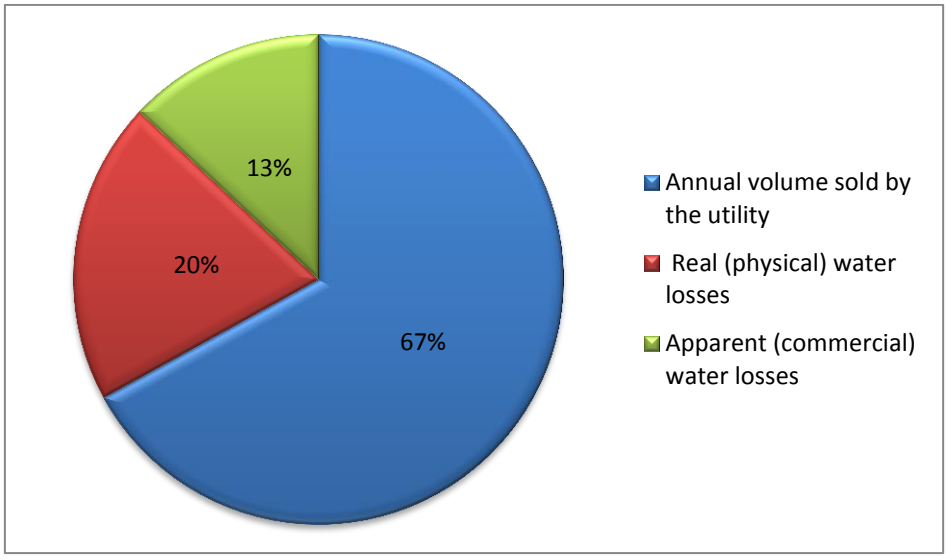
The water balance for water supply system in the town of Leova is provided in Table 4-13.

Table 4-13: Water balance

No.	Indicator	Unit of measurement		2014	
1.	Number of domestic consumers	pers.			10,352
2.	Annual volume of abstracted raw water	m³			227,142
3.	Annual volume of treated water	m³			227,142
4.	Annual volume of water sold	m³			151,816
5.	The annual volume of NRW, including:	m³	%	75,326	33
	• Real (physical) water losses (60% of NRW)	m³	%	45,196	20
	• Apparent (commercial) water losses (40% of NRW)	m³	%	30,130	13

Source: JSC „Apa-Canal" Leova, GIZ/MLPS assessments

Figure 4-6: Water balance



Source: JSC „Apa-Canal" Leova, GIZ/MLPS assessments

In order to reduce real (physical) losses of water it is recommended to:

- Identify the condition of pipes during operational or capital repairs (taking note of the material, interior and outer diameter, as well as interior and exterior condition);
- Identify the network sections with an advanced degree of wear or damage;
- Rapidly detect hidden water losses;
- Maintain records related to damages/ leaks and their quick remedy.

The measures related to apparent (commercial) water loss reduction can be identified by effective management of water supply system in the town of Leova. With the purpose to reduce apparent water losses it is recommended to:

- Install high precision water meters;

- Identify and replace defective water meters;
- Identify unauthorised connections of the water distribution network.

4.4.5 Water metering

During the period 2007-2009, a water metering programme was implemented, resulting in a metering rate of about 88% of customers in single-family dwellings, about 79% of multi-storey apartment building customers, and 100% of public institutions and business entities in the town of Leova. The installed water meters are of class "A", class “B” and class “C”.

4.4.6 Equipment and facilities

The JSC „Apa-Canal” Leova owns and operates the following equipment and facilities:

- Leakage detection equipment, which includes also acoustical detection system and correlator (one (1) unit);
- Laboratory equipment for monitoring of water quality analysis (one (1) unit); and
- Drainage truck with mixed functions of vacuum suction and pipelines cleaning (one (1) unit).

4.5 Technical and operational analysis of the water supply system

4.5.1 Non-revenue water (NRW)

Non-revenue water (as provided in Figure 4-6) has a negative impact on operating costs (high level of electricity consumption for pumping, costs for current and capital repairs, etc.) and revenues (apparent /commercial losses). Both the operating costs and revenues are important factors for sustainable development in water supply sector.

At this time, the degree of wear of existing pipelines is very high, causing large leaks in the water supply system in the town of Leova. The statistics on damages and repairs in the period 1 January 2014 – 31 December 2014 are provided in Tables 4-14 and 4-15.

Table 4-14: Statistics on pipe damage, 01 January - 31 December, 2014

No.	Location	Pipeline breakdowns
1.	On water transmission main	10
2.	On distribution network	231

Source: JSC „Apa-Canal” Leova

Table 4-15: Statistics on repairs made, 01 January - 31 December 2014

No.	Type of repair	Repairs made
1.	Current repairs	241
2.	Capital repairs	0

Source: JSC „Apa-Canal” Leova

4.6 Wastewater system

4.6.1 Wastewater system in the town of Leova

About 4,812 domestic consumers out of 10,900 inhabitants from the town of Leova are connected to the centralised wastewater system, connection rate for wastewater services is about 44%.

The wastewater system in the town of Leova consists of separate sewerage networks, which is a system that collects and disposes through - two networks the domestic wastewater, industrial wastewater and storm water. The main facilities of the wastewater system in the town of Leova are the following:

- Gravity and pressure sewerage networks;
- Wastewater pumping stations (five (5) wastewater pumping stations (WWPS), of which one (1) is the main wastewater pumping station (MWWPS) and four (4) local wastewater pumping stations (WWPS): two (2) wastewater pumping stations being in operation (WWPS-1 and WWPS–2) and two (2) wastewater pumping stations being under construction (WWPS-3 and WWPS–4));
- Wastewater treatment plant (WWTP).

A scheme of wastewater system is presented in Figure 4-7. More detailed information about wastewater system in the town Leova is provided in Annex 11.

The drainage area represents a defined territory, from which the wastewater is collected to a sewerage network.

In the town of Leova, the collection of wastewater is carried out by gravity to three (3) wastewater pumping stations.

The wastewater from the existing drainage area no.1 is collected by gravity to the main wastewater pumping station (MWWPS) located in the town's lower sector of Unirii street, and further pumped by pressure pipes to the wastewater treatment plant (WWTP) located in the town of Leova.

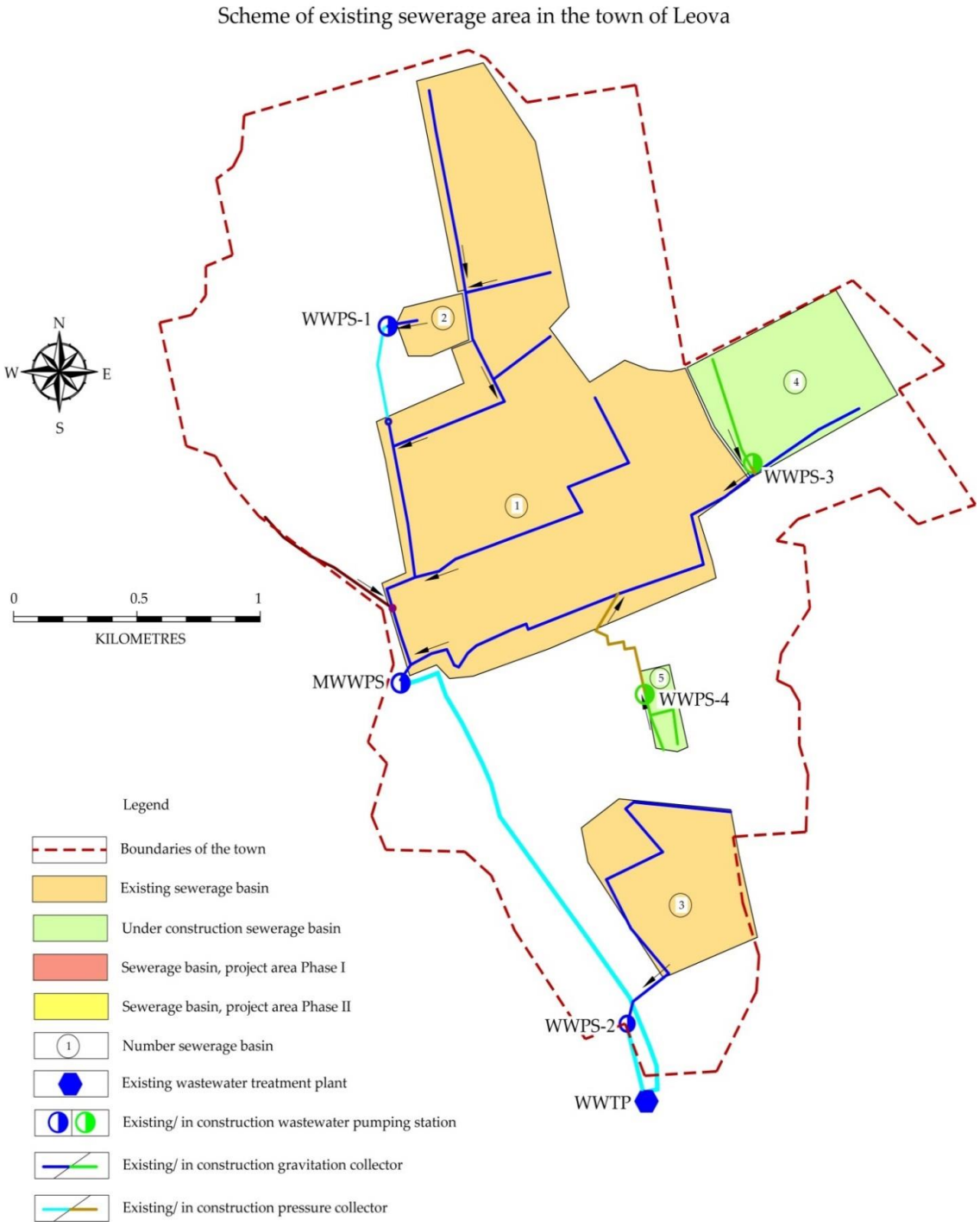
The wastewater from public institution located in the Unirii street is collected by gravity to the local wastewater pumping station (WWPS-1), and further pumped by pressure pipes into gravity sewerage network of the existing drainage area no.1.

The wastewater from the industrial area is collected by gravity to the local wastewater pumping station (WWPS-2) located in the Tighiceanului Street, and further pumped by pressure pipes to the WWTP located in the town of Leova.

At time of the site visits conducted by GIZ/MLPS experts, the construction works of following facilities had been performed:

- Gravity sewerage network designed for wastewater collection to the local wastewater pumping station (WWPS-3) under construction, further being pumped by pressure pipes into the gravity sewerage network of the existing drainage area no.1;
- Gravity sewerage network designed for wastewater collection to the local wastewater pumping station (WWPS-4) under construction, further being pumped by pressure pipes into the gravity sewerage network of the existing drainage area no.1.

Figure 4-7: The scheme of wastewater system in the town of Leova



Source: JSC „Apa-Canal" Leova, GIZ/MLPS

4.6.1.1 Sewerage network

The total length of gravity sewerage network is about 19,915 m. The main technical parameters of the gravity sewerage network are provided in Table 4-16. The total length of pressure sewerage network is about 4,300 m. The main technical parameters of the pressure sewerage network are provided in Table 4-17.

Table 4-16: Main technical parameters of gravity sewerage network

No.	Material	Length (m) / diameter (mm)							Length (m)	Pipe age (years)	Total length (m)
		100	160	200	250	300	400	500			
1.	Asbes-tos-cement	200		1,600					1,800	30	19,915
2.	Cast iron	300				2,100			2,400	20	
3.	Ceramic			2,100	300	700	400		3,500	30	
4.	PVC		8,995	2,020	400				11,415	6	
5.	Concrete							800	800	20	

Source: Water Utility "Apa-Canal Leova" JSC

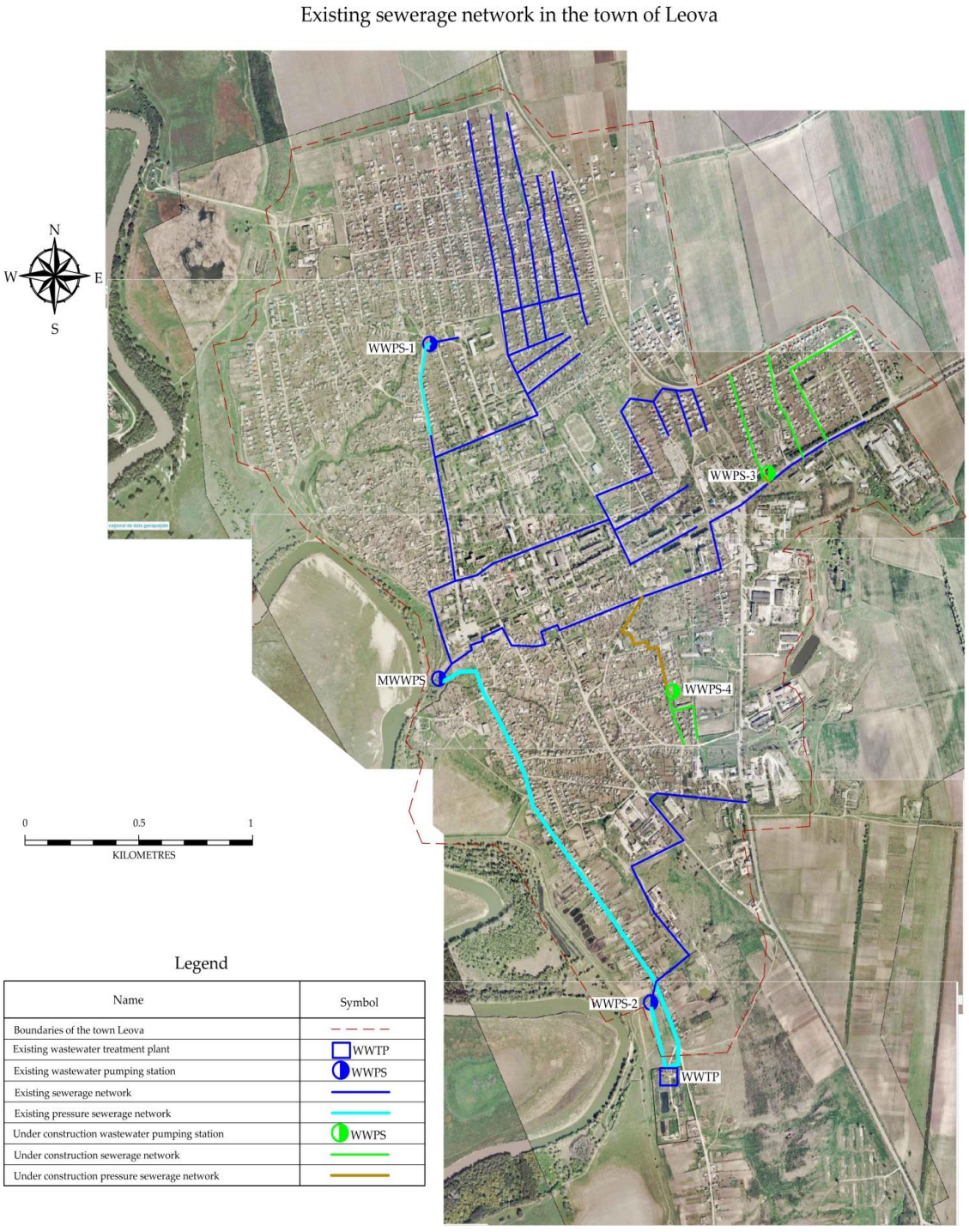
Table 4-17: Main technical parameters of pressure sewerage network

No.	Material	Length (m) / diameter (mm)			Length (m)	Pipe age (years)	Total length (m)
		160	100	300			
1.	Steel		800	3,300	4,100	30	4,300
2.	HDPE	200			200	6	

Source: JSC „Apa-Canal" Leova

The sewerage network in the town of Leova is provided in Figure 4-7. More detailed information is provided in Annex 11.

Figure 4-8: Sewerage network in the town of Leova



Source: www.geportal.md, JSC „Apa-Canal" Leova, GIZ/MLPS

4.6.1.2 Wastewater pumping stations

The wastewater pumping stations are located in the lower part of drainage area, where the gravity collection is impossible because of the topography in the area. The technical parameters of the wastewater pumping stations and pumps are presented in Table 4-18.

Table 4-18: Technical parameters of pumping equipment

No.	PS name/ Location	Year of installation	Year of rehabilitation	Pump type	Pump flow rate (m^3/h)	Head (m)	Pump power (kW)	Pump energy specific consumption (kwh/m³)
1.	MWWPS, Unirii str.	1990	2007	OMEGA	250	22.5	28	0.11
2.	WWPS-1, Unirii str.	1985	2005	CD 16/25	16	25	7.5	0.46
3.	WWPS-2, Tighiceanului str.	1990		CD 16/25	16	25	7.5	0.46

Source: JSC „Apa-Canal" Leova

At the moment feasibility study elaboration, the wastewater pumping stations are in a good condition, thus rehabilitation/ replacement is not required.

Figure 4-9: The wastewater pumping station WWPS-1

Source: GIZ/MLPS

4.6.1.3 Wastewater treatment plant

The wastewater in the town of Leova, collected by pressure pipes in the contact chamber located at main wastewater pumping station (MWWPS) is pumped to wastewater treatment plant (WWTP) located to the southeast from the town centre. The WWTP was brought into operation in 1990, with a design capacity of 4,700 m³/day. At present, the wastewater flow rate collected to the wastewater treatment plant is about 250 m³/day.

The wastewater treatment plant includes the following processes: mechanical treatment, biological treatment, tertiary treatment and disinfection level.

Gross solids and other constituents removal is carried out through screens, as a mandatory operation to be performed at the inlet of the wastewater treatment plant. In the town of Leova, gross solids and other constituents removal is carried out through screens installed at the main wastewater pumping station (MWWPS).

The technological scheme of wastewater treatment includes the following facilities:

- Energy dissipater;

- Horizontal grit chambers (two (2) units);
- Digester-settlers (two (2) units);
- Active sludge aeration tanks (ASAT) (two (2) units);
- Sludge drying beds (four (4) units);
- Biological ponds (two (2) units);
- Chlorination plant; and
- Warehouse and workshop.

The **mechanical treatment** or primary treatment is designed to remove suspended solids from wastewater by physical processes.

The energy dissipater (or contact chamber) is designed to reduce the flow rate of pumped wastewater and the transition in gravity flow through open channels to treatment facilities.

The horizontal grit chambers are designed for removal of mineral particles bigger than 0.2 mm from the wastewater, especially sand particles and particles considered non-decayed. The technological scheme includes two (2) horizontal grit chambers, of which only one is in operation.

The sand trapped sludge (dredged sludge) is non-decayed and it is subjected to dewatering on the sludge drying beds, which are not foreseen in the technological scheme.

The primary settlers are designed to gravity sedimentation of particles smaller than 0.2 mm, especially of organic suspended solids. The technological scheme includes two (2) digester-settlers units, of which one is in operation.

Figure 4-10: Wastewater treatment plant. Energy dissipater. Digester-settlers

Source: GIZ/MLPS

Biological treatment or secondary treatment uses the biological activity of microorganisms in order to oxidise and mineralise the organic matter from wastewater, which previously had been subjected to the primary treatment. The removal of organic matter dissolved in the wastewater is carried out by its absorption on the cell area, microorganisms, especially bacteria. As a result, the new bacteria cells and so-called metabolites (carbon dioxide, mineral salts) are formed.

The technological scheme includes two (2) activated sludge aeration tanks (of which one (1) is into operation) in which the wastewater collected from digester-settlers is

subjected to the intensive aeration. Through the blowers, the aeration system is designed to ensure the necessary oxygen for aerobic micro flora of the active sludge aeration tanks. In 2007, with the support of Czech Republic Government, the biological treatment unit was modernised, and namely the aeration process in active sludge aeration tanks (the blower capacity being of 400 m³/day).

The secondary settlers are designed to remove the grown microorganisms from wastewater, - (usually as a biological membrane) in the active sludge aeration tanks. Sedimented sludge is partially used for seeding aeration tanks with activated sludge, and the excess is stored on the sludge drying beds for dewatering, which aims to reduce humidity from 98% up to 70 – 80%. In the town of Leova, the secondary settlers and sludge drying beds located at the wastewater treatment plant have been out of operation.

Figure 4-11: Wastewater Treatment Plant. Active sludge aeration tank. The blower

Source: GIZ/MLPS

The **tertiary treatment** includes biological ponds, which represents open underground basins. The functioning of biological ponds is based on microbial cultures (usually aerobic). The necessary oxygen for aerobic treatment process which occurs in ponds, is taken from wastewater, organic compounds (sulphates; nitrates), and the atmosphere as a result of algae photosynthesis in the pond. The treatment in the biological ponds is ensured due to long period of wastewater retention, which is enough for development of natural self-treatment processes. The photosynthesis process is the main mechanism on which natural ponds are based. Regarding the design of ponds, their size depends on the required treatment, wastewater quality, climatic conditions (particularly temperature and brightness) and the depth of the pond. In ponds with a depth of 1,0 m occurs also anaerobic processes, on the bottom sludge, producing offensive odours. The technological scheme includes two (2) biological ponds.

The artificial biological treatments do not always ensure the elimination of all microbes, bacteria and pathogenic viruses. The **disinfection level** is foreseen to avoid the spread of infectious diseases at the wastewater discharge and it includes following units:

- Chlorination plant, where the chlorine solution is dosed and prepared;
- Mixing chamber of chlorine solution with treated wastewater;
- Contact chamber.

In the town of Leova, the existing facilities for wastewater treatment have a high degree of wear.

Figure 4-12: Wastewater treatment plant. Biological ponds

Source: GIZ/MLPS

According to obtained data, the quality of effluent wastewater does not comply to the current standards of the Republic of Moldova (Law no.950 of 25.11.2013 on Approval of the Regulations on the conditions of collection, treatment and wastewater evacuation into sewage and /or water bodies for rural and urban localities), and corresponding treatment, for following indicators: ammonia nitrogen (NH_4+) and total phosphorus (P). Quality indicators of influent and effluent wastewater were presented by Water Utility "Apa-Canal Leova" JSC, as provided in Table 4-19.

Table 4-19: Wastewater quality indicators

No.	Indicator	Unit	Influent concen-tration	Effluent concen-tration	Maximum allowed concentration acc. to GD nr.950
1.	Hydrogen ion concentration (pH)		7	7.75	6.5 – 8.5
2.	Suspended solids	mg/l	152	6	35.0
3.	Five days biochemical oxygen demand (BOD_5)	mgO_2/l	70	17.6	25.0
4.	Chemical oxygen demand (COD)	mgO_2/l	392	86	125.0
5.	Ammonia Nitrogen (NH_4+)	mg/l	48.4	4.3	2.0
6.	Total phosphorus (P)	mg/l	7.3	2.35	2.0
7.	Synthetical detergents biode-gradable active anions	mg/l	-	-	0.5

Source: JSC „Apa-Canal" Leova

The treated wastewater is discharged into the Prut River. The monthly volume of treat-ed wastewater is provided in Table 4-20.

Table 4-20: Monthly volume of treated wastewater for 2014

Month	Monthly volume of treated wastewater (m^3/month)
January	5,616
February	6,308
March	5,664
April	5,721

Month	Monthly volume of treated wastewater (m^3/month)
May	5,916
June	5,948
July	6,305
August	6,246
September	6,728
October	6,316
November	6,626
December	6,217
Total	**73,611**

Source: JSC „Apa-Canal" Leova

4.6.2 Wastewater systems in Hanasenii Noi, Filipeni and Romanovca localities

There are no centralised wastewater systems in the localities of Hanasenii Noi, Filipeni and Romanovca.

4.7 Available pre-feasibility studies and technical documentation

During the elaboration of this feasibility study, available studies, feasibility studies and existing technical designs have been consulted, as provided in Table 4-21.

Table 4-21: Available studies and technical documentation

No.	Project Name	Type of document	Financing Agency
1.	Water supply feasibility study for town of Leova, with options on sanitation services, based on chapter of WSS Socio-Economic Development Strategy, GIZ, 2014	Feasibility study	N.A.
2.	Water supply feasibility study for town of Leova, with options on sanitation services, based on chapter of WSS Socio-Economic Development Strategy, GIZ, 2014	Feasibility study	N.A.
3.	Construction of masterly water transmission main Leova-Hanasenii Noi, Filipeni-Romanovca, rayon of Leova (2013)	Implemented technical design	NEF
4.	Sewerage construction in Hanasenii Noi locality, rayon of Leova, SDI"IPROCOM" (2014)	Technical design	N.A.
5.	Water supply and sewerage providing in Hanasenii Noi locality, rayon of Leova, SDI"IPROCOM" (2014)	Technical design	N.A.
6.	Water supply, collection and discharge of wastewater from Romanovca locality, rayon of Leova, "FLUXPROIECT" Ltd. (2014)	Technical design	N.A.
7	Water transmission main and wastewater system construction in Filipeni locality, rayon of Leova, "GAZPROIECT" JSC (2015)	Technical design	N.A.

Source: LPA Leova

4.8 Conclusions

- In the town of Leova, the water supply service area is about 100% and water supply connection rate is about 95%;
- High real (physical) and apparent (commercial) water losses (annual volume of NRW is about 33%);
- High degree of wear of existing pipelines (the pipe age exceeds years of useful life) causes leakages in the water supply system in some sectors of the town of Leova;
- There are no centralized water supply systems in the neighbourhood localities (Hanasenii Noi, Filipeni and Romanovca);
- In the town of Leova, the wastewater service area is about 70% and wastewater service connection rate is about 44%;
- High degree of wear of existing pipelines (the pipe age exceeds years of useful life) causes frequent sewerage blockages and emergency driven maintenance;
- According to obtained data, the quality of effluent wastewater at wastewater treatment plant does not comply to the actual standards of the Republic of Moldova (Law no.950 of 25.11.2013 on Approval of the Regulations on the conditions of collection, treatment and wastewater evacuation into sewage and /or water bodies for rural and urban localities), and corresponding treatment, for following indicator: ammonia nitrogen (NH_4^+) and total Phosphorus (P);
- There are no centralized wastewater systems in the neighbourhood localities (Hanasenii Noi, Filipeni and Romanovca).

5 Investment programme

5.1 General

The objective of this chapter is to prepare an Investment Programme to set the general direction for sector development in the feasibility study area and to identify the investment needs that will lead to increased coverage of population with water supply and wastewater services, improved service quality and efficiency improvements.

The subject of Investment Programme has been developed by MLPS experts in collaboration with local and regional partners[6] based on the following:

- Existing pre-feasibility, feasibility studies and detailed designs (see Chapter 4.7);
- WSS Regional Sector Programme (RSP) and Possible Project Concept (PPC) for Leova developed in the framework of the project "Modernization of Local Public Services in the Republic of Moldova";
- Analysis of the existing situation (see Chapter 4- Technical aspects-Existing situation);
- The comparison of results and assessment of initial conditions with the Regional Sector Programme for Development Region South and the National Water Supply and Sanitation Strategy 2014-2028 (GD nr.199 of 20.03.2014);
- The Social and Economic Development Strategy (SEDS) for Leova district (2015-2020);
- The SEDS is aligned and harmonised with all national and regional strategic documents and policies;
- Strategies, goals and priorities defined by the Mayor's Office of the town of Leova and JSC 'Apa-Canal' Leova (see Chapter 5.2- Development strategy for water supply and wastewater services);
- Identified problems and objectives based thereon;
- Water demand and wastewater flow projection (see Chapter 5.4).

The Investment Programme includes:

- Short-term;
- Medium-term;
- Long-term measures.

The short-term measures are referred to as *Priority Investment Measures* and are again sub-divided into two sub-phases as follows:

- Phase 1 – priority measures to be implemented until 2018;

[6] A Project Working Group (PWG), established by decision of the local council and comprising members from the Regional Development Agency South (RDA South), the Leova Local Public Administration (LPA) and GIZ/MLPS experts, was instituted to facilitate and coordinate the process of preparation and agreeing this feasibility study, in particular the scope of the proposed project. The same PWG will endorse the study for approval by the Leova local council.

- Phase 2 – priority measures to be implemented between 2018 and 2021 (depending on the availability of funds and the capacity of the implementing and operating agency this period might be extended).

The main reason for the sub-division of the short-term measures into two phases is that the capacity of the implementing and operating agencies should not be overloaded. Further, the objective is to identify “no-regret” measures which can be implemented immediately after completion of this feasibility study and which neither require further studies or investigations nor might be in contradiction to other regional projects under development. Priority investment measures retained in Phase 1 are considered as “*The Project*” for which further assessments have been carried out (Option Analysis, Financial Analysis, Environmental Assessment, etc.) in this study.

The identified investment measures are presented in this chapter in the following sections:

- In Chapter 5.7 all identified measures are described (irrespective of their phasing);
- In Chapter 5.8 the identified measures will be prioritised and phased (grouping into the above mentioned phases);
- In Chapter 5.9 an Option Analysis for the Priority Investment measures retained for Phase 1 has been carried out;
- In Chapter 5.10 a Priority Investment Plan (PIP) including investment cost estimates for Phase 1 and Phase 2 measures has been presented.

5.2 Development strategy for water supply and wastewater services

In general, the main drivers for developing the Investment Programme in the water supply and wastewater sector are:

- Strategic goal;
- Urban development;
- Service objectives;
- Water demand projection;
- Metering policy;
- Tariff policy.

Strategic goal

The Rayon Administration of Leova developed together with all stakeholders the Social and Economic Development Strategy (SEDS) for Leova district (2015-2020). This strategy includes the water supply and sanitation chapter which provides guidance in the development of this sector and specifies strategic sector goals. The SEDS is aligned and harmonised with all national and regional strategic documents and policies.

The objectives and targets specified in the SEDS for the Leova district in the WSS are as follows:

- *General objective*:
  To improve the living conditions of the population in the Rayon of Leova by providing water supply and wastewater services to the population;

- Specific objectives:
  - Providing of drinking water supply services to 85% of the population in the Leova district until 2020;
  - Increasing the number Leova district population connected to sewerage services until 2020;
  - Strengthening capacities of the operator and form a regional water utility for the Leova district;
  - Increasing awareness and public awareness on the need for quality water consumption;
  - Raising public awareness about the influence of wastewater on the environment.

In order to mitigate the existing fragmentation in the WSS and to increase sector efficiency, the Leova Rayon Administration intends for sector planning to group localities of similar characteristic into clusters and not to deal with localities individually.

The following criteria were used to propose clusters:

- Distance to urban centre;
- Access and distance to water sources;
- Size (population of locality);
- Density of population;
- Priority has been given to Cluster A and B.

Cluster A includes Leova town and the localities in the region which are located in the catchment area of the existing WSS infrastructure in Leova town or can potentially be integrated into a joint service area after upgrading/enlarging of the infrastructure there.

Cluster B includes the biggest localities of the rayon after Leova town, which are Iargara and Borogani. Further, all potentially affected localities in the region in terms of topography and water source are considered for this cluster.

The Regional Sector Programme (RSP) provides the framework for improving the conditions of local operators so that they can expand services and provide a viable partner for any future regional transmission main should it be found to be the most feasible solution.

Urban development

According to the analysis of demographic development in recent years, the population of Leova town can be expected to slightly decrease throughout the period of analysis (see Chapter 2.4 - Population). Therefore, no major plans for large scale extensions of residential areas in the town of Leova are foreseen.

There is the plan that the Leova town will expand the service area and will connect the neighbouring localities Filipeni, Hanasenii Noi, and Romanovca.

Service objectives

The overall service objective is to provide the population with safe, reliable and continuous water supply and wastewater services. To achieve this, the Mayor Office and JSC ‘Apa-Canal’ Leova should consider (see assumptions and targets presented in Chapter 5.3) the following specific objectives:

- Provide water compliant with the national drinking water standards to all parts of the service area;
- Maintain the current level of service by providing water 24 hours per day;
- Provide water of sufficient quantity to all customers;
- Extend the water supply and sewerage service area in the town of Leova;
- Treat effluents from the sewer system in compliance with the current nation legislation and in the future in compliance with the respective EU legislation (Urban Wastewater Treatment Directive);
- Reduce non-revenue water to an acceptable level of a maximum 25% by 2045;
- Improve efficiency of service provision by enhancing operation and maintenance practices for the Mayor Office and JSC ‘Apa-Canal’ Leova;
- Reduce operating costs and provide sufficient funds for adequate maintenance, repair and capital renovation of the system in order to ensure sustainability of service provision;
- Improve environmental protection;
- Ensure affordability of the tariffs for water supply and wastewater services.

Water demand projection

For the last decades, there has been a constant trend of declining water consumption particularly in industrial use due to the decline in old industries. Further, the population is projected to decrease in the study area by about 10% until 2045, while the specific water demand is expected to increase in the future. The town of Leova does not have significant industry and there is limited potential to develop industrial zones in the near future.

The projected development of water demand including water losses and wastewater flow projection is presented in the following chapter.

Metering policy

Water production metering:

Currently, the water production is appropriately metered at the water abstraction from the Prut River at SP-1 level and further on SP-2 level, after the water treatment plant. On other relevant spots as reservoirs and central connections, and flow meters are missing. Improvement of the system knowledge (water flow, pressure and water losses) is of utmost importance. Therefore, the installation of missing flow meters is considered as a high priority measure. In the medium-term, a SCADA system with more advanced features for flow measuring and operation control is considered.

Customer metering:

About 85% of the service connections are metered in the town of Leova. All 59 multi-storey blocks in the town of Leova, business units and social institutions are metered with one meter per block/organisation/ business unit. About 260 private houses are not metered as the owners reside abroad and their houses are not inhabited. All meters installed are operational and are checked once per month by JSC 'Apa-Canal' Leova controllers during water meter readings. Water meters are calibrated once in five years. JSC 'Apa-Canal' Leova is supported by an EBRD project with the implementation of the metering policy.

Tariff policy

Water tariff policy and strategy (level of average tariff and tariff structure) has a significant impact on:

- Water consumption (demand elasticity results in reduction of consumption when tariffs increase);
- Revenue stream and consequently capacity of the operator to maintain the WSS system adequately (sustainability).

Capacity building measures should be foreseen to develop an appropriate tariff policy and to ensure sustainability of the proposed Priority Investment Plan. Reference is made to Chapter 6 – Financial and Economic analysis.

5.3 Design parameters and assumptions

The development of water demand is determined by the parameters and assumptions defined as follows.

5.3.1 Domestic water consumption and wastewater generation

- Population forecast and its assumptions as presented in Chapter 2.4;
- The development of the **service connection rate (water and wastewater)** for domestic customers considers the following:
  - Existing population connected;
  - Additional population connected due to on-going projects (completed before 2018);
  - Population connected due to network extension foreseen in Phase 1 by 2018;
  - Population connected due to network extension foreseen in Phase 2 by 2021;
  - Maximum target connection rate within the planning horizon is assumed to be reached in 2030 for urban localities and in 2045 for rural localities.
- It is further assumed that the coverage rate (population which can potentially be connected to the network) is different from the connection rate (population which actually is connected to the network) and the following applies: Data for the existing situation regarding coverage and connection rate are applied if available (see Chapter 4- Technical aspects-Existing situation); if data are not available it is assumed that the connection rate is 30% less than the coverage rate for water supply and 40% less than the coverage rate for wastewater. The difference between coverage rate and connection rate will then decrease linearly and will be zero in the year when the target connection rate is defined (e.g. water supply coverage rate for urban areas will reach 100% in 2030 and will be equal to the water supply connection rate in 2030). The respective targets are presented in Table 5-1 below;
- **Per capita domestic water consumption** (volume of water sold) is currently very low as presented in Chapter 4.4 - Water balance, mainly due to two reasons (i) absence of part of the registered customers and (ii) apparent water losses (water theft, metering inaccuracy). Due to measures proposed in this feasibility study (Chapter 5.7.6 - Technical assistance) aimed at drastically reducing apparent (commercial) losses it is assumed that per capita water sales are projected to in-

crease to the maximum of 110 l/c/d in urban areas and 80 l/c/d in rural areas due to economic development until the year 2045. It is noteworthy, that the demand projection model refers to "water sales" and not to "real water consumption[7]", which explains the difference to the suggested per capita consumption figures in the Regional Sector Programme (RSP);

- The **wastewater generation factor** (share of wastewater discharged to the wastewater system out of water consumed) for domestic customers is assumed to be 100% (factor of 1).

5.3.2 Non-domestic water consumption and wastewater flow

- **Industrial consumption**[8]: During the last decades, the economy in the study area has slowed down and many industries closed, which resulted in a decline in industrial water consumption. For the purpose of this study, it is assumed that industrial water consumption will slightly increase (from a very low level) linearly to 15 l/c/d until 2030, and will then remain constant until the end of the planning horizon. It is assumed that industrial consumption only applies to urban localities;
- **Institutional water consumption**: It is assumed that institutional water consumption will increase/decrease from current consumption level[9] linearly to 10 l/c/day until 2030 and will then remain constant until the end of the planning horizon. It is assumed that institutional consumption applies to urban and rural localities;
- **The wastewater generation factor** for non-domestic customers (share of wastewater discharged to the wastewater system out of water consumed) is assumed to be 100% for commercial and institutional customers (factor 1);
- **Industrial wastewater** flow from customers not connected to the water supply system (own wells) but discharging to the sewer system is unknown and cannot be determined based on the provided data). For future development it is assumed that this volume is insignificant and will not be taken into consideration for wastewater flow projection.

5.3.3 Extension of water supply system to localities in the neighbourhood of the town of Leova

The JSC 'Apa-Canal' Leova is going to extend the services to the localities of Filipeni, Hanasenii Noi, and Romanovca in the vicinity of the town of Leova. These localities are currently endowed neither with a water supply network nor with a sewer network. However, there are ongoing activities to connect these localities to central water supply system of the town of Leova. Transmission mains and water storage facilities are already constructed, supply networks within the localities are planned to be completed in the coming years. It is expected that the water supply system will be completed by 2018. Within this study it is assumed that all localities will be served with water supply from JSC 'Apa-Canal' Leova by 2018, no activities for the water supply for these localities

[7] The difference between water sales and real water consumption are the "apparent or commercial losses" due to meter under-registration, meter tampering, etc. and partly also due to consumption from private individual wells.

[8] Including all commercial entities

[9] According to data from JSC 'Apa-Canal' Leova sales department.

are planned within this study. Investments for a wastewater system for the localities of Filipeni, Hanasenii Noi, and Romanovca have been included for Phase 2 of this study.

5.3.4 Water losses

Currently non-revenue water (NRW) in the water supply system of the town of Leova is comparatively high. Reduction of NRW is therefore one of the main goals in order to increase efficiency of the WSS system. The following assumptions have been made with regard to reduction of NRW for the network:

- *Apparent Losses*[10] *(commercial losses)* are assumed to decrease linearly to 5% (unavoidable apparent losses) until the year 2045 due to technical assistance measures for reduction of commercial losses included in Phase 1;
- *Real losses (physical losses)* are assumed to decrease linearly to 20% until the end of the planning horizon in 2045. This target is assumed to be achieved by implementing (i) investment measures for renovation of the existing water supply system and (ii) technical assistance measures and equipment aiming at reducing water losses (including training in water loss reduction e.g. leakage detection and pressure management; improvement of revenue collection[11]) proposed in Phase 1. Further, in the long-term it is assumed that continuous renovation of the network[12] will further reduce real water losses;
- Overall, NRW is therefore assumed to decrease to 25 until the year 2045.

5.3.5 Sewerage infiltration rate

The sewerage infiltration rate (as% of total water discharged to the wastewater system) is assumed to decrease if measures for rehabilitation of the sewer network are foreseen. The development of this parameter is based on expert assessment, separate for each sewer network, depending on:

- The condition of the sewer network;
- The share of new and old sewer network;
- The type of sewer (separate or combined system);
- Information about groundwater table if available;
- Data of wastewater concentration at the outflow of the sewer system if available.

There is no information on the current infiltration rate available for Leova sewer network (see Chapter 4- Technical aspects-Existing situation) and therefore a typical[13] infiltration rate for sewer networks in the region has been applied in the model (see Table 5-1).

It is assumed that the infiltration rate will decrease after implementation of measures for rehabilitation of sewer network or extension of the sewer network in accordance

[10] Including unbilled authorized consumption

[11] Commercial improvements will result in availability of funds for regular renovation of the water network

[12] Financed from additional revenues generated by JSC 'Apa-Canal' Leova as a result of technical assistance measures included in Phase 1.

[13] Outworn and obsolete sewer system

with the ratio of “new sewer network[14]” and “old sewer network[15]” (see Table 5-1). Thereafter, it is assumed that the sewer infiltration rate will be maintained at constant level until the end of the planning horizon[16].

5.3.6 Wastewater flow and load

The following assumptions have been made regarding wastewater flow and load development:

- Specific domestic wastewater load: 60 gBOD_5/capita/day for design of WWTP;
- Specific non-domestic wastewater load: Wastewater flow at a max. admissible BOD_5 concentration of 225 mg/l to discharge into the sewer network;
- Peak Storm Water Factor: 1.3 for allowance for storm water entering into the sewer network from “unacceptable[17]” rainwater connections or rainwater entering into manholes during storm water run-off (applicable for separate systems).

All design parameters are in line with the national regulation and with international standards. The main design parameters are presented in the table below (reference is made to explanations in the previous Chapter 5.3- Design parameters and assumptions).

Table 5-1: Design parameter

N°	Design Parameter	Unit	2014[18]	2018[19]	2021[20]	2030	2045
0	Service coverage rate for domestic customers, disaggregated for total, urban and rural localities						
0.1	Water - total	%	69	100	100	100	100
0.2	Wastewater - total	%	48	56	92	95	97
0.3	Water supply – urban	%	100	100	100	100	100
0.4	Water supply – rural	%	0	100	100	100	100
0.5	Wastewater - urban	%	70	82	98	100	100
0.6	Wastewater - rural	%	0	0	80	84	90
1	Service connection rate for domestic customers, disaggregated for urban and rural localities						
1.1	Water - total	%	66	87	89	95	100
1.2	Wastewater - total	%	31	35	57	82	93
1.3	Water supply – urban	%	95	95	96	100	100
1.4	Water supply – rural	%	0	70	73	83	100
1.5	Wastewater - urban	%	44	52	61	90	95
1.6	Wastewater - rural	%	0	0	48	64	90
2	Volume of water sold for domestic consumers						
2.1	In urban localities	l/c/d	31	41	49	72	110

[14] Infiltration rate of 10% is assumed for new sewer networks

[15] An infiltration rate of 50% is assumed for old sewer networks (e.g. above 30 years)

[16] It is assumed that without major investments after Phase 2 the infiltration rate cannot be further reduced. However, regular replacement of sewer network by the JSC 'Apa-Canal' Leova will maintain the infiltration rate at constant level (increasing of the infiltration rate can be avoided by regular repairs and rehabilitation).

[17] It is best practice to avoid any connection from rainwater drains (e.g. from roofs or streets). However, practically a certain amount of rainwater entering the sewer network cannot be avoided.

[18] Existing situation

[19] 1st year of operation Phase 1 investments

[20] 1st year of operation Phase 2 investments

N°	Design Parameter	Unit	2014[18]	2018[19]	2021[20]	2030	2045
2.2	In rural localities	l/c/d	0	30	36	52	80
3	Volume of water sold for non-domestic consumer (industry, commercial…), disagg. for urban and rural localities						
3.1	Ind. and commercial - urban	l/c/d	1.4	4.8	7.3	15.0	15.0
3.2	Ind. and commercial - rural	l/c/d	0.0	0.0	0.0	0.0	0.0
3.3	Institutional entities - urban	l/c/d	8.3	8.7	9.0	10.0	10.0
3.4	Institutional entities - rural	l/c/d	0.0	5.0	6.3	10.0	10.0
4	Wastewater generation as factor of the water demand						
4.1	Domestic customers	factor	1	1	1	1	1
4.2	Non-domestic customers	factor	1	1	1	1	1
5	Non-Revenue Water (NRW) as share from the water production						
5.1	Total NRW	%	33	32	31	29	25
5.2	Apparent losses	%	13	12	11	9	5
5.3	Real losses (physical losses)	%	20	20	20	20	20
6	Sewer Infiltration rate as share of total water discharged to the wastewater system						
6.1	Sewerage infiltration rate	%	50	40	38	31	20
7	Water demand variation factors (in compliance with SNIP)						
7.1	Daily variation factor	factor					1.1
7.2	Hourly variation factor water supply	factor					1.56
7.3	Hourly variation factor wastewater	factor					1.9
7.4	Peak storm water factor	factor					1.3
8	Wastewater flow and load parameters for domestic and non-domestic sources						
8.1	Specific Domestic wastewater Load	$gBOD_5/c/d$					60
8.2	Specific Non-domestic Wastewater Load - maximum admissible BOD_5 concentration for sewer discharge	mg/l					225

Source: GIZ/MLPS

The assumptions for water demand projection related to financial projections require differentiating between two scenarios: (1) Business as usual and (2) after project implementation (Phase 1 measures). The results of the financial projections are presented in Chapter 6 – Financial and Economic Analysis. While the assumptions presented in the table above represent “Scenario 2 – With Project”, the main assumptions to differentiate between the two scenarios are presented as follows:

- Real (physical) water losses are assumed to remain constant without implementing the project measures in Phase 1 (reduction of water losses due to technical assistance measures (e.g. active leakage management, pressure management, etc.);
- Apparent (commercial) water losses are assumed to remain constant without implementation of the technical assistance measures (Revenue and metering improvement programme).

5.4 Water demand and wastewater flow projection

The water demand projection (volume of water sold, non-revenue water and water production) is presented in the Table 5-2 (a detailed table is presented in Annex 5.1). As

can be seen, the projected water production needs are highest in the year 2045, which will be the basis for design calculation.

Table 5-2: Water demand projection

N°	Parameter	Unit	2014[21]	2018[22]	2021[23]	2030	2045
1	Population in the study area served with water						
1.1	Total population serviced	N°	10,352	13,599	13,777	14,227	14,180
1.2	In urban localities	N°	10,352	10,192	10,206	10,243	9,695
1.3	In rural localities	N°	0	3,407	3,571	3,984	4,485
2	Volume of water sold in total and disaggr. for different consumers						
2.1	Total volume sold	m³/y	151,816	245,435	296,063	451,522	625,051
2.2	Domestic customers	m³/y	115,499	189,150	227,031	343,509	520,215
2.3	Industrial customers	m³/y	5,112	17,725	27,283	56,083	53,078
2.4	Institutional customers	m³/y	31,205	38,560	41,750	51,930	51,757
3	Total water sold disaggr. for urban and rural areas						
3.1	Urban localities	m³/y	151,816	201,907	241,581	361,042	477,703
3.2	Rural localities	m³/y	0	43,528	54,483	90,480	147,348
4	Non-Revenue Water (NRW) volume disaggregated for total NRW, apparent losses, and real losses						
4.1	Total NRW	m³/y	75,326	116,010	134,864	183,501	207,215
4.2	Apparent losses	m³/y	30,130	44,091	49,120	57,146	41,613
4.3	Real losses (physical losses)	m³/y	45,196	71,919	85,745	126,355	165,602
5	Water demand figures considering the demand variation factors						
5.1	Yearly water demand/production	m³/y	227,142	361,445	430,928	635,023	832,266
5.2	Average daily water demand	m³/d	622	990	1,181	1,740	2,280
5.3	Maximum daily water demand	m³/d	664	1,058	1,262	1,863	2,451
5.4	Average hourly water demand	m³/h	26	41	49	72	95
5.5	Max. hourly water demand	m³/h	38	61	73	109	146

Source: GIZ/MLPS

Wastewater flow and load projections are presented in the Table 5-3 (a detailed table is presented in Annex 5.2). As can be seen, the highest wastewater flow and the highest wastewater load occur in the year 2045, and the highest wastewater load occurs in the year 2045, which will be the basis for design calculation of sewer network and wastewater treatment plant (if applicable).

Table 5-3: Wastewater flow and load projection

N°	Parameter	Unit	2014[24]	2018[25]	2021[26]	2030	2045
1	Population in the study area served with sewerage						
1.1	Total population serviced	N°	4,812	5,535	8,799	12,266	13,247
1.2	In urban localities	N°	4,812	5,535	6,463	9,219	9,210
1.3	In rural localities	N°	0	0	2,336	3,047	4,037
2	Volume of wastewater charged in total and disaggregated for different customers						

[21] Existing situation

[22] 1st year of operation Phase 1 investments

[23] 1st year of operation Phase 2 investments

[24] Existing situation

[25] 1st year of operation Phase 1 investments

[26] 1st year of operation Phase 2 investments

N°	Parameter	Unit	2014[24]	2018[25]	2021[26]	2030	2045
2,1	Total volume of wastewater gen	m³/y	73,611	113,477	187,575	398,283	608,101
2,2	By domestic customers	m³/y	38,920	67,667	124,647	281,345	487,656
2,3	By industrial customers	m³/y	5,805	12,584	19,867	50,475	50,424
2,4	By Institutional customers	m³/y	28,886	33,226	43,061	66,464	70,021
3	Total wastewater charged disaggregated for urban and rural areas						
3,1	in urban localities	m³/y	73,611	113,477	157,729	332,939	475,488
3,2	in rural localities	m³/y	0	0	29,846	65,344	132,613
4	Sewer infiltration water based on the determined infiltration rate						
4.1	Sewer Infiltration water	m³/y	36,806	45,391	70,861	123,910	121,620
5	Wastewater generation figures considering the variation factors						
5.1	Average wastewater flow (dry weather)	m³/y	110,417	158,868	258,436	522,193	729,721
5.2	Maximum daily dry weather flow (Qdmax)	m³/d	323	466	759	1,540	2,166
5.3	Maximum hourly dry weather flow (QDWF)	m³/h	22	32	53	109	159
5.4	Maximum hourly storm water flow (QSWF)	m³/h	28	42	69	142	207
6	Population equivalents in total and disaggregated, for different customers						
6.1	Total population equivalent	PE60	5,168	6,006	9,446	13,468	14,484
6.2	by domestic customers	PE60	4,812	5,535	8,799	12,266	13,247
6.3	by Industrial and instit, customers	PE60	356	471	647	1,201	1,237
7	Pollution load – BOD in total and disaggregated for different customers						
7.1	Total BOD_5 load	kg/d	310	360	567	808	869
7.2	by domestic customers	kg/d	289	332	528	736	795
7.3	by industrial and institutional customers	kg/d	21	28	39	72	74

Source: GIZ/MLPS

5.5 Water demand projection versus available water resources and production capacities

5.5.1 Water supply

As presented in Chapter 4- Technical aspects-Existing situation, the available production capacity of the water treatment plant in Leova is 4,000 m³/d. Since the current demand in the service area is much lower only a capacity of about 500 – 1,000 m³/d is used, depending on the demand, with the peak in summer.

The long-term water demand projection for Leova town and all the envisaged connections of localities (see Chapter 5.4- Water demand and wastewater flow projection) presents an increase of the water demand with the peak water demand in the year 2045 and a slight decreasing demand in the following years.

Table 5-4: Water demand projection versus currently available production capacities

N°	Parameter	Unit	Quantity
1	Total capacity of the water treatment plant in Leova	m³/d	4,000
2	Peak water demand (Qdmax) in year 2030	m³/d	2,262
3	Peak water demand (Qdmax) in year 2045	m³/d	2,964

Source: GIZ/MLPS

This projected water demand can be covered with the currently operated water treatment plant. However, the water treatment plant was constructed in the 1970s and needs rehabilitation in the medium-term.

5.5.2 Wastewater

As presented in Chapter 4- Technical aspects-Existing situation, the available capacities of the wastewater treatment plant in Leova is 4,700 m³/d. Since the current wastewater production is much lower a capacity only about 300 m³/d is used.

The long term wastewater projection for the town of Leova town and all the envisaged connections of localities (see Chapter 5.4- Water demand and wastewater flow projection) presents an increase of the resultant wastewater with the peak water demand in the year 2045 and a slight decreasing demand in the following years.

Table 5-5: Wastewater flow projection versus currently available treatment capacities

N°	Parameter	Unit	Quantity
1	Total capacity of the wastewater treatment plant in Leova	m³/d	4,700
2	Av., daily dry weather flow (Qdav) in 2030	m³/d	1,430
3	Av., daily dry weather flow (Qdav) in 2045	m³/d	1,999

Source: GIZ/MLPS

This projected wastewater flow can be covered with the currently operated wastewater treatment plant. However, the wastewater treatment plant was constructed in the 1980s and is already quite outdated. Comprehensive rehabilitation or a new wastewater treatment plant is needed in the medium-term.

5.6 Unit costs

The prices are based on cost estimation from other studies, tendered projects which are implemented in Moldova and international experience.

5.6.1 Unit costs wastewater

The Table 5-6 shows the unit costs for the relevant wastewater components applied for the cost estimations for the investment measures proposed for Phase 1 and Phase 2.

Table 5-6: Unit costs for wastewater facilities

N°	Item	Dimension		Investment costs	
				Unit	Unit cost
1	Sewer network, collection pipe, PVC, Incl. all earth, works, installation works, pipes and fittings				
1.1	Pipe	OD	110	EUR/m	88
1.2	Pipe	OD	125	EUR/m	92
1.3	Pipe	OD	160	EUR/m	140
1.4	Pipe	OD	200	EUR/m	150
1.5	Pipe	OD	250	EUR/m	165
1.6	Pipe	OD	315	EUR/m	185
1.7	Pipe	OD	400	EUR/m	220
1.8	Pipe	OD	500	EUR/m	250
2	Manhole for collection system, Incl. all earth works, installation works and fittings				
2.1	Manhole	dia. mm	1,000	EUR/pc	1,030
3	House connection, Incl. all earth works, installation works, pipes and fittings				
3.1		pc	1	pc.	500

N°	Item	Dimension		Investment costs	
				Unit	Unit cost
4	Wastewater pumping stations, Incl. all electro- mechanical equipment, pipes, fittings, housing and installation works				
4.1	Facility	N° of Pop.	100	EUR	20,000
4.2	Facility	N° of Pop.	500	EUR	28,000
4.3	Facility	N° of Pop.	1,000	EUR	32,000
4.4	Facility	N° of Pop.	2,000	EUR	40,000
4.5	Facility	N° of Pop.	5,000	EUR	50,000
4.6	Facility	N° of Pop.	10,000	EUR	63,000
4.7	Facility	N° of Pop.	15,000	EUR	75,000
4.8	Facility	N° of Pop.	20,000	EUR	83,000
4.9	Facility	N° of Pop.	25,000	EUR	100,000
5	Wastewater treatment plant, accord. the European Commission directives for urban wastewater incl. primary treatment, secondary treatment (e.g. low load trickling filters, Low load activated sludge process, aerated pond system, constructed wetlands), all construction and installation works, electro- mechanical equipment.				
5.1	Plant	N° of Pop.	500	EUR/c	510
5.2	Plant	N° of Pop.	1,000	EUR/c	500
5.3	Plant	N° of Pop.	2,500	EUR/c	390
5.4	Plant	N° of Pop.	5,000	EUR/c	340
5.5	Plant	N° of Pop.	10,000	EUR/c	300
5.6	Plant	N° of Pop.	20,000	EUR/c	260
5.7	Plant	N° of Pop.	30,000	EUR/c	250
5.8	Plant	N° of Pop.	35,000	EUR/c	240

Source: GIZ/MLPS

5.7 Proposed investment measures

5.7.1 General

In order to achieve the local development objectives and goals (see Chapter 5.2- Development strategy for water supply and wastewater services) as well as the targets in line with the Regional Sector Programme (RSP), a number of investment measures have been identified and are presented in this chapter. These measures are based on the measures identified in previous assessments (“Possible Project Concept” - PPC) and the findings from this study (reference is made to Chapter 4 – Technical Aspects- Existing Situation and Chapter 5.4.- Water demand and wastewater flow projection).

This chapter contains:

- The main drivers for development of the investment framework;
- A detailed description of the proposed investment measures;
- A prioritisation and phasing of investment measures;
- An option analysis for priority investment measures Phase 1;
- The priority investment plan including cost estimates for each of the investment phases.

5.7.2 Investment framework

Based on the assessments within this study, the local WSS objectives and the RSP, the main drivers for development of the investment framework have been identified and are presented as follows.

5.7.2.1 Water supply

- Currently there are about 10,352 inhabitants connected to the existing water supply system (see Table 5-7) in the town of Leova, this is 95% of the population in the town of Leova and 66% of the total population in the study area (considering the localities which are planned to be connected);
- There is no supply shortage for the service area of JSC 'Apa-Canal' Leova. Service is provided continuously and the water quality corresponds to the national drinking water standards;
- The NRW is 33% of the water production;
- With support of an on-going EBRD project, part of the water supply network has been rehabilitated;
- Further optimisation of network operation is proposed in a medium-term (after Phase 2 until 2030). This optimisation shall be based on the detailed investment plan for medium and long-term network development prepared in the technical assistance measures in Phase 1. These optimisations shall include continuous replacement of existing old pipeline sections, as well as the establishment of adequate system operation and control comprising pressure zoning, district metering and leakage monitoring with installation of permanent and temporary measure and control spots and work routines;
- The localities of Filipeni, Hanasenii Noi, and Romanovca in the vicinity of the town of Leova are currently not connected to the water supply system of Leova but JSC 'Apa-Canal' Leova envisages connecting these localities in the near future. The total current population in these localities amounts to 4,831:
  - The technical projects of the three localities Filipeni, Hanasenii Noi, and Romanovca are developed and the project implementation and funding structures are in process. The transmission main and water storage facilities are already implemented. The investment projects for renovation of the internal network in the localities are planned to be completed by 2018.
- The water source for Leova and the three localities planned to be connected is the Prut River. The available water quantity and the treatment capacities are in general sufficient to cover the projected water demand for the long term (considering an increase of per capita consumption and additional population connected as defined in the table below). However, the water treatment plant needs rehabilitation in the medium-term or even replacement, depending on further plans of the rayon administration regarding enlargement of the service area of the water supply system. The rehabilitation of the water treatment plant is intended to be funded by the German Regional Development Fund, administrated by the German Development Cooperation (GIZ), the detailed design is in process;
- Considering the above, it is concluded that these investment measures in the water supply sector will be implemented within the next years and therefore **no capital investments are foreseen within the framework of this study**. Technical assistance as Water Supply Network Analysis and Water Loss Reduction Programme and equipment and tools for operational improvements are included.

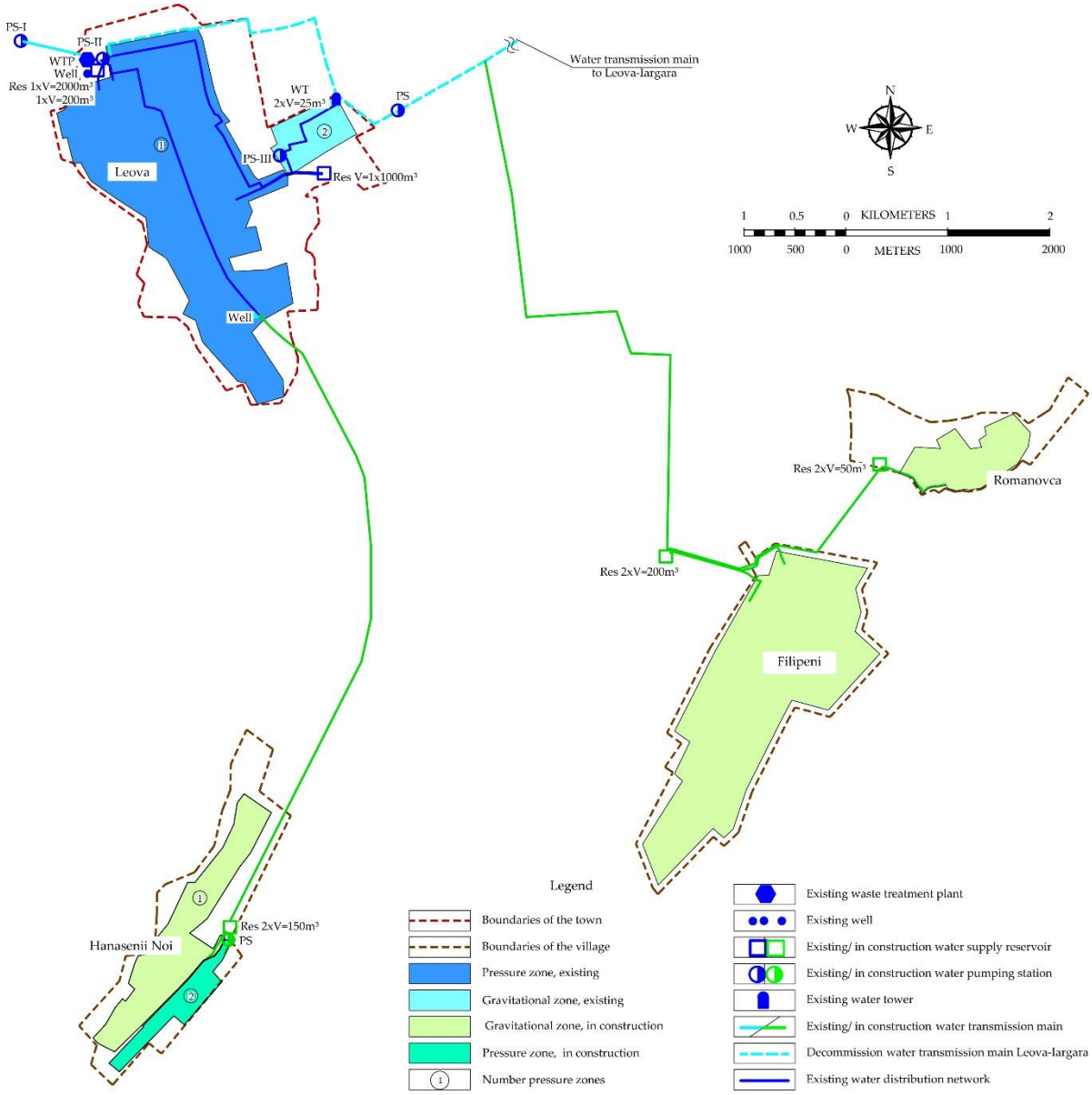
The Table 5-7 shows the development of service connections for the water supply network (existing situation and additional connections for the years 2018 until 2045), for more detailed projection tables reference is made to Annex 5.3 and 5.4.

Table 5-7: Development of connection rates water supply

Code	Locality	Population connected to the water supply system									
		2014		2018		2021		2030		2045	
		n°	%	n°	%	n°	%	n°	%	n°	%
1	Leova	10.352	95	10.192	95	10.206	96	10.243	100	9.695	100
2	Hanasenii Noi	0	0	758	70	795	73	887	83	998	100
3	Filipeni	0	0	2.257	70	2.365	73	2.639	83	2.971	100
4	Romanovca	0	0	392	70	411	73	459	83	516	100
Total		**10.352**	**66**	**13.599**	**87**	**13.777**	**89**	**14.227**	**95**	**14.180**	**100**

The existing water supply system and the extensions in process for the town of Leova and the localities Filipeni, Hanasenii Noi, and Romanovca is presented in the Figure 5-1. More detailed maps are provided in Annex 11.

Figure 5-1: Scheme of the existing water supply system and the on-going extensions for the town of Leova and the localities Filipeni, Hanasenii Noi, and Romanovca



5.7.2.2 Wastewater

- Currently, only the town of Leova is partly covered with a wastewater system (sewer network and wastewater treatment are described in Chapter 4-Technical Aspects-Existing Situation of this report). About 4,812 inhabitants are connected to the existing wastewater system (see table below) in the town of Leova, this is 44% of the population in the town of Leova and 31% of the total population in the study area (considering the localities which are planned to be connected);
- The other localities in the study area, Filipeni, Hanasenii Noi, and Romanovca, do not have any centralised wastewater facilities;
- In order to develop the wastewater infrastructure in the rayon, agglomerations (as per EU-definition “an area where the population and/or economic activities are sufficiently concentrated for urban wastewater to be collected and conducted to

an urban waste water treatment plant or to a final discharge point") have to be defined for the entire rayon. Further, an assessment (option analysis) will be necessary to decide which of these agglomerations should be grouped to be connected to a Wastewater Treatment Plant (WWTP). It is recommended to include this analysis in a technical assistance component to be implemented in Phase 1 (see Chapter 9 – Procurement strategy and implementation plan). The localities Filipeni, Hanasenii Noi, and Romanovca will be served in accordance with the results of the agglomeration analysis defined in this technical assistance component (see above) and possibly with the dates to be negotiated in the EU-accession treaty. Compliance of these localities with EU-environmental regulations (Urban Wastewater Treatment Directive 91/271/EEC) will require grouping the agglomerations into localities:

  - Below 2,000 P.E.;
  - Between 2,000 P.E. and 10,000 P.E.;
  - Above 10,000 P.E.

- For the town of Leova it is proposed to increase the connection rate in two steps to 61% in 2021 and to linearly increase to 95% in 2045:
  - Therefore, in Phase 1 an extension of the sewer network in the north and north-eastern parts of the town is proposed. In order to convey the collected wastewater to the WWTP, one WWPS will be necessary (WWPS-5) as presented in the figure 5-3. The connection rate is projected to increase to 52% (5,535 inhabitants) end of Phase 1;
  - For Phase 2, a further extension of the sewer network in the west and south part of the town is proposed. In order to convey the collected wastewater from this drainage area to the WWTP, one WWPS (WWPS-6) and a pressure line will be necessary, as presented in the Figure 5-3. The connection rate is projected to increase to 61% (6,463 inhabitants) end of Phase 2.
- Rehabilitation of the older parts of the existing sewer network in the town of Leova is proposed due to the frequent emergency cases in some sewer network sections in the town centre;
- The localities of Filipeni, Hanasenii Noi, and Romanovca will be served in accordance with the results of the agglomeration analysis defined in the technical assistance component (see above). Preliminary assumption is to cover the localities with sewer systems in Phase 2 (once the LPA established the centralised water supply);
- The connection rate in these localities will reach about 50% after Phase 2 (depending on the localities, details in Table 5-8) and will linearly increase to 90% in 2045;
- Wastewater generated in the total study area will increase from currently 5,168 P.E. to 9,446 P.E. in 2021 and will then increase to 14,484 P.E. in 2045 (see Chapter 5.4 -Water Demand and Wastewater Flow Projection);
- The available capacity of the existing WWTP is 4,700 m³/day. In the short term (until 2021), it is recommended to continue using the existing WWTP Leova which has sufficient capacity to treat the wastewater flow from the drainage areas of the existing network and the network extensions for Phase 1. The Consultant's assessment reveals that the condition of the WWTP is poor but still adequate to be operated until the year 2021;
- For the medium and long term (after 2021) it is proposed to use a new WWTP for Leova (and neighbouring localities according the proposed analysis);

- The design capacity of the future WWTP will depend on the above mentioned agglomeration analysis, depending on the number of localities to be connected to the WWTP in Leova the design capacity could be from 10,000 P.E. (only Leova town) up to 15,000 P.E. in 2045 in case the localities shall be connected to a centralised WWTP. Therefore, the design capacity can only be roughly estimated at this stage. Further planning shall be based on the results of the technical assistance-study to be carried out in Phase 1. For the investment costs estimations, separate WWTP for the individual localities are calculated. This should not be understood as presumption of the result of the proposed analysis.

The Table 5-8 shows the development of service connections for the wastewater network (existing situation and additional connections for the years 2018 until 2045). For more detailed projection tables reference is made to Annex 5.5 and Annex 5.6.

Table 5-8: Development of connection rates wastewater

Code	Locality	Population connected to the waste water system									
		2014		2018		2021		2030		2045	
		n°	%	n°	%	n°	%	n°	%	n°	%
1	Leova	4.812	44	5.535	52	6.463	61	9.219	90	9.210	95
2	Hanasenii Noi	0	0	0	0	501	46	666	63	898	90
3	Filipeni	0	0	0	0	1.537	48	2.012	64	2.674	90
4	Romanovca	0	0	0	0	299	53	369	67	465	90
Total		**4.812**	**31**	**5.535**	**35**	**8.799**	**57**	**12.266**	**82**	**13.247**	**93**

Figure 5-2: Scheme of the existing sewer system and the proposed extension of it in the town of Leova and the localities Filipeni, Hanasenii Noi, and Romanovca

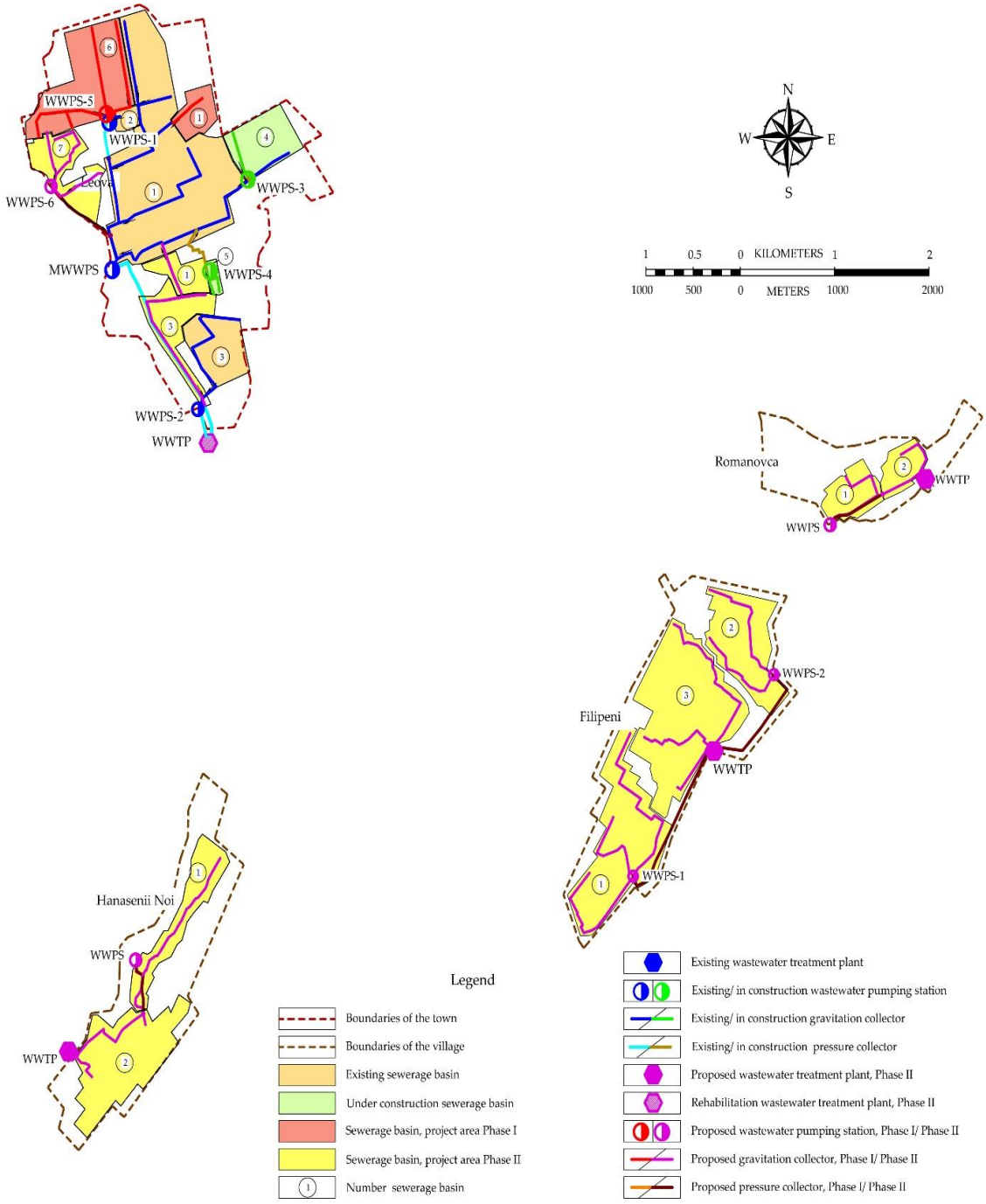
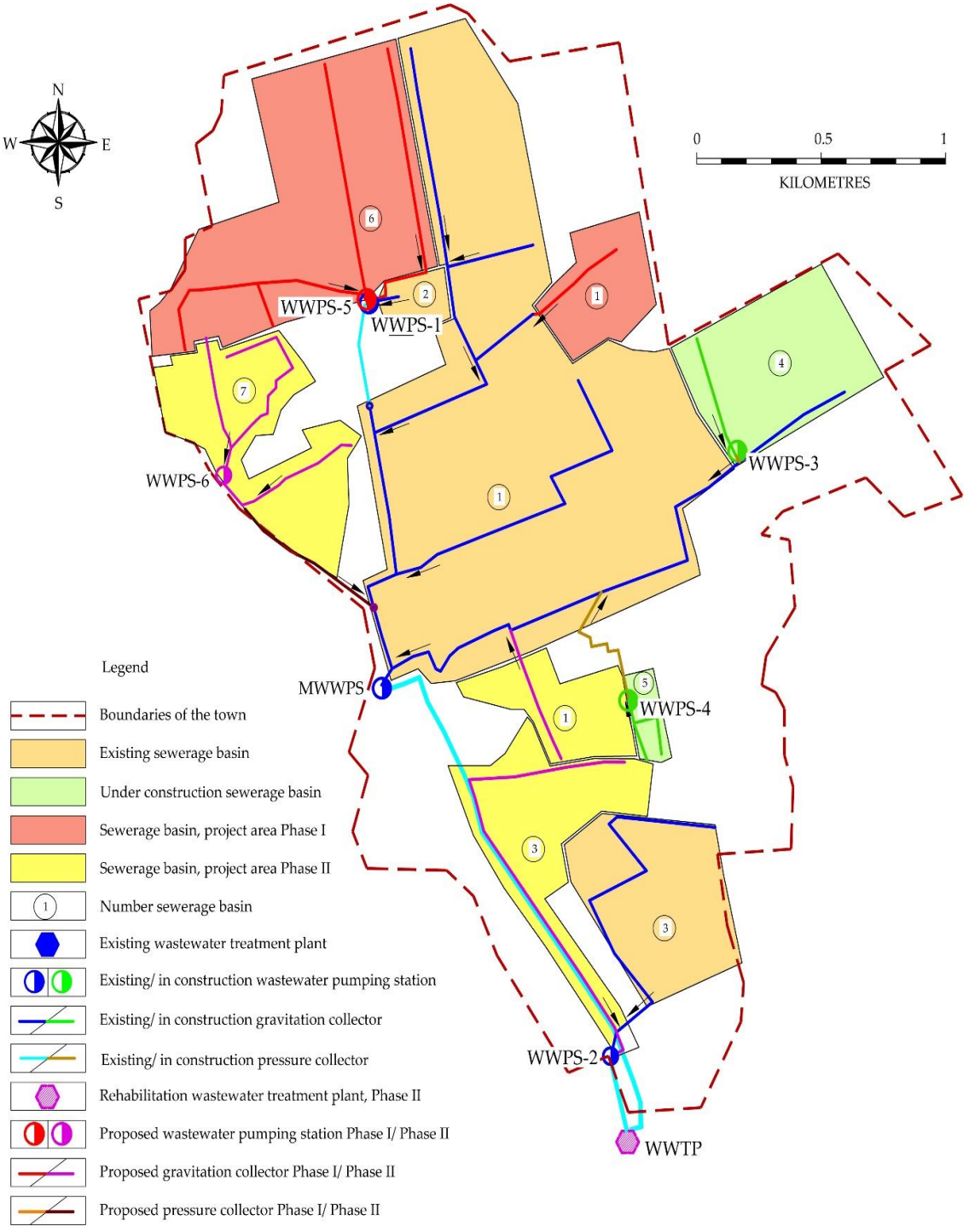


Figure 5-3: Scheme of the existing sewer system and the proposed extension of the sewer system in the town of Leova


N
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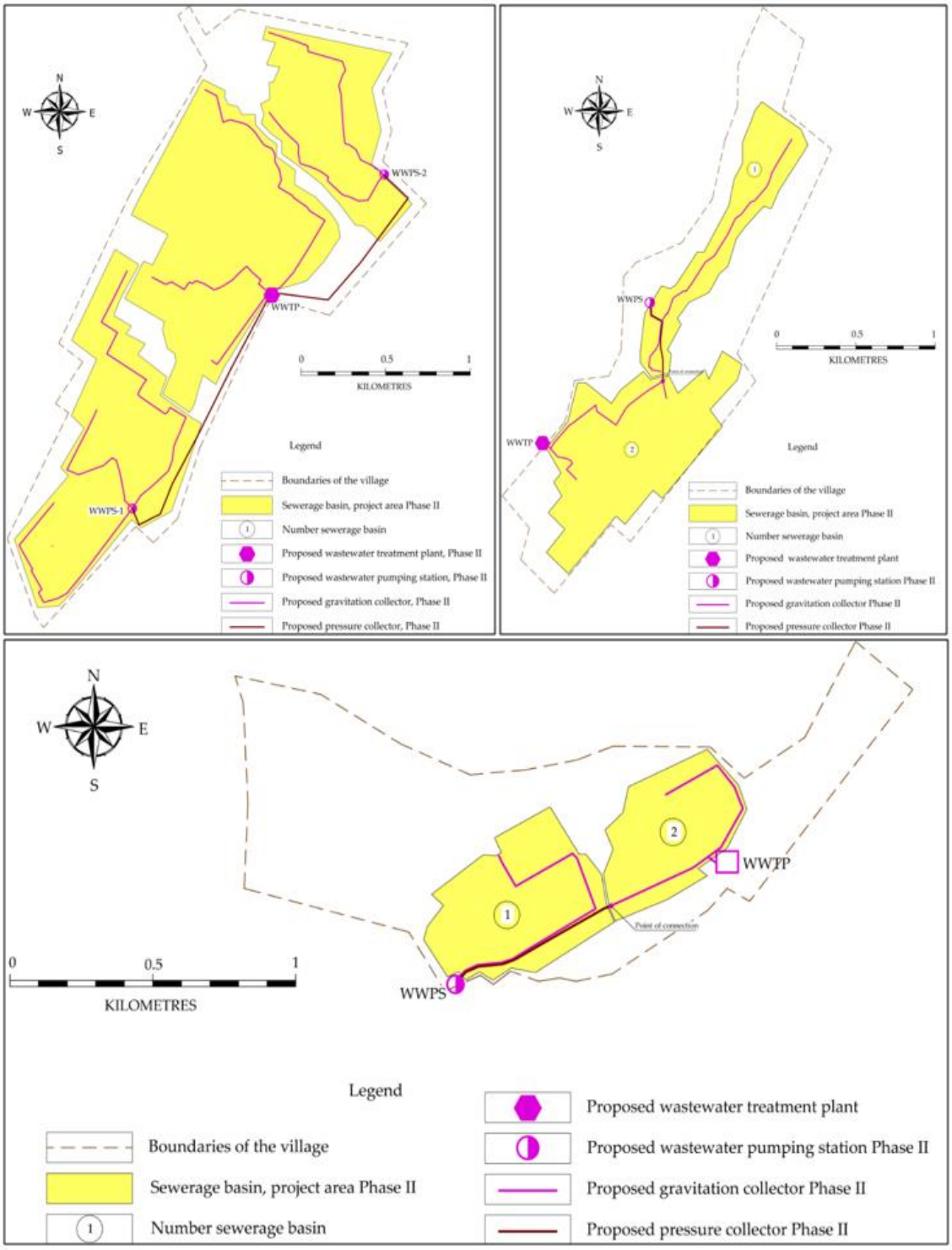
KILOMETRES
WWPS-5
WWPS-1
WWPS-6
WWPS-3
MWWPS
WWPS-4
WWPS-2
WWTP
Legend
Boundaries of the town
Existing sewerage basin
Under construction sewerage basin
Sewerage basin, project area Phase I
Sewerage basin, project area Phase II
Number sewerage basin
Existing wastewater treatment plant
Existing/ in construction wastewater pumping station
Existing/ in construction gravitation collector
Existing/ in construction pressure collector
Rehabilitation wastewater treatment plant, Phase II
Proposed wastewater pumping station Phase I/ Phase II
Proposed gravitation collector Phase I/ Phase II
Proposed pressure collector Phase I/ Phase II

Figure 5-4: Scheme of the proposed wastewater systems in the localities of Filipeni (left scheme), Hanasenii Noi (right scheme), and Romanovca (below)



5.7.3 Investment measures - water supply system

No capital investments are foreseen within this study for improvement of the water supply system due to the existing viable water supply services in Leova and the other planned projects for the localities Filipeni, Hanasenii Noi, and Romanovca as mentioned in the chapter above.

5.7.4 Investment measures - wastewater system

5.7.4.1 General description of proposed system

The main deficiencies in the wastewater system are:

- Low coverage rate of about 48% in the study area;
- Already quite outdated WWTP in Leova.

In order to remediate the above-mentioned deficiencies, the following improvements have been proposed in the wastewater sector:

- Extension of the sewer network in the town of Leova;
- Rehabilitation of the existing sewer network in the town of Leova;
- Construction of a new WWTP in the town of Leova;
- Installation of new sewer systems in the localities Filipeni, Hanasenii Noi, and Romanovca[27];
- Construction of a new WWTP in the localities Filipeni, Hanasenii Noi, and Romanovca.

5.7.4.2 Proposed investment measures

The wastewater investments proposed in this feasibility study are:

Extension of the sewerage network in the town of Leova

Due to the topography of the planning area, the wastewater system is subdivided into seven drainage areas (see the Figure 5-2).

- Extension of the existing wastewater system in the drainage area 1 to the north-east (Phase 1). The collected wastewater will be discharged by gravity to the existing main wastewater pumping station (MWWPS). From there it is pumped through existing facilities to the existing WWTP.
  In the north part of the town the drainage area 6 will be covered with a sewer system (Phase 1). The wastewater will be collected by gravity on the lowest point of drainage area 6 and will be pumped by a new wastewater pumping station (WWPS-5) through an existing pressure line to drainage area 1 and goes further by gravity to the main wastewater pumping station (MWWPS). From there it is pumped through existing facilities to the existing WWTP.
  These extensions for the town of Leova in Phase 1 comprise all in a sewer network of 9,870 m (including 540 service connections) and one wastewater pumping station (WWPS-5);

[27] The actual measures will identified by the sanitation study and agglomeration analysis to be carried out in the technical assistance-component for Phase 1

- In the west part of the town the wastewater collection area 7 will be covered with a sewer system (Phase 2). The wastewater will be collected by gravity on the lowest point of drainage area 7 and will be pumped by a new wastewater pumping station (WWPS-6) through a new pressure line to the drainage area 1 and goes further by gravitation to the main wastewater pumping station (MWWPS). From there it is pumped through existing facilities to the WWTP.
  In the south part of the town, the drainage area 3 will be covered with a sewer system (Phase 2). The wastewater will be collected by gravity on the lowest point of collection area 3 and will be pumped by the existing wastewater pumping station (WWPS-2) into the main pressure line leading to the WWTP.
  The drainage area 1 will be extended to the south (Phase 2). The collected wastewater will be discharged by gravity to the existing main waste water pumping station (MWWPS). From there it is pumped through existing facilities to the existing WWTP.
  The extensions for the town of Leova in Phase 2 comprise all in a sewer network of 10,970 m (including 680 service connections), one wastewater pumping station (WWPS-6) and a pressure line of 1,090 m.

Rehabilitation of the existing sewerage network in the town of Leova

It is assumed that about one-third of the sewer network older than 30 years will need immediate replacement (Phase 2: 9.4 km x 30% = 2,820 m). The remaining parts older than 30 years are proposed to be rehabilitated in the medium and long-term. The detailed requirements for sewer network rehabilitation should be assessed during Phase 1 (CCTV inspection within technical assistance measures).

Construction of a new WWTP in the town of Leova

A new WWTP will be constructed in Phase 2 on the spot of the existing WWTP and shall be operated from 2021 onwards. The design capacity and technology of the future WWTP will depend on the results of the sanitation study included in Phase 1, specifically depending on the number of neighbouring localities to be connected to the new WWTP in Leova. For preliminary cost estimations, a WWTP for 11,000 P.E. is considered.

Construction of a wastewater system and a WWTP in the locality Filipeni[28]

Construction of a wastewater system in the locality of Filipeni in Phase 2 including a sewer network of 22,250 m (including 635 service connections) to collect the generated wastewater, two wastewater pumping station and a pressure line of 2,860 m to transfer the wastewater to a new WWTP (approx. 2,000 P.E.).

Construction of a sewerage network and a WWTP in the locality Romanovca14

Construction of a wastewater system in the locality of Romanovca in Phase 2 including a sewerage network of 3,495 m (including 160 service connections) to collect the generated wastewater, one wastewater pumping station and a pressure line of 585 m to transfer the wastewater to a new WWTP (approx. 400 P.E.).

[28] The proposed investment measures for the localities Filipeni, Hanasenii Noi, and Romanovca shall be considered as preliminary assumptions as the appropriate solutions will be subject of the sanitation study and agglomeration analysis defined in the technical assistance-component for Phase 1.

Construction of a wastewater system and a WWTP in the locality Hanasenii Noi

Construction of a wastewater system in the locality of Hanasenii Noi in Phase 2 including a sewer network of 8,447 m (including 310 service connections) to collect the generated wastewater, one wastewater pumping station and a pressure line of 500 m to transfer the wastewater to a new WWTP (approx. 700 P.E.).

The wastewater investment measures described above are summarised for each locality as follows:

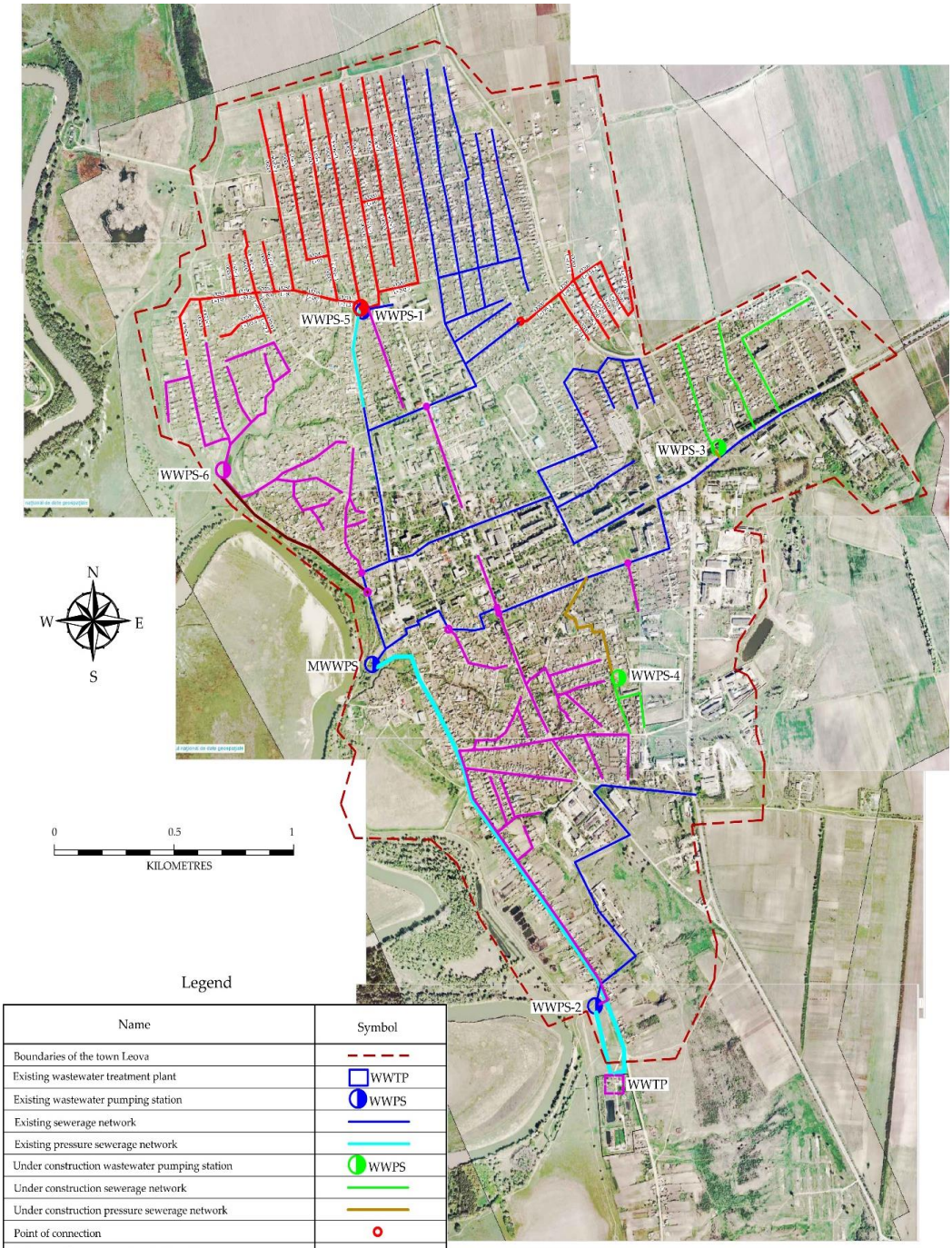
- Leova Town:
  - Extension of the existing sewer network in the town of Leova in two steps by construction of 20,840 m of PP/PVC[29] sewer collectors with diameters between 200 mm and 250 mm, including 1,220 service connections in the central and southern part of the town;
  - Construction of two wastewater pumping station (WWPS 5 & 6) and a pressure main (1,940 m OD 90 – 110 mm) aiming to pump wastewater from the new drainage area 6 & 7 to drainage area 1 and further to the WWTP;
  - Rehabilitation of 2,820 m sewer network (based on the assumption that 30% of the sewer network older than 30 years will have to be replaced in the short term and the remaining 70% in the medium and long-term as they reached the end of their service period);
  - Construction of a new wastewater treatment plant (WWTP) in Leova of a capacity of about 11,000 P.E.
- Filipeni Locality:
  - Implementation of a new sewer network in Filipeni by construction of 22,250 m of PP/PVC15 sewer collectors with diameters between 200 mm and 250 mm, including 635 service connections;
  - Construction of two new Wastewater Pumping Station (WWPS 1 & 2) and pressure mains of 2,860 m, OD 90 – 110 mm;
  - Construction of a new wastewater treatment plant (WWTP) in Filipeni of a capacity of about 2,000 P.E.
- Romanovca Locality:
  - Implementation of a new sewer network in Romanovca by construction of 3,495 m of PP/PVC15 sewer collectors with diameters between 200 mm and 250 mm, including 160 service connections;
  - Construction of one new Wastewater Pumping Station (WWPS) and a pressure main of 585 m, OD 90 – 110 mm;
  - Construction of a new wastewater treatment plant (WWTP) in Romanovca of a capacity of about 400 P.E.
- Hanasenii Noi Locality:
  - Implementation of a new sewer network in Hanasenii Noi by construction of 8,447 m of PP/PVC15 sewer collectors with diameters between 200 mm and 250 mm, including 310 service connections;
  - Construction of one new wastewater pumping station (WWPS) and a pressure main of 500 m, OD 90 – 110 mm;

[29] Material to be defined in the detailed design phase

- Construction of a new wastewater treatment plant (WWTP) in Hanasenii Noi of a capacity of about 700 P.E.

The existing and proposed sewer system in the town of Leova is presented in the Figure 5-5. More detailed maps and maps presenting an overview on the proposed sewer networks in the localities Filipeni, Hanasenii Noi, and Romanovca are provided in Annex 11.

Figure 5-5: Existing sewer system and the proposed extension of the sewer system in the town of Leova



Legend

Name	Symbol
Boundaries of the town Leova	
Existing wastewater treatment plant	WWTP
Existing wastewater pumping station	WWPS
Existing sewerage network	
Existing pressure sewerage network	
Under construction wastewater pumping station	WWPS
Under construction sewerage network	
Under construction pressure sewerage network	
Point of connection	
Extension of sewerage network , Phase I	
Extension of pressure sewerage network , Phase I	
Proposed wastewater pumping station, Phase I	WWPS
Rehabilitation wastewater treatment plant, Phase II	WWTP
Extension of sewerage network, Phase II	
Extension of pressure sewerage network , Phase II	
Proposed wastewater pumping station, Phase II	WWPS

Source: GIZ/MLPS

5.7.5 Operational improvement

Operational improvements in water and wastewater services presume knowledge about the condition of the facilities and a minimum of monitoring of the operation. Therefore, a tentative list of equipment (confirmation by JSC 'Apa-Canal' Leova during the detailed design stage needed) and is considered for the Phase 1.

5.7.5.1 Water supply

For improvement of the operational performance in the water supply, the following equipment should be procured:

- Portable ultrasonic flow meter and installed flow meters;
- Manometers and pressure loggers;
- Leak detection equipment including pipe locator and acoustic detection equipment and correlator;
- Other equipment to be specified during the detailed design study (e.g. hardware and software, maintenance tools, water meter calibration unit, etc.).

5.7.5.2 Wastewater

In order to assess the condition of the facilities and to ensure adequate Operation and Maintenance (O&M) for the wastewater system, procurement of the following equipment is proposed:

- Laboratory equipment for measuring key parameters (BOD_5, COD, Nitrogen, Phosphorus, Suspended solids, etc.) and flow meter. It is recommended to measure quality and volume of wastewater effluents at the outlet of the existing main collector during dry and wet weather conditions in order to ensure that sufficient data are available for designing the new WWTP;
- Sewer cleaning and other equipment needed in order to maintain the sewer network according to best practice;
- CCTV inspection equipment in order to assess in details the condition of the sewer network and based on these results to plan sewer rehabilitation works.

5.7.6 Technical assistance

Technical assistance measures will be necessary aimed at:

- Improving operational performance in the water and wastewater sector;
- Assessing in detail the required investment in the wastewater sector (agglomeration analysis and option analysis);
- Assessing in detail the investment needs for sewer network rehabilitation;
- Ensuring high quality standard for implementation of works (detailed designs[30], tender documents and supervision of works).

[30] In case of works contracts based on FIDIC Red-book.

The scope of work for the technical assistance measures should include inter alia the following:

Table 5-9: Technical assistance

Component	Objectives	Measures
Design and Engineering for **Phase 1 investments**	To ensure high quality and timely implementation of works and technical assistance-measures through support of the Project Implementing Agency[31]: • In preparing all necessary documentation for tendering of the works for Phase 1 Investment measures; • In tendering procedures; • During the implementation period in project management, works supervision and monitoring of technical assistance measures.	A**) Preparation of Detailed Design and Tender Documentation** for Phase 1 investment measures including (i) works contracts, (ii) equipment, (iii) design built contracts (if applicable), service contracts for follow-up technical assistance measures, The services should also include (i) topographic survey and geotechnical investigations, (ii) all necessary measurements to prepare detailed designs and to confirm and justify the investment measures (e.g. flow measurements at transmission mains, water quality, etc.), The Consultant should further prepare all necessary documentation for obtaining required permits (e.g. environmental permits, construction permits, etc.) in accordance with the national legislation, B) Support during **tendering** of contracts including: • Preparation of reports and minutes of meetings; • Communication; • Support in contract negotiations and preparation of contracts. C) Support of **Project Implementing Agency** in Project Management during contract implementation period (construction and defects liability period) including: • Establishment of adequate project management structures; • Preparation of detailed layout designs, construction designs (structural designs, shop drawings, etc.) and detailed pipeline routings; • Supervision of works; • Preparation of all necessary reports requested by the donor and the Project Implementing Agency (e.g, cash-flow reports, etc.); • Training in project management and other areas identified as capacity weakness.
Corporate Development Program	To improve the corporate planning capacity and to become a self-sustaining entity with commercially sustainable operations through improvement of the operational, financial and environmental performance of the operator.	• Corporate Development including improvements in (i) human resource development, (ii) service agreement with municipality and customers, (iii) strategy development, (iv) information system, (v) asset management; • Financial Performance Improvement including improvements in (i) accounting budgeting and cash management, (ii) billing system and revenue collection procedures, (iii) reporting pro-

[31] Reference is made to Chapter 9.3 – Project Implementation Plan (Set-up of a Project Implementation Structure)

Component	Objectives	Measures
		cedures, (iv) reduction of apparent (commercial) water losses; • Operational Performance Improvement including (i) staff efficiency, (ii) water loss reduction, (iii) energy efficiency, (iv) operation and maintenance procedures; • Environmental Management including (i) preparation of Environmental and Social Action Plan and support in implementing the action plan (ii) improve overall environmental procedures; • Prepare a Capacity Building Programme for all areas of improvement.
Stakeholder Participation Program	To ensure that all stakeholders are committed to the investment project and are involved during preparation and implementation phase. In particular the measures aim at enhancing public ownership by encouraging water conservation, increasing public participation in the provision of water services (service quality, rehabilitation activities, tariffs integrating poverty and social issues) and raising public awareness on issues related to the project implementation and water use	Raise customer awareness through education campaigns: • Identification of information needs; • Prepare Information campaign Plan and support the implementation. Facilitation of dialogue between clients and the Company: • Creation of and support to information exchange platform for customers; • Creation of an Advisory Committee comprising all major stakeholders; • Encourage transparency in decision-making; • Sustainability of dialogue.
Water Supply Network Analysis and Water Loss Reduction Programme	To improve the knowledge of water supply networks as a basis for preparation of a sound medium and long-term investment plan, To reduce water losses in the system through planning and implementing a comprehensive (i) strategy, (ii) action plan, (iii) capacity building programme,	A) **Network analysis**: Carry out comprehensive network analysis including (i) flow measurements at defined locations in the network (water intake, reservoirs, etc.), (ii) pressure measurements, (iii) analysis of system failures (pipe break data), (iv) analysis of pipe material, (v) preparation of Network Information System (NIS) including field data collection for mapping, (vi) hydraulic modelling and zoning, (vii) detailed investment plan for medium and long term development of the network (replacement, zoning, metering, etc.), (viii) training of operator's staff in applying the NIS and hydraulic modelling software tools, B) **Water loss reduction**: Prepare a water loss reduction strategy (in accordance with IWA best practice) including (i) recommendations for improvement of the organisation structure of the operator (e.g, set-up a water loss reduction department within the operator's organisation, recruitment of staff, etc.); (ii) prepare water balance (analyse components of the water balance in accordance with IWA standard procedures), (iii) recommend strategy and policy for reduction of water losses (e.g, pressure management, DMA/active

Component	Objectives	Measures
		leakage control, etc.), (iv) prepare detailed action plan for water loss reduction and leakage control including financial requirements, staff capacities required, time steps, methodology, etc.), (v) prepare a capacity building programme to support the operator in implementing the action plan,
Medium to Long-term Sanitation Study	To prepare a medium to long-term rayon investment plan for wastewater (Master Plan for Sanitation)	To assess in detail the required medium and long-term investment needs in the wastewater sector based on (i) detailed assessment of wastewater system including flow and load measurements for sewerage treatment and wastewater network analysis[32], (ii) definition of agglomeration borders in the rayon (as defined in EU Urban Wastewater Treatment Directive), (iii) preparation of option analysis for collection and treatment of wastewater (grouping of agglomerations to a wastewater treatment plan), (iv) preparation of strategy for localities not suitable for collection of wastewater (on-site sanitation, alternative systems, etc.), (v) preparation of wastewater treatment process options, (vi) preparation of a wastewater sludge management strategy and plan (vii) preparation of a medium to long-term investment plan for wastewater systems (collection, treatment and on-site sanitation), (viii) environmental and social impact assessment and (ix) economic and financial analysis. In particular the study should contain an option analysis for the localities of Filipeni, Hanasenii Noi, and Romanovca (at least the following 3 options should be assessed: • Option 1: Separate collection system and separate WWTP for each of the localities; • Option 2: Separate sewer collection system for each locality and either discharge of wastewater through a pressure main to the sewer network in the town of Leova or transport of sewerage by trucks to the WWTP in Leova; • Option 3: On-site sanitation (no collection system). Further, the study should assess if other localities near Leova should be connected to the WWTP of the town of Leova. Finally, based on the above agglomeration analysis, the study should define the necessary capacity and propose a staged development (including the feasibility of an extension of the existing WWTP)

[32] Procurement strategy for CCTV inspection of sewer network should be prepared under this assignment including comparison of an option with procurement of own equipment and staffing and outsourcing of all works to the contractor. For the retained option, a detailed action plan and draft specifications for a work contract should be prepared.

5.8 Prioritisation and phasing of investment measures

5.8.1 Criteria for phasing

The proposed investment measures described above in Chapter 5.7 have been grouped into:

- Short-term;
- Medium-term;
- Long-term measures.

The short-term measures are referred to as Priority Investment Measures and are again sub-divided into two sub-phases (Phase 1 and Phase 2).

The investment measures were phased according to the following criteria:

- Technical criteria (logical steps / order for implementation, robustness of investment measure (no-regret measures);
- Capacity of operator to implement and operate the system;
- Affordability;
- Available budget for investment expenditures;
- Contribution to health and environmental targets.

The main result of this phasing exercise is to identify priority measures which can be implemented immediately after completion of this feasibility study and which should be completed by end of 2017 (first year of operation in 2018). These measures are grouped in Phase 1 and constitute "*The Project*".

5.8.2 Justification for phasing

The following qualitative approach was used to apply the criteria presented in the previous section.

Table 5-10: Proposed investment measures and phasing

N°	Investment Measures	Proposed Phase[33]	Justification for phasing
1	Water supply	MT	No capital investment measures are foreseen for Phase 1 and Phase 2 due to the high coverage of population in Leova town and the on-going and planned projects for the installation of centralised water supply systems in the neighbouring localities Filipeni, Hanasenii Noi, and Romanovca. However, procurement of equipment required for operational performance improvement is foreseen.
1.1	Renovation of water supply network in Leova town	MT	It is recommended to optimize network operation, based on the results of the detailed investment plan to be prepared in the frame of the Water *Supply Network Analysis and Water Loss Reduction Programme* included in the technical assistance measures in Phase 1. These measures might inter alia include

[33] PH 1: Phase 1, PH 2: Phase 2, MT: Medium Term, LT: Long-Term

N°	Investment Measures	Proposed Phase[33]	Justification for phasing
			(i) Replacement of water supply network (30% of network older than 30 years), (ii) Establishment of adequate system operation and control, (iii) Installation of SCADA. These measures require substantial input from the operator (high investment needs and complexity of measures). In order to avoid overloading of the operator in the short-term, a gradual development in the medium-term (stretched over several years) is proposed.
1.2	Rehabilitation/new construction of a water treatment plant	MT	As the water supply system of the town of Leova shall be basis for the regional water supply system (see Social and Economic Development Strategy (SEDS) for Leova district (2015-2020), and the Feasibility Study for water supply services in Leova Rayon, December 2014), the existing water treatment plant needs to be rehabilitated and adjusted to the water demand according the further implemented extensions. The rehabilitation of the water treatment plant is intended to be funded by the German Regional Development Fund, administrated by the German Development Cooperation (GIZ), the detailed design is in process.
2.	Wastewater system	PH 1 and 2 MT/LT	As the water supply in the town of Leova and for the neighbouring localities is relatively well organised or in process, it is proposed to give priority to the wastewater services. In order to improve the living conditions of the population and the environmental situation in the study area, the extension and implementation of the wastewater facilities in Leova and neighbouring localities in is proposed: • In Phase 1, the extension of the sewer system in the town of Leova is proposed. The measures are aimed at increasing the coverage rate and connection rate for wastewater services; • In Phase 2, a new WWTP for the town of Leova is proposed in order to treat the collected wastewater from the extended drainage area. Once the water supply is established in the localities (not part of this study but separate activities), the implementation of wastewater facilities in the localities of Filipeni, Hanasenii Noi, and Romanovca is proposed; • In Phase 2, on medium- and long-term, the rehabilitation of the already existing sewer system is proposed in order to improve efficiency of the wastewater services.
2.1	Extension of sewer network in northern part of the town of Leova (wastewater collection area 6 and 1)	PH 1	JSC 'Apa-Canal' Leova gives priority for extension of the sewer network in the norther part of the town (drainage are 1) due to the fact that the standard of the houses in this area is higher and it is more likely that population will connect rapidly to the sewer network than in other areas in the town centre. Extension of this network needs 9,870 m of new sewer system and a new WWPS-5. The capacity of the existing WWTP is sufficient for Phase 1 extensions.
2.2	Extension of sewer network in the western and southern part of the town of Leova (drainage area 1, 3, and 7)	PH 2	With the extension in southern and western part the town of Leova is almost fully covered with a sewer system. The extension needs additional 19,970 m of sewer, one WWPS and 1,090 m of pressure mains.
2.3	Construction of	PH 2	A new WWTP will be constructed in Phase 2 on the spot of the

N°	Investment Measures	Proposed Phase[33]	Justification for phasing
	a new WWTP in the town of Leova		existing WWTP and shall be operated from 2021 onward. The design capacity and technology of the future WWTP will depend on the results of the sanitation study included in Phase 1, specifically depending on the number of neighbouring localities to be connected to the new WWTP in Leova.
2.4	Construction of a wastewater system in the localities Filipeni, Hanasenii Noi, and Romanovca	PH 2	Construction of a wastewater systems in the localities of Filipeni, Hanasenii Noi, and Romanovca including a sewer network, wastewater pumping station and a pressure lines to transfer the wastewater to a new WWTP in each of the localities Note: The proposed investment measures for the localities Filipeni, Hanasenii Noi, and Romanovca shall be considered as preliminary assumptions as the appropriate solutions will be subject of the sanitation study and agglomeration analysis defined in the technical assistance component for Phase 1.
2.5	Rehabilitation of the existing sewer network in Leova town	PH2/MT/ LT	Based on the results of CCTV inspection (proposed in technical assistance measures in Phase 1) a phased rehabilitation of the existing sewer network is proposed. In Phase 2, the rehabilitation of about 2,820 m of the existing sewer network is proposed, which is 30% of the sewer network older than 30 years. The rehabilitation of the remaining parts is proposed for the medium- and long-term.
3.	Equipment for operational performance improvement	PH 1	High priority in order to ensure adequate Operation and Maintenance (O&M) for the wastewater system (e.g. laboratory equipment for measuring key parameters and flow, sewer inspection and maintaining equipment. Equipment to control the water supply system and reduce real water losses (e.g. leak detection and flow meters, hydraulic modelling software and hardware, etc.) and commercial water losses (billing hard- and software, etc. The equipment shall be procured in parallel to the implementation of technical assistance measures in order to ensure its effectiveness.
4.	Technical assistance		
4.1	Design and Engineering for Phase 1 investments	PH 1	Mandatory for implementation of works contracts for Phase 1.
4.2	Corporate Development Program	PH 1	Should start as early as possible (in Phase 1) in order to increase the capacity of the operator and to generate additional revenues for implementing long-term investment measures (e.g. pipe replacements).
4.3	Stakeholder Participation Program	PH 1	Should be implemented before and in parallel to the works contracts of Phase 1 (start as early as possible during design phase)
4.4	Water Supply Network Analysis and Water Loss Reduction Programme	PH 1 (PH 2)	Should be carried out in parallel to the design stage of Phase 1 investment measures in order to ensure that part of its results are available for designing Phase 1 investments. In case of insufficient budget, this measure can be split into two phases (follow up in Phase 2 in order to determine long-term network development needs).
4.5	Medium to long-term Sanitation Study	PH 1	Should be implemented as soon as possible (in Phase 1) in order to ensure that all wastewater investment measures (in particular design and construction of WWTP) can be implemented in Phase 2.

5.9 Option analysis for investment measures

Possible options for the priority investment measures proposed to be implemented in Phase 1 were identified and analysed, while for measures in Phase 2 the options have been identified but will be analysed in subsequent studies (see technical assistance measures above). Detailed options (such as pipe materials, type of pumps, zoning options, etc.) will be carried out in the subsequent detailed design stage (technical assistance measure 4.1. and 4.4).

Option analysis for Phase 1:

In Phase 1 sewerage network extensions in the town of Leova are proposed. Other systems for wastewater collection in urban areas than the extension of the already established sewerage system could not be identified. Therefore, no option analysis for the proposed extension of the wastewater collection is needed.

Identified options for Phase 2:

In order to define the required capacity of the WWTP (extensions) an assessments of the agglomerations (localities in the vicinity of Leova) to be connected to the central WWTP in Leova has to be carried out. This assessment includes an options analysis comparing central versus decentralised options for each of the agglomerations/localities. Hence, for each agglomeration the assessment reveals if the preferred option will be a connection to the WWTP in the town (centralised option) or if a decentralised solution is the least cost option (e.g. separate WWTP for each locality). Further, the agglomeration boarders have to be assessed, defining clearly which part of the service area should be connected to a central sewer network and which part of the service area should better be served through on-site sanitation (e.g. septic tanks, etc.). This assessment should be carried out at least at rayon level (or even beyond administrative borders) and should include all localities in a defined study area (typically at master plan level). As the scope of this feasibility study is limited to the preselected urban localities (towns) and localities in the immediate vicinity of this town, this study has to be carried out within the scope of the subsequent technical assistance measure in Phase 1 (see above).

The subsequent Sanitation Study should in particular assess the following options (see Chapter 5.7.2 Investment framework and Chapter 5.7.4 Investment measures – wastewater system):

For Filipeni (3,200 inhabitants in 2014), Hanasenii Noi (1,075 inhabitants in 2014), and Romanovca (556 inhabitants in 2014), located in the south/south-east of the town centre, various options for wastewater treatment and collection are possible:

- Option 1: Separate collection system and separate WWTP for each of the localities;
- Option 2: Separate wastewater collection system for each locality and either discharge of wastewater through a pressure main to the sewerage network in the town of Leova or transport of sewerage by trucks to the WWTP of Leova;
- Option 3: On-site sanitation (no collection system).

5.10 Proposed priority investment plan

The phased priority investment plan is presented in the Tables 5-11, 5-12. The total investment costs for Phase 1 have been estimated at 3 MEUR and for Phase 2 at 18 MEUR (see summary Table 5-13).

Table 5-11: The investment plan for Phase 1

N°	Component	Units	Quantity	Unit costs	Total cost
				EUR	EUR
1	**Wastewater**				
1.1	Extension of the sewer network in the town of Leova				
1.1.1	Sewer network PP/PVC pipe OD 200	m	8,925	150	1,338,750
1.1.2	Sewer network PP/PVC pipe OD 250	m	945	150	141,750
1.1.3	Manholes, ϕ 1,000	pcs	225	1,030	231,750
1.1.4	Service connections	pcs	540	500	270,000
ST - 1.1	Subtotal 1.1 Extension of the sewer network				1,982,250
1.2	Wastewater pumping station				
1.2.1	Wastewater pumping station (WWTP-5)	LS	1	32,000	32,000
ST-1	SUB TOTAL Wastewater (1.1+1.2)				2,014,250
2	**Equipment and Tools for operational performance improvement (water supply and wastewater)**	**LS**	**1**	**200,000**	**200,000**
ST-1&2	SUB -TOTAL ST -1&2				2,214,250
3	**Technical Assistance**				
3.1	Design, engineering, supervision (12% of investment costs)				265,710
3.2	Technical Assistance (Corporate Development Programme, Stakeholder Participation Programme, Water Supply Network Analysis and Water Loss Reduction Programme, Medium to long-term Sanitation Study)	LS	1	300,000	300,000
ST-3	Sub-TOTAL Technical Assistance (3.1+3.2)				565,710
4.	Contingencies (10% of 1+2+3)				277,996
GT	**Total Costs for Leova Phase 1 (1+2+3+4)**				**3,057,956**

Source: GIZ/MLPS

Table 5-12: The investment plan for Phase 2

N°	Component	Units	Quantity	Unit costs	Total cost
				EUR	EUR
A	**Leova town**				
1	**Wastewater**				
1.1	Extension of the sewer network in the town of Leova				
1.1.1	Sewer network PP/PVC pipe OD 200-315	m	10,970	165	1,810,050
1.1.2	Manholes, ϕ 1000	pcs	220	1,030	226,600
1.1.3	Pressure main PE OD 90-110	m	1,090	62	67,580
1.1.4	Service connections	pcs	680	500	340,000
ST -1	Subtotal 1.1 Extension of the sewer network				2,444,230
1.2	Wastewater pumping station				
1.2.1	Wastewater pumping station (WWPS-6)	LS	1	28,000	28,000
1.3	Wastewater Treatment Plant				
1.3.1	Wastewater Treatment Plant	P.E	10,421	300	3,126,300
1.4	Rehabilitation of sewer network in the town of Leova * (OD 200-250)	m	2,820	165	465,300
ST-1	Subtotal Wastewater (1.1+1.2+1.3+1.4)				6,063,830
B	**Filipeni locality**				
1	**Wastewater**				
1.1	Extension of the sewer network in the locality of Filipeni				
1.1.1	Sewer network PP/PVC pipe OD 200-250	m	22,250	165	3,671,250

N°	Component	Units	Quantity	Unit costs	Total cost
				EUR	EUR
1.1.2	Manholes, ϕ 1000	pcs	445	1,030	458,350
1.1.3	Pressure main PE OD 90-110	m	2,860	62	177,320
1.1.4	Service connections	pcs	635	500	317,500
	Subtotal 1.1 Extension of the sewer network				4,624,420
1.2	Wastewater pumping station				
1.2.1	Wastewater pumping station (WWPS-1)	LS	1	20,000	20,000
1.2.2	Wastewater pumping station (WWPS-2)	LS	1	20,000	20,000
	Subtotal 1.2 Wastewater pumping station				40,000
1.3	Wastewater Treatment Plant				
1.3.1	Wastewater Treatment Plant	P.E	2,012	390	784,680
ST-1	Subtotal Wastewater (1.1+1.2+1.3)				5,449,100
C	**Romanovca locality**				
1	**Wastewater**				
1.1	Extension of the sewer network in the locality of Romanovca				
1.1.1	Sewer network PP/PVC pipe OD 200-250	m	3,495	165	576,675
1.1.2	Manholes, ϕ 1000	pcs	73	1,030	75,190
1.1.3	Pressure main PE OD 90-110	m	585	62	36,270
1.1.4	Service connections	pcs	160	500	80,000
	Subtotal 1.1 Extension of the sewer network				768,135
1.2	Wastewater Pumping Station				
1.2.1	Wastewater Pumping Station	LS	1	28,000	28,000
1.3	Wastewater Treatment Plants				
1.3.1	Wastewater Treatment Plants	P.E	369	510	188,190
ST-1	Subtotal Wastewater (1.1+1.2+1.3)				984,325
D	**Hanasenii Noi locality**				
1	**Wastewater**				
1.1	Extension of the sewer network in the locality of Hanasenii Noi				
1.1.1	Sewer network PP/PVC pipe OD 200-250	m	8,447	165	1,393,755
1.1.2	Manholes, ϕ 1000	pcs	170	1,030	175,100
1.1.3	Pressure main PE OD 90-110	m	500	62	31,000
1.1.4	Service connections	pcs	310	500	155,000
	Subtotal 1.1Extension of the sewer network				1,754,855
1.2	Wastewater pumping station				
1.2.1	Wastewater pumping station (WWTP-1)	LS	1	20,000	20,000
1.3	Wastewater Treatment Plant	P.E	666	510	339,660
ST-1	Subtotal Wastewater (1.1+1.2+1.3)				2,114,515
SUM	Summary for Total Investment Costs for all localities				
1	Leova Town				
1.1	Wastewater				6,063,830
ST-1	Sub-total capital investment costs Leova Town				6,063,830
2	Filipeni locality				
2.1	Wastewater				5,449,100
ST-2	Sub-total capital investment costs Filipeni locality				5,449,100
3	Romanovca locality				
3.1	Wastewater				984,325
ST-3	Sub-total capital investment costs Romanovca locality				984,325
4	Hanasenii Noi locality				
4.1	Wastewater				2,114,515
ST-4	Sub-total capital investment costs Hanasenii Noi locality				2,114,515

N°	Component	Units	Quantity	Unit costs	Total cost
				EUR	EUR
TOT	Total capital Investment cost all localities (1+2+3+4)				
T1	Wastewater				14,611,770
TOT	Total capital Investment cost all localities				14,611,770
TA	Technical Assistance				
	Design and engineering (12% of investment costs)				1,753,412
CON	Contingencies (10% of Investment costs and TA)				1,636,518
GT II	**Grand TOTAL for Phase 2 (Investment costs +technical assistance + Contingencies)**				**18,001,701**

Source: GIZ/MLPS

Table 5-13: Summary of the investment plan for Phase 1 and Phase 2

N°	Component	Costs Phase 1	Costs Phase 2	Costs Phase 1 & 2
		EUR	EUR	EUR
1	Water supply and wastewater, capital investments			
1.1	Wastewater	2,014,250	14,611,770	16,626,020
1.2	Equipment and tools for operational performance improvement (water supply and wastewater)	200,000		
ST-1	Sub-total capital investments water supply and wastewater	2,214,250	14,611,770	16,826,020
2	Technical assistance	565,710	1,753,412	2,319,122
3	Contingencies	277,996	1,636,518	1,914,514
Total	**Total Costs Phase 1 & 2**	**3,057,956**	**18,001,701**	**21,059,657**

Source: GIZ/MLPS

6 Financial and economic analysis

6.1 Assumptions for financial and economic analysis

The financial model is structured in nominal Moldovan lei (MDL), the base year is 2014 and forecast begins in 2015.

The financial and economic analysis was based on macroeconomic assumptions on a forecast of GDP per capita, wages increase and electricity prices described below (Macroeconomic forecast).

The financial and economic analysis was prepared using incremental analysis, which considers the differences in the costs and benefits between the 'do something' alternative(s) and a single counterfactual without the project, that is, in principle, the BAU[34] scenario[35], in reference to the EU Guide to Cost-Benefit Analysis (further EU guide) of investment projects.

The project was prepared using following assumptions:

- The water supply service area will be restricted to the current service area of 'Apa-Canal Leova' JSC, no expanding of the service area is forecasted for both scenarios;
- The wastewater service area will be extended with 540 households in Leova in with project scenario and no extension of the service area is forecasted for the BAU scenario;
- The connection rate increases in the existing service area to 100% as the targets was set by 2030 and for the new area (new connected localities) to the 100% in 2045;
- Apparent losses (Commercial losses) will decrease down to the target of 15% until 2030 and down to the 5% in 2045;
- Physical losses will remain at the same level for the forecasted project period;
- Fixed costs and depreciation do not change, except increases in salaries as described in the macroeconomic forecast;
- Variable costs are proportional to the unit water consumption.

The details of the financial and economic analysis are presented in Annex 6, Tables 1-25 as follows:

- Table 1. Macroeconomic forecast;
- Table 2. Investment costs for wastewater;
- Table 3. Depreciation rates for wastewater;
- Table 4. Summary of investment costs for wastewater;
- Table 5. Depreciation for wastewater;
- Table 6. Gross value of new assets for wastewater;

[34] Business as Usual

[35] In fact, the BAU scenario is an adjusted "do-minimum" scenario used as the reference solution. This is because in some cases, the BAU (do-nothing) scenario cannot be considered acceptable because it produces catastrophic effects.

- Table 7. Net assets for wastewater;
- Table 8. Depreciation costs for wastewater;
- Table 9. Variable costs – summary;
- Table 10. Fixed costs;
- Table 11. Total costs;
- Table 12. Calculation of the water and wastewater tariff;
- Table 13. Tariff affordability;
- Table 14. Profits and losses - with project;
- Table 15. Profits and losses - without project;
- Table 16. Working Capital - with project;
- Table 17. Working Capital - without project;
- Table 18. Balance sheet - with project;
- Table 19. Balance sheet - without project;
- Table 20. Cash flow - with project;
- Table 21. Cash flow - without project;
- Table 22. Financial analysis on profitability of the investment;
- Table 23. Calculation of NPV on own capital;
- Table 24. Economic analysis;
- Table 25. Sensitivity analysis.

The financial analysis was prepared in an annual presentation and covers a time horizon of 30 years. Calculation of NPV was conducted for a 30-year reference period as the most appropriate infrastructure investments in the WSS sector and also advised by EU guide for water and environment (Table 2.2 of the guide which provides reference time horizon in years).

Historical financial data for 2012, 2013 and 2014 are used as the basis for the financial model. Data from 2014 is used as basis for the current costs structure.

The exchange rate used for the analysis represents the average exchange rate for the 2015 (the period from 1 January to 1 November) and is 1 EUR = 20.78 MDL. (Source: (https://www.bnm.md/en/content/official-exchange-rates).)

6.1.1 Macroeconomic forecast

Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period. GDP is usually calculated on an annual basis. The major source for the GDP forecast is the Poverty Reduction Strategy[36].

The National Development Strategy (NDS)—known as ‘Moldova 2020’—was approved by the Parliament of the Republic of Moldova on July 11, 2012 and officially published on November 30, 2012. The Strategy is not only a policy guide for the Government of Moldova but also the base for relations with IMF and other IFOs. The Strategy sets the priorities for country development for the time horizon 2012-2020. At the same time the

[36] http://www.imf.org/external/pubs/cat/longres.aspx?sk=40895.0

Strategy assumes two development scenarios: base case scenario and scenario Moldova 2020.

The base case scenario, which regards a continuation of trends of the last decade, assumes that Moldova will develop as it has done to date, with the same economic, social, political phenomena, with rising remittances and the same pace of reforms. The base case scenario estimates an average annual GDP growth of 4.7% during 2012-2020.

The implementation of the Strategy's priorities, considering the direct and quantifiable effects of each priority, supplements this annual growth rate by more than 1.2% annually, thus forming the alternative scenario Moldova 2020, which in this study is called the optimistic scenario. The annual supplement to the additional GDP growth will emerge gradually, but will accelerate rapidly and sustainably, from 1.1% (2015) to 2.1% (by 2020), continuing beyond the analysis horizon used in this study. The difference is small at first glance, but in developed economies an annual GDP growth difference of 2% is sometimes the difference between stagnation and growth, or the difference between normal growth and economic boom. Hence, the alternative scenario assumes that, due to effects only, in 2020 the GDP will be 12% higher compared to the base case scenario and, with each year beyond 2020, this difference will grow significantly. Along with the implementation of these priorities, the annual income per capita by 2020 will be on average 12% higher compared to the base case scenario and 79% higher compared to 2011.

Taking into account that the National Development Strategy 2012-2020 also serves as the Poverty Reduction Strategy (PRS) and is the official basis for internal programming and for bilateral relations between the Government of the Republic of Moldova and the IMF and other international financial institutions, it may be concluded that the annual percentage changes in GDP presented in the Strategy can serve as a reference for the feasibility study projections.

Table 6-1: Gross Domestic Product annual percentage of change based on the information provided by Poverty Reduction Strategy (%)

Scenario/ Years	2015	2016	2017	2018	2019	2020
Base case scenario, %	4.70	4.60	4.65	4.70	4.65	4.70
Moldova 2020 scenario (optimistic), %	5.80	5.90	6.40	6.50	6.40	6.70
Pessimistic, %	1.10	1.30	1.75	1.80	1.75	2.00

Source: GIZ/MLPS

The base case scenario in the Poverty Reduction Strategy assumes that in the period 2012 – 2020, the annual GDP growth rate will be on average 4.70%. The Moldova 2020 scenario assumes that GDP will be higher than in the base case scenario in 2015 by 1.10% and in 2020 by 2.10%. Table 6-1 presents GDP growth estimates from 2015-2020 based on the assumptions and figures provided in the PRS. This study includes also a third scenario, pessimistic, where growth is half of that in the base scenario.

During the development of this feasibility study, the World Bank and IMF changed their GDP forecasts for the Republic of Moldova, due to social and political events that recently took place in region and the country itself. In this context, the World Bank has revised its GDP forecast downward, as shown in the following table.

Table 6-2: Gross Domestic Product projection by World Bank (%)

Scenario/ Years	2015	2016	2017
Base case scenario, %	-2.0	1.5	4.00

Source: http://www.worldbank.org/content/dam/Worldbank/GEP/GEP2015b/Global-Economic-Prospects-June-2015-Europe-and-Central-Asia-analysis.pdf

Applying the same methodology used in the Poverty Reduction Strategy, the GDP growth for all three scenarios has been estimated and is presented in the table below.

Table 6-3: GDP annual percentage of change in the feasibility study (%)

Scenario/ Years	2015	2016	2017	2018	2019	2020
Base case scenario, %	-2.0	1.5	4.0	4.0	4.0	4.0
Optimistic scenario, %	-2.0	3.00	4.5	5.0	5.0	5.0
Pessimistic scenario, %	-2.0	0.8	2.0	2.0	2.0	2.0

Source: GIZ/MLPS

Extending the GDP projections beyond 2020, it is assumed that the high growth of 4% annually will continue until 2035 as a result of structural reforms. However, in the later years the GDP growth will gradually slow, achieving the growth of 3% in the period of 2035-2044. The GDP growth forecasts for the period 2025-2045, estimated according to the above assumptions are presented in Table 6-4. In the optimistic scenario, the GDP growth will remain higher, while in the pessimistic scenario there will be stagnation.

Table 6-4: GDP annual percentage of change projection 2025-2045 (%)

Scenario/ Years	2025	2030	2035	2040	2045
Base case scenario, %	4.0	4.0	3.0	3.0	3.0
Optimistic scenario, %	5.0	5.0	5.0	5.0	5.0
Pessimistic scenario, %	2.0	2.0	1.5	1.5	1.5

Source: GIZ/MLPS

The base case scenario was used further in the financial analysis and financial calculations.

6.1.2 Wages forecast

According to the National Bureau of Statistics of the Republic of Moldova, the gross average monthly salary was MDL 4,172.0 in 2014, which was higher by 10.8% compared to the gross average salary in 2013. For the period 2009-2014, the average salary growth rate was 8.7%. The table below presents the gross average salaries and the salary growth rate for the period 2005 – 2014.

Table 6-5: Gross average monthly salary (MDL)

Indicator / Years	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gross average monthly salary, MDL	1,319	1,697	2,065	2,530	2,748	2,972	3,194	3,478	3,765	4,172
Salary growth rate, %	19.5	28.7	21.7	22.5	8.6	8.2	7.5	8.9	8.3	10.8

Source: (http://statbank.statistica.md/pxweb/Dialog/varval.asp?ma=SAL0108_en&ti=Gross+average+monthly+salary+by+economic+activities+and+sectors%2C+2004-2010&path=../Database/EN/03%20SAL/SAL01/serii%20anuale/&lang=3)

The gross average salary for the next four years (2015-2018) is described on the macro economic forecast of the Moldovan Ministry of Economy. The table below presents the gross average salaries and the salary growth rate for 2015 – 2018.

Table 6-6: The forecast of gross average monthly salary for the next years (MDL)

Indicator / Years	2015	2016	2017	2018
Gross average monthly salary, MDL	4,500	4,925	5,400	5,900
Nominal growth rate, %	7.9	9.4	9.6	9.3

Source: (http://www.mec.gov.md/ro/documents-terms/situatia-macroeconomica-prognozare-macroeconomica)

The base case scenario, which regards a continuation of trends of the last decade, assumes that Moldova will develop as it has done to date, with the same economic, social, political phenomena.

The base case scenario estimates an average monthly salary growth of 9.0% during 2012-2020.The optimistic scenario (Moldova 2020) assumes that gross monthly salary will be higher than in the base case scenario in 2015 - 2020 by 2.0%. The pessimistic scenario assumes that the salary growth will be half of the provided by base scenario.

Table 6-7 presents gross monthly salary growth estimates for the period 2015-2020 based on the assumptions and figures provided by the Moldovan Ministry of Economy.

Table 6-7: The forecast of gross average monthly salary growth for the next years (%)

Scenario/Years	2015	2016	2017	2018	2019	2020
Base Case scenario, %	7.9	9.4	9.6	9.3	9.3	8.5
Pessimistic scenario, %	3.95	4.70	4.80	4.65	4.66	4.26
Optimistic scenario, %	9.9	11.4	11.6	11.3	11.3	10.5

Source: GIZ/MLPS

Extending the projections of gross average monthly wages beyond 2020, it is assumed that the high growth of about 6.3% annually will continue until 2025 as a result of structural reforms and the growth of the economy. For the period 2025-2035, the growth will slow down up to approximately 4.3% annually. In later years, it is estimated that growth will gradually slow, achieving the rate of 3% in the period of 2035-2044.

The gross average monthly salary forecast for the period 2020-2045 is presented in the table below.

Table 6-8: The forecast of gross average monthly salary growth, 2020-2045 (%)

Scenario/Years	2020	2025	2030	2035	2040	2045
Base Case scenario, %	8.5	5.6	4.3	3.6	3.0	2.7
Pessimistic scenario, %	4.26	2.78	2.17	1.79	1.52	1.35
Optimistic scenario, %	10.5	7.6	6.3	5.6	5.0	4.7

The base case scenario was used in this feasibility study.

6.1.3 Household income forecast

According to National Bureau of Statistics of the Republic of Moldova the disposable household income was (in 2014), in person per month: MDL 2,292.6 in Chisinau, MDL 1,697.2 in the North, MDL 1,564.3 in the Centre and MDL 1,526.6 in the South Region[37].

In 2014 the disposable household income was MDL 1,767.5 on average at national level, MDL 2,111.1 in urban and MDL 1,505.7 in rural areas.

The forecast for disposable household income was estimated based on disposable household income per capita per month from 2014 and increased according to the assumptions for the annual real wage growth. The following table presents the forecast for disposable household income for the period 2015-2020 and 2020-2045.

Table 6-9: Forecast of disposable household income, 2015-2020[38]

Scenario/Years	2015	2016	2017	2018	2019	2020
Base Case scenario, MDL	1,730	1,781	1,863	1,944	2,021	2,102
Pessimistic scenario, MDL	1,730	1,756	1,796	1,835	1,871	2,066
Optimistic scenario, MDL	1,730	1,816	1,936	2,058	2,161	2,837

Source: GIZ/MLPS

Table 6-10: Forecast of disposable household income, 2020-2045[39]

Scenario/Years	2020	2025	2030	2035	2040	2045
Base Case scenario, MDL	2,102	2,558	3,112	3,786	4,389	4,940
Pessimistic scenario, MDL	1,909	2,107	2,327	2,569	2,767	2,937
Optimistic scenario, MDL	2,269	3,008	3,838	4,899	6,252	7,600

Source: GIZ/MLPS

6.1.4 Electricity prices forecast

Electricity prices have a significant influence on costs of providing services and therefore on the tariffs that customers should pay.

While electricity prices in Moldova are below the European average, they are among the highest when compared to disposable household income. Thus, the following factors will affect electricity prices:

[37] http://statbank.statistica.md/pxweb/Dialog/view.asp?ma=NIV0103_EN_t&ti=Disposble+incomes+average+monthly+per+capita+by+Years%2C+Sources+of+income%2C+Unit+and+Zones&path=./quicktables/EN/04%20NIV/NIV01/&lang=3

[38] Per capita per month (MDL)

[39] Per capita per month (MDL)

- Regulation and government policy keeping prices low;
- Regional price of gas as a major fossil fuel used in the power generation in Moldova;
- Demand for the electricity in the region;
- Situation in Transnistria, from where Moldova imports electricity at a low price due to subsidized gas prices in Transnistria;
- Development of grid connections to Romania and Ukraine;
- General growth of the country's GDP and increase in disposable household income, which may provide the government with the possibility of relaxing control on electricity prices.

Based on these factors, the feasibility study makes following assumptions:

- By 2020, the real increase in electricity prices will be limited to 1% annually, with the exception of 2016, when according to Administrative Board Decision of National Agency for Energy Regulation of the Republic of Moldova no. 153 of July 18, 2015, the electricity price was increased by 37%;
- In years 2020-2030, it will be proportional to the half of GDP increase;
- After 2030, it will be proportional to the GDP increase;
- In the pessimistic scenario, it will be proportional to half of GDP increase by 2020 and then it will be proportional to the GDP increase;
- In the optimistic scenario, there will be annual real growth of 1%.

The following table summarizes the assumed future electricity price increases:

Table 6-11: Increase of electrify prices (%)

Scenario/ Years	2015	2016	2017	2018	2019	2020	2030	2040
Base case scenario, %	0.0	37.0	1.0	1.0	1.0	1.0	2.5	4.0
Pessimistic scenario, %	0.0	37.0	2.3	2.4	2.3	2.4	5.0	4.0
Optimistic scenario, %	0.0	37.0	1.0	1.0	1.0	1.0	1.0	1.0

Source: GIZ/MLPS

The base case scenario is used in the feasibility study and further in the financial analysis and financial calculations.

6.2 Evaluation of the financial capacity of the Operator

6.2.1 Analysis of the current financial situation of the Operator

6.2.1.1 Analysis of the Balance Sheet

The WSS operator's Balance Sheet reveals a decrease in equity (see Table 6-12).

Table 6-12: Balance Sheet of the 'Apa-Canal Leova' JSC

Balance Sheet	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
ASSETS				
LONG-TERM FIXED ASSETS				
Incomplete fixed assets	040	3,956,551	11,947,196	38,803,366

Balance Sheet	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Fixed Assets	060	20,430,066	23,971,427	25,319,029
Depreciation and depletion of long-term fixed assets	080	-10,003,235	-10,412,689	-11,306,557
Long-term fixed assets' book cost	090	14,383,382	25,505,934	52,815,838
Total Non-Current Assets	180	14,383,382	25,505,934	52,815,838
CURRENT ASSETS				
Stocks of goods and materials				
Raw materials	190	74,095	94,781	167,810
Inventory	210	95,922	1,383,872	1,234,336
Stocks of goods and materials	250	170,017	1,478,653	1,402,146
Trade accounts receivables	260	134,589	265,702	335,723
Advances	290	27,826	1,210,546	21,031
Receivables related to budget	300	875		15,665
Receivables from staff	320	7,501	8,419	19,054
Deferred income	330	208,552	212,437	299,860
Other short-term receivables	340	575,434	714,642	601,766
Short-term receivables	350	954,777	2,411,746	1,293,099
Cash				
Settlement Account	400	483	3,119	1,546
Cash	410	18,290	19,679	162,668
Total Current Assets	460	1,143,567	3,913,197	2,872,325
TOTAL - ASSETS	470	**15,526,949**	**29,419,131**	**55,711,195**
LIABILITIES AND OWN EQUITY				
EQUITY				
Share capital and capital surplus				
Share capital	480	24,200	24,200	24,200
Provisions	560	11,876,606	11,876,606	11,876,606
Retained profit (uncovered loss) of previous years	580	-2,217,370	-2,217,370	-1,935,309
Net income (loss) of the reporting period	590	0	282,061	-163,621
Retained earnings (uncovered loss)	610	-2,217,370	-1,935,309	-2,098,930
Differences from revaluation of long-term assets	620	585,278	585,293	585,315
Subsidies	630	84,127		
Total Equity	650	10,352,841	10,550,790	10,387,191
LONG-TERM LIABILITIES				
Long-term bank loans	660	44,111	4,294,958	12,898,090
Anticipated long-term income	710		8,063,183	25,344,056
Special purpose funding and receipts	720	4,575,397	4,575,397	4,575,397
Other long-term accrued liabilities	750	0	0	55,540
Total Long Term Liabilities	770	4,619,508	16,933,538	42,873,083
SHORT-TERM LIABILITIES				
Total short-term financial liabilities	820	0	1,211	1,111
Short-term accounts payables				
Commercial account payables	830	72,447	1,852,840	1,758,939
Advances received	850	4,800	0	39,481
Short-term accounts payables	860	77,247	1,852,840	1,798,420
Wages owed	870	123,863	138,393	206,678
Insurance	890	241,102	7,280	212,261
Debt settlement related to the budget	900	55,172	49,845	208,638
Short-term accrues liabilities	960	477,353	271,072	651,390
Total Short Term Liabilities	970	554,600	2,125,123	2,450,921
TOTAL – EQUITY and LIABILITIES	**980**	**15,526,949**	**29,609,451**	**55,711,195**

Source: 'Apa-canal Leova' JSC

The following conclusions results from the Balance Sheet analysis:

- The largest assets category is long-term assets, which constituted 94.8% of the total in 2014. It should be mentioned that the operator's assets increased from MDL 15.5 million in 2012 to MDL 55.7 million in 2014;
- Liabilities show that the operator is financed mainly from permanent capital where an increase in long-term loans that were offered to rehabilitate the water and wastewater systems;
- The share of short-term debts in 2014 is 4.4% of total liabilities. The operator honours its current and long-term liabilities in due time.

6.2.1.2 Analysis of the Profit and Losses Statement

The Profit and Losses Statement for the period 2012-2014 is shown in the following Table 6-13.

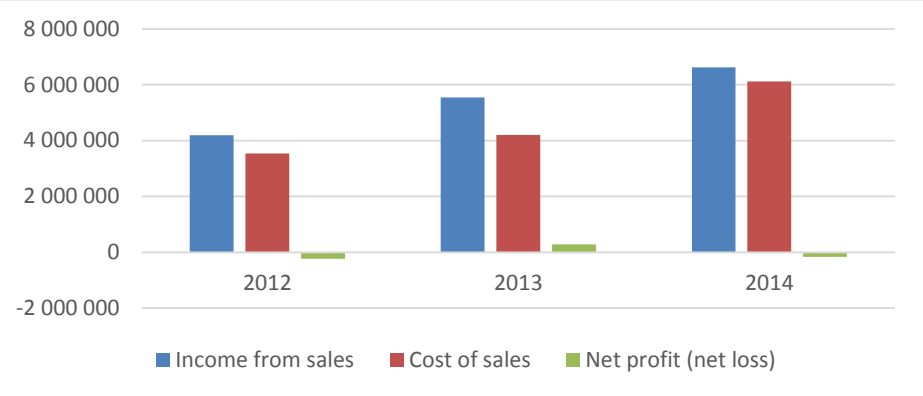
Table 6-13: Profit and Losses Statement of the of the 'Apa-canal Leova' JSC

Income Statement	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Income from sales	010	4,192,959	5,542,836	6,621,356
Cost of sales	020	3,542,093	4,208,880	6,111,422
Gross profit (gross loss)	030	650,866	1,333,956	509,934
Other operating income	040		310	48,784
Commercial expenses	050			
General and administrative expenses	060	636,030	815,358	932,260
Other operating expenses	070	249,900	284,027	140,586
Result from operating activities: profit (loss)	080	-235,064	234,881	-514,128
Result from investing activities: profit (loss)	090	360		3,481
Result from financial activities: profit (loss)	100	4,096	64,495	347,026
Result from financial and economic activities: profit (loss)	110	-230,608	299,376	-163,621
Extraordinary result: profit (loss)	120			
Profit (loss) before tax	130	-230,608	299,376	-163,621
Income tax	140		17,315	
Net profit (net loss)	150	-230,608	282,061	-163,621

Source: 'Apa-canal Leova' JSC

- The operator generated a profit from operating activities of MDL 234.9 thousand in 2013. On the other hand, in 2014, it was registered losses of MDL 514.1 thousand, that reflects a negative tendency of the operator;
- The evolution of the operator's income, cost of sales and net profit for the period of 2012-2014 is presented in the Figure 6-1.

Figure 6-1: Operator income, cost of sales and net profit (MDL)



Source: GIZ/MLPS

6.2.1.3 Cash flow analysis

The Cash Flow Statement for the period 2012-2014 is shown in Table 6-14.

Table 6-14: Cash Flow Statement of the 'Apa-Canal Leova' JSC

Cash Flow Statement	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Operating activities				
Cash inflows from sales	010	4,528,358	5,834,619	7,260,069
Cash paid to suppliers and contractors	020	2,265,856	2,750,837	3,247,338
Cash payments to employees and social security contributions	030	1,760,267	2,370,181	2,467,096
Interest payments	040	74,105	274,722	798,391
Income tax payments	050			23,496
Other cash receipts	060			
Other cash payments	070	414,560	434,854	582,692
Net cash flow from operating activities	080	13,570	4,025	141,056
Financing activities				
Interest received	110	360	0	360
Financing activities				
Other cash receipts (payments)	200	0	0	0
Net cash flow from financial activity	210	0	0	0
Net cash flow before extraordinary items	220	13,930	4,025	141,416
Cash proceeds (payments) from extraordinary items	230			
Net cash flow	240	13,930	4,025	141,416
Positive (negative) foreign exchange differences	250			
Cash balance at the beginning of the year	260	4,843	18,773	22,798
Cash balance at the end of the reporting period	270	18,733	22,798	164,214

Source: 'Apa-Canal Leova' JSC

6.2.1.4 Financial indicators

A series of indicators derived from the financial statements were calculated based on the data collected (see Table 6-15).

Table 6-15: Financial indicators

No	Financial indicators	2012	2013	2014	Indicators limits
1	Current Liquidity Ratio	0.93	1.55	1.17	1.0 – 2.0
2	ROE, %	-2.4	2.8	-1.6	
3	ROA, %	-1.5	1.0	-0.3	
4	Operating Profitability, %	-5.6	4.2	-7.8	> 0
5	Debts Service Converge Ratio	0.62	0.34	0.19	<1.2
6	Financial Ratio	0.38	0.66	0.81	
7	Inventory Turnover, days	18	71	86	
8	Accounts Receivable Turnover, days	83	111	102	< 30
9	Accounts Payable Turnover, days	8	84	109	< 30

Source: GIZ/MLPS

- Profitability indicators (2, 3, 4) have oscillating values, but are generally negative for 2012-2014. This means that the operator revenues covers its current costs partially;
- Financial ratio indicator (6) shows a high weight of debt;
- Liquidity indicator (1) shows a constant capacity of paying in the short-term, however it is the case to mention that the cash structure is composed of cash that is held in reserve to repay the EBRD and EIB long-term loans;
- The inventory turnover period increased from 18 days in 2012 to 86 days in 2014, which demonstrates the inefficient management of current assets. The collection of receivables shows an increase in the collection period from 83 days in 2012 to 102 days in 2014. The accounts payable period increased from 8 days in 2012 to 109 days in 2014.

6.2.1.5 Revenue analysis

The revenues from the provision of water and wastewater services are presented in Table 6-16.

Table 6-16: Revenues from water supply and wastewater services of 'Apa-Canal Leova'[40]

Consumers	Revenues		Volumes	
	(MDL)	(%)	(m^3)	(%)
WATER SUPPLY	3,045,519	100.0	152,056	100.0
Population	1,855,301	60.9	115,739	76.1
Budgetary Consumers	1,012,269	33.2	31,205	20.5
Private Entities	177,949	5.8	5,112	3.4
WASTEWATER SERVICES	1,163,974	100.0	73,611	100.0
Population	380,642	32.7	38,920	52.9
Budgetary Consumers	600,126	51.6	28,886	39.2
Private Entities	183,206	15.7	5,805	7.9

Source: 'Apa-canal Leova' JSC

The operator differentiates tariffs by customer groups and tariffs are approved by the Local Council (see Table 6-17).The tariffs are indicated without VAT.

[40] 2014

Table 6-17: Evolution of tariffs, 2013-2015

Tariffs by customer group	2013 (MDL / 1m^3)	2014 (MDL / 1m^3)	2015 (MDL / 1m^3)
Budgetary Consumers	53.87	66.39	66.39
• Water supply	28.78	34.82	34.82
• Wastewater services	26.09	31.57	31.57
Private Entities	53.87	66.39	66.39
• Water supply	28.78	34.82	34.82
• Wastewater services	26.09	31.57	31.57
Population	20.10	25.81	25.81
• Water supply	11.60	16.03	16.03
• Wastewater services	8.50	9.78	9.78
Weighted average		40.57	
• Water supply		20.52	
• Wastewater services		20.05	

Source: 'Apa-canal Leova' JSC

In the period 2013 - 2015, the operator increased tariffs for WSS services by 33% for budgetary consumers and private entities and for residential customers by 45%. This fact demonstrates that the tariffs are established based on cost recovery principle. Also, in accordance with the operator's data the weighted average tariffs were calculated.

6.2.1.6 Detailed cost structure

The operator's detailed cost structure for water and wastewater services is shown in Table 6-18.

Table 6-18: Detailed cost structure of 'Apa-Canal Leova' JSC, 2014

Cost category	Amount (MDL)	Percentage (%)
WATER SUPPLY	3,134,300	100.0
Electricity:	859,199	27.4
• For pumping	274,898	8.8
• For water treatment	567,288	18.1
• For office, heating and other purposes	17,013	0.5
Chemicals for water treatment	528,024	16.8
Salaries of employees working in water supply	885,721	28.3
• Number of employees (pers.)	30	-
• Average monthly salary per employee	2,345	-
Social benefits (pension fund/insurance)	237,964	7.6
Depreciation	392,786	12.5
Maintenance costs for water supply	184,336	5.9
Tax for water capturing	15,517	0.5
Other costs	30,753	1.0
WASTEWATER SERVICES	1,019,020	100.0
Electricity:	68,893	6.8
• For pumping	18,931	1.9
• For wastewater treatment	47,439	4.7
• For office, heating and other purposes	2,523	0.2
Chemicals for wastewater treatment	53,836	5.3
Salaries of employees working in wastewater services	328,334	32.2
• Number of employees (pers.)	9	-
• Average monthly salary per employee	3,040	-
Social benefits (pension fund/insurance)	88,369	8.7
Depreciation	436,114	42.8
Maintenance costs for wastewater services	23,158	2.3
Other costs	20,316	2.

Cost category	Amount (MDL)	Percentage (%)
OTHER SERVICES	1,829,473	100.0
Electricity	13,341	0.7
Salaries of employees working in other services	602,787	32.9
• Number of employees (pers.)	22	-
• Average monthly salary per employee	2,283	-
Social benefits (pension fund/insurance)	160,481	8.8
External services (outsourcing) for other services	4,587	0.3
Fees paid for other services	35,919	2.0
Other costs for other services	1,012,358	55.3
ADMINISTRATION AND OVERHEAD	1,266,110	100.0
Salaries of employees working in administration	371,958	29.4
• Number of employees (pers.)	6	-
• Average monthly salary per employee	5,166	-
Social benefits (pension fund/insurance)	99,886	7.9
Maintenance costs for administration	50,986	4.0
Fuel for transport for administration	25,085	2.0
Insurance costs	4,062	2.0
External services	4,588	0.4
Other costs	709,545	56.0

Source: 'Apa-Canal Leova' JSC

It can be noticed that the majority of the costs are for salaries and electricity.

6.2.1.7 Investments

The operator obtained co-financing for external sources for investments and capacity development as follows (see Table 6-19).

Table 6-19: Investments

Investments	Source	Period	Amount (MDL)
Water Supply and Sewerage Utilities Development Program financed by the EBRD	EBRD, State Budget	2012	134,263
Water Supply and Sewerage Utilities Development Program financed by the EBRD	EBRD, State Budget	2013	11,131,153
Water Supply and Sewerage Utilities Development Program financed by the EBRD	EBRD, State Budget	2014	28,854,936
Total			40,120,352

Source: 'Apa-Canal Leova' JSC

6.2.2 Information on existing loans

On 30 September 2010, an agreement for a long-term bank loan was signed between the Ministry of Finance and the Leova Rayon Council to improve water and wastewater services. According to the agreement, the Ministry of Environment is responsible for the project implementation, for carrying out the works and quality verification.

The loan amount of EUR 900 thousand was granted for a period of 15 years, including a grace period of 3 years.

6.2.3 Operator creditworthiness

Capacity to repay a loan is the most important criterion used to assess the operator's creditworthiness. The loan repayment shall be less than the net profit and depreciation if there are no investment and financial activities. Unfortunately, the operator uses cash

surpluses generated from depreciation to decrease working capital. In conclusion, the operator presently has no creditworthiness capacity.

6.3 Financial analysis

6.3.1 Investment costs

The total investment outlays amount to MDL 63.54 million (EUR 3.06 million). The outlays include:

- Extension of sewer network - 9.87 km;
- Wastewater pumping station – 1 piece;
- Detailed design and procurement;
- Technical assistance, supervision and capacity development;
- Contingencies.

The presented construction costs were prepared using conceptual design estimates. Using the information obtained, the costs were estimated based on expert experience from many years of design works, tenders and investment supervision in water management. Also, in preparation of investment plan was taking into consideration the priority objectives regarding the development of water supply system and wastewater system established by Local Public Administration and WSS operator. In the calculations, the experts took into account the different investment conditions. The costs are inclusive of VAT.

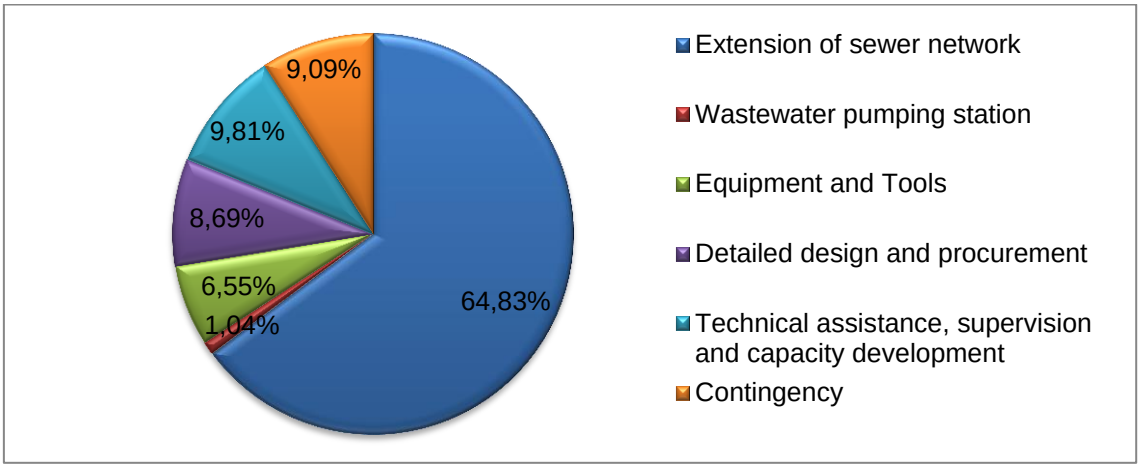
Table 6-20: Summary of the investment costs (MDL mil.)

Project investment outlays	Amount (MDL mil.)	Percentage (%)
Extension of sewer network	41.19	64.83
Wastewater pumping station	0.66	1.04
Equipment and Tools	4.16	6.55
Detailed design and procurement	5.52	8.69
Technical assistance, supervision and capacity development	6.23	9.81
Contingency	5.78	9.09
Total	**63.54**	**100.00**

Source: GIZ/MLPS

The main part of investment costs about 64.8% will be for the extension of wastewater network, manholes and household connections. Capacity development and technical assistance will be around 19% of the total investment cost. Also, in the project are provided various and unforeseen expenditures in the amount of 9% of investment costs.

Figure 6-2: Structure of the project investment costs



6.3.2 Financing of the project and assessing the need for additional funding

6.3.2.1 Additional sources of income

There are two additional sources of project financing: 'local contribution' and tariffs. Local contributions – co-financing of capital investment projects by citizens – are widely used in Moldova. The possible local contributions were proposed based on the experience in Moldova in implementing other investment projects. Accordingly, the estimated contribution of citizens is MDL 1,000 MDL per household connected to the system[41].

These funds will be spent on the local wastewater network, thus households already connected to the local wastewater system will not contribute because usually they already had been contributing to the construction of the network. Thus only households not connected to sanitation system were taken into account.

It is estimated that 319 households will be connected to the wastewater network in the first year of the project realization. The estimation of the citizens contribution is amounted to MDL 0.32 million.

Tariffs could be a source of financing of the WSS capital project, in particular to help repay existing and future loans. On the other hand, if the development of water and wastewater systems will be realized through loans, than the tariffs calculated, will exceed the affordable constrains. In addition, currently the 'Apa Canal Leova' JSC has no creditworthiness capacity. Therefore, for this project the tariff will not be used to contribute to project financing.

As indicated when calculating the financial gap (see Chapter 6.3.7 'Financial performance of the project'), project is not profitable (FNPV(K)~=0) when own contribution is MDL 12.27 million. This means that apart from citizen contributions of MDL 0.32 million, the additional MDL 11.95 million needs to be provided from other sources.

6.3.2.2 Financial plan

The total investment outlays will be financed by:

[41] This is not the total household spending capacity, as the connection to the water supply system also has to be financed.

- Domestic and international donors;
- Citizens providing local contribution;
- National sources (national development funds, local and central budgets, water operator).

The following methods for assessing the amount to be financed from each source of financing were used:

Table 6-21: Methods used for assessing the amount to be financed from each source of financing

Source of financing	Method used to estimate share in project financing
Citizens providing local contribution	The practice of 'local contribution' – co-financing of capital investment projects, including water supply, by citizens – is widely used in Moldova. The estimate was based on experience from other projects in Moldova. The estimated contribution of citizens is MDL 1,000 per household which will be connected to the wastewater system.
Domestic and international donors	The assumption is that remaining part of the investment costs will be financed by donors. Donors may not spend more than the estimated 'financing gap'[42]. The calculation of the required donor contribution takes into account that the project should not lead to financial losses for residents and communes. The social discount rate of 5% is used to determine the financial net present value (FNPV(K)) of the project. The donor contribution is then determined at the level at which FNPV(K) is equal to zero.
Water utility	The water utility may co-finance the project from tariffs. As the level of tariff is above affordability level, it means that currently the water utility will have no capacity to co-finance the project from tariffs. Also, currently 'Apa Canal Leova' JSC has no creditworthiness capacity.

Source: GIZ/MLPS

The following table presents the investment outlays and their financing:

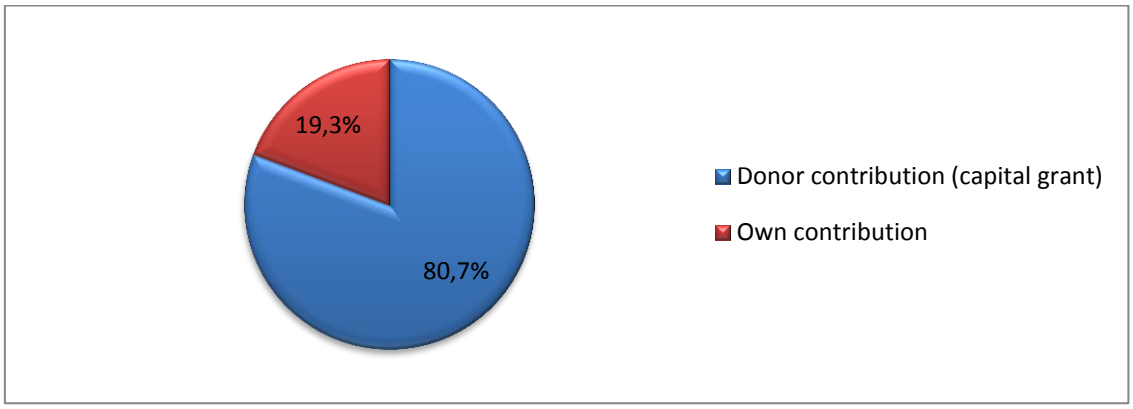
Table 6-22: Summary of the financing sources (MDL mil.)

Project financing sources	Amount (MDL mil.)	Percentage (%)
Citizens providing local contribution	1.65	2.59
Domestic and International donors	51.49	81.02
Other domestic sources	10.41	16.39
Water utility	0.00	0.00
Total	**63.54**	**100.00**

The donor contribution was estimated as 81.0% of the total investment costs, while the local sources' contribution is 19.0%, which will be split down by citizens' contribution about 0.5% and other domestic sources 18.5%.

[42] This is not an EU financing gap calculation, however, it is based on a similar assumptions.

Figure 6-3: Structure of project financing (%)



Source: GIZ/MLPS

The project will be implemented during the period of three years and the implementation schedule is as indicated in the following table. For the first year, it is assumed that the project will be implemented in 10%, for the second year is foreseen 50% and for the third year 40%.

Table 6-23: Summary of the investment implementation schedule (MDL mil.)

Project investment outlays	2015 (MDL mil.)	2016 (MDL mil.)	2017 (MDL mil.)	Total (MDL mil.)
	10%	50%	40%	
Extension of sewer network	4.12	20.60	16.48	41.19
Wastewater pumping station	0.07	0.33	0.26	0.66
Equipment and Tools	0.42	2.08	1.66	4.16
Detailed design and procurement	0.55	2.76	2.21	5.52
Technical assistance, supervision and capacity development	0.62	3.12	2.49	6.23
Contingency	0.58	2.89	2.31	5.78
Total	**6.35**	**31.77**	**25.41**	**63.54**

6.3.3 Forecast of operating costs

A detailed cost structure of 'Apa Canal Leova' JSC for the year 2014 was presented in section 6.2.1.6 (Detailed costs structure). The cost structure was used as a basis for the expenditure forecast with and without the project.

The following assumptions were used for the expenditure forecast:

- **Direct costs for labour – salaries and benefits**. In the project the labour cost is calculated based on forecasted enterprise staff number (Description of enterprise staff is provided in Chapter 7.6 'Corporate development of the operator'). For both options (BAU and with project) it have been used an average real growth rate equal to the wages increase forecast. Three scenarios of wages increase were prepared (see Chapter 6.1.2 'Wages forecast'), but for the financial forecast the base case scenario is presented;
- **Direct costs (chemicals for treatment and water abstraction fee).** Currently, these costs are estimated to be 2.39 MDL/m^3 of water treated. No real cost increase is forecasted;

- **Direct costs (electricity).** The following assumptions were used for unit consumption of water/wastewater:
  - **For pumping station (SP1).** The electricity consumption for the pumping stations of SP1 is estimated to be 0.766 kWh/m^3;
  - **For pumping station (SP2**). The electricity consumption for the pumping stations of SP2 is estimated to be 1.581 kWh/m^3;
  - **For wastewater treatment plant**. The electricity consumption for the wastewater treatment plant is estimated to be 0.1035 kWh/m^3.

Electricity costs are estimated taking into account the electricity prices and the electricity consumption. Price of energy[43] for the reference period is adjusted by forecast of real changes of electricity prices. Electricity consumption is calculated resulting from electricity consumption based on unit of water/wastewater (1 m^3 of water/wastewater) multiplied by total volume of water/wastewater production:

- **General administration costs**. General administration costs are currently MDL 1.27 million annually. For the expenditure forecast, due to limited expansion of the service area, it is assumed that the costs will increase with the GDP growth rate forecasted for both scenarios (BAU and with project). The GDP growth forecast is presented in the macroeconomic forecasts, where was developed three scenarios of GDP growth (base case, optimistic and pessimistic). The base case scenario was used in the financial forecast;
- **Depreciation**. Currently, depreciation is at the level of MDL 0.83 million annually. However, depreciation costs will increase to about MDL 2.59 million annually, after the investments in new assets have been implemented, beginning with the year 2018.

The depreciation costs are taken into account for project sustainability analysis, and are taken into account in the tariff policy discussion.

Details on depreciation forecast are presented in Annex 6, Tables 3-8, which also include calculation of net assets that is further used for the balance sheet forecast.

The operational costs forecasts are presented in the following table.

Table 6-24: Summary of the operational costs projections (MDL mil.)

Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Variable costs water	MDL mil.	0.29	1.50	1.96	2.11	2.74	2.91	4.11	7.25	11.71
Electricity for pumping	MDL mil.	0.27	0.91	1.34	1.44	1.87	2.00	2.91	5.60	9.74
Water treatment costs	MDL mil.	0.02	0.59	0.63	0.67	0.86	0.91	1.20	1.65	1.96
Fixed costs water	MDL mil.	2.66	2.66	2.71	2.80	4.89	5.02	5.75	7.62	9.59
Salaries and related costs	MDL mil.	1.12	1.12	1.16	1.21	1.26	1.31	1.60	2.37	3.21

[43] It has to be noted that current price of electricity in SP1 and wastewater pumping station is 1.40 MDL/kWh, while in other places it will be 1.58 MDL/kWh, which reflects the difference in prices according to the connection line.

Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Maintenance - old assets	MDL mil.	0.00	0.00	0.00	0.00	2.00	2.04	2.25	2.75	3.20
Depreciation of fixed assets	MDL mil.	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
General and administrative expenditures	MDL mil.	0.92	0.92	0.93	0.97	1.01	1.05	1.27	1.88	2.55
Other costs	MDL mil.	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Total costs for water	MDL mil.	2.95	4.16	4.68	4.91	7.63	7.94	9.86	14.87	21.30
Sanitation service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Variable costs wastewater	MDL mil.	0.12	0.13	0.16	0.17	0.21	0.22	0.51	1.04	1.66
Electricity for pumping	MDL mil.	0.07	0.07	0.10	0.11	0.13	0.14	0.34	0.76	1.33
Wastewater treatment costs	MDL mil.	0.05	0.06	0.06	0.06	0.08	0.08	0.18	0.28	0.34
Fixed costs water	MDL mil.	1.25	1.25	1.50	2.73	4.23	4.27	4.51	4.74	5.39
Salaries and related costs	MDL mil.	0.42	0.42	0.43	0.45	0.47	0.49	0.59	0.88	1.19
Maintenance - old assets	MDL mil.	0.00	0.00	0.00	0.00	0.50	0.51	0.56	0.69	0.80
Maintenance - new assets	MDL mil.	0.00	0.00	0.06	0.38	0.64	0.64	0.64	0.64	0.64
Depreciation of fixed assets	MDL mil.	0.44	0.44	0.61	1.49	2.19	2.19	2.19	1.78	1.74
General and administrative expenditures	MDL mil.	0.35	0.35	0.36	0.37	0.38	0.40	0.49	0.72	0.98
Other costs	MDL mil.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Total costs for wastewater	MDL mil.	1.37	1.37	1.66	2.90	4.44	4.49	5.03	5.78	7.05
TOTAL COSTS	**MDL mil.**	**4.32**	**5.53**	**6.34**	**7.81**	**12.07**	**12.43**	**14.89**	**20.65**	**28.35**

The summary of the variable costs forecast are provided in Annex 6, Table 9. The fixed costs are presented in Annex 6, Table 10 and total (fixed and variable) in Table 11.

6.3.4 Revenue forecast (including the calculation of tariffs)

6.3.4.1 Forecast of the tariff

To estimate revenues for the water supply and wastewater services in the future, the average tariff for the service is calculated. This is done by taking into account:

- Operating and maintenance cost of the system, including: direct costs of labour, electricity costs, chemicals, fuel, maintenance costs, financial and administrative costs;
- Application of polluter-pays principle and full cost recovery tariff (including depreciation) in the long run;
- Need to generate positive cumulative cash flow of the operator to maintain sustainable operations. This requires that the tariff calculation includes reserves for irregular receivables.

The Table 12 in the Annex 6 contains a calculation of the tariff with and without depreciation. The proposed tariff takes into account the full cost recovery principle and affordability. The full cost recovery principle means that the operational costs and capital costs should be covered by the tariff. If the tariff with depreciation exceeds the assumed affordability limit, a lower tariff needs to be proposed, albeit one that fully covers operating costs.

Based on the foregoing the future tariff is proposed as illustrated in the following table.

Table 6-25: Tariff calculation for the option with the project (MDL mil.)

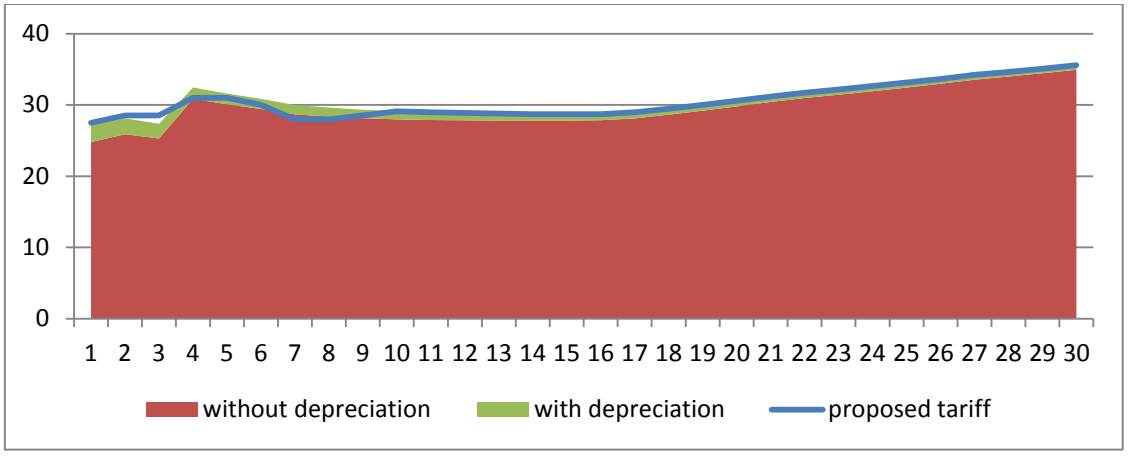
Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Variable and fixed costs	MDL mil.	3.66	3.77	4.28	4.52	7.24	7.55	9.46	14.48	20.91
Depreciation	MDL mil.	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
Interest and financial costs	MDL mil.	0.00	0.10	0.09	0.08	0.06	0.05	0.00	0.00	0.00
Reserve for irregular receivables	MDL mil.	0.00	0.21	0.21	0.20	0.27	0.24	0.25	0.37	0.53
Sale of water	ths m^3	151.8	164.5	177.1	189.5	245.4	260.5	347.2	498.6	613.7
Tariff without depreciation	MDL/ m^3	24.09	24.78	25.88	25.28	30.85	30.09	27.97	29.79	34.93
Tariff with depreciation	MDL/ m^3	26.68	27.17	28.10	27.36	32.45	31.60	29.10	30.57	35.57
Proposed average tariff	MDL/ m^3	20.52	27.50	28.50	28.50	31.00	31.00	29.10	30.57	35.57
Sanitation service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Variable and fixed costs	MDL mil.	0.93	0.94	1.05	1.41	2.24	2.30	2.84	4.00	5.31
Depreciation	MDL mil.	0.44	0.44	0.61	1.49	2.19	2.19	2.19	1.78	1.74
Interest and financial costs	MDL mil.	0.00	0.10	0.09	0.08	0.06	0.05	0.00	0.00	0.00
Reserve for irregular receivables	MDL mil.	0.00	0.07	0.08	0.12	0.16	0.14	0.13	0.14	0.18
Sale of wastewater	ths m^3	73.6	79.6	85.5	91.3	113.5	120.2	265.0	448.7	570.3
Tariff without depreciation	MDL/ m^3	12.68	13.93	14.24	17.60	21.72	20.71	11.18	9.23	9.62
Tariff with depreciation	MDL/ m^3	18.60	19.41	21.40	33.92	41.05	38.96	19.46	13.20	12.68
Proposed average tariff	MDL/ m^3	20.05	20.05	22.00	28.00	28.00	28.00	19.46	13.20	12.68

Source: GIZ/MLPS

The following Figure 6-4 illustrates the evolution of the proposed tariffs. During the construction period when the capital costs will increase significantly and water sales are limited approximately to the same level, it is proposed that tariff does not contain depreciation costs. This would stimulate the water consumption and will keep the tariffs below affordability constraints. After the project is completed, the water consumption will increase because of new consumers connecting to the system; when possible, the tariff should include depreciation. The estimation shows that a full cost recovery tariff

can be applied starting with year 10 of the forecast for water supply service and in year 8 for the sanitation system.

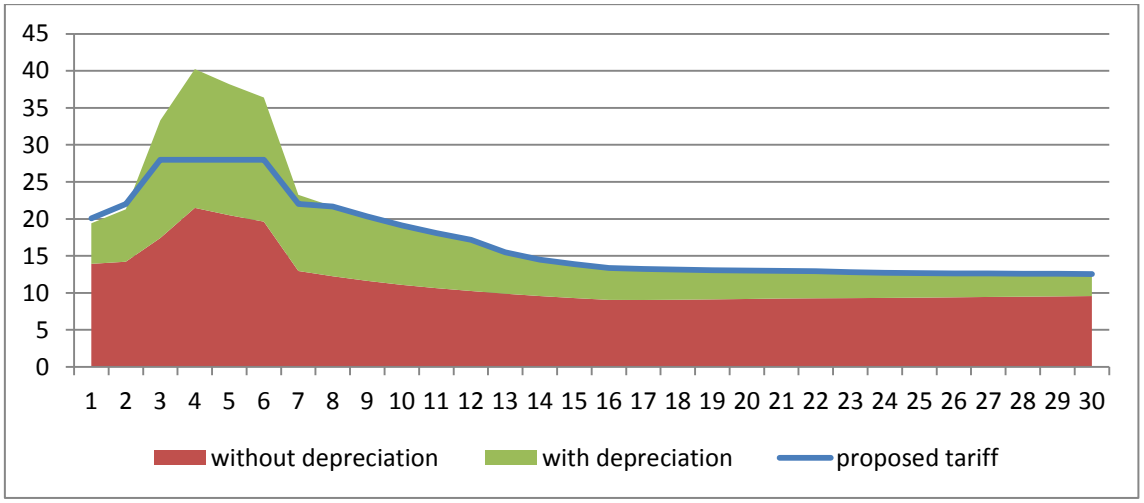
Figure 6-4: Forecast of the tariff for water (MDL/m^3)



Source: GIZ/MLPS

The tariff of water is forecasted to be about MDL 30.51 per m^3 on average for the entire forecast period. The financial projections, however, do not take into account the effect of inflation. As a result, the real decrease or increase of tariffs will depend of the development of costs and their variation.

Figure 6-5: Forecast of the tariff for wastewater (MDL/m^3)



Source: GIZ/MLPS

The tariff for wastewater is forecasted to be about MDL 16.98 per m^3 on average for the whole projected period. Also, the financial projections do not consider the effect of inflation, but the real decrease or increase of tariff will depend on how costs develop and fluctuate.

6.3.4.2 Tariff affordability

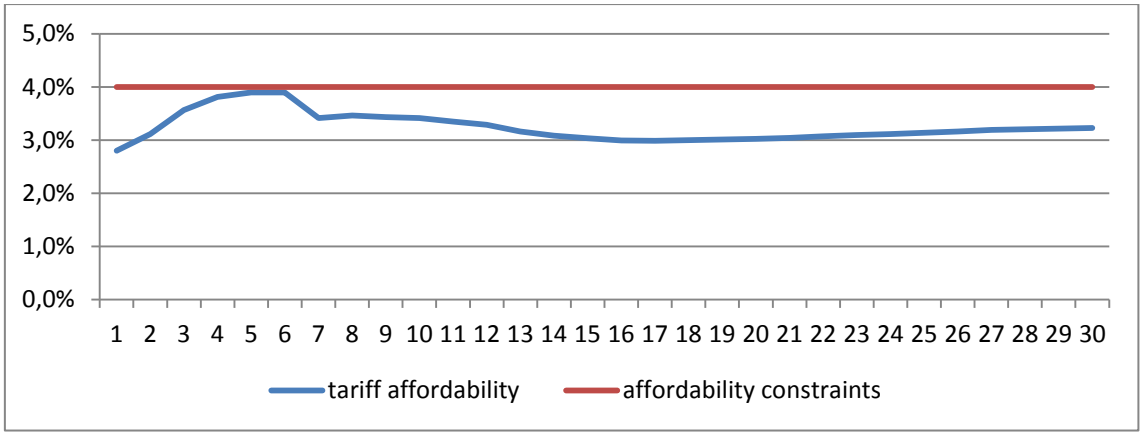
The affordability of tariffs, expressed as the ability of households to pay for services, is estimated as the household expenditures on water and wastewater services expressed as a percentage of disposable household income. For Eastern Europe countries, a common benchmark figure for the affordability threshold for water and wastewater services is 4%. As discussed, the tariff should cover at least operating and maintenance costs and should not exceed a level covering these costs together with capital costs (depreciation). In the event the calculated tariff is higher than the affordable tariff, a subsidy to the price from the LPA should be proposed. Tariff affordability, based on household bills for WSS services as a percentage of disposable household income, is presented in Table 13 in Annex 6.

During the entire period of the financial projections, the average tariff will constitute about 3.2% of average disposable household income, which means that it is within the limits of the affordability threshold of 4%.

For the first years of the project implementation, it is proposed that tariff does not contain the capital cost component (depreciation). Otherwise, the proposed tariff would be too high and the affordability constraint would lead to a further decrease of water consumption. The average bill in these years does not exceed 4% of average disposable household income.

The proposed bill for water as a percentage of disposable household income is presented by Figure 6-6.

Figure 6-6: Proposed tariff and tariff affordability (MDL/m^3)



Source: GIZ/MLPS

6.3.4.3 Revenue forecast

The calculation of revenues was based on the demand analysis taking into account water demand and the proposed tariff for water and wastewater services. The revenues forecast for each service is presented in the Table 6-26.

Table 6-26: Revenues forecast for the option with the project (MDL mil.)

Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Sale of water	ths m^3	151.8	164.5	177.1	189.5	245.4	260.5	347.2	498.6	613.7
Weighted average tariff for	MDL/m^3	20.52	27.50	28.50	28.50	31.00	31.00	29.10	30.57	35.57

Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
water										
Revenues from water service	MDL mil.	3.12	4.52	5.05	5.40	7.61	8.08	10.10	15.24	21.83
Sanitation service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Sale of wastewater	ths m^3	73.6	79.6	85.5	91.3	113.5	120.2	265.0	448.7	570.3
Weighted average tariff for wastewater	MDL/m^3	20.05	20.05	22.00	28.00	28.00	28.00	19.46	13.20	12.68
Revenues from sanitation service	MDL mil.	1.48	1.60	1.88	2.56	3.18	3.37	5.16	5.92	7.23
Total Revenues	**MDL mil.**	**4.59**	**6.12**	**6.93**	**7.96**	**10.79**	**11.44**	**15.26**	**21.16**	**29.06**

The water demand will increase from 151.8 thousand m^3 per year to 613.7 thousand m^3 year at the end of the period of analysis. This increase is determined by the growth of water consumption per capita from 30.6 l/c/d to 110 l/c/d in 2045 and the increase of consumers by 3,530.

The wastewater inflow is calculated based on the wastewater generation per capita and the number of consumers. It is assumed that the number of consumers will grow from the current number of 4,812 to 12,970 persons and the wastewater generation will increase from the current 22.2 l/c/d up to 110 l/c/d in 2045.

The tariff for water services will increase slowly from 27.0 MDL/m^3 to approximately 35.00 MDL/m^3 at the end of projection period. For the sanitation service the tariff will be higher in the first 12 years and will constitute about 22.0 MDL/m^3, and after that will decrease and will constitute approximately 13.00 MDL/m^3 in the period 2028-2045.

6.3.5 Income statement and balance sheet forecast

6.3.5.1 Income statement

The profit and loss (income) statement illustrates the financial performance of the operator in each year of the reference period. It should be noted, however, that financial statements are more relevant instruments to assess the financial situation of business entities/commercial companies. The negative values of net profit are acceptable and do not mean that the operator will face cash flow problems during the implementation phase. In the long-term, however, financial losses mean that the revenue from tariffs do not cover O&M and capital costs.

The financial results from the provision of water supply services will be positive with the exception of the fourth to eleventh years in which the profit is expected to be negative. The average annual profit is expected to be about MDL 290.0 thousand. For sanitation services, the financial results of the service will be positive with the exception of the period 2017-2020 when the financial results will be negative. The average annual profit for the sanitation service will be about MDL 50.0 thousand. The cumulated net profit for the projected period will be positive with a value of MDL 7.12 million. The calculation of net profit for each service in the “with project” option is presented in Table 6-27.

Table 6-27: Net profit forecast for the 'with project' scenario (MDL mil.)

Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Sale of water	MDL mil.	3.12	4.52	5.05	5.40	7.61	8.08	10.10	15.24	21.83
Costs of water services	MDL mil.	4.05	4.16	4.68	4.91	7.63	7.94	9.86	14.87	21.30
Gross profit from water services	MDL mil.	-0.93	0.36	0.37	0.49	-0.02	0.14	0.25	0.37	0.53
Sanitation service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Sale of wastewater	MDL mil.	1.48	1.60	1.88	2.56	3.18	3.37	5.16	5.92	7.23
Costs of wastewater services	MDL mil.	1.37	1.37	1.66	2.90	4.44	4.49	5.03	5.78	7.05
Gross profit from wastewater services	MDL mil.	0.11	0.22	0.22	-0.35	-1.26	-1.13	0.13	0.14	0.18
Total gross profit	MDL mil.	-0.83	0.59	0.59	0.15	-1.28	-0.99	0.37	0.52	0.71
Income tax	MDL mil.	0.00	0.05	0.05	0.00	0.00	0.00	0.04	0.06	0.09
Net profit	MDL mil.	-0.83	0.54	0.54	0.15	-1.28	-0.99	0.33	0.45	0.62
Cumulated net profit	MDL mil.		0.54	1.07	1.22	-0.06	-1.05	-2.26	1.65	7.12

Source: GIZ/MLPS

The forecast of income statement for 'with project' and BAU scenarios, is presented in Annex 6, Tables 14 and 15.

6.3.5.2 Balance sheet

The balance sheet illustrates the 'net worth' of the company. It reveals the company's assets, liabilities and owner's equity at certain point of time (e.g. end of the year). The balance sheet forecast is presented in Annex 6, Tables 18 and 19 for with project and BAU scenario.

6.3.6 Cash flow and financial indicators forecast

6.3.6.1 Working capital

The working capital sheet illustrates the current assets and current liabilities of the company and is use to estimate balance sheet and cash flow. The following assumptions were made in the calculation of working capital (see Table 6-28):

Table 6-28: Assumptions for working capital

Current assets or liabilities	Average payment period
Inventory	30 days
Short-term receivables	30 days
Accounts payable to suppliers	30 days
Accounts payable to employees	30 days

Source: GIZ/MLPS

The forecast of working capital is presented in the Annex 1, table 16 and 17 for the 'with project' and BAU scenario.

6.3.6.2 Cash flow and financial sustainability

A cash flow analysis was carried out for the project. The cash flow statement is a basic instrument used to assess the financial sustainability of the project of improving the operator's infrastructure. The purpose of carrying out a cash flow analysis is to verify whether the project operator faces of cash flow constraints. The projections were made for the entire reference period, i.e. 30 years. As cumulative cash flow is positive in each year of project analysis, the project is considered financially sustainable. The cash flow is presented in the Table 6-29:

Table 6-29: Cash flow forecast for the 'with project' scenario (MDL mil.)

Indicator	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Financial inflows	MDL mil.	0.00	10.55	38.75	33.43	11.08	11.48	15.31	21.24	29.14
Donor contribution (capital grant)	MDL mil.	0.00	5.13	25.64	20.51	0.00	0.00	0.00	0.00	0.00
Own contribution	MDL mil.	0.00	1.23	6.13	4.91	0.00	0.00	0.00	0.00	0.00
Revenues from sale	MDL mil.	0.00	6.12	6.93	7.96	10.79	11.44	15.26	21.16	29.06
Increase in current liabilities	MDL mil.	0.00	-1.92	0.05	0.05	0.30	0.03	0.05	0.07	0.08
Financial outflows	MDL mil.	0.00	10.63	38.82	33.01	11.44	11.44	12.49	18.61	26.38
Investment costs	MDL mil.	0.00	6.35	31.77	25.42	0.00	0.00	0.00	0.00	0.00
Costs of providing services	MDL mil.	0.00	4.90	5.51	6.08	9.61	9.95	12.30	18.48	26.21
Increase in current assets	MDL mil.	0.00	-2.10	0.07	0.09	0.40	0.06	0.07	0.07	0.08
Income tax	MDL mil.	0.00	0.05	0.05	0.00	0.00	0.00	0.04	0.06	0.09
Net cash flow (inflow - outflow)	MDL mil.	0.00	-0.08	-0.07	0.42	-0.35	0.04	2.81	2.62	2.76
Cumulated cash	MDL mil.	0.16	0.09	0.02	0.44	0.08	0.12	5.72	32.32	59.22

Source: GIZ/MLPS

The detailed cash flow analysis is presented in Annex 6, Tables 20 and 21 for 'with project' and BAU scenarios.

The amount of the financial surplus is not sufficient to repay a new loan to finance the investment costs of MDL 63.54 million. In the first years of the project, the net cash flow is insignificant, and is increasing in value in later years. During the 30-year period of analysis, the project is expected to generate a MDL 59.22 million cumulative cash flow, which can be used for capital investments to reduce water losses and expand services, as required.

It has to be emphasised that Table 20 in Annex 6 – as its major purpose is to present project sustainability – does not present incremental values but values for the 'with project' scenario.

6.3.7 Financial performance of the project - NPV and IRR calculation

The analysis of NPV was based on discounting the incremental cash flows (operating surpluses) generated by WSS operator. The nominal discount rate used for the financial analysis was 5% over the entire forecast period.

In estimating NPV, no re-investment rate was assumed and thus it was assumed that the generated funds (available funds at the end of each year) are not re-invested (e.g. paid into term deposit accounts or put into treasury bills). This assumption avoids distortions in the NPV due to differences in the price of capital because usually the present reinvestment rate differs from the price of capital (in the present case the discount rate).

A key element in determining the NPV of a project is the residual value of assets, defined at the end of the forecast period. The residual value was defined at a level equal to the net present value of the fixed assets at the end of the forecast period.

The NPV analysis was conducted using an incremental cash flow model. This means that the financial projections were constructed in such a manner so as to identify additional cash flows attributable to the project.

Table 22 in Annex 6 presents the incremental cash flows used to calculate the FNPV(C) of the project. FNPV(C) means that financial net present value of the investment is calculated. This indicator and FRR(C) - Financial Rate of Return of the Investment – illustrate the profitability of the investment project. Inflows include the increase in revenues associated with increasing the volume of water and wastewater services provided. On the expenditures side, investment outlays and changes in operating costs were taken into account.

It is important to point out that the project involves an increase in the amount of water delivered and volume of wastewater discharged. For this reason, the return on the investment should be viewed from the social rather than financial perspective.

The calculated NPV at a 5% discount rate for a 30-year operating period is negative. This attests to the fact that the project does not generate a return and is financially unprofitable.

This is a typical result for a project in which costs are incurred (capital and operating) but revenues do not significantly increase. Public sector investments often generate similar results.

Negative financial indicators (rate of return) for a project cannot serve as the sole basis for determining whether a project should be pursued. These results, however, serve as the basis for estimating the social benefits associated with the project.

FNPV (C)=	-45.86	MDL million
FRR (C)=	-1%	

Source: GIZ/MLPS

The financial analysis on profitability of the own capital contribution was also conducted. The analysis is similar to that presented above, but takes into account the capital contribution to the project only and does not count grant (donor) contribution to the project.

Table 23 in Annex 6 presents the incremental cash flows used to calculate the financial net present value of own capital of the project - FNPV(K). Financial Rate of Return of

the own capital (FRR(K)) indicates the profitability of the own capital invested in the project and is equal to 5%.

The results are close to 0, what is according to the assumption that external co-financing should not lead to profitability of own funds used.

FNPV (K) =	0.0	MDL million
FRR (K) =	5%	

Source: GIZ/MLPS

6.3.8 Sensitivity analysis

A sensitivity analysis was conducted to analyse the forecast in the event of changes in the following variables:

- **Investments costs**. The sensitivity was conducted for investments costs varying from 100% to 125% of the calculated values;
- **Real wage increase**. The real wage increase indicator is used in the financial model to determine the costs of employment and also to determine the increase in disposable household income. The sensitivity analysis was done not by changing a single indicator on annual real wage increase, but rather switching the entire forecast for the entire time horizon of the project. Thus, three forecasts of real wage increase were prepared (as described in the section 6.1 “Macroeconomic assumptions”):
  - Base case;
  - Half base case;
  - Pessimistic.
- **Real GDP growth**. Similarly to real wage increase, three forecasts of real GDP growth were prepared. The real GDP growth is used in the financial model to forecast increase in water demand from industry and institutions. The proposed forecasts are: base case, optimistic, pessimistic;
- **Costs of electricity**. The financial analysis assumed an increase in the costs of electricity. As electricity costs are a large component of total costs, the sensitivity analysis also covers these costs. Similarly to real GDP growth, three forecasts of real increase of electricity prices were prepared.

For each variable, the sensitivity analysis provides results for:

- FNPV(C);
- FRR(C);
- FNPV(K);
- FRR(K);
- Financial sustainability (TRUE/FALSE – indicating whether the cumulated cash flow is positive during the entire time horizon of the analysis).

The results of sensitivity analysis are presented in Annex 6, Table 25.

The analysis shows that project is sensitive an increase in investment costs. The influence of investment costs, however, is limited due to the fact that majority of investments costs are assumed to be co-financed by donors.

Nevertheless, in none of the cases did the project lose financial sustainability (cumulated cash flow less than zero).

6.3.9 Cost-benefit analysis / economic analysis

Preparing an economic analysis (Cost-Benefit Analysis, or CBA) is important for infrastructure projects; especially those co-financed using international donor aid.

The objective of a CBA is to analyse a measure's impact on society's well-being in the region (or country) in which the project is implemented. This approach is what makes a CBA different from a financial analysis, which only takes into account the costs and benefits that accrue to the investor as a result of the measure. A CBA should include the total costs and benefits from the perspective of the public that benefits from the project. The fundamental rule in selecting projects holds that benefits from the measure should exceed its costs. In essence, for a CBA this means that the measure should generate a positive economic net present value (ENPV).

In describing the economic effectiveness of the project, the CBA includes the following indicators:

- ENPV;
- ERR.

The starting point for calculation of these indicators is the financial cash flows from the financial analysis.

Many methods exist to estimate the social costs and benefits for CBA purposes. The general rule holds that outlays on the project should be described in terms of their opportunity cost, while the benefits (effects) of the measure should be measured by the society's willingness to pay to obtain a given effect. Often the benefits transfer technique is used, which involves extrapolating results from studies from sectors and projects similar to the analysed project.

6.3.9.1 Analysis of socio-economic costs

Price distortions on means of production

Shadow prices arise when distortions occur in a given market, which lead to the costs of a factor of production to differ from the cost that society incurs. Market distortions may be caused by the existence of a monopoly, quotas and price regulation.

Due to the competitive market for factors of production, no price distortions on factors of production were considered. Only electricity prices – which are regulated – differ from market values and appropriate corrections have been made.

Wage distortions

The scale of the project is low and given the unemployment rate in Moldova, it is not expected to distort wages.

Tax aspects

The project does not involve negative tax aspects.

External costs

Investments in wastewater networks involve external costs generated due to the temporary exclusion of land and streets from use; yet, these costs are taken into account in investment outlays (possible damages/compensation, repairs of the road). Moreover,

the project has a positive impact on the natural environment and no other external costs are expected.

A CBA should take into account social costs that are not compensated and that have a significant impact for the wider public apart from those that refer directly to the project.

The decline in the value of land in the vicinity of the wastewater treatment plant, wastewater reservoirs and pumping stations – these types of objects do not motivate buyers, which means that land in the vicinity will have a lower value – could be an external cost. Yet, the facilities' location was selected outside built-up areas, close to the existing water production facilities and will not be significant or will have minimal impact.

Non-financial costs

It is not expected that the project will involve non-financial costs.

Social costs resulting from additional employment

Additional employment is not required for the project operation. It is required for the project implementation but will not distort the labour market and thus social costs do not arise due to the investment.

6.3.9.2 Analysis of socio-economic benefits

Price distortions on the means of production

The effect of engaging unemployed persons during construction was taken into account. This aspect is described in the section on social benefits from additional employment.

Tax aspects

Transfers include all taxes, fees, financial costs and subsidies. These should be excluded from a CBA because they do not constitute a cost to society but rather a transfer of income (a tool for the redistribution of income). They do not contribute to an increase or decline in social welfare.

Value Added Tax

The VAT contained in investment outlays is a transfer and the cash flows used to calculate ENPV have been corrected by the amount of this tax.

External benefits

The concept of external effect is associated with the imperfections of the functioning of the market. An external effect occurs when the actions of one economic actor cause a change in the welfare of another economic actor and this change is not compensated. In other words the external effect occurs if the utility function or production function of entity 'A' contain real (that is. monetary) variables, the value of which were determined by other entities (person, company, government) without their taking into account the impact on the level of welfare of actor 'A'.

In the present project, a number of external benefits arise due to implementation. Among the main external effects the following should be mentioned:

- Health effects due to reduction of pollution in the water;
- Social effects due to uninterrupted water supply;
- Economic development effects.

Health benefits

The approach to estimating benefits from improvement of the sanitation system programme involves determining the positive health effects that will result from the programme and assigning a monetary value to them. Although the proposed project programme is related to extension of wastewater infrastructure, increase volume of treated wastewater will have effect on cleaner environment in general, including more safe water supply.

The approach for determining positive health effects, however, requires precise study of the relationships between pollution in the environment and a response (e.g., improvement of health, reduction in morbidity). This relationship is described in a dose-response function. While these studies have been conducted in EU countries for various pollutants, their application in sewerage improvement programmes have many limitations.

The economic valuation of the benefits from implementing a wastewater infrastructure extension programme, which cause environment and water quality improvement, is difficult due to the low number of studies conducted on this issue as well as the need to determine precisely the physical effects of these programmes (knowledge of the dose-response relationship is essential).

Evaluating the benefits based on data from studies conducted in other countries does not yield authoritative results due to the differences in the conditions that prevail in project impact area. Further limitations in evaluating programme benefits are due to the inability of estimating some benefits in monetary terms. The literature indicates that these results should be viewed in the context of many assumptions, limitations and uncertainties in evaluating benefits. Limitations include, inter alia, lack of available data on illnesses caused by wastewater pollution; underestimation of economic costs of wastewater pollution, etc., P. Faircloth[44] describes four types of benefits of implementing water quality improvement programmes:

- Health benefits;
- Amenity benefits;
- Non-use benefits;
- Benefits for water users – agriculture, households.

Another problem is that, although, it is obvious that the amount of pollution in water will be reduced quantitative data on nitrates and other pollutions differs from commune to commune and are not available. However, there are studies that estimate, especially health benefits. ECOTEC report[45] provides estimation of benefits of avoided water-related diseases. Per capita value for Romania (good proxy for Moldova) is EUR 27 per capita and this value was used for the estimation.

New business enterprises

The demand analysis uses the annual increase in businesses proportional to the GDP increase. Currently, the sewerage system is not able to collect wastewater for new businesses. This situation is due to lack of wastewater network in the Leova and in

[44] Peter Faircloth (Cranford Economics) and others “Approximation of Environmental legislation A Study of the Benefits of Compliance with the EU Environmental Acquis”

[45] THE BENEFITS OF COMPLIANCE WITH THE ENVIRONMENTAL ACQUIS FOR THE CANDIDATE COUNTRIES

other localities. The situation reduces the possibilities of business development or the business will have to find other ways to discharge wastewater - this may cause very high social costs if the project is not implemented (or high social benefits for the project implementation). Having in mind, limitations in valuation of the social benefits from establishing new businesses, shadow prices for discharge wastewater from new business were used. The shadow price was estimated at 30 MDL/m^3, as equal to the costs of discharge a wastewater by septic trucks. The shadow price was applied to the wastewater demand from business.

Non-financial benefits

Apart from those described elsewhere in this chapter no non-financial benefits in this project were identified.

Social benefits resulting from additional employment

In a CBA, additional employment is a cost because the project is using labour resources that become unavailable for alternative social purposes.

Two separate methods exist of estimating the social benefits of additional employment:

- Using accounting wages below the current wages in the project;
- Estimating the income multiplier of investment revenues on the social income resulting from the project that will be higher than the income for private investors.

Both methods have disadvantages and limitations. In this CBA results are corrected so that the cost of employing persons from the ranks of unemployed is equal to zero.

The following social effects from additional employment were taken into account in the analysis:

- Increase in the number of jobs during investment implementation (temporary effect);
- New jobs resulting from the economic development made possible due to investment implementation.

The first effect was estimated and described in detail below, while the second effect is not quantified.

Increase in jobs during investment implementation

Project implementation results in additional employment. This will be a temporary effect from the infrastructure investments, in which a significant portion of the investment outlays is associated with labour. Full automation is not possible during construction of the water and sewer networks, especially in excavation works, and thus the required labour includes a significant portion of low qualified workers from the ranks of the unemployed. Due to the lack of detailed data on outlays, typical cost estimates of similar project scopes were analysed in order to determine the share of wages for low qualified labour in total outlays. Based on this analysis, a share of 30% of such labour in outlays was assumed and in the CBA this result was adjusted so that the cost of employing these persons was equal to zero.

Reducing developmental disparities among regions

The project's impact on reducing developmental disparities among regions results foremost from the expansion of access to technical infrastructure. Tasks completed

under the project have a positive impact on increasing investment also in the entire region.

Two aspects are of key importance for reducing the level of development between regions:

- Expansion of infrastructure is the basic element of development in the region and is viewed by residents as a requirement. A lack of infrastructure leads to a degradation in the region and an outflow of persons toward areas that are better developed;
- The second element in reducing developmental disparities between regions is linked to the strict relationship between the expansion of communal infrastructure – including water– and economic development. The project provides not only for constructing water pipes but also gives the possibility for business development in commercial and service (agriculture) areas. The lack of a water capacity is a large barrier to development of these areas because transporting water by cisterns is much more expensive. This discourages potential investors from developing activities in the area that is lacking basic infrastructure.

6.3.9.3 Economic rate of return (ERR) and economic net present value (ENPV)

Table 24 in Annex 6 contains a calculation of the economic rate of return (ERR) and the economic net present value (ENPV).

This table includes the results of the financial analysis that were corrected for transfers external effects and price distortions on factors of production.

The net cash flow balance was corrected for the social costs and benefits described earlier:

- Fiscal corrections:
  - VAT.
- Price distortions:
  - Engaging unemployed persons during construction;
  - Price distortions for electricity prices.
- External effects:
  - Shadow prices related to business development;
  - Benefits of avoided water-related diseases.

The calculation does not take into account the grant because it is a transfer.

After making the above corrections, the surplus after corrections was calculated; this in turn was the basis for calculating the economic rate of return (ERR) and the economic net present value (ENPV).

The calculated ERR is 12% while the ENPV is MDL 39.07 million at a discount rate of 5%.

The CBA lists many factors that were not expressed in monetary terms. If it were possible to estimate them, the value of ERR would be considerably higher. The positive result of the economic analysis (ENPV greater than zero) indicates that from a public perspective, the project should be implemented.

7 Institutional development

7.1 Potential for WSS area extension

With respect to the regionalisation of water supply and wastewater services in administrative-territorial units of the project, the parties have expressed a consensus of opinion. The Noint Stock Company ‘Apa-Canal’ Leova, hereinafter JSC ‘Apa-Canal’ Leova, has stated that extension of water supply and wastewater services area to other administrative units is one of the company's strategic development activities.

Representatives of local public administrations in the localities of Filipeni, Romanovca and commune of Hanasenii Noi have agreed to appoint JSC ‘Apa-Canal’ Leova as regional operator, to whom they intend to delegate the management of water supply and wastewater services.

Opinions of the local authorities/operator on the regionalisation of Water Supply and Sanitation (WWS) services in the Leova Rayon were received following discussions at meetings of the project working groups and from questionnaires completed by each administrative-territorial unit.

7.2 Competence of local public administration and inter-municipal cooperation

The Constitution of the Republic of Moldova (RM) states in Article 109 that the public administration in administrative-territorial units is based on the principles of local autonomy, decentralisation of public services, eligibility of authorities of local public administration and consultations with citizens on local problems of major interest. Thus, Moldova returned to the principle of autonomy through decentralisation and transfer of major responsibilities to local authorities.

The deliberative authorities of administrative-territorial units have the exclusive competence on the set-up, organisation, coordination, monitoring and control of water supply and wastewater services. They have also the competence of management and operation of the public goods which make up the administrative-territorial units’ public infrastructure associated with those services.

According to the Law no. 303 on water supply and sanitation public service dated December 13, 2013, the local councils have the competence to:

- Draw up and implement own business operations and development plan on water supply and wastewater public services for short/mid/long term;
- Approve tariffs of water supply and wastewater public services;
- Manage water supply and sewerage public systems as the integrated components of the administrative-territorial units’ infrastructure;
- Approve the regulations and specifications of the service;
- Select the method of management and approve the documentation on organisation and conducting of procedures regarding management delegation;
- Approve the performance indicators of the services.

The management of services concerns the organisation, operation and control of water supply and wastewater services under the conditions laid down by Local Public Administrations.

Management of water supply and wastewater services can be organised in two ways, the choice being left to the discretion of local public administrations:

- Direct management through specialised structures (divisions, departments) organised within the local public administrations;
- Delegated management, defined as a type of management through which the local authorities assign one or more operators to manage directly this service, namely the management and operation of water supply and wastewater systems, under a contract of management delegation. Delegated management is performed via a management delegation contract between one or more administrative-territorial units, as granting authority, and an operator as a delegate. The basis for awarding such a contract of management delegation is the public tendering in compliance with the applicable procedures.

The form of management is determined by the decisions of the deliberative authorities of the administrative-territorial units, depending on the nature and status of the service, the need to ensure the best price / quality ratio, present and future interests of administrative-territorial units, and size and complexity of public utility systems.

The legal basis for local public administration cooperation on water supply and wastewater services development is mentioned in law no. 303[46], local public administration level 1 (LPA 1):

- Decide on administrative-territorial units association for the purpose of setting up, organising and encouraging investments in the relevant systems of water supply and wastewater services;
- Use own financial resources/or goods to increase the operator's assets to provide water supply and wastewater services.

The development of water supply and wastewater services requires a level of investment in infrastructure that far exceeds the financial capacities of most local authorities. In addition, localities lack staff specialised in service provision as well as experience in the preparation and implementation of projects.

Thus, the recommended solution to address the lack of sufficient financial and human resources capacity is to organise and operate the services at the regional level, in order to ensure sustainable development and efficiency of activities through achieving economies of scale.

7.3 Institutional model for regionalisation

From the institutional point of view, regionalisation is achieved by reorganisation of existing public services owned by local authorities. For the current project, regionalisation is achieved through two institutional elements:

- Regional operator, a public equity company founded by one or more administrative-territorial units, to which water supply and wastewater services are delegated through delegated management contract;

[46] Art. 8 of Law no. 303 on water supply and sanitation public service dated December 12, 2013

- Contract on delegated management services. The administrative-territorial units through local authorities delegate the management of water supply and wastewater services to the regional operator through a single delegated management contract.

The relationship between these institutions will be regulated by constitutive act of the regional operator and by delegated management contract.

7.3.1 Regional operator

JSC 'Apa-Canal' Leova is a legal successor of rights and obligations of Municipal Enterprise 'Apa-Canal' Leova reorganised following the implementation of the Project 'Water Supply and Sanitation Companies Development Program', financed by the European Bank for Reconstruction and Development.[47]

One of conditions imposed in that project was the regionalisation of water supply and wastewater public services enterprises, by expanding their operations into neighbouring selected localities (becoming in such a way regional companies).

Thus, the Municipal Enterprise 'Apa-Canal' Leova was reorganised into Joint Stock Company 'Apa-Canal' Leova with the Leova Town Council as the sole shareholder. Afterwards, the town of Leova and the locaity of Sarata Noua delegated the management of the water supply and wastewater services within their territorial jurisdiction (via regional services delegated contract), to the new reorganised operator JSC 'Apa-Canal' Leova.

Referring to the joint operation of the water supply and wastewater services, the localities of Filipeni and Romanovca, as well as the commune of Hanasenii Noi with its localities Hanasenii Noi and Nicolaevca have the following options regarding the existing operator to either to become shareholders of 'Apa-Canal Leova' JSC, increasing its share capital through the contribution of capital of all or just some of the local authorities who become shareholders of regional operator; or not be a shareholder and thereby not have the possibility of controlling the activity of JSC 'Apa-Canal' Leova.

7.3.2 Delegated management contract

Under a delegated management contract, an LPA as delegator assigns to a licensed operator as a delegate, acting on own risk and responsibility, the rights and obligations to provide full water supply and wastewater services for a specified period of time. Alternatively, only some specific activities may be delegated to the operator, including the rights and obligations to manage and operate the technical infrastructure associated with services provided, in return for a management fee.

The delegated management contract establishes specific rights and obligations of each party on the provision of water supply and wastewater services, development of investment programs, and achievement of the certain performance levels. The provisions of the delegated management contract are stipulated in Law no. 303[48].

[47] Law on ratification of the Loan Agreement between Moldova and the European Bank for Reconstruction and Development (Development Program on drinking water supply services) no. 203 of 07.16.2010 published in Monitorul Official of Republic of Moldova no. 135-137 of 08.03.2010.

[48] Art. 13, par. 8 of Law no. 303

In this way, the regional operator bears responsibility for the management, operation, maintenance, renovation and expansion of fixed assets, pursuant to the contract.

In the regionalisation process, a delegated management contract for water supply and wastewater services is an agreement between regional operator (delegatee), on the one hand, and the local authority (delegator) on the other.

One approach would be to draw up a single contract for the entire project area (Town of Leova, localities of Filipeni and Romanovca, commune of Hanasenii Noi with its localities Hanasenii Noi and Nicolaevca), signed by each administrative-teritorrial unit separately, corresponding to the jurisdiction of all administrative-territorial units that delegate water supply and wastewater services to the operator.

The following addendums are mandatory to be attached to the delegated management contract:

- Technical specifications regarding provision of service;
- Regulations on provision of service;
- Inventory of movable and immovable assets, which are associated with the service provided, including public or private property;
- Protocols on the take-over assets listed in 3rd subparagraph.

Regardless of the stipulations in the contract, the ownership of public assets and the responsibility for providing water supply and wastewater services at affordable prices remains with the local public administrations. Since the assets remain under public ownership, they need to be reclaimed by their owner (administrative-territorial units) upon termination of the contract.

The delegated management contract is typically concluded for a long period of time. The tariff policy aims at full cost recovery and is applied by the regional operator in accordance with the applicable regulations issued by ANRE, under the control and with the approval of the administrative-territorial unit. The financing and commercial risk is assumed by reorganised operator.

Delegating management is made by direct award, as stipulated in Law no. 303[49].

7.4 Steps to implement institutional framework

7.4.1 Selecting the management model of water supply and wastewater public services

At this stage, local public administrations (the town of Leova, localities of Filipeni and Romanovca, commune of Hanasenii Noi) should decide on the management model for water supply and wastewater services, specifically direct management or delegated management.

Under Law no. 303[50], this phase begins with the preparation by local authorities of a study to substantiate and identify optimal solutions for water supply and wastewater services delegation.

[49] Art.13, par. 12 of Law no. 303

[50] Art. 13, par. 14 of Law no. 303

Based on the study findings and proposed solutions, local councils then adopt decisions on the management model. A decision on delegation of service management to a single / regional operator provides the grounds for taking the next step.

7.4.2 Decision on shares in JSC 'Apa-Canal' Leova/waiving of pre-emptive right

If any or all of the localities of Filipeni and Romanovca, and the commune of Hanasenii Noi (including the localities Hanasenii Noi and Nicolaevca) take a decision to become shareholders in JSC 'Apa-Canal' Leova, the next step is taken.

If all parties agree to increase the share capital of the joint stock company through capital contributions of all or of some local public administrations only, local councils will issue decisions on becoming shareholders and increasing of the share capital of the existing operator.

The Leova Local Council then takes a decision to waive its pre-emptive right, giving the right to become a shareholder to the administrative-territorial units.

7.4.3 Delegation of water supply and wastewater services

The activities necessary for the delegation of water supply and wastewater services to the regional operator are under the competence of deliberative authorities from administrative-territorial units in the project area. Thus, local councils of the Filipeni, Romanovca, and Hanasenii Noi are responsible for:

- Drawing up and approving the delegated management contract and awarding this contract directly to the regional operator;
- Defining and elaborating performance indicators for water supply and wastewater services provided to consumers;
- Elaborating and approving the regulations and specifications of water supply and wastewater services;
- Ensuring the signature of the contract by executive authorities, for and on behalf of administrative-territorial units.

7.5 Timeframe for regionalisation process of water supply and wastewater services

The regionalisation of the water supply and wastewater services needs time because the legislation is quite rigid regarding deadlines that must be followed and the required activities are complex and time-consuming. In addition, local authorities in Moldova point to the lack of legal and regulatory framework that would guide the entire regionalisation process.

Given the steps needed to introduce regionalisation of services, as well as time limits imposed by legislation, an outline time schedule with approximate limits is as follows:

- Increase in authorised capital stock through acceptance of the new shareholders: administrative-territorial units Filipeni, Romanovca, Hanasenii Noi (5-7 months);
- Delegation of management of water supply and sanitation services to JSC 'Apa-Canal' Leova (3 months).

Following the deadlines foreseen by legislation in force and taking into account the practical aspects of regionalisation of water supply and wastewater services, it can be stated that the whole process will coincide with Phase 1 of the feasibility study imple-

mentation (the Project). Once the Phase 2 starts, the full regionalisation of water supply and wastewater services within the localities of the Leova Rayon will be completed.

7.6 Corporate and human resources development of the operator

The existing institutional setup of the JSC 'Apa – Canal' Leova will require considerable changes, in order to meet the increasing demands of the expanding service area.

In general, JSC 'Apa – Canal' Leova is currently overstaffed, as the staff efficiency indicator is 8.39 staff (both water and wastewater) per 1,000 total (water and wastewater) connections, while the average value for Moldova is 5.51.

At this point, it is rather difficult to propose an efficient institutional model, as the beneficiary localities have to decide first on the legal form of the company (e.g. to maintain and expand the existing joint-stock company or use some other form) and ways of service management (e.g. delegated to the company, certain activities outsourced to third-parties etc.). This may have an impact on the number of staff and internal procedures.

The following factors are expected to improve the institutional and operational capacity of the company:

- Increased level of automation: Introduction of automated systems for the existing water production, pumping and distribution facilities, as well as wastewater pumping, will have a positive impact on the reduction of the number of technicians and operating staff. Introduction of a SCADA system will improve data management and will require less administrative effort;
- Introduction of Management Information System: This is expected to reduce the burden over the accounting, economic, human resources and customer service departments and may contribute to the optimisation of administration;
- Implementation of a dispatch centre: Regular monitoring and control of all service localities will help determine if customer service targets are being met. A mobile emergency team may replace local operating staff;
- Outsourcing of activities: Outsourcing may be suggested for billing system or specialised services (e.g. heavy equipment works).

Most of the mentioned activities shall be further developed under the corporate development programme proposed as part of the technical assistance in the first phase of implementation of the priority investment programme (i.e., the Project). This corporate development programme should also provide a general direction for institutional development, in close relation to the phasing of infrastructure investments.

For the Project (first phase of investments until 2018), no considerable extension of water services over the rural localities is planned, while most of investments will be spent on extension of the existing sewerage network in the town of Leova. However, an increase of 31% in total number of water consumers is foreseen by 2018 on account of the rural population from the localities of Hanasenii Noi, Filipeni and Romanovca connecting to the Leova water supply system in 2015-2016. The extension of wastewater services within the town of Leova by 15% in Phase 1 will have a small but measureable impact on increasing the number of customers.

This means that while the proposed investments for Phase 1 do not require an increase in the company staffing. The company still needs to improve its staff efficiency to be able to operate WSS services in a sustainable manner in the future.

It is projected that the utility will tend to reach an average staff efficiency indicator for Moldovan utilities of 5.5 water and wastewater staff per 1,000 total connections, with the first benchmark of 6.5 staff persons per 1,000 water and wastewater connections in 2018. Based on the projected number of future water and wastewater consumers, this would result in total need of 52 staff persons in 2018. In absolute values this means a decrease by one person only, as compared to the current situation.

As for the second phase (2018-2021), an extension of wastewater service areas is foreseen in urban and rural communities. This will require an increase in water and wastewater (W&WW) staff. It is estimated that the Company shall tend to keep the same staff optimisation pace, as in the first phase (2015-2018), and will achieve the staff efficiency indicator of 5.5 W&WW staff per 1000 W&WW connections by 2021. It is expected that that number of water staff will be increased for the new rural members, having representatives in each rural locality. The reduced staff from the first phase can be hired for the new positions in the second phase. In order to avoid interruptions in the staff activities, a smooth HR strategy shall be foreseen, which will link improvement of operational efficiency and relocation/optimisation of staffing.

In the meantime, continuous slow reduction of admin and support staff is foreseen. The staff projections are provided in the Table below:

Table 7-1: Staff projections

Indicator	Unit	Current Situation, as of 2015	Projected Situation for 2018	Projected Situation for 2021
Number of water staff	people	31	30	27
Number of wastewater staff	people	14	15	18
Number of administrative and other W&WW staff	people	8	7	7
Total number of staff	people	53	52	52
Number of water connections	conn.	4,313	5,666	5,740
Number of wastewater connections	conn.	2,005	2,306	3,666
Water & related admin staff per 1000 W connections	pers./1,000 conn.	8.58	6.18	5.40
WW & related admin staff per 1,000 WW connections	pers./1,000 conn.	7.98	7.37	5.73
Total staff per 1,000 W&WW connections	pers./1,000 conn.	8.39	6.50	5.50

Source: GIZ/MLPS

In order to facilitate further institutional development of the company, the Phase I investments foresee Technical Assistance for Corporate Development (see Chapter 5).

7.7 FOPIP

Because the process of regionalisation of water supply and sanitations services requires a relatively long period of time comprising several stages that have to be completed in order to implement the institutional framework, active support of the national / local authorities is absolutely necessary to complete this process successfully.

Also, given the need for sequencing in the process of establishment of the regional operator, based on the existing services operator JSC ‘Apa – Canal’ Leova, it is the priority and extremely important to develop its capacity to take over some administrative units, whose operational and financial results are reduced or even non-performing.

Based on mentioned above, a Financial and Operational Performance Improvement Program (FOPIP) for the regional operator is necessary to elaborate for the benefit of all administrative-territorial units involved in the project.

The program of improving financial and operational performances should have the objective to provide assistance in/for:

- Compliance with legal provisions in the water and wastewater sector;
- The process of regionalisation;
- Regional operator to become sustainable and able to implement investment projects etc.

In this regard, the main activities will comprise support for institutional reorganisation; improving staff performance and efficiency; support for improving operational and technical performance; and financial and business performance improvement, among others.

8 Environmental and social assessment

It is proposed to rehabilitate and extend the wastewater system in the town of Leova and the localities of Hanasenii Noi, Filipeni and Romanovca. The proposed concept does not include the water supply system as a subject of feasibility study.

The feasibility study (FS) for Leova town and Hanasenii Noi, Filipeni and Romanovca localities has been developed in the WSS sector by the Project ”Modernisation of Local Public Services” (MLP Project), (intervention area 2) and it refers the following components:

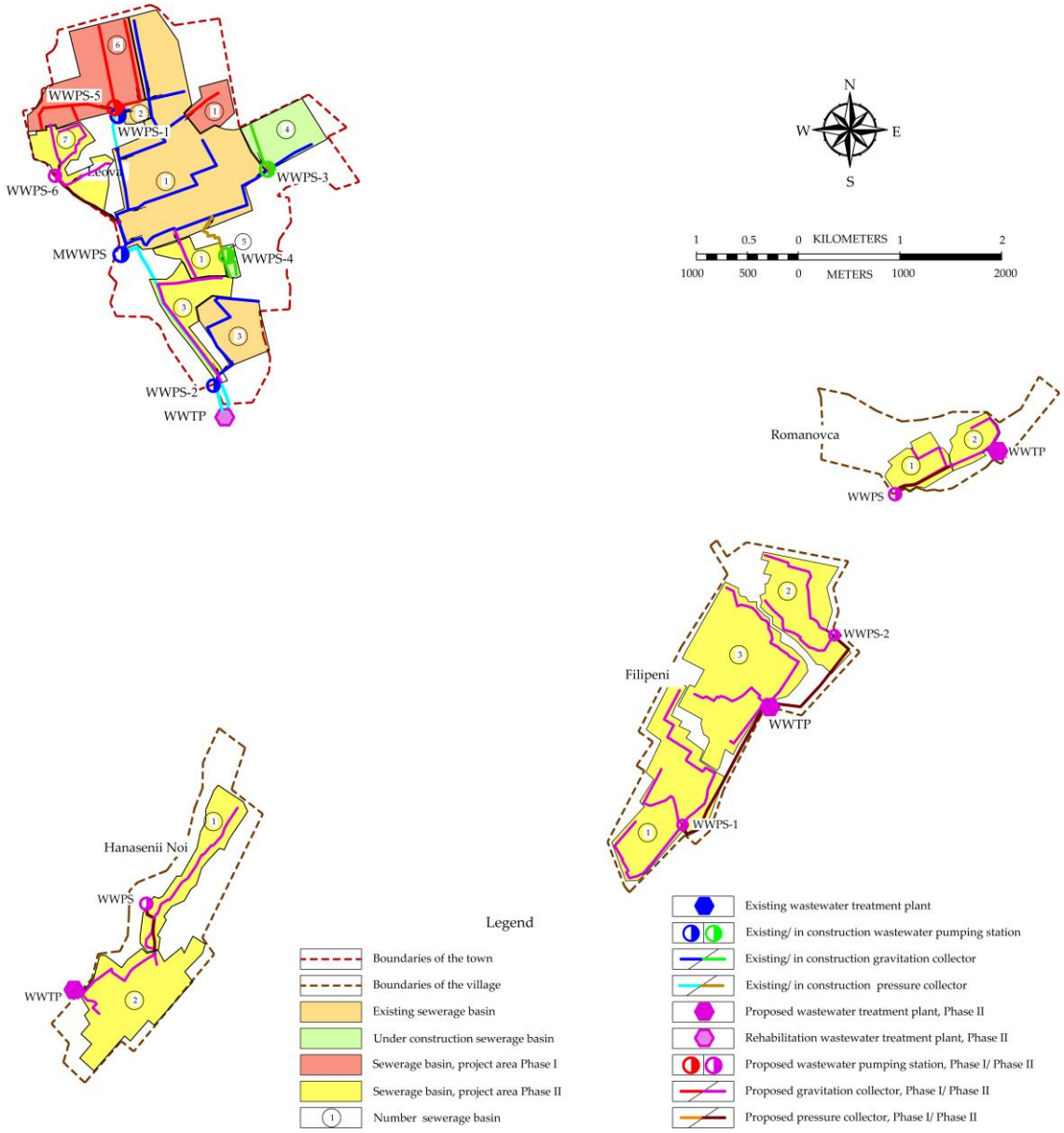
- Wastewater system:
  - Extension of sewerage network in the town of Leova – 21,930 m;
  - Rehabilitation of sewerage network in the town of Leova – 2,820 m;
  - Construction of wastewater pumping station in the town of Leova – 2 pcs.;
  - Rehabilitation of wastewater treatment plant in the town of Leova – 1 pcs.;
  - Construction of sewerage network in the Hanasenii Noi locality – 8,947 m;
  - Construction of wastewater pumping station in the Hanasenii Noi locality – 1 pcs.;
  - Construction of wastewater treatment plant in the Hanasenii Noi locality – 1 pcs.;
  - Construction of sewerage network in the Filipeni locality – 25,110 m;
  - Construction of wastewater pumping station in the Filipeni locality – 2 pcs.;
  - Construction of wastewater treatment plant in the Filipeni locality – 1 pcs;
  - Construction of sewerage network in the Romanovca locality – 4,080 m;
  - Construction of wastewater pumping station in the Romanovca locality – 1 pcs;
  - Construction of wastewater treatment plant in the Romanovca locality – 1 pcs.

The investment programme includes short, medium and long term measures designed for a planning horizon until the year 2045. The priority short-term measures are divided into two phases as follows:

- Phase 1 – priority measures to be implemented until 2018, which in the context of this FS is considered the “The Project”;
- Phase 2 – priority measures to be implemented between 2018 and 2021 (the period might be extended depending on the availability of funds and the capacity of the operator or implementing agency).

Priority Investment Plan (PIP) including investment cost estimates for Phase 1 and Phase 2 measures. Schemes of existing water proposed wastewater systems in the town of Leova and Hanasenii Noi, Filipeni and Romanovca localities for Phase 1 and Phase 2 are presented in the Figure 8-1.

Figure 8-1: Scheme of existing and proposed wastewater system in the town of Leova and Hanasenii Noi, Filipeni and Romanovca localities



Source: GIZ/ MLPS

An Environmental and Social Assessment (ESA) was prepared in order to facilitate the implementation of the Project and to ensure that the envisaged Project objectives will comply with Moldova's environmental and social legislation, as well as procedures and policies and international and EU conventions. In addition, this ESA addresses the environmental and social impacts, mitigation measures and management issues associated with the proposed objectives of the project.

According to the new law on environmental assessment (Law No. 86/29.05.2014 on Environmental Impact Assessment which is in force from beginning January 4, 2015) none of the wastewater system objectives of the Project is subject to full scale EIA on the national level.

For acquiring the environmental and construction permission it is required to prepare the documents for the State Ecological Expertise (SEE). This needs to be done in the detailed design stage of the Project.

The environmental impacts of the measures proposed in this FS have been assessed in this Environmental and Social Assessment. The results of analysing the environmental impacts and mitigation measures are presented below “Environmental Impacts and Mitigation measures”. Potential environmental impacts arising from the project along with a set of the mitigation measures to reduce the impacts to acceptable levels is provided.

The analysis reveals that the environmental impacts associated with the implementation of the Project are site specific, small scale and mostly limited to the construction stage. Therefore, the overall conclusion of the assessment is that provided the mitigation and enhancement measures are implemented in full, there should be no significant negative environmental impacts as a result of location, design, construction or operation of the various objectives of the Project. There should in fact be positive benefits through major improvements in quality of life and individual and public health once the scheme is in operation. The implementation of the Project will stimulate economic growth and generate new job opportunities.

Individual and public health standards will improve as a result of the project.

8.1 Introduction

This document presents the Environmental and Social Assessment (ESA) for the Phase 1 of the feasibility study (“the Project”). The Environmental and Social Report is part of this feasibility study (FS).

8.1.1 Objective of the environmental and social assessment

The objective of the ESA is to facilitate the implementation and to ensure that the envisaged Project objectives will comply with Moldova’s environmental and social legislation, procedures and policies and international and EU conventions. In addition the ESA Report addresses the environmental and social impacts, mitigation measures and management issues associated with the proposed objectives of the Project.

8.1.2 Methodology

The methodology used for the preparation of this Environmental and Social Assessment Report was based upon the review of the documents that were so far prepared in the lead up to this FS, particularly the Regional Sector Programme in the WSS sector for the Development Region South (DRS) and the documents prepared in the PPC (Possible Project Concept) stage of the Project Development Pathway.

In addition, the existing Moldovan environmental and social legislation and the pertinent safeguard requirements of International Financing Agencies (IFA) were respected.

8.1.3 Study area

The Project Area of Influence (PAI) comprises the territory of the town of Leova.The area that is foreseen for wastewater extension is shown in the Chapter 8.3 ”Project Description and Location”.

8.2 Legislation and legal approval procedure

According to the new law on environmental assessment (Law No. 86/29.05.2014 on Environmental Impact Assessment which is in force from beginning January 4, 2015)

none of the wastewater system components of the FS is subject to EIA on the large scale on national level.

For acquiring the environmental and construction permission it is required to prepare the documents for the SEE. This needs to be done in the detailed design stage of the Project.

A separate annex has been prepared on the legal approval procedure. The Annex 8 describes in detail the legal framework conditions and the SEE approval process.

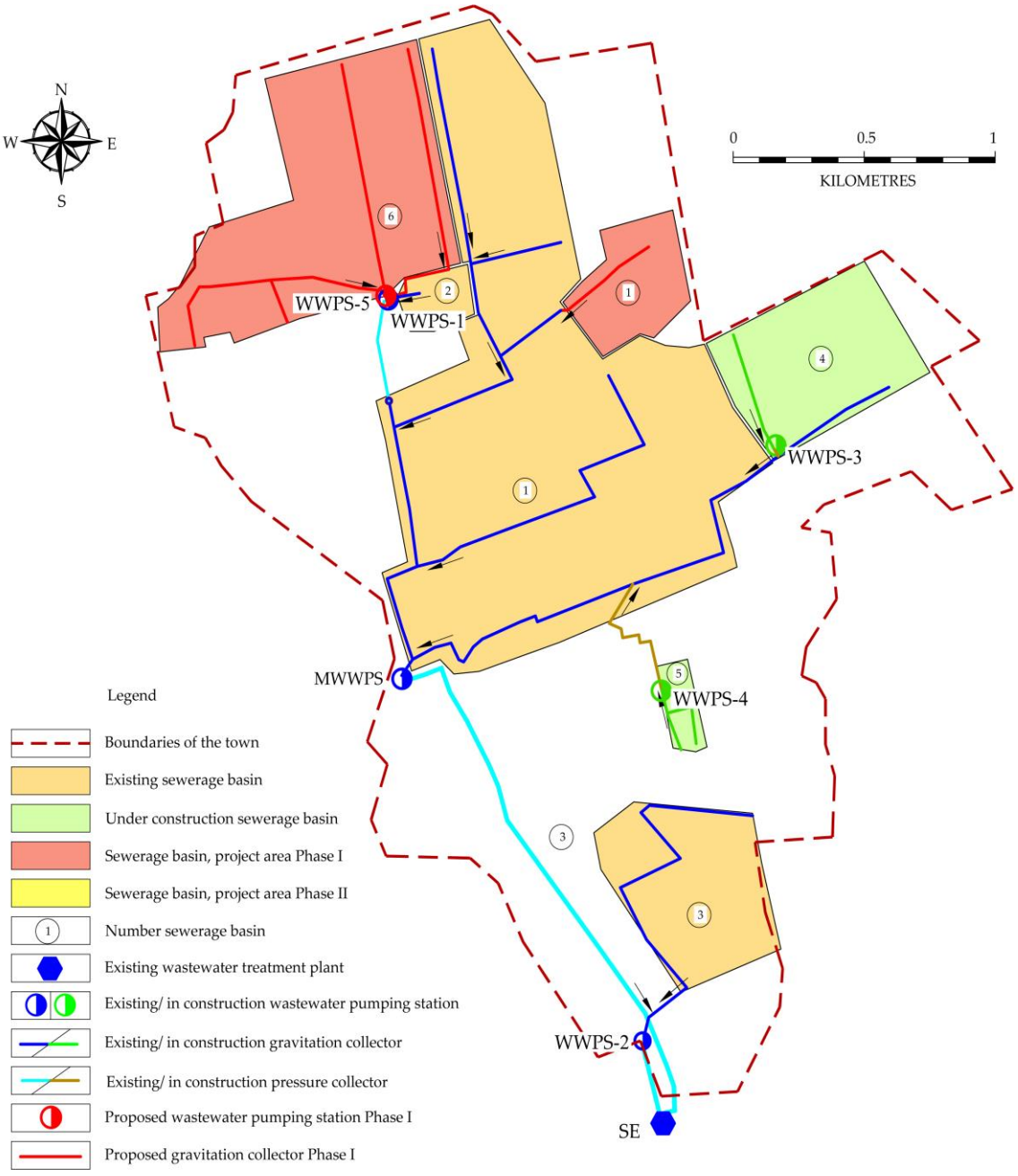
8.3 Project description and location

The FS involves the new construction and rehabilitation of various components in the wastewater system. It is designed to improve the service standards of the wastewater collection as follows:

- Extension of sewerage network in the town of Leova – 9,870 m;
- Construction of wastewater pumping station in the town of Leova– 1 pcs.

The scheme of existing and proposed wastewater system in the town of Leova (Phase 1) is presented in the following figure:

Figure 8-2: Scheme of existing and proposed wastewater system in the town of Leova[51]



Source: GIZ/ MLPS

8.4 Project implementation stages

With regard to potential environmental impacts it needs to be distinguished between the construction stage and the operational stage of the new wastewater system. The

[51] Phase 1

following required activities for these stages are described under Environmental considerations.

8.4.1 Construction stage

In the wastewater system the following main elements are planned:

- Wastewater system:
  - Extension of sewerage network in the town of Leova (9,870 m);
  - Construction of wastewater pumping station in the town of Leova.

The new sewer pipes in Leova will be laid along existing streets, lanes or other linear structures, thus keeping the involved environmental impacts and land acquisition requirements to a minimum. Typically, the depth of the trench will be between 1.5– 4.0m, depending on topographical conditions. The width of the trench will be 0.8-3.0m. Excavated soil will be placed alongside the open trenches, and the pipes will be placed in the trench. The trench will be refilled with sand and excavated soil, compacted manually and mechanically.

Earthwork for the wastewater pumping station will consist of site clearing, trench excavation, grading, embankment filling and backfilling of excavated trench. Excavated soil will be placed alongside. Surplus soil will be used for other purposes. Base of foundation will be gravel and sand.

Main construction materials used for the various components for the wastewater pumping station are concrete and steel. The area of impact during construction comprises the construction site, the borrow areas required for material extraction and the haulage routes. Impacts arising within these areas during construction activities are described in the chapter on impacts and mitigation measures.

The sources of construction materials are: sand and aggregates will be sourced from licensed borrow areas. There is no designated disposal site for construction waste; instead, it is generally disposed of in low lying areas.

Water needed for civil works comprises potable water and construction water. Potable water shall comply with the national quality standards and shall not compete with the needs of the local population. Construction water and water to be used for dust suppression measures may be taken from the Prut River or other surface waters in the vicinity of construction site.

Transportation routes: construction site is accessible via the Republican Road R34 and regional and local roads.

For mitigation measures please refer to subsequent chapters.

8.4.2 Operation stage

The sewerage infrastructure will require repair and maintenance activities including cleaning and regular inspection. Since good quality pipes are being used sedimentation on the pipe sides will be very rare and leaks will be mainly limited to joints between pipes. Repair work will be conducted in the same way the pipe was laid, after locating the leaking section. The extension of the wastewater system will improve the environmental situation in the respective area allowing to increase the collected wastewater flow.

The rehabilitated WWTP will require inspection and maintenance activities like physical and chemical analyses and disposal of stabilized sludge and compacted waste on a waste disposal site.

No significant environmental impacts are associated with the operation of the new wastewater system.

8.5 Environmental and social baseline conditions

8.5.1 Physical environment

The town of Leova is located in the South-West part of the Republic of Moldova, at a distance of approximately 85 km by road from the city of Chisinau. Most of the study area is built up area. The adjoining area is mainly under agricultural use.

According to the geological map of Moldova the project area and its vicinity is mainly characterized by Pliocene and Quaternary deposits. These overlay older sediments and metamorphic rocks of Palaeozoic and Mesozoic age. The quaternary deposits are either of alluvial origin, e.g. fluvial sediments within the Prut River valley, or loess deposits. According to the geologic map of Moldova nearly the whole south of it is dominated by loess sediments. Some smaller stretches within project area are of tertiary age, mainly Pliocene sediments. The prevailing soil type within the study corridor is chernozem. Within the floodplain of the Prut River azonal riverside soils occur.

The climate is temperate continental climate with an annual average temperature in between 10 and 10.5°C. July average temperature is 22°C, and January average temperature is -4°C. Annual precipitation ranges in between 450–550mm. Average wind speed is 3–6m\s.

The study area is entirely located in the basin of River Prut. River Prut has its source in the Carpathian Mountains, crosses a depression near the Black Sea and discharges into the Danube near the locality Giurgiulesti (District Vulcanesti). River Prut is about 850 km long. By most normal standards, the river's water quality is fairly good throughout much of its length between Moldova and Romania. As a fenced and guarded international border, the river is little used for recreational purposes or fishing. The heavy rainfalls are likely to flood the settlements that lay out close to the Prut River Meadow.

8.5.2 Biological environment

The natural vegetation of the study area is characterized by forests. Main species in this type of forests are sessile oak (*Quercus robur*), ash (*Fraxinus*), hornbeam (*Carpinus betulus*), linden (*Tilia sp*.), maple (*Acer platanoides*) and walnut (*Juglans regia*). Mammal species that potentially occur in the wider vicinity of the study area include the fox (*Vulpes*), hedgehog (*Erinaceus sp*), deer (*Cervus*), wild boar (*Sus scrofa*), polecat (*Putorius putorius*), wild cat (*Felis silvestris*), ermine (*Mustela erminea*) and others. Within the shoreline of the river Prut Amphibians and Reptiles are expected to occur including the common spade foot (*Pelobates fuscus*), the green toad (*Bufo viridis*), the fire bellied toad (*Bombina bombina*), the common newt (Triturus vulgaris) and the crested newt (Triturus cristatus), the grass snake (*Natrix natrix*), tessellated water snake (*Natrix tessellate*) and the European pond turtle (*Emys orbicularis*).

No nature protected areas are impacted by the implementation of the Project.

8.6 Environmental impacts and mitigation measures

In the below table the environmental impacts that are associated with the Project implementation are described together with the identified mitigation measures that need

to be implemented for reducing the impacts to acceptable levels. The environmental impacts and mitigation measures are described for the 3 different phases of Project implementation, the pre-construction, construction phase and the operation phase.

Ultimately, all proposed measures for impact avoidance or mitigation that relate to construction need to be incorporated into the bidding or contract documents thereby becoming binding elements of the construction and construction supervision contracts.

Table 8-1: Environmental impacts and mitigation measures

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
Pre-Construction				
Possible removal of terrestrial habitat. Loss of vegetation and top soil	Construction site rehabilitation by contractor after finalization of construction activities. Vegetation planting and stabilization of site, including replacement of any native plant species that were removed during construction activities.	Construction Contractor	Construction and labour camp, storage area. Wastewater pumping station. Pipe trench	Part of construction cost
Construction				
Ambient Air and Local Dust	• Cover or damp down by water spray on the excavated mounds of soil to control dust generation; • Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process; • Bring the material (aggregate and sand) as and when required; • Ensure speedy completion of work and proper site clearance after completion; • Damp down unsatisfied /bad condition roads to avoid dust generation while using for transport of waste/material; • Use tarpaulins to cover loose material that is transported to and from the site by truck; • Control dust generation while unloading the loose material (particularly aggregate and sand) at the site by sprinkling water/unloading inside barricaded area; • Clean wheels and undercarriage of haul trucks prior to leaving construction site; • Don't allow access in the work area except workers to limit soil disturbance and prevent access by fencing.	Construction Company	Excavation areas for trenches. Construction site for waste water pumping stations	Part of construction cost
	The Contractor shall coordinate with local Traffic Management Department to minimize construction traffic impact in the following topics: • Temporary parking restrictions; • Pedestrian and cyclist diversion routes where construction prevents access; • Temporary traffic signals; • One way scheme; • Maintaining local residential access at all times; • General traffic diversion routes where roads are closed; • Sound barriers should be erected at schools and hospitals if the distance to the construction site is less than 50 m.	Contractor	Transportation routes of construction material	Part of construction cost
Noise Pollution	• Maintain machinery and vehicle silencer units to minimize noise; • Keep noise generating activities associated with construction activities to a minimum and within working hours;	Construction Contractor	Excavation areas for trenches at Leova town	Part of construction cost

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
	• Notify the residents close to the Project area prior to commencement of the construction phase; • Vehicles and machinery that are used intermittently should not be left idling condition for long period of time; • Equipment used on site will be quietest reasonably available; • Haul routes for construction traffic entering and leaving the site will be selected to ensure noise levels at noise sensitive receptors are kept at a minimum.		Wastewater pumping station	
Impact on surface water bodies due to construction	• In case of heavy rain, protect open trenches from entry of rain water by raising earthen bunds with excavated soil; • Confine construction area including the material storage (sand and aggregate) so that runoff from upland areas will not enter the site; • Ensure that drains are not blocked with excavated soil.	Construction Contractor	Project area	Part of construction cost
Soil Contamination	• The contractors will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination; • Solid waste generated during construction and at campsites will be properly treated and safely disposed of only in demarcated waste disposal sites; • Construction chemicals will be managed property; • Clearly labelling of all dangerous products; • Fuel tanks (diesel or oil) should be placed in a concrete pool with perimeter walls that are at least 1.0 m high; • A proper floor drain should be installed on the slab of the concrete pool for safely discharging the leakages.	Construction Contractor	Construction site, Camp	Part of construction cost
Impact on Flora and Fauna	• Avoid tree cutting; • In unavoidable cases, plant two trees of same species for each tree that is cut for construction; • The trench shall not be kept open in the night/after working hours. This will avoid any safety risk to people, domesticated, stray or wild animals; • The Contractor shall ensure that the work site be kept clean, tidy and free of rubbish that would attract animals.	Construction Contractor	WWTP, main sewage collector, Camp site.	Part of construction cost
Impact on Traffic	• Inform all residents and businesses about the nature and duration of any work well in advance so that they can make necessary preparations if necessary; • Provide wooden walkways/planks across trenches for pedestrians and metal sheets where vehicle access is required; • Increasing workforce to complete the work in minimum time in these stretches; • Initial situation of private properties has to be re-established after construction.	Construction Contractor	Construction site, Access Roads	Part of construction cost
Hazardous Materials	• Comply with all national, regional and local legislation with regard to the storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials;	Construction Contractor	Construction site	Part of construc-

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
	• Establish an emergency procedure for dealing with spills or releases of petroleum; • Storage of all hazardous material to be safe, tamper proof and under strict control; • Petroleum, chemical, harmful and hazardous waste throughout the site must be stored in appropriate, well maintained containers; • Any accidental chemical / fuel spills need to be corrected immediately.		Storage Area	tion cost
Solid Waste	• Place for disposal of waste must be demarcated; • The waste may not be stored nearby drainage structures; • Waste has to be immediately removed from the working sites; • Waste has to be placed in secondary protective basins; • Waste may only be transferred to a certified contractor. The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in: • Waste handling; • Waste treatment; • Waste storage.	Construction Contractor	Construction site, waste storage area, camp site	Part of construction cost
Loss of top soil	Top soil of about 0.3 m shall be removed and stored separately during excavation work, and after pipeline construction the same soil shall be replaced on the top.	Construction Contractor	Main sewage collector, pipe trenches under natural soil	Part of construction cost
Erosion due to excavation/refilling	Ensure proper compaction of refilled soil. There shall not be any loose soil particles on the top; the material shall be refilled in layers and compacted properly layer by layer.	Construction Contractor	Construction sites	Part of construction cost
Impact on air quality due to emissions from construction equipment/vehicles	Ensure that all equipment & vehicles used for construction activity are in good condition and are well maintained Ensure that all equipment & vehicles confirm to emission and noise norms	Construction Contractor	Construction site in Leova town and access roads	Part of construction cost
Socio-economic benefits from employing local people in construction work	To the extent possible labour force should be drawn from the local community	Construction Contractor	All construction sites	Part of construction cost
Safety risk – public and worker	• Follow standard and safe procedures for all activities – such as provision of shoring up deep trenches (>2 m); • Exclude public from the site – enclose construction area, provide warning and sign boards,	Construction Contractor	All construction sites	Part of construction cost

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
	security personnel; • Provide adequate lighting to avoid accidents; • Ensure that all workers are provided with and use appropriate Personal Protective Equipment - helmets, hand gloves, boots, masks, safety belts (while working at heights etc.); • Maintain accidents records and report regularly; • Trench construction shall be taken up in small segments, so that work (excavation, pipe laying and refilling) in each segment is completed in a day. No trenches shall be kept open in the night/after work hours.			
Historical, archaeological chance finds during excavation	Contractor shall put in place a protocol for conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved. This should involve: • Having excavation observed by a person with archaeological field training; • Stopping work immediately to allow further investigation if any finds are suspected; • Calling in the state archaeological authority if a find is suspected, and taking any action they require ensuring its removal or protection in situ.	Construction Contractor	All construction sites	Part of construction cost
Operation Phase				
Disturbance/ nuisance/ noise due to operation activity including haulage of waste, dewatered sludge	• Plan transportation routes in consultation with Municipality and Police; • Schedule transportation activities by avoiding peak traffic periods; • Use tarpaulins to cover loose material that is transported to and from the site by truck; • Educate drivers: limit speed between 20-25 KMPH and avoid use of horn in the town; • Provide prior information to local people about work.	JSC 'Apa Canal'	WWTP, access road	Part of operation costs
Influx of insects, rodents	Regular waste and sludge disposal on landfill, regular cleaning of the facility;	State Environmental Inspection of the Ministry of Environment and Centre of Public Health of the Minis-try of Health	WWTP	Part of operation costs
Potential waste water discharges	Monitoring and regular inspection of waste water discharges networks	State Environmental Inspection of the Ministry of Environment		

Source: GIZ/MLPS

8.7 Social and gender assessment of WSS project in Leova

8.7.1 Social and gender issues in Moldova and in WSS project area

The main gender characteristics for the Republic of Moldova, including for the Project area, are as follow:

- **The population of the Republic of Moldova has decreased in recent years, with Leova rayon exhibiting the same trend**. As of 1 January 2015, the official population of the Republic of Moldova was 3,555,159 persons, by 4,382 persons less than 2012. The population decrease is determined by the negative natural growth rate and the on-going migration processes. The same situation is observed in Leova rayon where the population decreased by 417 persons: from 53,623 in 2012 to 53,206 in 2014.[52] The population of Leova town was 10,900 persons in 2014[53] (the same like in 2012) and it represented 20.5% of the total population of Leova rayon and 0.3% of the total population of the Republic of Moldova;
- **Women are predominant in both the general population, and the population of the Project area.** The gender distribution of the population in the country has been practically the same for a long period of time, with small deviations: around 52% of women and 48% of men. In 2014 in the Republic of Moldova the breakdown of the population by gender was: 51.9% women and 48.1% men. Nevertheless, in Leova rayon, the number of men and women is almost even, as follow: women – 50.1% and men – 49.9%.[54] In Leova town women constituted 50.5% and men 49.5% in 2013;
- **On average, at the national level women have higher life expectancy at birth than men by 7.9 years in 2014**.[55] In 2015 the average life expectancy at birth was 67.5 years for men and 75.4 years for women. Because of the differentiated level of mortality, the average life expectancy of inhabitants at birth in the urban areas is higher than in rural areas, respectively by 4.6 years for men and 3.5 years for women. In Leova rayon, the average duration of life by ages is lower than the average per country (men – 65.7 years, women – 73.4 years)[56];
- **In 2015, the average age of women (39.1 years) was higher than the average age of men (35.8 years).** The average age at the national level increased from 36.7 years in 2012 to 37.5 years in 2015. In Leova rayon, the average age increased from 35.4 years in 2012 to 35.9 years in 2014 while for the town the figures are 37.8 in 2012 and 38.5 in 2014. The average age by gender for the Project area is higher than the one at national level: women – 40.3 years and men – 36.6 years[57];
- **The employment rate among women is lower (37.4%) compared to that for men (42.1%) in 2014**. The South Statistical Region has the employment rate

[52] Statistica teritoriala, 2014; Statistical databank, NBS website

[53] Unlike the databank from the NBS webpage, the territorial statistics from 2014 shows that the population of Leova town in 2014 was 15642.

[54] Statistica teritoriala, 2014

[55] http://www.statistica.md/newsview.php?l=ro&id=3814&idc=168

[56] Statistica teritoriala, 2014

[57] Ibid

(33.1%), for men being 33.5% while for women – 32.7%. Women with higher levels of education are more likely to participate in the labour market. Therefore, the employment rate is greater among women with higher education (49%), followed by those with specialised secondary education (45%), secondary professional education (38%) secondary school (31%) and gymnasium (24%).[58] The analysis of statistical data also shows that the female employment rate depends on various factors, including whether they have children under 16. The employment rate of women with children gradually decreases depending on the number of children: from 52.2% for women with one child up to 43.9% for women with three or more children. This rate of employed women also depends on the children's age, the biggest differences being registered to persons with children up to two years old, the employment rate being 15.3% for women compared to 53% for men[59];

- **There are significant discrepancies in the employment of women and men in different spheres**.
  There is a larger share of women employed in the service sector (60% compared to 40% of men) but they are less in the agricultural (44%), industry (44%) and constructions (9%) sectors. Women are predominant in economic activities like hotels and restaurants (73.7%), education (81.5%), health protection (81.3%) and trade (56.6%)[60];
- **Women are mostly employed in low-paying jobs and occupy lower positions in the job hierarchy where they are employed**.[61] The statistical data show that women are dominant in the group of specialists with higher levels of qualification (65% women and 35% men), in administrative officials (83% women and 17% men) and in workers in services and trade (77% women and 23% men). However, men constitute 56% of the total managers of all levels. The gender differences for the top leaders of economic and social units are even more pronounced. The gender ratio among employers is one woman to four men regardless of ownership of the unit they lead[62];
- **Unemployment affects men more than women**. The unemployment rate at the country level was 3.9% in 2014, compared to 5.6% in 2012[63], the rate among unemployed men being higher (4.6%) compared to women (3.1%). In 2013, in Leova town the unemployment rate was 3.7% compared to 3.9% at the national level;
- **At the national level, the average salary for women is 11.6% less than the average salary for men.** Discrepancies between the salaries of women and men decreased in the period 2003-2013; however, this trend has slightly reversed since then. Thus, the monthly average earnings for women amount to 88.4% of the average salary for men in 2013; in monetary terms, the discrepancy constituted 454 MDL on average (according to NBS). This gap persists because women, most often, either work in lower-paid sectors – education, healthcare or ser-

[58] Statistical databank, NBS website

[59] Statistica Moldovei, 2014. Portretul statistic al barbatilor si femeilor in Republica Moldova

[60] Ibid

[61] http://www.undp.md/mdg/MDG3/gender.shtml

[62] Statistica Moldovei, 2014. Portretul statistic al barbatilor si femeilor in Republica Moldova.

[63] Statistical databank, NBS website

vices – or occupy lower-paid positions. For Leova rayon the gender pay gap was 95% or a difference of 138 MDL between the salary of men and women[64];

- **Women spend more time on unremunerated household work than men**. According to statistical data, unremunerated work in Moldova constitutes on average 3.9 hours per day per person (in urban areas – 3.8 hours, in rural areas – 4.9 hours). Women spend on average 4.9 hours per day (in rural areas – 5.9 hours and in urban areas – 4.4 hours) and men – 2.8 hours per day (in rural areas – 3.9 hours and in urban areas – 2.7 hours)[65];
- **The average size of female pensions is less than the average size for men**. The discrepancies in the remuneration of men and women influence also the size of pensions for statutory retirement. In 2013, the average woman's pension was 16% lower than the average man's pension. Furthermore, the average pension for employees in the non-agricultural sector is higher compared to agricultural sector: in the case of women, the difference is 20.7% while for men the gap is higher – 45.7%[66];
- **The average nominal monthly earning per employee** in Leova in 2013 was 2678 MDL (compared to 3765.1 MDL in the country overall), with 439 MDL more than in 2011; this constitutes 72.9% of the average salary in the country overall. According to the deprivation index of the small areas calculated in 2012, out of 35 LPAs of 2nd level, Leova rayon is ranked first for the index of multiple deprivation (which means that it is the most deprived rayon) and 15th in income deprivation specifically[67];
- **More women than men are enrolled in the higher education system.** In 2014, from the total number of graduates from higher education institutions, women represented about 60.5% compared to 39.5% of men (statistical databank). There are gender discrepancies at the level of specialities with a significant share of women in the teaching staff (over 80%). The almost exclusive domination of primary education by women confirms that there are stereotypes according to which women are those who must educate and take care of children. The poor remuneration in education and the exodus of teachers abroad are also worth mentioning[68];
- **Domestic violence and human trafficking have gender dimensions and remain among the largest problems for women in Moldova**. According to data from the Ministry of Internal Affairs on combating human trafficking, during 2012 the following was recorded: 151 criminal cases for human trafficking offences, with 266 identified victims out of which about 65% are women and 35% are men. The purpose of trafficking varied as following: a) 126 victims were sexually exploited (100% women); b) 126 victims were exploited in labour (37 women, 89 men); and, c) 13 victims were exploited in begging (6 women, 7 men)[69];

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[64] Promote gender equality and empower women, UNDP Moldova; Statistica teritoriala 2014

[65] Biroul National de Statistica, Chisinau 2013. Utilizarea timpului in Republica Moldova. Sinteza

[66] Statistica Moldovei, 2014. Portretul statistic al barbatilor si femeilor in Republica Moldova

[67] In order to establish the deprivation level of the locality in a certain field, the city halls were arranged in the order of rank obtained: first rank indicates the most deprived community (the poorest, lacking certain services), rank 35 – the lowest deprivation (the wealthiest).

[68] Government decision no.933 from 31.12.2009 on approval of the National Programme on ensuring gender equality in the Republic of Moldova during the period 2009-2015.

[69] CEDAW. Replies of Moldova to the list of issues.

- **Women in Moldova are less represented in politics than men**, constituting 19.8% of the members of Parliament, 18.6% of councillors in rayonal councils, 29.9% in local councils, and 20.5% of the mayors. After the local elections in June 2015, the Leova Rayon Council comprised 33 councillors, of whom eight (24%) were women.[70] Regarding the local council of Leova town, of 23 councillors six (26%)[71] were women in 2015;
- Poverty in Moldova continues to affect vulnerable population categories: traditional families who depend on farming, older people, people without education and professional skills, and households consisting of several children. Although the poverty rate in Moldova decreased from 26.4% in 2008 to 12.7% in 2013, it continued to be high in rural areas (18.8%), in households with three and more children (34.6%), in households with the head aged over 65 (18%), in households where the head has low level of education (no education – 40.8%; primary/gymnasium education - 24.1%), among agricultural workers (31.3%), self-employed (21.7%) and retired persons (14.7%). The proportion of the poor population that lives in rural areas increased from 75.6% in 2006 to 84% in 2013.[72] In Leova town, the vulnerable families constituted 25.3% of the total families in 2012 and included 387 families with persons with disabilities, 392 families – with one parent, 53 families – with three and more children, 90 families –that have children under the tutorship[73];
- **The high poverty level limits the access of vulnerable groups to goods and services for a decent standard of living**. Expenditure for the purchase of food and communal services' payments absorb approximately 73% of the budget of poor families, a fact which limits their access to other goods and services necessary for a decent living. According to the Household Budget Survey (2013), in the 1st quintile, only 35.5% of population have access to water supply services, only 7.33% of the population have access to a centralised sewage system, and only 7.4% of the population have access to the toilet inside their houses. The poor, in comparison with the wealthy group of population spend 20 times less for education, 11 times less for leisure activities, six times less for clothes and shoes and five times less for health services[74].

Based on the analysis of social and gender dimensions in the Republic of Moldova and in the Project intervention area, the conclusion is that, despite the adoption of the legal and regulatory framework on ensuring gender equality, and the relatively high ranking of Moldova in the Global Gender GAP Index 2015 (26)[75] there are still many problems faced within its practical implementation in the country, including in the Project area, including among others:

- Employment inequalities;

[70] Web page of the Rayonal Council Leova http://www.leova.md/index.php?pag=page&id=853&l=ro

[71] Web page of the town hall Leova http://primarialeova.md/consilieri/

[72] Raport privind saracia in Republica Moldova, 2014

[73] Ministry of Economy, Deprivation Index for Small Areas, 2012 http://www.mec.gov.md/ro/content/indicatori-social-economici-pe-localitati

[74] Raport privind saracia in Republica Moldova, 2014

[75] World Economic Forum. The Global Gender GAP Report, 2015 http://reports.weforum.org/global-gender-gap-report-2015/economies/#economy=MDA

- Under-representation of women in decision-making positions;
- Salary and pension disparity between women and men;
- Engagement of women in unremunerated household work etc.

Poverty in Moldova still affects the most vulnerable groups of population (families who depend on farming, older people, people without education and professional skills, households consisting of three and more children) and limits their access to goods and services, like water supply and sanitation, centralised heating systems, education and health. Given this situation, social and gender mainstreaming is an essential component of the implementation of WSS project in Leova town. The methodological approach and the description of the pilot gender study (performed for the town of Straseni and considered to apply also for the FS of Leova) are presented in Annex 8.2.

9 Procurement strategy and implementation plan

9.1 General

The following chapter describes all actions for the procurement of services and works for a successful and efficient project implementation including an envisaged time schedule. The project measures for Leova in Phase 1 comprise capital investments and technical assistance that need to be procured and implemented.

The works and services to be procured for the implementation of Phase 1 measures are as follows:

- Technical assistance components:
  - Design and Engineering for Phase 1 investments;
  - Corporate Development Programme;
  - Stakeholder Participation Programme;
  - Water Supply Network Analysis and Water Loss Reduction Programme;
  - Medium to Long-term Sanitation Study.
- Capital investments and goods:
  - Extension of 9.9 km sewer network in the town of Leova;
  - Construction of one wastewater pumping station;
  - Equipment and tools for operational performance improvement (water supply and wastewater).

9.2 Procurement plan

In line with Moldova's policies and rules, the required public sector services and works contracts shall be awarded based on open competitive tendering, which should assure a maximum of competition and transparency.

The fundamental requirements of open competitive tendering are:

- Be open to all qualified and interested bidders;
- Be advertised locally (and internationally, when required);
- Have objective qualification criteria;
- Have neutral and clear technical specifications;
- Have clear and objective evaluation criteria;
- Be awarded to the least-cost provider, without contract negotiations.

9.2.1 Procurement strategy

It is proposed to arrange procurement into four different contracts:

- Design & Engineering Contract;
- Works Contract;
- Supply Contract;
- Technical Assistance.

9.2.1.1 Design & engineering contract / technical assistance

Design and Engineering is proposed to be procured separately from the remaining Technical Assistance Tasks (Corporate Development Programme, Stakeholder Participation Programme, Water Supply Network Analysis and Water Loss Reduction Programme, Medium to Long-term Sanitation Study) as the requirements for the consulting company are different.

9.2.1.2 Capital investment and goods

The strategy is to keep contract values at a size to attract international contractors as well as local contractors. Due to the similarity of the works (mainly network rehabilitation and extension; investment amount of chlorination equipment will be too small to be procured in a separate contract) and the relatively small total investment value it is proposed to combine all capital investment measures in one contract. The conditions of contracts for the works contracts should be based on “FIDIC Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer (FIDIC Red Book)”.

Although the contract value will be relatively small, the equipment for operation and maintenance improvement is proposed to be procured under a supply contract (shopping).

The summary of cost breakdown per contract and the procurement plan below, lists the different contracts to be procured during the entire project including, project component, costs and financing, type of contract and the procurement method.

Table 9-1: Summary cost breakdown per contract

N°	Component	Total project costs	Design & Engineering	Construction Works	Supply of Equipment	Technical assistance
1	Wastewater					
1.1	Extension of the sewer network in the town of Leova	1,982,250		1,982,250	-	
1.2	Wastewater pumping station in Leova	32,000		32,000	-	
2	Equipment and Tools for operational performance improvement (water supply and wastewater)	200,000			200,000	
3	Technical Assistance				-	
3.1	Design, Engineering, Supervision for Phase 1 investments (12% of investment costs)	265,710	265,710		-	
3.2	Technical Assistance (Corporate Development Programme, Stakeholder Participation Programme, Water Supply Network Analysis and Water Loss Reduction programme, Medium to Long-term Sanitation Study)	300,000			-	300,000
4	Contingencies (10% of 1+2+3)	277,996	26,571	201,425	20,000	30,000
GT	**Total Costs per contract**	**3,057,956**	**292,281**	**2,215,675**	**220,000**	**330,000**

Source: GIZ/MLPS

Table 9-2: Procurement plan

N°	Description	Estimated contract value[76], EUR	Contract type	Procurement method
1	Design and Engineering for Phase I investments	292,281	Consulting services	Competitive
2	Construction Works: Extension of the sewer network in the town of Leova (sewer and WWPS)	2,215,675.00	Works	Open
3	Supply of Equipment for operational performance improvement	220,000	Supply of goods	Shopping
4	Technical assistance: Corporate Development Programme, Stakeholder Participation Programme, Water Supply Network Analysis and Water Loss Reduction Programme, Medium to Long-term Sanitation Study	330,000	Consulting services	Competitive
GT	**Total amount**	**3,057,956**		

Source: GIZ/MLPS

9.3 Project implementation plan

9.3.1 Key steps of project implementation

Key steps in project implementation will be the following:

Concluding of funding arrangements

In order to conclude on the funding arrangements the following will be necessary:

- Agreement of all relevant stakeholders (i.e. local authorities, ministries, relevant funding institutions) on project volume, funding sources, financing plan;
- Conclusion of funding agreements as basis for project start.

Setting-up of project implementation structures

In order to establish a sound and efficient project steering and project management a proper project implementation structure shall be established by the client of the project (the Employer). The client will either[77] be the LPA Leova, which is the owner of the assets or the “Apa-Canal”, which manages and operates these assets. Further, relevant stakeholders shall be involved in the project implementation structure in order to have coordinated decisions and processes.

The project implementation shall be managed by a Project Manager (PM), appointed by the Employer.

The main tasks of a project implementation structure are:

- Establish adequate conditions for operation, location, and endowment;
- Selection of a qualified staff;
- Develop implementation plan for the project;

[76] Including Contingencies

[77] Depending on the funding arrangement (donor and the type of contract)

- Tendering process for services and works contracts;
- Monitor the implementation of the service and works contracts;
- Organize in due time all required licenses, permits and conclusions;
- Financial management and reporting;
- Maintain records for all the documents and communications;
- Monitor of disbursements and reporting to the funding institution.

Procurement and implementation of consulting services

The first key activity directly related with project implementation will be the timely and successful procurement of the required consulting services for detailed design, tendering and construction supervision of the identified rehabilitation works, supplies and their installation.

The steps concerning procurement and implementation of the Consulting Services (the Engineer) will be:

- Issuing the Request for Proposal;
- Technical and financial evaluation of the received proposals;
- Recommendation for consultant selection;
- Contract award for consulting services;
- Implementation of consulting services.

Procurement and Implementation of works and supplies contracts

In cooperation with the Engineer, the Employer (project implementation structure) will hold responsible for the procurement process for the works contracts comprising following steps:

- Invitation for tendering and issuing of tender documents;
- Tender period;
- Receiving of bids;
- Bid evaluation and preparation of evaluation report;
- Contract award for work contracts;
- Implementation of works contract;
- Defects liability period.

Project monitoring and evaluation

Project monitoring during implementation of the project and internal as well as external evaluation at the end of the project implementation period shall be carried out.

Monitoring is an instrument for systematic collection of data on specific indicators to provide the management and the main stakeholder relevant information on the project progress and the achievement of objectives.

Evaluation is the systematic and objective assessment of the on-going or completed project, its design, implementation and results. The aim is to determine the relevance and fulfilment of objectives, development efficiency, effectiveness, impact and sustainability.

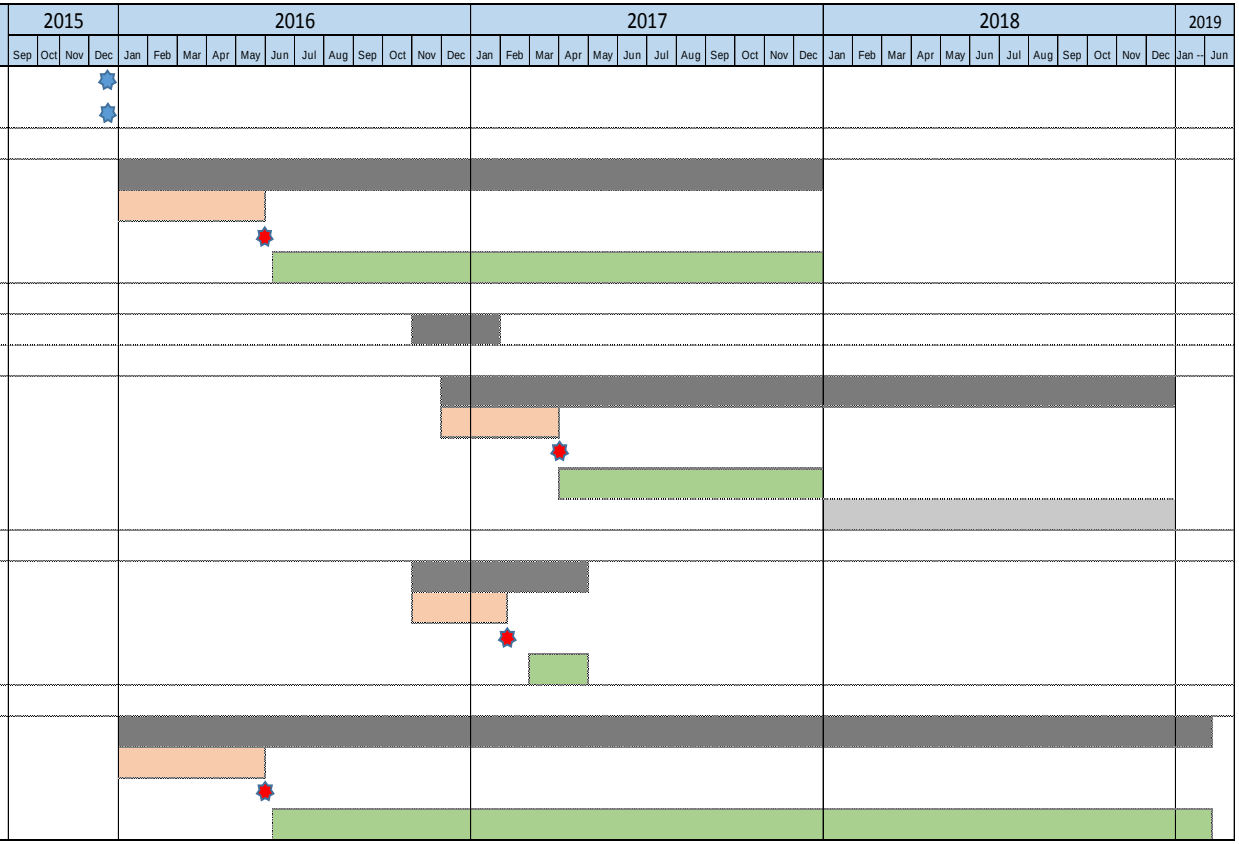
For both instruments, the setting of targets and indicators as well as the methodology and administration of data collection need to be organized.

9.3.2 Project implementation plan

All key data for the above mentioned implementation steps are based on having the funding arrangement concluded by end of 2015. The table below gives the project implementation plan for the proposed measures.

Table 9-3: Project implementation plan

No	Item	start date	end date
1	Concluding of funding arrangements*	31.12.2015	
2	Setting-up of project implementation structures	31.12.2015	
3	Design and engineering	01.01.2016	01.12.2017
3.1	Procurement of consulting services	01.01.2016	30.05.2016
3.2	Contract award for consulting services	30.05.2016	
3.3	Implementation of consulting services	09.06.2016	01.12.2017
4	Obtaining required conclusions and permits	01.11.2016	30.01.2017
5	Works contracts	01.12.2016	31.12.2018
5.1	Procurement of works	01.12.2016	31.03.2017
5.2	Contract award for works contracts	31.03.2017	
5.3	Implementation of works contract	31.03.2017	31.12.2017
5.4	Defects liability period	01.01.2018	31.12.2018
6	Supply contracts	01.11.2016	30.04.2017
6.1	Procurement of equipment and tools	01.11.2016	31.01.2017
6.2	Contract award for works contracts	31.01.2017	
6.3	Delivery of goods	01.03.2017	30.04.2017
7	Other technical assistance components	01.01.2016	09.06.2019
7.1	Procurement of consulting services	01.01.2016	30.05.2016
7.2	Contract award for consulting services	30.05.2016	
7.3	Implementation of consulting services	09.06.2016	09.06.2019



* In case the conclusion of funding arrangements and/or the setting up of the project implementation structures are delayed all following activities will be postponed accordingly

Source: GIZ/MLPS

10 Risk analysis

10.1 General

The following chapter applies and adapts the methodology for qualitative risk analysis in the new guide to cost-benefit analysis published by the European Commission[78]. According to the Guide, a qualitative risk analysis includes the following elements:

- "A list of adverse events to which the project is exposed;
- A risk matrix for each adverse event indicating:
  - The possible causes of occurrence;
  - The link with the sensitivity analysis, where applicable;
  - The negative effects generated on the project;
  - The (ranked) levels of probability of occurrence and of the severity of impact;
  - The risk level.
- An interpretation of the risk matrix including the assessment of acceptable levels of risk;
- A description of mitigation and/or prevention measures for the main risks, indicating who is responsible for the applicable measures to reduce risk exposure, when they are considered necessary[79]."

Further, the Guide continues that "according to the CBA methodology, as described in Annex III to the Implementing Regulation on application form and CBA methodology, the probabilistic risk analysis is required where the residual risk exposure is still significant. In other cases it may be carried out where appropriate, depending on project size and data availability80". Given that the project at hand entails "no regrets" measures in the first phase of a short-term priority investment programme (PIP), which in turn is part of a long-term investment plan, the residual risk exposure is not expected to be significant. Further, the project size, while above the threshold of a typical water and wastewater sector project in the Republic of Moldova, is below any objective measure of a major project. Therefore, a qualitative risk analysis is deemed sufficient for the present study.

10.2 Assumptions

A number of assumptions related to the project are important to its success. These assumptions serve to acknowledge the dependencies, potential points of weakness, and risks associated with the project:

- The per capita water consumption will increase, as provided in Chapter 5-4 Water demand and wastewater flow projection;

[78] European Commission, Guide to Cost-Benefit Analysis of Investment Projects, Economic appraisal tool for Cohesion Policy 2014-2020, December 2014.

[79] Ibid, p 69

[80] Ibid, p. 71

- The connection rate to the water systems will increase as a result of the investments and technical assistance;
- The operators will implement unified tariffs for the entire area of their operations;
- As a target for the tariff strategy, we have considered that the affordability ratio should be somewhere between 3% and 3.5% of average household income.

It is also assumed that the local authorities, as owners of the assets operated by the target water utility will commit themselves to support the implementation of the Project and the Priority Investment Programme.

It is finally assumed that the sensitivity analysis covers overall changes in investment costs, operating costs and revenues, and the overall impacts of these changes on project effectiveness. Specific aspects of risk are covered in the following risk matrix.

10.3 Identification of adverse events and risks

As an input to the risk matrix, a list of adverse events to which the project is exposed needs to be developed. The following list is offered, together with a brief description of each risk:

- Political and policy risks, including:
  - Political risk from national and local elections – possibly delaying key decisions and policy changes;
  - Political risk from interference in day-to-day operations – causing both instability and delay in implementing day to day operational decisions;
  - Financial crisis at national level – limiting domestic financing sources;
  - Legal and regulatory framework – sectoral policy: delays in establishment of new tariff policy for the regional and local water companies by the National Agency for Energy Regulation (ANRE);
  - Legal and regulatory framework – sectoral policy: Lack of regulation regarding the elaboration of PAAS (Water Supply and Sanitation plans);
  - Legal and regulatory framework – sectoral policy: Lack of legal framework on ownership of land and public infrastructure at the regional level.
- Institutional risks, including:
  - Limited understanding of functioning of commercial companies – raising risk that the operator will not make necessary improvements to improve and expand its services;
  - Operator size – operators are rather small in Moldova, making regionalisation of services difficult;
  - Institutional capacity – weak institutional capacity on the operational level in WSS, including financial weaknesses of the institutions to attract investments, manage investments, as well as provide quality services to the population;
  - Institutional capacity – ongoing and delayed decentralization process which leads to uncertainty in WSS sector and artificial fragmentation of the areas managed by the specialized institutions;
  - Institutional capacity – financial weakness of the institutions which increases the perceived risks of making investments in Water Supply and Sanitation(WSS), including financial weaknesses of the institutions to attract investments, manage assets, as well as provide quality services to the population;
- Operational risks, including:

  - Insufficient number of customers when networks extended – raising the risks that forecasted revenues will not be realised;
  - Lack of reliable data collection and recording on the part of the operator – increasing the number of assumptions required in any study, thus raising the uncertainty, as well as reducing the likelihood that project impacts will be properly tracked in the future;
  - Delay in obtaining the construction permits due to delay in submission or approval by the local authorities.
- Financial risks, including:
  - Low financial absorption capacity at national and local level;
  - Lack of expressed co-financing commitment from donors for priority projects;
  - Lower number of actual consumers than estimated after the investment implementation;
  - Political interference in tariff adjustments.
- Project implementation and management risks, including:
  - Insufficient technical expertise at local level that creates serious difficulties in supplementing project teams with qualified staff;
  - Insufficient project management and implementation experience at local level;
  - Construction delays;
  - Cost overruns;
  - Outdated construction standards of materials and technologies applied for design and project implementation.

10.3.1 Risk matrix

The risk matrix is presented in the following tables.

Key:

Probability of occurrence: A. Very unlikely (0–10% probability); B. Unlikely (10–33% probability); C. About as likely as not (33–66% probability); D. Likely (66–90% probability); E. Very likely (90–100% probability).

Severity of impact: I – No relevant effect on social welfare, even without remedial actions.; II – Minor loss of the social welfare generated by the project, minimally affecting the project long run effects- However, remedial or corrective actions are needed.; III – Moderate: social welfare loss generated by the project, mostly financial damage, even in the medium‑long run. Remedial actions may correct the problem.; IV – Critical: High social welfare loss generated by the project; the occurrence of the risk causes a loss of the primary function(s) of the project. Remedial actions, even large in scope, are not enough to avoid serious damage; V Catastrophic: Project failure that may result in serious or even total loss of the project functions.

Table 10-1: Risk matrix, political and policy risks

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
Delay in key decisions and policy changes	n/a	National and/or local elections	Reduced project efficiency	Medium	Delay in establishing positive cash flow	D	III	High	Intensify work within partner systems to ensure policy decisions are taken in a timely manner and followed by subsequent regimes	High, but cannot be modelled
Instability and delay in implementing day to day operational decisions	Operating costs	Political interference in day-to-day operations	Reduced project efficiency	Medium	Negative	C	III	Moderate	Corporate development programme as part of technical assistance	Low to moderate
Limited availability of domestic financing sources	n/a	Financial crisis at national level	Delay in project start	Short	Delay in establishing positive cash flow and benefits to public	E	IV	Very high	Policy recommendations at national level to consolidate funding sources. Supporting unified policy to external donors	Moderate
Unclear tariff regime	Operating revenues	Delays in establishment of new tariff policy for the regional and local water companies	Reduced project efficiency and financial stability of operator	Medium	Negative	C	III	Moderate	Policy recommendations at national level; Corporate development programme as part of technical assistance	Low to moderate
Planning uncertainty	n/a	Lack of regulation regarding the elaboration of PAAS (Water Supply and Sanitation	Reduced project efficiency; project not meeting local	Medium to long-term	Negative	C	III	Moderate	Regional sector programmes; intensive cooperation with local partners to identify needs; Corporate development programme	Low

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
		plans)	needs						as part of technical assistance	
Uncertainty in ownership of assets at regional operator	n/a	Lack of legal framework on ownership of land and public infrastructure at the regional level	Reduced project efficiency and financial stability of operator	Medium to long-term	Negative	B	III	Moderate	Corporate development programme as part of technical assistance; Road map for establishment of regional operator	Low

Table 10-2: Risk matrix, institutional risks

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
AC will not make necessary improvements to improve and expand its services	Operating revenues	Limited understanding of functioning of commercial companies	Reduced operator efficiency; delays in provision of improved services	Medium to long-term	Negative	C	III	Moderate	Corporate development programme as part of technical assistance; Road map for establishment of regional operator	Low to moderate
Regionalisation of services will not be achieved	Operating revenues	Small existing operators; lack of national level policy guidance	Reduced operator efficiency; delays in provision of improved services	Medium to long-term	Negative	C	III	Moderate	Corporate development programme as part of technical assistance; Road map for es-	Low to moderate

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
									tablishment of regional operator; National level policy advise	
Expansion of higher quality services is delayed	n/a	Weak institutional capacity on the operational level in WSS, including financial weaknesses of the institutions to attract investments, manage investments, as well as provide quality services to the population	Delay in project start	Short	Delay in establishing positive cash flow and benefits to public	E	IV	Very high	Policy recommendations at national level to consolidate funding sources. Supporting unified policy to external donors	Moderate
Unclear tariff regime ongoing and delayed decentralization process which leads to uncertainty in WSS sector and artificial fragmentation of the areas managed by the specialized institutions	Operating revenues	Delays in establishment of new tariff policy for the regional and local water companies ongoing and delayed decentralization process which leads to uncertainty in WSS sector and artificial frag-	Reduced project efficiency and financial stability of operator	Medium	Negative	C	III	Moderate	Policy recommendations at national level; Corporate development programme as part of technical assistance	Low to moderate

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
		mentation of the areas managed by the specialized institutions								
Planning uncertainty financial weakness of the institutions which increases the perceived risks of making investments in WSS	n/a	financial weakness of the institutions which increases the perceived risks of making investments in WSS	Reduced project efficiency; project not meeting needs	Medium and long-term	Negative	C	III	Moderate	Regional sector programmes; intensive cooperation with local partners to identify needs; Corporate development programme as part of technical assistance	Low
Uncertainty in ownership of assets at regional operator	n/a	Lack of legal framework on ownership of land and public infrastructure at the regional level	Delays in implementation; depreciation not calculated in tariff	Short to medium-term	Negative	B	III	Moderate	Corporate development programme as part of technical assistance	Low

Table 10-3: Risk matrix, financial risks

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
Delay in project implementation	n/a	Low financial absorption capacity at national and local level	Delay in project start	Short to medium	Delay in establishing positive cash flow	D	II	Moderate	Capacity development within partner systems	Moderate
Delay in project approval and implementation	n/a	Lack of expressed co-financing commitment from donors for priority projects	Delay in project start	Short to medium	Delay in establishing positive cash flow	C	III	Moderate	Corporate development programme as part of technical assistance	Low to moderate
Project indicators and cash flow forecast not met	Operating revenues	Lower number of actual consumers than estimated after the investment implementation	Reduced project efficiency and financial stability of operator	Medium	Negative	D	III	High	Corporate development programme – revenue enhancement activities, as part of technical assistance; public information campaign	Moderate
Unclear tariff regime	Operating revenues	Political interference in tariff adjustments	Reduced project efficiency and financial stability of operator	Short to medium	Negative	C	III	Moderate	Policy recommendations at national level; Corporate development programme as part of technical assistance	Low to moderate

Table 10-4: Risk matrix, project implementation and management risks

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
Difficulties in supplementing project teams with qualified staff	n/a	Insufficient technical expertise at local level	Reduced project efficiency	Medium	Delay in establishing positive cash flow	C	III	High	Corporate development programme as part of technical assistance; establishment of Project Implementation Unit (PIU)	Moderate
Difficulties in supplementing project teams with qualified staff	n/a	Insufficient project management and implementation experience at local level	Reduced project efficiency	Medium	Delay in establishing positive cash flow	C	III	High	Corporate development programme as part of technical assistance; establishment of PIU	Moderate
Construction delays	n/a	Insufficient project management and implementation experience at local level	Reduced project efficiency	Short to medium	Delay in benefits to public	C	II	Moderate	Corporate development programme and technical supervision as part of technical assistance; assistance to PIU	Moderate
Cost overruns in excess of contingencies	n/a	Insufficient project management and implementation experience at local level	Reduced project efficiency	Short to medium	Negative	C	III	Moderate	Corporate development programme and technical supervision as part of technical assistance; assistance to PIU	Low to moderate
Project targets not met	n/a	Outdated construction standards of materials and technologies applied for design and project implementation	Project not meeting local needs	Medium to long-term	Delay in benefits to public	C	III	Moderate	Lobbying within partner systems; Technical supervision as part of technical assistance; assistance to PIU	Moderate

Table 10-5: Risk level

Severity/Probability	I - none	II – minor	III – moderate	IV - critical	V - catastrophic
A. Very unlikely (0-10% probability)	Low	Low	Low	Low	Moderate
B. Unlikely (10–33% probability)	Low	Low	Moderate	Moderate	High
C. About as likely as not (33–66% probability)	Low	Low	Moderate	High	High
D. Likely (66–90% probability)	Low	Moderate	High	Very high	Very high
E. Very likely (90–100% probability)	Moderate	High	Very high	Very high	Very high

10.3.2 Interpretation of risk matrix

Adverse events for which the residual risk is higher than “moderate” should be modelled in a probabilistic risk analysis. It is assumed that all risk resulting from the adverse events will be mitigated down to at least “moderate” level through the measures indicated, with the exception of the political risk from elections and the winding up of various governments. This risk, in turn, cannot be adequately modelled in a probabilistic risk analysis.

The main mitigation measures are related to lobbying within partner systems (work with line ministries), establishment and assistance to a Project Implementation Unit, and technical assistance to the WSS operator through a corporate development programme. The corporate development programme is described in Chapter 5.7.6 - Technical Assistance.

Annexes

Annex 3	Legal and regulatory framework
Annex 4	General information on consumers
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Annex 3

Legal and regulatory framework

Annex 3: Legal and regulatory framework

International regulations:

- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991), ratified by Parliament Decision No. 1546-XII dated 23 June, 1993. It was applied in construction impact assessment of a larger number of facilities, including Giurgiulesti terminal on Prut - Danube Rivers;
- Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992), ratified by Republic of Moldova Parliament Decision no. 1546 -XII dated 23 June 1993. Institutional cooperation entities in transboundary watercourses management were established based on bilateral cooperation agreements with Ukraine (11.23.1994) and Romania (08.28.2010);
- Convention on the Transboundary Effects of Industrial Accidents (Helsinki, 1992), ratified by Parliament Decision no. 1546-XII dated 23 June, 1993;
- Convention on cooperation and protection and sustainable use of the Danube River (Sofia, 1994) created the general legal instrument for cooperation in transboundary watercourse management in Danube River basin. The Convention was ratified by Republic of Moldova Parliament Decision no. 323-XIV of 17 March 1999, respectively that is a part of the management committee of Danube river basin;
- Convention on Access to Environmental Information, Public Participation in Environmental Decision-making and Access to Justice in environmental matters (The Aarhus Convention) was signed on 25 June 1998 and entered into force on 30 October 2001. The Aarhus Convention was ratified by Republic of Moldova Parliament Decision o. n46-XIV dated 07 April 1999 and the National Action Plan for implementing the Aarhus Convention in Moldova was approved by Government Decision no. 471 dated 28 June 2011;
- The Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes EEC UNO / WHO-EURO, adopted in London on 17 June 1999 entered into force on 4 August 2005. Republic of Moldova ratified the Protocol on Water and Health based on Law No. 207 dated 29 July 2005.

National Regulations:

- Law on local public administration no. 436 dated 12.28.2006, published in Monitorul Oficial, Republic of Moldova no. 32-35 dated 03.09.2007;
- Law on administrative decentralisation no. 435-XVI dated 12.28.2006, published in Monitorul Oficial, Republic of Moldova no. 29-31/91 dated 03.02.2007;
- Law on Local Public Finances No. 397-XV of 10.16.2003, published in Monitorul Oficial of Republic of Moldova no. 248/253 dated 10.16.2003;
- Law on public utility services no. 1402-XV of 10.24.2002, published in Monitorul Oficial, Republic of Moldova no.14-17/49 dated 02.07.2003;
- Law on Water Supply and Sanitation Public Services no. 303 dated 13 December 2013, published in Monitorul Oficial, Republic of Moldova no. 60-65 dated 03.14.2014;

- Water Law no. 272 of 23 December 2011, published in Monitorul Oficial al Republicii Moldova no. 81 dated 04.26.2012;
- Law on drinking water no. 272-XIVof 02.10.1999, published in Monitorul Oficial, Republic of Moldova no. 39-41 dated 22 April 1999;
- Law on state supervision of public health no. 10-XVI dated 02.03.2009, published in Monitorul Oficial, Republic of Moldova No. 67/183 dated 04.03.2009;
- Law on Public - Private Partnership no. 179-XVI of 07.10.2008, published in Monitorul Oficial, Republic of Moldova no. 165-166/605 dated 09.02.2008;
- Law on Concessions no. 534-XIII of 07.13.95, published in Monitorul Oficial, Republis of Moldova no. 67/752 dated 11.30.1995;
- Law on protection areas and protection strips of river waters and water basins no. 440-XIII of 27 Aprilie 1995, published in Monitorul Oficial, Republic of Moldova no. 43/482 dated 08.03.1995;
- Law on irrigation water users associations no. 171 of 07.09.2010, published in Monitorul Oficial, Republic of Moldova no. 160-162 dated 09.07.2010;
- Civil Code of Republic of Moldova no. 1107-XV of 6 June 2002, published in Monitorul Oficial, Republic of Moldova no. 82-86 dated 06.22.2002;
- Law on entrepreneurship and enterprises no. 845-XII of 01.03.1992, published in Monitorul Oficial, Republic of Moldova no. 2 dated 02.28.1994;
- Law on Joint Stock Companies no.1134-XIII of 04.02.1997, published in Monitorul Oficial, Republic of Moldova no. 38-39 dated 06.12.1997;
- Law on Limited Liability Companies no. 135 of 06.14.2007, published in Monitorul Oficial, Republic of Moldova no. 127-130 dated 08.17.2007;
- The law on state registration of legal entities and individual entrepreneurs no. 220-XVI of 10.19.2007, published in Monitorul Oficial, Republic of Moldova no. 184-187 dated 11.30.2007;
- Government Decision of Republic of Moldova no. 685 dated September 4 2013 on the National Strategy for Regional Development for the period 2013-2015, published in Monitorul Oficial, Republic of Moldova no. 198-204 dated 09.13.2013;
- Government Decision of Republic of Moldova on approval of Water Supply and Sanitation Strategy (2014-2028) no. 199 dated 20 March 2014, published in Monitorul Oficial, Republicof Moldova no. 72-77 dated 03.28.2014;
- Government Decision of Republic of Moldova no. 802 dated 10.09.2013 for approving the Regulation on conditions for waste water discharge into water bodies, published in Monitorul Oficial, Republic of Moldova no. 243-247 dated 11.01.2013;
- Government Decision of Republic of Moldova no. 950 of 25 November 2013 approving the Regulation on requirements for collection, treatment and discharge of wastewater into the sewerage system and / or water bodies for urban and rural areas, published in Monitorul Oficial, Republic of Moldova no. 284-289 dated 12.06.2013;

- Government Decision of Republic of Moldova no. 387 of 06.06.1994 on the approval of the Model Regulation for Municipal enterprises, published in Monitorul Oficial, Republic of Moldova no. 2 dated 09.02.1994;
- Government Decision of Republic of Moldova no. 1006 of 09.13.2004 on the approval of the Regulation on public utility service concession, published in Monitorul Oficial, Republic of Moldova no. 171 dated 09.17.2004;
- Government Decision of Republic of Moldova no. 656 of 05.27.2002 on the approval of the Regulation Framework on the use of municipal water supply and sewerage system, published in Monitorul Oficial, Republic of Moldova no. 71-73 dated 06.06.2002;
- Government Decision of Republic of Moldova no. 1228 dated 11.13.2007 approving the Regulation on the acquisition, designing, installation, reception and operation of the equipment for recording water consumption, published in Monitorul Oficial, Republic of Moldova no. 180-183 dated 11.23.2007;
- Government Decision of Republic of Moldova no. 1188 dated in 11.02.2004 on the Action Plan related to the operation of the 'Soroca - Balti' water main and the water supply of some areas of the country, published in Monitorul Oficial, Republic of Moldova no. 199-204 of 11.05.2004;
- Government Decision of Republic of Moldova no. 619 dated 08.16.1994 on the regulation of links in the field of water management and rational use of water resources in Republic of Moldova, published in Monitorul Oficial, Republic of Moldova no. 3 dated 09.08.1994;
- Decision of the National Agency for Energy Regulation no. 741 of 12.18.2014 on approving the Methodology for determination, approval and application of tariffs for public water supply, sanitation and wastewater treatment services, published in Monitorul Oficial, Republic of Moldova no. 33-38 dated 02.13.2015;
- Decision of the Ministry of Regional Development, Construction, Housing and Communal Services on the approval of the Strategy for modernization and development of municipal water supply and sewerage systems no. 7/1 dated 05.14.99, published in Monitorul Oficial, Republic of Moldova no. 130-133/238 of 11.25.1999;
- Order of the Ministry of Environment and Ministry of Health on approving the list of target indicators for implementation of the Protocol on Water and Health no. 91 / 704 of 20 October 2010.

Standards for the design and construction of infrastructure in the field of water supply and sanitation are:

- Construction Standard of Moldova / CSM L.01.07: 2005 The structure of the bill of quantity in construction;
- CSM A.07.03: 2014 Procedure on development, notification and approval of special technical conditions regarding project documentation of building projects (this one is valid);
- CSM G.03.01: 2012 Small capacity wastewater treatment plants;
- Practice Code / PC G.03.02-2006 Design and installation of water supply and sewerage systems made of polymer materials;

- PC G.03.06-2011 Design and installation of sewage underground pipes made of glass fiber reinforced plastics;
- SNiP 2.04.01-85 Internal water supply and sewerage systems;
- SNiP 2.04.02-84 Water supply. External networks and installations;
- SNiP 2.04.03-85 Sewerage. External networks and installations;
- SNiP 3.05.04-85 Water supply and sewerage external networks and installations;
- GOST 12.3.006-75* Safety standards system. Operation of the water supply and sewage facilities and networks. General safety requirements;
- Guideline to SNiP 2.04.02 Design of installations for surface water catchment;
- Guideline to SNiP 2.04.02-84 Design of installations for water treatment;
- Guideline to SNiP 2.04.03-85 Design of installations for wastewater treatment;
- Guideline to SNiP 2.04.02-84 Guideline on the volume and content of the project documentation for external water supply and sewerage systems;
- Guideline to SNiP 3.05.04-85 Guideline on laying and installation of cast iron, concrete and asbestos-cement pipelines of water supply and sewerage systems.

Annex 4

General information on consumers

Annex 4: General information on consumers

Table 4-1: General information about public institutions in the town of Leova

No.	Public institution name	No. of pupils/ children/ places/ beds	Employee's number	Connect-ed to wa-ter supply system	Connected to centralized sewer system
1.	Theoretical Lyceum "Mihai Eminescu"	761	89	Yes	Yes
2.	Theoretical Lyceum "Lev Tolstoi"	130	28	Yes	Yes
3.	Theoretical Lyceum "Constantin Spătaru"	259	32	Yes	Yes
4.	Professional school	275	89	Yes	
5.	Boarding school	52	36	Yes	Yes
6.	Kindergarten no. 1	191	32	Yes	Yes
7.	Kindergarten no. 2	225	38	Yes	Yes
8.	Public Health Centre		25	Yes	Yes
9.	Rayon Hospital	190	360	Yes	Yes
10.	Retirement homes	35	17	Yes	Yes
11.	Penitentiary No. 3	390	116	Yes	Yes
12.	Rayon Council			Yes	Yes
13.	LPA Leova		24	Yes	Yes
14.	Border Guard Service		40	Yes	

Source: LPA Leova, "Apa-Canal Leova"JSC

Table 4-2: General information about public institutions in Hanasenii Noi, Filipeni and Romanovca villages

No.	Type of public institution	Locality name					
		Hanasenii Noi		Filipeni		Romanovca	
		No. of pupils/ children/ /places/ beds	Employee's number	No. of pupils/ children/ /places/ beds	Employee's number	No. of pupils/ children/ /places/ beds	Employee's number
1.	School	94	17	397	54	20	
2.	Kindergarten no.1 Kindergarten no.2	26	9	200 200	19 19	50	8
3.	Hospital	3	3	11	15	2	1

Source: LPA Hănăsenii Noi, LPA Filipeni and LPA Romanovca

Table 4-3: General information about business entities in the town of Leova

No.	Name	Employee's number	Field	Property type	Connected to water supply system	Connected to centralized sewer system
1.	„Onorial" Ltd.	4	hotel	private	Yes	Yes
2.	I.E „Leocons Plus"	20	commerce	private	Yes	Yes
3.	I.E. „Vladimir Ciobanu"	67	commerce	private	Yes	Yes
4.	JSC„Universcoop"	8	commerce	private	Yes	Yes
5.	JSC „Moldtelecom"	30	commerce	private	Yes	Yes
6.	I.E. „Andrearoza"	20	commerce	private	Yes	Yes
7.	Ltd. „Corpiza"	8	commerce	private	Yes	Yes
8.	Ltd "Rustana Com"	15	commerce	private	Yes	Yes
9.	JSC „Prim-Com-Prod"	10	commerce	private	Yes	Yes
10.	Ltd. „Elsirlux"	20	commerce	private	Yes	Yes

Sourc: LPA Leova, "Apă-Canal Leova" JSC

Annex 5

Investment Programme

Annex 5: Investment Programme

Annex 5.1: Water Demand Projection

N°	Parameter	Unit	2014*	2015	2016	2017	2018**	2019	2020	2021***	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	**Population in the project area served with water**																																	
1.1	Total population serviced	N°	10,352	10,312	10,272	10,232	13,599	13,561	13,521	13,777	13,829	13,881	13,932	13,983	14,033	14,082	14,131	14,180	14,227	14,227	14,227	14,226	14,224	14,223	14,220	14,218	14,214	14,211	14,207	14,202	14,197	14,192	14,186	14,180
1.2	In urban settlements	N°	10,352	10,312	10,272	10,232	10,192	10,152	10,113	10,206	10,212	10,217	10,222	10,226	10,230	10,234	10,238	10,241	10,243	10,207	10,170	10,134	10,097	10,061	10,024	9,987	9,951	9,914	9,878	9,841	9,804	9,768	9,731	9,695
1.3	In rural settlements	N°	0	0	0	0	3,407	3,409	3,409	3,571	3,617	3,664	3,710	3,756	3,802	3,848	3,894	3,939	3,984	4,020	4,056	4,092	4,127	4,162	4,196	4,230	4,264	4,297	4,329	4,361	4,393	4,424	4,455	4,485
2	**Volume of water sold in total and disaggr. for different consumers**																																	
2.1	Total volume sold	m³/y	151,816	164,492	177,065	189,536	245,435	260,545	275,545	296,063	313,038	330,091	347,222	364,427	381,707	399,058	416,478	433,967	451,522	463,325	475,098	486,841	498,552	510,231	521,877	533,489	545,066	556,607	568,111	579,578	591,006	602,395	613,744	625,051
2.2	Domestic customers	m³/y	115,499	124,695	133,817	142,866	189,150	200,371	211,510	227,031	239,731	252,495	265,321	278,208	291,155	304,159	317,221	330,338	343,509	355,513	367,488	379,435	391,352	403,238	415,092	426,914	438,703	450,457	462,177	473,860	485,506	497,115	508,685	520,215
2.3	Industrial customers	m³/y	5,112	8,303	11,468	14,609	17,725	20,816	23,883	27,283	30,476	33,673	36,871	40,070	43,271	46,473	49,676	52,880	56,083	55,883	55,682	55,482	55,282	55,081	54,881	54,681	54,480	54,280	54,080	53,879	53,679	53,479	53,278	53,078
2.4	Institutional customers	m³/y	31,205	31,494	31,779	32,062	38,560	39,358	40,152	41,750	42,830	43,924	45,030	46,149	47,281	48,425	49,581	50,750	51,930	51,930	51,928	51,924	51,919	51,912	51,904	51,894	51,883	51,870	51,855	51,839	51,821	51,801	51,780	51,757
3	**Total water sold disaggr. for urban and rural areas**																																	
3.1	Urban Settlements	m³/y	151,816	164,492	177,065	189,536	201,907	214,179	226,351	241,581	254,845	268,116	281,390	294,666	307,944	321,222	334,498	347,772	361,042	369,299	377,487	385,606	393,658	401,640	409,555	417,400	425,178	432,887	440,527	448,099	455,603	463,038	470,405	477,703
3.2	Rural settlements	m³/y	0	0	0	0	43,528	46,367	49,194	54,483	58,192	61,975	65,832	69,761	73,763	77,836	81,980	86,195	90,480	94,026	97,611	101,234	104,895	108,591	112,323	116,089	119,888	123,720	127,584	131,479	135,403	139,357	143,339	147,348
4	**Non-Revenue Water (NRW) volume dissagregated for total NRW, apparent losses, and real losses**																																	
4.1	Total NRW	m³/y	75,326	80,637	85,757	90,688	116,010	121,651	127,080	134,864	140,835	146,665	152,352	157,898	163,302	168,565	173,685	178,664	183,501	185,864	188,109	190,239	192,254	194,155	195,945	197,624	199,193	200,654	202,008	203,256	204,399	205,440	206,378	207,215
4.2	Apparent losses	m³/y	30,130	31,862	33,461	34,930	44,091	45,603	46,967	49,120	50,525	51,801	52,949	53,967	54,858	55,621	56,256	56,765	57,146	56,690	56,146	55,516	54,799	53,999	53,115	52,149	51,103	49,977	48,772	47,490	46,132	44,699	43,193	41,613
4.3	Real losses (physical losses)	m³/y	45,196	48,775	52,295	55,758	71,919	76,048	80,113	85,745	90,310	94,863	99,404	103,931	108,444	112,944	117,429	121,899	126,355	129,174	131,963	134,723	137,454	140,157	142,830	145,475	148,090	150,677	153,236	155,766	158,267	160,740	163,185	165,602
5	**The water demand figures considering the demand variation factors**																																	
5.1	Yearly water demand/production	m³/y	227,142	245,129	262,822	280,225	361,445	382,196	402,625	430,928	453,873	476,756	499,574	522,326	545,009	567,622	590,164	612,631	635,023	649,189	663,208	677,080	690,806	704,387	717,822	731,113	744,259	757,261	770,119	782,834	795,406	807,835	820,121	832,266
5.2	Average daily water demand	m³/d	622	672	720	768	990	1,047	1,103	1,181	1,243	1,306	1,369	1,431	1,493	1,555	1,617	1,678	1,740	1,779	1,817	1,855	1,893	1,930	1,967	2,003	2,039	2,075	2,110	2,145	2,179	2,213	2,247	2,280
5.3	Maximum daily water demand	m³/d	664	717	769	820	1,058	1,118	1,179	1,262	1,329	1,397	1,464	1,531	1,598	1,664	1,731	1,797	1,863	1,906	1,947	1,988	2,029	2,070	2,110	2,149	2,188	2,227	2,266	2,304	2,341	2,378	2,415	2,451
5.4	Average hourly water demand	m³/h	26	28	30	32	41	44	46	49	52	54	57	60	62	65	67	70	72	74	76	77	79	80	82	83	85	86	88	89	91	92	94	95
5.5	Max. hourly water demand	m³/h	37	40	43	46	59	63	66	71	75	79	83	87	91	94	98	102	106	108	111	113	116	118	121	123	125	128	130	132	135	137	139	141

*existing situation

**1st year of operation phase 1 investments

*** 1st year of operation phase 2 investments

Annex 5.2: Wastewater Flow and Load Projection

N°	Parameter	Unit	2014*	2015	2016	2017	2018**	2019	2020	2021***	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	**Population in the project area served with sewerage**																																	
1.1	Total population serviced	N°	4,812	4,793	4,775	4,756	5,535	5,513	5,492	8,799	9,186	9,572	9,958	10,344	10,729	11,114	11,498	11,883	12,266	12,333	12,399	12,466	12,532	12,598	12,663	12,729	12,794	12,859	12,924	12,989	13,054	13,118	13,183	13,247
1.2	In urban settlements	N°	4,812	4,793	4,775	4,756	5,535	5,513	5,492	6,463	6,773	7,081	7,389	7,696	8,002	8,308	8,612	8,916	9,219	9,220	9,221	9,222	9,222	9,222	9,222	9,222	9,221	9,220	9,219	9,218	9,216	9,214	9,212	9,210
1.3	In rural settlements	N°	0	0	0	0	0	0	0	2,336	2,413	2,491	2,569	2,648	2,727	2,806	2,886	2,966	3,047	3,113	3,178	3,244	3,310	3,375	3,441	3,507	3,573	3,639	3,705	3,771	3,838	3,904	3,970	4,037
2	**Volume of wastewater charged in total and disaggr. for different customers**																																	
2.1	Total volume of wastewater gen,	m^3/y	73,611	79,562	85,465	91,320	113,477	120,208	126,884	187,575	207,250	227,865	249,415	271,901	295,319	319,669	344,947	371,152	398,283	411,630	425,071	438,606	452,234	465,954	479,766	493,669	507,662	521,746	535,918	550,180	564,529	578,967	593,491	608,101
2.2	by domestic customers	m^3/y	38,920	43,727	48,495	53,225	67,667	73,105	78,500	124,647	139,076	154,255	170,180	186,852	204,268	222,427	241,327	260,967	281,345	294,440	307,632	320,921	334,304	347,783	361,356	375,022	388,782	402,634	416,578	430,614	444,740	458,956	473,261	487,656
2.3	by industrial customers	m^3/y	5,805	7,061	8,308	9,544	12,584	14,006	15,416	19,867	22,625	25,545	28,627	31,870	35,273	38,836	42,557	46,437	50,475	50,481	50,485	50,489	50,491	50,491	50,490	50,488	50,485	50,480	50,474	50,467	50,458	50,448	50,437	50,424
2.4	by Institutional customers	m^3/y	28,886	28,774	28,662	28,551	33,226	33,097	32,968	43,061	45,549	48,065	50,608	53,179	55,779	58,406	61,063	63,749	66,464	66,709	66,954	67,197	67,439	67,680	67,919	68,158	68,395	68,631	68,866	69,099	69,331	69,562	69,792	70,021
3	**Total wastewater charged disaggr, for urban and rural areas**																																	
3.1	in urban Settlements	m^3/y	73,611	79,562	85,465	91,320	113,477	120,208	126,884	157,729	174,093	191,241	209,169	227,874	247,352	267,601	288,617	310,398	332,939	342,515	352,083	361,644	371,196	380,739	390,272	399,794	409,304	418,802	428,287	437,758	447,214	456,655	466,080	475,488
3.2	in rural settlements	m^3/y	0	0	0	0	0	0	0	29,846	33,157	36,624	40,247	44,027	47,967	52,068	56,330	60,755	65,344	69,115	72,988	76,962	81,038	85,215	89,494	93,875	98,358	102,944	107,631	112,422	117,315	122,311	127,410	132,613
4	**The sewer infiltration water based on the determined infiltration rate**																																	
4.1	**Sewer Infiltration water**	m^3/y	36,806	37,129	37,035	36,528	45,391	47,193	48,874	70,861	76,759	82,706	88,681	94,662	100,627	106,556	112,427	118,219	123,910	125,014	125,947	126,708	127,295	127,706	127,938	127,988	127,856	127,538	127,033	126,338	125,451	124,371	123,094	121,620
5	**The wastewater generation figures considering the variation factors**																																	
5.1	Avg, wastewater flow (dry weather)	m^3/y	110,417	116,691	122,500	127,848	158,868	167,400	175,758	258,436	284,010	310,571	338,096	366,563	395,947	426,225	457,374	489,371	522,193	536,644	551,018	565,314	579,529	593,660	607,703	621,657	635,518	649,283	662,951	676,517	689,980	703,337	716,585	729,721
5.2	Max, daily dry weather flow (Qdmax)	m^3/d	323	341	359	375	466	492	516	759	835	913	995	1,079	1,166	1,255	1,348	1,442	1,540	1,583	1,626	1,669	1,712	1,754	1,796	1,838	1,880	1,922	1,963	2,004	2,045	2,086	2,126	2,166
5.3	Max, hourly dry weather flow (QDWF)	m^3/h	22	23	25	26	32	34	36	53	58	64	70	76	82	88	95	102	109	112	116	119	122	126	129	132	136	139	142	146	149	152	156	159
5.4	Max, hourly Storm Water Flow (QSWF)	m^3/h	28	30	32	34	42	44	47	69	76	83	91	98	107	115	124	133	142	146	151	155	159	163	168	172	176	181	185	189	194	198	202	207
6	**Population equivalents in total and disaggr, for different customers**																																	
6.1	Total population equivalent	PE_{60}	5,168	5,162	5,155	5,148	6,006	5,997	5,989	9,446	9,886	10,329	10,772	11,218	11,665	12,113	12,563	13,015	13,468	13,537	13,606	13,675	13,743	13,812	13,880	13,948	14,016	14,083	14,150	14,218	14,285	14,351	14,418	14,484
6.2	by domestic customers	PE_{60}	4,812	4,793	4,775	4,756	5,535	5,513	5,492	8,799	9,186	9,572	9,958	10,344	10,729	11,114	11,498	11,883	12,266	12,333	12,399	12,466	12,532	12,598	12,663	12,729	12,794	12,859	12,924	12,989	13,054	13,118	13,183	13,247
6.3	by Industrial and instit, customers	PE_{60}	356	368	380	391	471	484	497	647	700	756	814	874	935	999	1,065	1,132	1,201	1,204	1,207	1,209	1,212	1,214	1,217	1,219	1,221	1,224	1,226	1,228	1,231	1,233	1,235	1,237
7	**Pollution load – BOD in total and disaggr, for different customers**																																	
7.1	The total BOD_5 load	kg/d	310	310	309	309	360	360	359	567	593	620	646	673	700	727	754	781	808	812	816	820	825	829	833	837	841	845	849	853	857	861	865	869
7.2	by domestic customers	kg/d	289	288	286	285	332	331	330	528	551	574	598	621	644	667	690	713	736	740	744	748	752	756	760	764	768	772	775	779	783	787	791	795
7.3	by industrial and instit, customers	kg/d	21	22	23	23	28	29	30	39	42	45	49	52	56	60	64	68	72	72	72	73	73	73	73	73	73	73	74	74	74	74	74	74

*existing situation
**1st year of operation phase 1 investments)
*** 1st year of operation phase 2 investments)

Annex 5.3: Development of connection rates water supply

N°	Settlement	2014*	2015	2016	2017	2018**	2019	2020	2021***	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Leova	95%	95%	95%	95%	95%	95%	95%	96%	97%	97%	98%	98%	98%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2	Hanasenii Noi	0%	0%	0%	0%	70%	70%	70%	73%	74%	75%	76%	78%	79%	80%	81%	82%	83%	84%	85%	86%	88%	89%	90%	91%	92%	93%	94%	95%	96%	98%	99%	100%
3	Filipeni	0%	0%	0%	0%	70%	70%	70%	73%	74%	75%	76%	78%	79%	80%	81%	82%	83%	84%	85%	86%	88%	89%	90%	91%	92%	93%	94%	95%	96%	98%	99%	100%
4	Romanovca	0%	0%	0%	0%	70%	70%	70%	73%	74%	75%	76%	78%	79%	80%	81%	82%	83%	84%	85%	86%	88%	89%	90%	91%	92%	93%	94%	95%	96%	98%	99%	100%
TOT	**Total**	**66%**	**66%**	**66%**	**65%**	**87%**	**87%**	**87%**	**89%**	**90%**	**90%**	**91%**	**91%**	**92%**	**93%**	**93%**	**94%**	**95%**	**95%**	**95%**	**96%**	**96%**	**96%**	**97%**	**97%**	**97%**	**98%**	**98%**	**99%**	**99%**	**99%**	**100%**	**100%**

Annex 5.4: Development of connected population water supply

N°	Settlement	2014*	2015	2016	2017	2018**	2019	2020	2021***	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Leova	10,352	10,312	10,272	10,232	10,192	10,152	10,113	10,206	10,212	10,217	10,222	10,226	10,230	10,234	10,238	10,241	10,243	10,207	10,170	10,134	10,097	10,061	10,024	9,987	9,951	9,914	9,878	9,841	9,804	9,768	9,731	9,695
2	Hanasenii Noi	0	0	0	0	758	758	759	795	805	815	826	836	846	856	866	876	887	895	903	911	918	926	934	941	949	956	963	970	978	984	991	998
3	Filipeni	0	0	0	0	2,257	2,258	2,258	2,365	2,396	2,427	2,458	2,488	2,519	2,549	2,579	2,609	2,639	2,663	2,687	2,711	2,734	2,757	2,780	2,802	2,824	2,846	2,868	2,889	2,910	2,931	2,951	2,971
4	Romanovca	0	0	0	0	392	392	392	411	416	422	427	432	438	443	448	453	459	463	467	471	475	479	483	487	491	495	498	502	506	509	513	516
TOT	**Total**	**10,352**	**10,312**	**10,272**	**10,232**	**13,599**	**13,561**	**13,521**	**13,777**	**13,829**	**13,881**	**13,932**	**13,983**	**14,033**	**14,082**	**14,131**	**14,180**	**14,227**	**14,227**	**14,227**	**14,226**	**14,224**	**14,223**	**14,220**	**14,218**	**14,214**	**14,211**	**14,207**	**14,202**	**14,197**	**14,192**	**14,186**	**14,180**

Annex 5.5: Development of connection rates wastewater

N°	Settlement	2014*	2015	2016	2017	2018**	2019	2020	2021***	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Leova	44	44	44	44	52	52	52	61	64	67	70	74	77	80	83	87	90	90	91	91	91	92	92	92	93	93	93	94	94	94	95	95
2	Hanasenii Noi	0	0	0	0	0	0	0	46	48	50	51	53	55	57	59	61	63	64	66	68	69	71	73	75	76	78	80	82	84	86	88	90
3	Filipeni	0	0	0	0	0	0	0	48	49	51	53	54	56	58	60	62	64	65	67	68	70	72	73	75	77	79	80	82	84	86	88	90
4	Romanovca	0	0	0	0	0	0	0	53	55	56	58	59	61	62	64	65	67	69	70	71	73	74	76	77	79	81	82	84	85	87	88	90
TOT	**Total**	**31**	**31**	**30**	**30**	**35**	**35**	**35**	**57**	**60**	**62**	**65**	**68**	**70**	**73**	**76**	**79**	**82**	**82**	**83**	**84**	**85**	**85**	**86**	**87**	**88**	**89**	**89**	**90**	**91**	**92**	**93**	**93**

Annex 5.6: Development of connected population wastewater

N°	Settlement	2014*	2015	2016	2017	2018**	2019	2020	2021***	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Leova	4,812	4,793	4,775	4,756	5,535	5,513	5,492	6,463	6,773	7,081	7,389	7,696	8,002	8,308	8,612	8,916	9,219	9,220	9,221	9,222	9,222	9,222	9,222	9,222	9,221	9,220	9,219	9,218	9,216	9,214	9,212	9,210
2	Hanasenii Noi	0	0	0	0	0	0	0	501	518	536	554	573	591	610	628	647	666	681	696	712	727	742	757	773	788	804	820	835	851	867	882	898
3	Filipeni	0	0	0	0	0	0	0	1,537	1,588	1,640	1,692	1,745	1,798	1,851	1,904	1,958	2,012	2,055	2,099	2,143	2,187	2,231	2,275	2,319	2,363	2,407	2,452	2,496	2,540	2,585	2,629	2,674
4	Romanovca	0	0	0	0	0	0	0	299	307	315	323	330	338	346	354	361	369	376	383	389	396	402	409	415	422	428	434	440	447	453	459	465
TOT	**Total**	**4,812**	**4,793**	**4,775**	**4,756**	**5,535**	**5,513**	**5,492**	**8,799**	**9,186**	**9,572**	**9,958**	**10,344**	**10,729**	**11,114**	**11,498**	**11,883**	**12,266**	**12,333**	**12,399**	**12,466**	**12,532**	**12,598**	**12,663**	**12,729**	**12,794**	**12,859**	**12,924**	**12,989**	**13,054**	**13,118**	**13,183**	**13,247**

Annex 6

Financial and economic analysis

Annex 6: Financial and economic analysis

Table 6-1: Macroeconomic forecast

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Indicator	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Real Wage Increase	1.50%	3.00%	4.60%	4.30%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Base Case	1.50%	3.00%	4.60%	4.30%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Pessimistic	0.75%	1.50%	2.30%	2.15%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Optimistic	3.50%	5.00%	6.60%	6.30%	5.00%	5.00%	5.00%	6.00%	6.00%	6.00%	6.00%	5.00%	5.00%	5.00%	5.00%
Real GDP growth	-2.00%	1.50%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Base Case	-2.00%	1.50%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Pessimistic	-2.00%	0.75%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Optimistic	-2.00%	3.00%	4.50%	5.00%	5.00%	5.00%	5.00%	6.00%	6.00%	6.00%	6.00%	5.00%	5.00%	5.00%	5.00%
Costs of electricity	0.0%	37.0%	1.0%	1.0%	1.0%	1.0%	1.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.5%	2.5%	2.5%
Base Case	0.0%	37.0%	1.0%	1.0%	1.0%	1.0%	1.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.5%	2.5%	2.5%
Pessimistic	0.0%	37.0%	2.3%	2.4%	2.3%	2.4%	2.4%	6.0%	6.0%	6.0%	6.0%	6.0%	5.0%	5.0%	5.0%
Optimistic	0.0%	37.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%

	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Indicator	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Real Wage Increase	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Base Case	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Pessimistic	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Optimistic	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Real GDP growth	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Base Case	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Pessimistic	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Optimistic	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Costs of electricity	2.5%	2.5%	5.0%	5.0%	5.0%	5.0%	5.0%	4.0%	4.0%	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%
Base Case	2.5%	2.5%	5.0%	5.0%	5.0%	5.0%	5.0%	4.0%	4.0%	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%
Pessimistic	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	4.0%	4.0%	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%
Optimistic	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%

Table 6-2: Investment costs for wastewater

			TOTAL	1	2	3	4	5
Equipment and tools		MDL M	4.16	0.42	2.08	1.66		
Sewage network		MDL M	41.19	4.12	20.60	16.48		
Pumping stations		MDL M	0.66	0.07	0.33	0.27		
Wastewater treatment plant		MDL M						
TOTAL Construction and installation costs		**MDL M**	**46.01**	**4.60**	**23.01**	**18.40**	**0.00**	**0.00**
Design and engineering		MDL M	5.52	0.55	2.76	2.21	0.00	0.00
Technical assistance		MDL M	6.23	0.62	3.12	2.49	0.00	0.00
Contingencies		MDL M	5.78	0.58	2.89	2.31	0.00	0.00
TOTAL Investment Costs		**MDL M**	**63.54**	**6.35**	**31.77**	**25.42**	**0.00**	**0.00**

Table 6-3: Depreciation rates for wastewater

		years	%
1	Sewage network	50	2.0%
2	Pumping stations	20	5.0%
3	Equipment and tools	10	10.0%
4	Wastewater treatment plant	35	2.9%
5	Land acquisition	99999999	0.0%
6	Technical assistance	50	2.0%
7	Contingency	50	2.0%

Table 6-4: Summary of investment costs for wastewater

			TOTAL	1	2	3	4	5	6
1	Sewage network	MDL M	41.2	4.1	20.6	16.5	0.0	0.0	0.0
2	Pumping stations	MDL M	0.7	0.1	0.3	0.3	0.0	0.0	0.0
3	Equipment and tools	MDL M	4.2	0.4	2.1	1.7	0.0	0.0	0.0
4	Wastewater treatment plant	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Land acquisition	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Technical assistance	MDL M	11.8	1.2	5.9	4.7	0.0	0.0	0.0
7	Contingency	MDL M	5.8	0.6	2.9	2.3	0.0	0.0	0.0
	TOTAL	**MDL M**	**63.5**	**6.4**	**31.8**	**25.4**	**0.0**	**0.0**	**0.0**

Table 6-5: Depreciation for wastewater

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Sewage network	MDL M		0.1	0.5	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
2	Pumping stations	MDL M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Equipment and tools	MDL M		0.0	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
4	Wastewater treatment plant	MDL M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Land acquisition	MDL M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Technical assistance	MDL M		0.0	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
7	Contingency	MDL M		0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	TOTAL Depreciation costs	MDL M	**0.0**	**0.2**	**1.1**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sewage network	MDL M	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
2	Pumping stations	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Equipment and tools	MDL M	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
4	Wastewater treatment plant	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Land acquisition	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Technical assistance	MDL M	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
7	Contingency	MDL M	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	TOTAL Depreciation costs	MDL M	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**

Table 6-6: Gross value of new assets for wastewater

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Sewage network	MDL M	4.1	24.7	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2
2	Pumping stations	MDL M	0.1	0.4	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
3	Equipment and tools	MDL M	0.4	2.5	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
4	Wastewater treatment plant	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Land acquisition	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Technical assistance	MDL M	1.2	7.1	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
7	Contingency	MDL M	0.6	3.5	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
	TOTAL	MDL M	**6.4**	**38.1**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sewage network	MDL M	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2
2	Pumping stations	MDL M	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
3	Equipment and tools	MDL M	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
4	Wastewater treatment plant	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Land acquisition	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Technical assistance	MDL M	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
7	Contingency	MDL M	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
	TOTAL	MDL M	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**	**63.5**

Table 6-7: Net assets for wastewater

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Sewage network	MDL M	4.1	24.6	40.6	39.8	39.0	38.1	37.3	36.5	35.7	34.8	34.0	33.2	32.4	31.6	30.7
2	Pumping stations	MDL M	0.1	0.4	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.2
3	Equipment and tools	MDL M	0.4	2.5	3.9	3.4	3.0	2.6	2.2	1.8	1.4	1.0	0.5	0.1	0.0	0.0	0.0
4	Wastewater treatment plant	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Land acquisition	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Technical assistance	MDL M	1.2	7.0	11.5	11.2	10.9	10.6	10.2	9.9	9.6	9.3	8.9	8.6	8.3	8.0	7.6
7	Contingency	MDL M	0.6	3.5	5.7	5.5	5.3	5.2	5.0	4.9	4.7	4.5	4.4	4.2	4.1	3.9	3.7
	TOTAL	MDL M	**6.4**	**38.0**	**62.3**	**60.6**	**58.8**	**57.0**	**55.3**	**53.5**	**51.8**	**50.0**	**48.3**	**46.5**	**45.0**	**43.7**	**42.3**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sewage network	MDL M	29.9	29.1	28.3	27.4	26.6	25.8	25.0	24.1	23.3	22.5	21.7	20.8	20.0	19.2	18.4
2	Pumping stations	MDL M	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Equipment and tools	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Wastewater treatment plant	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Land acquisition	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Technical assistance	MDL M	7.3	7.0	6.7	6.3	6.0	5.7	5.4	5.0	4.7	4.4	4.0	3.7	3.4	3.1	2.7
7	Contingency	MDL M	3.6	3.4	3.3	3.1	2.9	2.8	2.6	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4
	TOTAL	MDL M	**41.0**	**39.7**	**38.3**	**37.0**	**35.6**	**34.3**	**33.0**	**31.6**	**30.3**	**29.0**	**27.7**	**26.4**	**25.1**	**23.8**	**22.5**

Table 6-8: Depreciation costs for wastewater

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Sewage network	MDL M		0.1	0.5	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
2	Pumping stations	MDL M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Equipment and tools	MDL M		0.0	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.1	0.0	0.0
4	Wastewater treatment plant	MDL M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Land acquisition	MDL M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Technical assistance	MDL M		0.0	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
7	Contingency	MDL M		0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	TOTAL	**MDL M**		**0.2**	**1.1**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.5**	**1.3**	**1.3**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sewage network	MDL M	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
2	Pumping stations	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Equipment and tools	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Wastewater treatment plant	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Land acquisition	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Technical assistance	MDL M	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
7	Contingency	MDL M	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	TOTAL	**MDL M**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**

Table 6-9: Variable costs – summary

	Water supply		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Electricity for pumping	MDL M	0.91	1.34	1.44	1.87	2.00	2.13	2.30	2.50	2.70	2.91	3.14	3.37	3.60	3.84	4.08
2	Water treatment costs	MDL M	0.59	0.63	0.67	0.86	0.91	0.96	1.03	1.09	1.14	1.20	1.25	1.30	1.36	1.41	1.47
	TOTAL variable costs for water	MDL M	1.495	1.964	2.108	2.738	2.915	3.092	3.332	3.582	3.841	4.110	4.388	4.677	4.959	5.250	5.549
	Wastewater																
1	Electricity for pumping	MDL M	0.070	0.101	0.106	0.133	0.142	0.151	0.247	0.275	0.306	0.340	0.375	0.413	0.452	0.492	0.535
2	Wastewater treatment costs	MDL M	0.06	0.06	0.06	0.08	0.08	0.09	0.14	0.15	0.16	0.18	0.19	0.20	0.21	0.23	0.24
	TOTAL variable costs for water	MDL M	0.127	0.161	0.169	0.211	0.224	0.236	0.386	0.426	0.469	0.515	0.563	0.614	0.666	0.720	0.777

	Water supply		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Electricity for pumping	MDL M	4.34	4.55	4.88	5.23	5.60	6.00	6.42	6.80	7.19	7.61	8.05	8.51	8.91	9.32	9.74
2	Water treatment costs	MDL M	1.52	1.55	1.59	1.62	1.65	1.69	1.72	1.75	1.78	1.81	1.84	1.87	1.90	1.93	1.96
	TOTAL variable costs for water	MDL M	5.858	6.099	6.463	6.847	7.253	7.681	8.133	8.545	8.975	9.425	9.894	10.385	10.811	11.252	11.707
	Wastewater																
1	Electricity for pumping	MDL M	0.581	0.610	0.656	0.704	0.756	0.810	0.868	0.921	0.976	1.033	1.094	1.157	1.212	1.268	1.326
2	Wastewater treatment costs	MDL M	0.26	0.26	0.27	0.27	0.28	0.29	0.29	0.30	0.30	0.31	0.31	0.32	0.33	0.33	0.34
	TOTAL variable costs for water	MDL M	0.836	0.872	0.924	0.978	1.036	1.096	1.160	1.219	1.279	1.343	1.409	1.477	1.537	1.599	1.662

Table 6-10: Fixed costs

	Water		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Maintenance - old assets	MDL M	0.00	0.00	0.00	2.00	2.04	2.08	2.12	2.16	2.21	2.25	2.30	2.34	2.39	2.44	2.49
2	Maintenance - new assets	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Salaries and related costs	MDL M	1.12	1.16	1.21	1.26	1.31	1.37	1.42	1.48	1.54	1.60	1.66	1.73	1.80	1.87	1.94
4	Fuel	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	General and administrative expenditures	MDL M	0.92	0.93	0.97	1.01	1.05	1.09	1.13	1.18	1.22	1.27	1.32	1.38	1.43	1.49	1.55
6	Other costs	MDL M	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
	TOTAL fixed costs for water	MDL M	2.271	2.319	2.409	4.500	4.631	4.766	4.906	5.050	5.200	5.354	5.514	5.679	5.850	6.027	6.210
	Wastewater																
1	Maintenance - old assets	MDL M	0.00	0.00	0.00	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.59	0.60	0.61	0.62
2	Maintenance - new assets	MDL M	0.00	0.06	0.38	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
3	Salaries and related costs	MDL M	0.42	0.43	0.45	0.47	0.49	0.51	0.53	0.55	0.57	0.59	0.62	0.64	0.67	0.69	0.72
4	Fuel	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	General and administrative expenditures	MDL M	0.35	0.36	0.37	0.38	0.40	0.42	0.43	0.45	0.47	0.49	0.51	0.53	0.55	0.57	0.59
6	Other costs	MDL M	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	TOTAL fixed costs for wastewater	MDL M	0.811	0.892	1.244	2.032	2.076	2.122	2.169	2.218	2.269	2.321	2.376	2.432	2.490	2.551	2.614

	Water		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Maintenance - old assets	MDL M	2.54	2.59	2.64	2.69	2.75	2.80	2.84	2.89	2.93	2.97	3.02	3.06	3.11	3.15	3.20
2	Maintenance - new assets	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Salaries and related costs	MDL M	2.02	2.10	2.19	2.27	2.37	2.46	2.53	2.61	2.69	2.77	2.85	2.94	3.02	3.12	3.21
4	Fuel	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	General and administrative expenditures	MDL M	1.61	1.67	1.74	1.81	1.88	1.96	2.02	2.08	2.14	2.20	2.27	2.34	2.41	2.48	2.55
6	Other costs	MDL M	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
	TOTAL fixed costs for water	MDL M	6.400	6.596	6.798	7.008	7.226	7.450	7.625	7.804	7.988	8.177	8.370	8.569	8.774	8.983	9.198
	Wastewater																
1	Maintenance - old assets	MDL M	0.63	0.65	0.66	0.67	0.69	0.70	0.71	0.72	0.73	0.74	0.75	0.77	0.78	0.79	0.80
2	Maintenance - new assets	MDL M	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
3	Salaries and related costs	MDL M	0.75	0.78	0.81	0.84	0.88	0.91	0.94	0.97	1.00	1.03	1.06	1.09	1.12	1.16	1.19
4	Fuel	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	General and administrative expenditures	MDL M	0.62	0.64	0.67	0.69	0.72	0.75	0.77	0.79	0.82	0.84	0.87	0.89	0.92	0.95	0.98
6	Other costs	MDL M	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	TOTAL fixed costs for wastewater	MDL M	2.679	2.746	2.816	2.888	2.963	3.040	3.101	3.163	3.227	3.292	3.359	3.428	3.499	3.572	3.647

Table 6-11: Total costs

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Variable costs	MDL M	1.62	2.12	2.28	2.95	3.14	3.33	3.72	4.01	4.31	4.62	4.95	5.29	5.62	5.97	6.33
2	Fixed costs	MDL M	3.08	3.21	3.65	6.53	6.71	6.89	7.07	7.27	7.47	7.68	7.89	8.11	8.34	8.58	8.82
3	Depreciation	MDL M	0.83	1.00	1.88	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.30	2.17	2.17
	TOTAL costs	MDL M	5.533	6.340	7.813	12.067	12.432	12.802	13.379	13.863	14.365	14.887	15.428	15.989	16.261	16.719	17.321

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Variable costs	MDL M	6.69	6.97	7.39	7.83	8.29	8.78	9.29	9.76	10.25	10.77	11.30	11.86	12.35	12.85	13.37
2	Fixed costs	MDL M	9.08	9.34	9.61	9.90	10.19	10.49	10.73	10.97	11.21	11.47	11.73	12.00	12.27	12.56	12.85
3	Depreciation	MDL M	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.15	2.14	2.14	2.14	2.14	2.14	2.14	2.14
	TOTAL costs	MDL M	17.943	18.484	19.172	19.893	20.648	21.439	22.190	22.878	23.607	24.374	25.170	25.998	26.759	27.544	28.352

Table 6-12: Calculation of the water and wastewater tariff

	Water Supply		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Variable and fixed costs	MDL M	3.66	3.77	4.28	4.52	7.24	7.55	7.86	8.24	8.63	9.04	9.46	9.90	10.36	10.81	11.28	11.76
2	Depreciation	MDL M	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
3	Interest and financial costs	MDL M	0.00	0.10	0.09	0.08	0.06	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4	Reserve for irregular receivables	MDL M	0.00	0.21	0.21	0.20	0.27	0.24	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30
5	Sale of water	m3	151,816	164,492	177,065	189,536	245,435	260,545	275,545	296,063	313,038	330,091	347,222	364,427	381,707	399,058	416,478	433,967
6	Tariff without depreciation	MDL M/m3	24.09	24.78	25.88	25.28	30.85	30.09	29.43	28.67	28.37	28.14	27.97	27.88	27.84	27.79	27.78	27.80
7	Tariff with depreciation	MDL M/m3	26.68	27.17	28.10	27.36	32.45	31.60	30.85	29.99	29.62	29.33	29.10	28.96	28.87	28.77	28.72	28.70
8	**Proposed avarage tariff**	**MDL/m3**	**20.52**	**27.50**	**28.50**	**28.50**	**31.00**	**31.00**	**30.00**	**28.00**	**28.00**	**28.50**	**29.10**	**28.96**	**28.87**	**28.77**	**28.72**	**28.70**
	Wastewater Services																	
1	Variable and fixed costs	MDL M	0.93	0.94	1.05	1.41	2.24	2.30	2.36	2.55	2.64	2.74	2.84	2.94	3.05	3.16	3.27	3.39
2	Depreciation	MDL M	0.44	0.44	0.61	1.49	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	1.90	1.78	1.78
3	Interest and financial costs	MDL M	0.00	0.10	0.09	0.08	0.06	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4	Reserve for irregular receivables	MDL M	0.00	0.07	0.08	0.12	0.16	0.14	0.11	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13
5	Sale of wastewater	m3	73,611	79,562	85,465	91,320	113,477	120,208	126,884	206,848	225,499	244,870	264,951	285,734	307,211	329,373	352,212	375,720
6	Tariff without depreciation	MDL M/m3	12.68	13.93	14.24	17.60	21.72	20.71	19.83	13.09	12.36	11.73	11.18	10.73	10.34	9.97	9.65	9.37
7	Tariff with depreciation	MDL M/m3	18.60	19.41	21.40	33.92	41.05	38.96	37.12	23.69	22.09	20.69	19.46	18.41	17.48	15.74	14.69	14.10
8	**Proposed avarage tariff**	**MDL/m3**	**20.05**	**20.05**	**22.00**	**28.00**	**28.00**	**28.00**	**28.00**	**22.00**	**22.09**	**20.69**	**19.46**	**18.41**	**17.48**	**15.74**	**14.69**	**14.10**
	Direct dynamic costs	**MDL/m3**		**28.58**														
	Direct dynamic costs	**MDL/m3**		**23.35**														

	Water Supply		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Variable and fixed costs	MDL M	12.26	12.69	13.26	13.86	14.48	15.13	15.76	16.35	16.96	17.60	18.26	18.95	19.58	20.23	20.91
2	Depreciation	MDL M	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
3	Interest and financial costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Reserve for irregular receivables	MDL M	0.32	0.33	0.34	0.36	0.37	0.39	0.40	0.42	0.43	0.45	0.47	0.48	0.50	0.52	0.53
5	Sale of water	m3	451,522	463,325	475,098	486,841	498,552	510,231	521,877	533,489	545,066	556,607	568,111	579,578	591,006	602,395	613,744
6	Tariff without depreciation	MDL M/m3	27.85	28.11	28.63	29.19	29.79	30.42	30.97	31.43	31.92	32.43	32.97	33.54	33.98	34.45	34.93
7	Tariff with depreciation	MDL M/m3	28.72	28.95	29.46	30.00	30.57	31.19	31.72	32.17	32.64	33.14	33.66	34.22	34.65	35.10	35.57
8	**Proposed avarage tariff**	**MDL/m3**	**28.72**	**28.95**	**29.46**	**30.00**	**30.57**	**31.19**	**31.72**	**32.17**	**32.64**	**33.14**	**33.66**	**34.22**	**34.65**	**35.10**	**35.57**
	Wastewater Services																
1	Variable and fixed costs	MDL M	3.51	3.62	3.74	3.87	4.00	4.14	4.26	4.38	4.51	4.63	4.77	4.91	5.04	5.17	5.31
2	Depreciation	MDL M	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.75	1.74	1.74	1.74	1.74	1.74	1.74	1.74
3	Interest and financial costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Reserve for irregular receivables	MDL M	0.13	0.13	0.14	0.14	0.14	0.15	0.15	0.15	0.16	0.16	0.16	0.17	0.17	0.17	0.18
5	Sale of wastewater	m3	399,887	412,079	424,272	436,466	448,660	460,852	473,041	485,226	497,405	509,579	521,745	533,902	546,049	558,185	570,309
6	Tariff without depreciation	MDL M/m3	9.12	9.11	9.14	9.18	9.23	9.30	9.33	9.35	9.37	9.41	9.45	9.50	9.53	9.57	9.62
7	Tariff with depreciation	MDL M/m3	13.57	13.42	13.33	13.26	13.20	13.16	13.09	12.96	12.88	12.83	12.79	12.77	12.73	12.70	12.68
8	**Proposed avarage tariff**	**MDL/m3**	**13.57**	**13.42**	**13.33**	**13.26**	**13.20**	**13.16**	**13.09**	**12.96**	**12.88**	**12.83**	**12.79**	**12.77**	**12.73**	**12.70**	**12.68**

Table 6-13: Tariff affordability

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Avarage bill for water (per person)	MDL/month	27.33	30.52	32.71	37.96	40.34	41.35	40.74	42.90	45.85	49.05	51.04	53.10	55.14	57.25	59.42
2	Avarage bill for wastewater (per person)	MDL/month	19.93	23.56	32.13	34.29	36.44	38.59	32.01	33.84	33.29	32.81	32.45	32.16	30.17	29.29	29.19
3	Avarage bill for water and wastewater (per perso	MDL/month	47.26	54.07	64.84	72.25	76.78	79.94	72.76	76.74	79.14	81.86	83.49	85.26	85.31	86.53	88.61
4	Disposable households income	MDL/month	1687.89	1738.53	1818.50	1896.69	1972.56	2051.46	2133.52	2218.86	2307.62	2399.92	2495.92	2595.76	2699.59	2807.57	2919.87
5	Tariff affordability	%	2.8%	3.1%	3.6%	3.8%	3.9%	3.9%	3.4%	3.5%	3.4%	3.4%	3.3%	3.3%	3.2%	3.1%	3.0%
6	Affordability constrains	%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Avarage bill for water (per person)	MDL/month	61.65	64.39	67.78	71.32	75.04	78.94	82.73	86.37	90.14	94.07	98.15	102.39	106.35	110.43	114.64
2	Avarage bill for wastewater (per person)	MDL/month	29.13	29.85	30.67	31.52	32.39	33.30	34.13	34.80	35.58	36.43	37.30	38.21	39.07	39.96	40.86
3	Avarage bill for water and wastewater (per perso	MDL/month	90.78	94.23	98.44	102.84	107.44	112.24	116.86	121.17	125.72	130.50	135.45	140.60	145.42	150.39	155.51
4	Disposable households income	MDL/month	3036.67	3158.13	3284.46	3415.84	3552.47	3694.57	3805.41	3919.57	4037.16	4158.27	4283.02	4411.51	4543.85	4680.17	4820.57
5	Tariff affordability	%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.1%	3.1%	3.1%	3.1%	3.2%	3.2%	3.2%	3.2%	3.2%
6	Affordability constrains	%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%

Table 6-14: Profits and losses - with project

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Sale of water	MDL M	4.52	5.05	5.40	7.61	8.08	8.27	8.29	8.77	9.41	10.10	10.55	11.02	11.48	11.96	12.46
2	Sale of wastewater	MDL M	1.60	1.88	2.56	3.18	3.37	3.55	4.55	4.98	5.07	5.16	5.26	5.37	5.19	5.18	5.30
3	Other revenues	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	**Total revenues**	**MDL M**	**6.12**	**6.93**	**7.96**	**10.79**	**11.44**	**11.82**	**12.84**	**13.75**	**14.47**	**15.26**	**15.81**	**16.39**	**16.67**	**17.14**	**17.75**
5	Costs of water services	MDL M	4.16	4.68	4.91	7.63	7.94	8.25	8.63	9.02	9.43	9.86	10.30	10.75	11.20	11.67	12.15
	variable costs	MDL M	1.50	1.96	2.11	2.74	2.91	3.09	3.33	3.58	3.84	4.11	4.39	4.68	4.96	5.25	5.55
	fixed costs	MDL M	2.27	2.32	2.41	4.50	4.63	4.77	4.91	5.05	5.20	5.35	5.51	5.68	5.85	6.03	6.21
	depreciation	MDL M	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
6	Costs of wastewater services	MDL M	1.37	1.66	2.90	4.44	4.49	4.55	4.75	4.84	4.93	5.03	5.13	5.24	5.06	5.05	5.17
	variable costs	MDL M	0.13	0.16	0.17	0.21	0.22	0.24	0.39	0.43	0.47	0.51	0.56	0.61	0.67	0.72	0.78
	fixed costs	MDL M	0.81	0.89	1.24	2.03	2.08	2.12	2.17	2.22	2.27	2.32	2.38	2.43	2.49	2.55	2.61
	depreciation	MDL M	0.44	0.61	1.49	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	1.90	1.78	1.78
7	Interest and financial costs	MDL M	0.19	0.17	0.15	0.13	0.11	0.09	0.07	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00
8	Costs of other services and general costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	**Total costs**	**MDL M**	**5.73**	**6.51**	**7.96**	**12.20**	**12.54**	**12.89**	**13.44**	**13.91**	**14.39**	**14.89**	**15.43**	**15.99**	**16.26**	**16.72**	**17.32**
10	**Gross profit**	**MDL M**	0.39	0.41	-0.01	-1.41	-1.10	-1.07	-0.60	-0.16	0.09	0.37	0.39	0.40	0.41	0.42	0.43
11	**Income tax**	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
12	**Net profit**	**MDL M**	0.34	0.36	-0.01	-1.41	-1.10	-1.07	-0.60	-0.16	0.08	0.33	0.34	0.35	0.36	0.37	0.38

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sale of water	MDL M	12.97	13.41	14.00	14.60	15.24	15.91	16.55	17.16	17.79	18.44	19.12	19.83	20.48	21.14	21.83
2	Sale of wastewater	MDL M	5.43	5.53	5.66	5.79	5.92	6.06	6.19	6.29	6.41	6.54	6.68	6.82	6.95	7.09	7.23
3	Other revenues	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	**Total revenues**	**MDL M**	**18.39**	**18.95**	**19.65**	**20.39**	**21.16**	**21.98**	**22.74**	**23.45**	**24.20**	**24.98**	**25.80**	**26.65**	**27.43**	**28.23**	**29.06**
5	Costs of water services	MDL M	12.65	13.09	13.65	14.25	14.87	15.52	16.15	16.74	17.36	17.99	18.66	19.35	19.98	20.63	21.30
	variable costs	MDL M	5.86	6.10	6.46	6.85	7.25	7.68	8.13	8.54	8.98	9.42	9.89	10.39	10.81	11.25	11.71
	fixed costs	MDL M	6.40	6.60	6.80	7.01	7.23	7.45	7.62	7.80	7.99	8.18	8.37	8.57	8.77	8.98	9.20
	depreciation	MDL M	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
6	Costs of wastewater services	MDL M	5.29	5.40	5.52	5.64	5.78	5.92	6.04	6.14	6.25	6.38	6.51	6.65	6.78	6.92	7.05
	variable costs	MDL M	0.84	0.87	0.92	0.98	1.04	1.10	1.16	1.22	1.28	1.34	1.41	1.48	1.54	1.60	1.66
	fixed costs	MDL M	2.68	2.75	2.82	2.89	2.96	3.04	3.10	3.16	3.23	3.29	3.36	3.43	3.50	3.57	3.65
	depreciation	MDL M	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.75	1.74	1.74	1.74	1.74	1.74	1.74	1.74
7	Interest and financial costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Costs of other services and general costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	**Total costs**	**MDL M**	**17.94**	**18.48**	**19.17**	**19.89**	**20.65**	**21.44**	**22.19**	**22.88**	**23.61**	**24.37**	**25.17**	**26.00**	**26.76**	**27.54**	**28.35**
10	**Gross profit**	**MDL M**	0.45	0.46	0.48	0.50	0.52	0.54	0.55	0.57	0.59	0.61	0.63	0.65	0.67	0.69	0.71
11	**Income tax**	MDL M	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
12	**Net profit**	**MDL M**	0.39	0.41	0.42	0.44	0.45	0.47	0.49	0.50	0.52	0.54	0.55	0.57	0.59	0.61	0.62

Table 6-15: Profits and losses - without project

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Sale of water	MDL M	4.52	5.05	5.40	7.61	8.08	8.27	8.29	8.77	9.41	7.96	8.40	8.85	9.30	9.76	10.25
2	Sale of wastewater	MDL M	1.60	1.88	2.56	2.72	2.88	3.04	2.91	1.84	1.91	1.98	2.06	2.15	2.25	2.34	2.45
3	Other revenues	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	**Total revenues**	**MDL M**	**6.12**	**6.93**	**7.96**	**10.33**	**10.96**	**11.31**	**11.20**	**10.61**	**11.32**	**9.94**	**10.46**	**11.00**	**11.54**	**12.11**	**12.70**
5	Costs of water services	MDL M	4.17	4.69	4.94	5.67	5.96	6.24	6.60	6.97	7.36	7.77	8.19	8.63	9.07	9.52	10.00
	variable costs	MDL M	1.50	1.98	2.13	2.78	2.97	3.17	3.42	3.70	3.98	4.27	4.58	4.90	5.22	5.54	5.88
	fixed costs	MDL M	2.27	2.32	2.41	2.50	2.59	2.69	2.78	2.89	2.99	3.10	3.22	3.34	3.46	3.59	3.72
	depreciation	MDL M	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
6	Costs of wastewater services	MDL M	1.38	1.43	1.48	1.53	1.57	1.62	1.71	1.78	1.85	1.93	2.01	2.10	2.19	2.29	2.39
	variable costs	MDL M	0.13	0.17	0.18	0.19	0.21	0.22	0.27	0.30	0.33	0.37	0.41	0.45	0.50	0.55	0.60
	fixed costs	MDL M	0.81	0.83	0.86	0.90	0.93	0.97	1.00	1.04	1.08	1.12	1.17	1.21	1.26	1.31	1.36
	depreciation	MDL M	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
7	Interest and financial costs	MDL M	0.19	0.17	0.15	0.13	0.11	0.09	0.07	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00
8	Costs of other services and general costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	**Total costs**	**MDL M**	**5.74**	**6.30**	**6.57**	**7.33**	**7.64**	**7.95**	**8.37**	**8.80**	**9.24**	**9.70**	**10.20**	**10.73**	**11.26**	**11.81**	**12.39**
10	**Gross profit**	**MDL M**	0.38	0.63	1.39	3.00	3.32	3.36	2.83	1.81	2.08	0.24	0.26	0.27	0.28	0.30	0.31
11	**Income tax**	MDL M	0.0	0.1	0.2	0.4	0.4	0.4	0.3	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
12	**Net profit**	**MDL M**	0.34	0.55	1.23	2.64	2.92	2.95	2.49	1.60	1.83	0.21	0.22	0.24	0.25	0.26	0.27

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sale of water	MDL M	10.75	11.19	11.77	12.38	13.02	13.70	14.37	15.01	15.67	16.36	17.08	17.84	18.53	19.24	19.98
2	Sale of wastewater	MDL M	2.56	2.66	2.77	2.89	3.02	3.16	3.28	3.41	3.54	3.68	3.82	3.98	4.13	4.28	4.44
3	Other revenues	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	**Total revenues**	**MDL M**	**13.31**	**13.84**	**14.54**	**15.27**	**16.04**	**16.86**	**17.66**	**18.42**	**19.21**	**20.04**	**20.91**	**21.82**	**22.66**	**23.53**	**24.43**
5	Costs of water services	MDL M	10.49	10.91	11.48	12.08	12.70	13.37	14.02	14.64	15.29	15.96	16.67	17.40	18.08	18.77	19.50
	variable costs	MDL M	6.23	6.51	6.93	7.37	7.83	8.32	8.85	9.33	9.83	10.36	10.92	11.50	12.02	12.55	13.11
	fixed costs	MDL M	3.86	4.01	4.16	4.32	4.48	4.65	4.78	4.92	5.06	5.20	5.35	5.51	5.67	5.83	6.00
	depreciation	MDL M	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
6	Costs of wastewater services	MDL M	2.50	2.59	2.70	2.82	2.95	3.08	3.20	3.33	3.45	3.59	3.73	3.88	4.03	4.18	4.34
	variable costs	MDL M	0.65	0.69	0.75	0.81	0.87	0.94	1.01	1.08	1.16	1.24	1.33	1.42	1.50	1.59	1.69
	fixed costs	MDL M	1.41	1.46	1.52	1.58	1.64	1.70	1.75	1.81	1.86	1.91	1.97	2.03	2.09	2.15	2.21
	depreciation	MDL M	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
7	Interest and financial costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Costs of other services and general costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	**Total costs**	**MDL M**	**12.99**	**13.51**	**14.18**	**14.90**	**15.65**	**16.45**	**17.22**	**17.97**	**18.74**	**19.55**	**20.40**	**21.28**	**22.10**	**22.95**	**23.83**
10	**Gross profit**	**MDL M**	0.32	0.34	0.35	0.37	0.39	0.41	0.43	0.45	0.47	0.49	0.51	0.53	0.55	0.57	0.60
11	**Income tax**	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
12	**Net profit**	**MDL M**	0.29	0.30	0.31	0.33	0.34	0.36	0.38	0.40	0.41	0.43	0.45	0.47	0.49	0.50	0.52

Table 6-16: Working Capital - with project

			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	**Current assets**	**MDL M**	**2.70**	**0.60**	**0.66**	**0.75**	**1.15**	**1.21**	**1.25**	**1.34**	**1.42**	**1.49**	**1.56**	**1.62**	**1.67**	**1.70**	**1.75**	**1.81**
1	Inventories	MDL M	1.40	0.09	0.10	0.10	0.27	0.27	0.28	0.29	0.29	0.30	0.31	0.32	0.32	0.33	0.34	0.35
2	Accounts receivable	MDL M	1.29	0.50	0.57	0.65	0.89	0.94	0.97	1.06	1.13	1.19	1.25	1.30	1.35	1.37	1.41	1.46
	Increase in current assets	MDL M		-2.10	0.07	0.09	0.40	0.06	0.04	0.09	0.08	0.07	0.07	0.05	0.06	0.03	0.05	0.06
B	**Current liabilities**	**MDL M**	**2.45**	**0.53**	**0.58**	**0.64**	**0.93**	**0.97**	**1.00**	**1.05**	**1.10**	**1.14**	**1.19**	**1.24**	**1.30**	**1.35**	**1.41**	**1.46**
1	Liabilities to suppliers	MDL M	1.80	0.40	0.45	0.50	0.79	0.82	0.85	0.89	0.93	0.97	1.01	1.06	1.10	1.15	1.20	1.25
2	Liabilities to employees	MDL M	0.65	0.13	0.13	0.14	0.14	0.15	0.15	0.16	0.17	0.17	0.18	0.19	0.19	0.20	0.21	0.22
3	Increase in current liabilities	MDL M		-1.92	0.05	0.05	0.30	0.03	0.03	0.05	0.04	0.05	0.05	0.05	0.05	0.05	0.06	0.06

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Current assets**	**MDL M**	**1.87**	**1.93**	**1.99**	**2.07**	**2.14**	**2.22**	**2.29**	**2.35**	**2.42**	**2.50**	**2.57**	**2.65**	**2.73**	**2.80**	**2.88**
1	Inventories	MDL M	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.44	0.45	0.46	0.47	0.48	0.49
2	Accounts receivable	MDL M	1.51	1.56	1.62	1.68	1.74	1.81	1.87	1.93	1.99	2.05	2.12	2.19	2.25	2.32	2.39
	Increase in current assets	MDL M	0.06	0.05	0.07	0.07	0.07	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.07	0.08	0.08
B	**Current liabilities**	**MDL M**	**1.52**	**1.58**	**1.64**	**1.71**	**1.79**	**1.86**	**1.93**	**2.00**	**2.07**	**2.14**	**2.21**	**2.29**	**2.36**	**2.44**	**2.52**
1	Liabilities to suppliers	MDL M	1.30	1.34	1.40	1.46	1.52	1.58	1.65	1.70	1.76	1.83	1.89	1.96	2.02	2.09	2.15
2	Liabilities to employees	MDL M	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36
3	Increase in current liabilities	MDL M	0.06	0.05	0.07	0.07	0.07	0.08	0.07	0.07	0.07	0.07	0.07	0.08	0.07	0.07	0.08

Table 6-17: Working Capital - without project

			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	**Current assets**	**MDL M**	**2.70**	**0.60**	**0.66**	**0.75**	**0.95**	**1.01**	**1.04**	**1.03**	**0.99**	**1.05**	**0.94**	**0.99**	**1.04**	**1.09**	**1.14**	**1.19**
1	Inventories	MDL M	1.40	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.14	0.14	0.15
2	Accounts receivable	MDL M	1.29	0.50	0.57	0.65	0.85	0.90	0.93	0.92	0.87	0.93	0.82	0.86	0.90	0.95	1.00	1.04
	Increase in current assets	MDL M		-2.10	0.07	0.09	0.20	0.06	0.03	-0.01	-0.04	0.06	-0.11	0.05	0.05	0.05	0.05	0.05
B	**Current liabilities**	**MDL M**	**2.45**	**0.53**	**0.58**	**0.61**	**0.68**	**0.71**	**0.74**	**0.78**	**0.82**	**0.86**	**0.91**	**0.96**	**1.01**	**1.06**	**1.11**	**1.17**
1	Liabilities to suppliers	MDL M	1.80	0.40	0.45	0.47	0.53	0.56	0.59	0.62	0.65	0.69	0.73	0.77	0.81	0.86	0.90	0.95
2	Liabilities to employees	MDL M	0.65	0.13	0.13	0.14	0.14	0.15	0.15	0.16	0.17	0.17	0.18	0.19	0.19	0.20	0.21	0.22
3	Increase in current liabilities	MDL M		-1.92	0.05	0.03	0.07	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.06

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Current assets**	**MDL M**	**1.25**	**1.29**	**1.36**	**1.42**	**1.49**	**1.57**	**1.64**	**1.70**	**1.77**	**1.85**	**1.92**	**2.00**	**2.08**	**2.16**	**2.24**
1	Inventories	MDL M	0.15	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20	0.21	0.21	0.22	0.22	0.23
2	Accounts receivable	MDL M	1.09	1.14	1.19	1.26	1.32	1.39	1.45	1.51	1.58	1.65	1.72	1.79	1.86	1.93	2.01
	Increase in current assets	MDL M	0.06	0.05	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.07	0.08	0.08
B	**Current liabilities**	**MDL M**	**1.23**	**1.28**	**1.34**	**1.41**	**1.48**	**1.56**	**1.63**	**1.70**	**1.78**	**1.85**	**1.93**	**2.01**	**2.09**	**2.17**	**2.25**
1	Liabilities to suppliers	MDL M	1.00	1.04	1.10	1.16	1.22	1.28	1.35	1.41	1.47	1.54	1.61	1.68	1.75	1.82	1.89
2	Liabilities to employees	MDL M	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36
3	Increase in current liabilities	MDL M	0.06	0.05	0.07	0.07	0.07	0.08	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08

Table 6-18: Balance sheet - with project

			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	**Assets**	**MDL M**	**55.71**	**59.06**	**89.83**	**113.87**	**111.33**	**108.84**	**106.38**	**104.41**	**102.86**	**101.56**	**101.86**	**102.25**	**102.66**	**103.07**	**103.49**	**103.93**
1	Fixed assets	MDL M	52.84	58.36	89.13	112.67	110.08	107.49	104.91	102.32	99.73	97.15	94.56	91.97	89.39	87.09	84.92	82.75
2	Current assets	MDL M	2.87	0.70	0.70	1.20	1.25	1.35	1.48	2.08	3.13	4.41	7.30	10.28	13.27	15.98	18.57	21.18
3	Inventories	MDL M	1.40	0.09	0.10	0.10	0.27	0.27	0.28	0.29	0.29	0.30	0.31	0.32	0.32	0.33	0.34	0.35
4	Short-term receivables	MDL M	1.29	0.50	0.57	0.65	0.89	0.94	0.97	1.06	1.13	1.19	1.25	1.30	1.35	1.37	1.41	1.46
5	Cash and other financial assets	MDL M	0.16	0.09	0.02	0.44	0.08	0.12	0.21	0.73	1.69	2.91	5.72	8.65	11.58	14.26	16.81	19.36
6	Other current assets	MDL M	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
B	**Liabilities**	**MDL M**	**55.71**	**59.06**	**89.83**	**113.87**	**111.33**	**108.84**	**106.38**	**104.41**	**102.87**	**101.56**	**101.86**	**102.25**	**102.66**	**103.07**	**103.49**	**103.93**
1	Equity capital	MDL M	10.39	10.73	11.10	11.09	9.68	8.58	7.51	6.91	6.75	6.83	7.15	7.49	7.84	8.20	8.57	8.95
2	Long-term liabilities	MDL M	42.87	41.45	40.02	38.60	37.17	35.75	34.32	32.90	31.47	30.05	29.97	29.97	29.97	29.97	29.97	29.97
3	Long-term loan	MDL M	0.00	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-0.08	0.00	0.00	0.00	0.00	0.00
4	Short-term liabilities	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Short-term loan	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Current liabilities to suppliers	MDL M	1.80	0.40	0.45	0.50	0.79	0.82	0.85	0.89	0.93	0.97	1.01	1.06	1.10	1.15	1.20	1.25
7	Current liabilities	MDL M	0.65	0.13	0.13	0.14	0.14	0.15	0.15	0.16	0.17	0.17	0.18	0.19	0.19	0.20	0.21	0.22
8	Accruals	MDL M	0.00	6.35	38.13	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Assets**	**MDL M**	**104.39**	**104.85**	**105.33**	**105.84**	**106.37**	**106.91**	**107.47**	**108.04**	**108.63**	**109.24**	**109.87**	**110.52**	**111.18**	**111.86**	**112.56**
1	Fixed assets	MDL M	80.58	78.41	76.24	74.07	71.90	69.72	67.55	65.41	63.27	61.13	58.99	56.86	54.72	52.58	50.44
2	Current assets	MDL M	23.81	26.44	29.10	31.77	34.47	37.19	39.92	42.64	45.36	48.11	50.88	53.66	56.46	59.28	62.12
3	Inventories	MDL M	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.44	0.45	0.46	0.47	0.48	0.49
4	Short-term receivables	MDL M	1.51	1.56	1.62	1.68	1.74	1.81	1.87	1.93	1.99	2.05	2.12	2.19	2.25	2.32	2.39
5	Cash and other financial assets	MDL M	21.92	24.50	27.09	29.70	32.32	34.96	37.62	40.27	42.93	45.60	48.29	51.00	53.72	56.46	59.22
6	Other current assets	MDL M	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
B	**Liabilities**	**MDL M**	**104.39**	**104.85**	**105.33**	**105.84**	**106.37**	**106.92**	**107.47**	**108.04**	**108.63**	**109.24**	**109.87**	**110.52**	**111.18**	**111.86**	**112.56**
1	Equity capital	MDL M	9.35	9.75	10.17	10.61	11.07	11.54	12.03	12.53	13.05	13.59	14.14	14.71	15.30	15.91	16.53
2	Long-term liabilities	MDL M	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97
3	Long-term loan	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Short-term liabilities	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Short-term loan	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Current liabilities to suppliers	MDL M	1.30	1.34	1.40	1.46	1.52	1.58	1.65	1.70	1.76	1.83	1.89	1.96	2.02	2.09	2.15
7	Current liabilities	MDL M	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36
8	Accruals	MDL M	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54	63.54

Table 6-19: Balance sheet - without project

			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	**Assets**	**MDL M**	**55.71**	**52.70**	**51.88**	**51.71**	**52.99**	**54.52**	**56.08**	**57.18**	**57.40**	**57.84**	**58.02**	**58.30**	**58.58**	**58.88**	**59.20**	**59.53**
1	Fixed assets	MDL M	52.84	52.01	51.18	50.35	49.52	48.69	47.87	47.04	46.21	45.38	44.55	43.72	42.89	42.06	41.23	40.41
2	Current assets	MDL M	2.87	0.69	0.70	1.36	3.47	5.83	8.22	10.15	11.19	12.46	13.47	14.58	15.69	16.82	17.96	19.12
3	Inventories	MDL M	1.40	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.14	0.14	0.15
4	Short-term receivables	MDL M	1.29	0.50	0.57	0.65	0.85	0.90	0.93	0.92	0.87	0.93	0.82	0.86	0.90	0.95	1.00	1.04
5	Cash and other financial assets	MDL M	0.16	0.08	0.02	0.59	2.51	4.81	7.16	9.10	10.19	11.40	12.52	13.58	14.64	15.72	16.81	17.92
6	Other current assets	MDL M	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
B	**Liabilities**	**MDL M**	**55.71**	**52.70**	**51.88**	**51.71**	**52.99**	**54.52**	**56.08**	**57.18**	**57.40**	**57.84**	**58.03**	**58.30**	**58.59**	**58.88**	**59.20**	**59.53**
1	Equity capital	MDL M	10.39	10.72	11.28	12.50	15.14	18.07	21.02	23.50	25.10	26.93	27.14	27.37	27.61	27.85	28.11	28.39
2	Long-term liabilities	MDL M	42.87	41.45	40.02	38.60	37.17	35.75	34.32	32.90	31.47	30.05	29.97	29.97	29.97	29.97	29.97	29.97
3	Long-term loan	MDL M	0.00	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-0.08	0.00	0.00	0.00	0.00	0.00
4	Short-term liabilities	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Short-term loan	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Current liabilities to suppliers	MDL M	1.80	0.40	0.45	0.47	0.53	0.56	0.59	0.62	0.65	0.69	0.73	0.77	0.81	0.86	0.90	0.95
7	Current liabilities	MDL M	0.65	0.13	0.13	0.14	0.14	0.15	0.15	0.16	0.17	0.17	0.18	0.19	0.19	0.20	0.21	0.22
8	Accruals	MDL M	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Assets**	**MDL M**	**59.87**	**60.22**	**60.60**	**60.99**	**61.41**	**61.85**	**62.30**	**62.76**	**63.25**	**63.75**	**64.28**	**64.83**	**65.39**	**65.98**	**66.59**
1	Fixed assets	MDL M	39.58	38.75	37.92	37.09	36.26	35.43	34.60	33.77	32.95	32.12	31.29	30.46	29.63	28.80	27.97
2	Current assets	MDL M	20.29	21.47	22.68	23.90	25.15	26.41	27.69	28.99	30.30	31.64	32.99	34.37	35.76	37.18	38.61
3	Inventories	MDL M	0.15	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20	0.21	0.21	0.22	0.22	0.23
4	Short-term receivables	MDL M	1.09	1.14	1.19	1.26	1.32	1.39	1.45	1.51	1.58	1.65	1.72	1.79	1.86	1.93	2.01
5	Cash and other financial assets	MDL M	19.03	20.16	21.31	22.47	23.64	24.84	26.05	27.27	28.51	29.78	31.06	32.36	33.67	35.01	36.36
6	Other current assets	MDL M	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
B	**Liabilities**	**MDL M**	**59.87**	**60.22**	**60.60**	**60.99**	**61.41**	**61.85**	**62.30**	**62.76**	**63.25**	**63.75**	**64.28**	**64.83**	**65.40**	**65.98**	**66.59**
1	Equity capital	MDL M	28.67	28.97	29.28	29.61	29.95	30.31	30.69	31.09	31.50	31.93	32.38	32.85	33.33	33.84	34.36
2	Long-term liabilities	MDL M	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97
3	Long-term loan	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Short-term liabilities	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Short-term loan	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Current liabilities to suppliers	MDL M	1.00	1.04	1.10	1.16	1.22	1.28	1.35	1.41	1.47	1.54	1.61	1.68	1.75	1.82	1.89
7	Current liabilities	MDL M	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36
8	Accruals	MDL M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6-20: Cash flow - with project

			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	**Financial inflows**	**MDL M**		**10.55**	**38.75**	**33.43**	**11.08**	**11.48**	**11.85**	**12.89**	**13.79**	**14.52**	**15.31**	**15.86**	**16.44**	**16.72**	**17.19**	**17.81**
1	Loan disbursement	MDL M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Donor contribution (capital grant)	MDL M		5.13	25.64	20.51	0.00	0.00										
3	Own contribution	MDL M		1.23	6.13	4.91	0.00	0.00										
4	Revenues from sale	MDL M		6.12	6.93	7.96	10.79	11.44	11.82	12.84	13.75	14.47	15.26	15.81	16.39	16.67	17.14	17.75
5	Increase in current liabilities	MDL M		-1.92	0.05	0.05	0.30	0.03	0.03	0.05	0.04	0.05	0.05	0.05	0.05	0.05	0.06	0.06
B	**Financial outflows**	**MDL M**		**10.63**	**38.82**	**33.01**	**11.44**	**11.44**	**11.76**	**12.37**	**12.83**	**13.30**	**12.49**	**12.94**	**13.51**	**14.05**	**14.65**	**15.26**
1	Investment costs	MDL M		6.35	31.77	25.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Costs of providing services	MDL M		4.90	5.51	6.08	9.61	9.95	10.30	10.86	11.32	11.80	12.30	12.84	13.40	13.97	14.55	15.15
3	Long term loan repayment	MDL M		1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	0.08	0.00	0.00	0.00	0.00	0.00
4	Increase in current assets	MDL M		-2.10	0.07	0.09	0.40	0.06	0.04	0.09	0.08	0.07	0.07	0.05	0.06	0.03	0.05	0.06
5	Income tax	MDL M		0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.05	0.05	0.05	0.05	0.05
C	Net cash flow (inflow - outflow)	**MDL M**		-0.08	-0.07	0.42	-0.35	0.04	0.09	0.52	0.96	1.22	2.81	2.92	2.94	2.68	2.55	2.55
D	Cumulated cash	**MDL M**	0.16	0.09	0.02	0.44	0.08	0.12	0.21	0.73	1.69	2.91	5.72	8.65	11.58	14.26	16.81	19.36

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Financial inflows**	**MDL M**	**18.45**	**19.00**	**19.72**	**20.46**	**21.24**	**22.05**	**22.81**	**23.52**	**24.27**	**25.06**	**25.87**	**26.73**	**27.50**	**28.31**	**29.14**
1	Loan disbursement	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Donor contribution (capital grant)	MDL M															
3	Own contribution	MDL M															
4	Revenues from sale	MDL M	18.39	18.95	19.65	20.39	21.16	21.98	22.74	23.45	24.20	24.98	25.80	26.65	27.43	28.23	29.06
5	Increase in current liabilities	MDL M	0.06	0.05	0.07	0.07	0.07	0.08	0.07	0.07	0.07	0.07	0.07	0.08	0.07	0.07	0.08
B	**Financial outflows**	**MDL M**	**15.89**	**16.42**	**17.13**	**17.85**	**18.61**	**19.41**	**20.16**	**20.87**	**21.61**	**22.38**	**23.18**	**24.02**	**24.78**	**25.56**	**26.38**
1	Investment costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Costs of providing services	MDL M	15.77	16.31	17.00	17.72	18.48	19.27	20.02	20.73	21.47	22.24	23.03	23.86	24.62	25.41	26.21
3	Long term loan repayment	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Increase in current assets	MDL M	0.06	0.05	0.07	0.07	0.07	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.07	0.08	0.08
5	Income tax	MDL M	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.09
C	Net cash flow (inflow - outflow)	**MDL M**	2.56	2.58	2.59	2.61	2.62	2.64	2.66	2.65	2.66	2.67	2.69	2.71	2.73	2.74	2.76
D	Cumulated cash	**MDL M**	21.92	24.50	27.09	29.70	32.32	34.96	37.62	40.27	42.93	45.60	48.29	51.00	53.72	56.46	59.22

Table 6-21: Cash flow - without project

			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	**Financial inflows**	**MDL M**		**4.20**	**6.98**	**7.99**	**10.40**	**10.99**	**11.34**	**11.24**	**10.65**	**11.36**	**9.99**	**10.51**	**11.05**	**11.59**	**12.16**	**12.75**
1	Loan disbursement	MDL M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Donor contribution (capital grant)	MDL M		0.00	0.00	0.00	0.00	0.00										
3	Own contribution	MDL M		0.00	0.00	0.00	0.00	0.00										
4	Revenues from sale	MDL M		6.12	6.93	7.96	10.33	10.96	11.31	11.20	10.61	11.32	9.94	10.46	11.00	11.54	12.11	12.70
5	Increase in current liabilities	MDL M		-1.92	0.05	0.03	0.07	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.06
B	**Financial outflows**	**MDL M**		**4.28**	**7.04**	**7.42**	**8.48**	**8.69**	**8.98**	**9.30**	**9.56**	**10.14**	**8.87**	**9.45**	**9.98**	**10.51**	**11.07**	**11.65**
1	Investment costs	MDL M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Costs of providing services	MDL M		4.91	5.47	5.74	6.50	6.81	7.12	7.54	7.97	8.41	8.87	9.37	9.90	10.43	10.98	11.56
3	Long term loan repayment	MDL M		1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	0.08	0.00	0.00	0.00	0.00	0.00
4	Increase in current assets	MDL M		-2.10	0.07	0.09	0.20	0.06	0.03	-0.01	-0.04	0.06	-0.11	0.05	0.05	0.05	0.05	0.05
	Income tax			0.05	0.08	0.17	0.36	0.40	0.40	0.34	0.22	0.25	0.03	0.03	0.03	0.03	0.04	0.04
C	**Net cash flow (inflow - outflow)**	**MDL M**		-0.08	-0.06	0.57	1.91	2.30	2.36	1.94	1.09	1.21	1.12	1.06	1.07	1.08	1.09	1.10
D	**Cumulated cash**	**MDL M**	0.16	0.08	0.02	0.59	2.51	4.81	7.16	9.10	10.19	11.40	12.52	13.58	14.64	15.72	16.81	17.92

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Financial inflows**	**MDL M**	**13.37**	**13.90**	**14.60**	**15.34**	**16.12**	**16.93**	**17.73**	**18.48**	**19.28**	**20.12**	**20.99**	**21.90**	**22.73**	**23.61**	**24.51**
1	Loan disbursement	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Donor contribution (capital grant)	MDL M															
3	Own contribution	MDL M															
4	Revenues from sale	MDL M	13.31	13.84	14.54	15.27	16.04	16.86	17.66	18.42	19.21	20.04	20.91	21.82	22.66	23.53	24.43
5	Increase in current liabilities	MDL M	0.06	0.05	0.07	0.07	0.07	0.08	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08
B	**Financial outflows**	**MDL M**	**12.25**	**12.77**	**13.46**	**14.18**	**14.94**	**15.74**	**16.52**	**17.26**	**18.04**	**18.85**	**19.71**	**20.60**	**21.41**	**22.27**	**23.16**
1	Investment costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Costs of providing services	MDL M	12.16	12.68	13.36	14.07	14.82	15.62	16.40	17.14	17.91	18.72	19.57	20.45	21.27	22.12	23.00
3	Long term loan repayment	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Increase in current assets	MDL M	0.06	0.05	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.07	0.08	0.08
	Income tax		0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.07	0.07	0.07
C	**Net cash flow (inflow - outflow)**	**MDL M**	1.12	1.13	1.14	1.16	1.18	1.19	1.21	1.23	1.24	1.26	1.28	1.30	1.32	1.34	1.36
D	**Cumulated cash**	**MDL M**	19.03	20.16	21.31	22.47	23.64	24.84	26.05	27.27	28.51	29.78	31.06	32.36	33.67	35.01	36.36

Table 6-22: Financial analysis on profitability of the investment

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	**Financial inflows**	**MDL M**	**0.00**	**0.00**	**0.02**	**0.69**	**0.49**	**0.51**	**1.65**	**3.14**	**3.16**	**5.32**	**5.36**	**5.39**	**5.13**	**5.03**	**5.06**
1	Incremental revenues from sales	MDL M	0.00	0.00	0.00	0.46	0.48	0.51	1.64	3.14	3.16	5.32	5.36	5.39	5.13	5.03	5.06
2	Incremental increase in current liabilities	MDL M	0.00	0.00	0.02	0.23	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Residual value	MDL M															
B	**Financial outflows**	**MDL M**	**4.25**	**31.88**	**25.85**	**3.51**	**3.21**	**3.22**	**3.40**	**3.44**	**3.46**	**3.50**	**3.52**	**3.56**	**3.57**	**3.61**	**3.65**
1	Investment costs	MDL M	6.35	31.77	25.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Incremental operational costs of providing services	MDL M	-0.01	0.04	0.34	3.11	3.14	3.18	3.31	3.35	3.39	3.43	3.47	3.50	3.53	3.56	3.59
3	Incremental increase in current assets	MDL M	-2.10	0.07	0.09	0.40	0.06	0.04	0.09	0.08	0.07	0.07	0.05	0.06	0.03	0.05	0.06
C	Net cash flow (inflow - outflow)	**MDL M**	-4.25	-31.88	-25.82	-2.82	-2.72	-2.70	-1.75	-0.29	-0.30	1.82	1.84	1.84	1.56	1.42	1.41
D	FNPV(C)	**MDL M**	**-45.86**														
E	FRR(C) - Financial Rate of Return of the Investment	%	**-1%**														

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Financial inflows**	**MDL M**	**5.08**	**5.10**	**5.11**	**5.12**	**5.12**	**5.12**	**5.09**	**5.03**	**4.98**	**4.94**	**4.89**	**4.83**	**4.77**	**4.70**	**27.10**
1	Incremental revenues from sales	MDL M	5.08	5.10	5.11	5.12	5.12	5.12	5.09	5.03	4.99	4.94	4.89	4.83	4.77	4.71	4.63
2	Incremental increase in current liabilities	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
3	Residual value	MDL M															22.47
B	**Financial outflows**	**MDL M**	**3.68**	**3.69**	**3.71**	**3.72**	**3.73**	**3.73**	**3.69**	**3.66**	**3.63**	**3.59**	**3.54**	**3.48**	**3.42**	**3.36**	**3.29**
1	Investment costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Incremental operational costs of providing services	MDL M	3.62	3.63	3.65	3.65	3.65	3.65	3.62	3.59	3.56	3.51	3.46	3.41	3.35	3.28	3.21
3	Incremental increase in current assets	MDL M	0.06	0.05	0.07	0.07	0.07	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.07	0.08	0.08
C	Net cash flow (inflow - outflow)	**MDL M**	1.41	1.41	1.40	1.40	1.39	1.39	1.39	1.37	1.36	1.35	1.35	1.34	1.35	1.34	23.81

Table 6-23: Calculation of NPV on own capital

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	**Financial inflows**	**MDL M**	**5.13**	**25.64**	**20.54**	**0.69**	**0.49**	**0.51**	**1.65**	**3.14**	**3.16**	**5.32**	**5.36**	**5.39**	**5.13**	**5.03**	**5.06**
1	Incremental revenues from sales	MDL M	0.00	0.00	0.00	0.46	0.48	0.51	1.64	3.14	3.16	5.32	5.36	5.39	5.13	5.03	5.06
2	Incremental increase in current liabilities	MDL M	0.00	0.00	0.02	0.23	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Donor contribution (capital grant)	MDL M	5.13	25.64	20.51	0.00	0.00										
4	Residual value	MDL M															
B	**Financial outflows**	**MDL M**	**4.25**	**31.88**	**25.85**	**3.51**	**3.21**	**3.22**	**3.40**	**3.44**	**3.46**	**3.50**	**3.52**	**3.56**	**3.57**	**3.61**	**3.65**
1	Investment costs	MDL M	6.35	31.77	25.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Incremental operational costs of providing services	MDL M	-0.01	0.04	0.34	3.11	3.14	3.18	3.31	3.35	3.39	3.43	3.47	3.50	3.53	3.56	3.59
3	Incremental increase in current assets	MDL M	-2.10	0.07	0.09	0.40	0.06	0.04	0.09	0.08	0.07	0.07	0.05	0.06	0.03	0.05	0.06
C	**Net cash flow (inflow - outflow)**	**MDL M**	0.88	-6.24	-5.31	-2.82	-2.72	-2.70	-1.75	-0.29	-0.30	1.82	1.84	1.84	1.56	1.42	1.41
D	**FNPV(K) - Financial Net Present value of the Capit**	**MDL M**	**0.00**														
E	**FRR(K)- Financial Rate of Return of Capital**	%	**5%**														

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Financial inflows**	**MDL M**	**5.08**	**5.10**	**5.11**	**5.12**	**5.12**	**5.12**	**5.09**	**5.03**	**4.98**	**4.94**	**4.89**	**4.83**	**4.77**	**4.70**	**27.10**
1	Incremental revenues from sales	MDL M	5.08	5.10	5.11	5.12	5.12	5.12	5.09	5.03	4.99	4.94	4.89	4.83	4.77	4.71	4.63
2	Incremental increase in current liabilities	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
3	Donor contribution (capital grant)	MDL M															
4	Residual value	MDL M															22.47
B	**Financial outflows**	**MDL M**	**3.68**	**3.69**	**3.71**	**3.72**	**3.73**	**3.73**	**3.69**	**3.66**	**3.63**	**3.59**	**3.54**	**3.48**	**3.42**	**3.36**	**3.29**
1	Investment costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Incremental operational costs of providing services	MDL M	3.62	3.63	3.65	3.65	3.65	3.65	3.62	3.59	3.56	3.51	3.46	3.41	3.35	3.28	3.21
3	Incremental increase in current assets	MDL M	0.06	0.05	0.07	0.07	0.07	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.07	0.08	0.08
C	**Net cash flow (inflow - outflow)**	**MDL M**	1.41	1.41	1.40	1.40	1.39	1.39	1.39	1.37	1.36	1.35	1.35	1.34	1.35	1.34	23.81

Table 6-24: Economic analysis

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	**Net cash flow (inflow - outflow)**	**MDL M**	**-4.25**	**-31.88**	**-25.82**	**-2.82**	**-2.72**	**-2.70**	**-1.75**	**-0.29**	**-0.30**	**1.82**	**1.84**	**1.84**	**1.56**	**1.42**	**1.41**
1	Social costs	MDL M	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.03
2	Shadow prices - electricity	MDL M	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.03
B	**Social benefits**	**MDL M**	**2.86**	**14.30**	**11.44**	**4.43**	**4.43**	**4.44**	**4.57**	**4.59**	**4.61**	**4.64**	**4.66**	**4.69**	**4.71**	**4.74**	**4.77**
1	Tax correction - VAT	MDL M	1.27	6.35	5.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Social benefits resulting from additional employment	MDL M	1.59	7.94	6.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Shadow price - business	MDL M	0.00	0.00	0.00	0.05	0.06	0.07	0.19	0.21	0.24	0.26	0.29	0.31	0.34	0.37	0.39
4	Benefits of avoiding water related disease	MDL M	0.00	0.00	0.00	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37
C	**Net cash flow (inflow - outflow)**	**MDL M**	-1.39	-17.58	-14.38	1.61	1.72	1.74	2.82	4.30	4.32	6.47	6.51	6.54	6.30	6.18	6.20
D	**ENPV**	**MDL M**	**39.07**														
E	**ERR**	%	**12%**														

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Net cash flow (inflow - outflow)**	**MDL M**	**1.41**	**1.41**	**1.40**	**1.40**	**1.39**	**1.39**	**1.39**	**1.37**	**1.36**	**1.35**	**1.35**	**1.34**	**1.35**	**1.34**	**23.81**
1	Social costs	MDL M	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.08	-0.09	-0.10	-0.10	-0.11
2	Shadow prices - electricity	MDL M	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.08	-0.09	-0.10	-0.10	-0.11
B	**Social benefits**	**MDL M**	**4.80**	**4.79**	**4.79**	**4.79**	**4.78**	**4.78**	**4.78**	**4.77**	**4.77**	**4.76**	**4.76**	**4.76**	**4.75**	**4.75**	**4.74**
1	Tax correction - VAT	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Social benefits resulting from additional employment	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Shadow price - business	MDL M	0.42	0.42	0.42	0.41	0.41	0.41	0.40	0.40	0.39	0.39	0.39	0.38	0.38	0.37	0.37
4	Benefits of avoiding water related disease	MDL M	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37
C	**Net cash flow (inflow - outflow)**	**MDL M**	6.23	6.24	6.23	6.22	6.22	6.22	6.22	6.21	6.19	6.19	6.19	6.19	6.19	6.19	28.66

Table 6-25: Sensitivity analysis

A	**Investment Costs**	**%**	100%	105%	110.00%	115.00%	120.00%	125.00%
1	FNPV(C)	MDL M	-45.86	-46.01	-47.71	-49.40	-51.10	-52.80
2	FRR(C)	%	-1.5%	-1.4%	-1.4%	-1.4%	-1.4%	-1.4%
3	FNPV(K)	MDL M	0.00	0.28	0.56	0.84	1.12	1.40
4	FRR(K)	%	5.0%	5.1%	5.2%	5.3%	5.3%	5.4%
5	Financially sustainable		True	True	True	True	True	True

B	**Real Wage Increase**		Base Case	Base Case	Pessimistic	Optimistic
			1	1	2	3
1	FNPV(C)	MDL M	-45.86	-44.31	-44.31	-44.31
2	FRR(C)	%	-1.5%	-1.47%	-1.47%	-1.47%
3	FNPV(K)	MDL M	0.00	0.00	0.00	0.00
4	FRR(K)	%	5.0%	5.0%	5.0%	5.0%
5	Financially sustainable		True	True	True	True

C	**Real GDP growth**		Base Case	Base Case	Pessimistic	Optimistic
			1	1	2	3
1	FNPV(C)	MDL M	-45.86	-44.31	-43.86	-44.60
2	FRR(C)	%	-1.5%	-1.47%	-1.45%	-1.48%
3	FNPV(K)	MDL M	0.00	0.00	0.45	-0.29
4	FRR(K)	%	5.0%	5.0%	5.2%	4.9%
5	Financially sustainable		True	True	True	True

D	**Costs of electricity**		Base Case	Base Case	Pessimistic	Optimistic
			1	1	2	3
1	FNPV(C)	MDL M	-45.86	-44.31	-44.64	-44.51
2	FRR(C)	%	-1.5%	-1.47%	-1.44%	-1.55%
3	FNPV(K)	MDL M	0.00	0.00	-0.32	-0.19
4	FRR(K)	%	5.0%	5.0%	4.9%	4.9%
5	Financially sustainable		True	True	True	True

Annex 8

Environmental impact assessment and gender aspects

Annex 8: Environmental impact assessment and gender aspects

8.1 Summary for legal framework on SEE and EIA in WSS sector

The Moldovan legal basis for environmental assessment is covered by three main laws. During the process of approximation of Moldovan legislation to the EU acquis, these laws are to be amended and/or adjusted in the near future as follow:

- Law on Environmental Protection with subsequent amendments;
- Law on Ecological Expertise with subsequent amendments;
- Law on Environmental Impact Assessment.

The Law on Environment Protection[1] represents the main legal framework for development of special normative acts and instructions in the field of environment protection in order to ensure a healthy living environment, conservation of the natural environment, ecosystem restoration etc.

The Law on Ecological Expertise[2] describes the concept of the State Ecological Expertise (SEE) which precedes decision-making on activities that may have an adverse impact on the environment. It is compulsory for all economic activities that might have negative impact on environment regardless of their destination, ownership, investments, location, source of financing, etc.

The Law on Environmental Impact Assessment[3] describes procedures and requirements for Environmental Impact Assessment (EIA) on the national level.

As result of feasibility studies, technical designs will be developed, which in the regional and local planning process in the WSS (Water Supply and Sanitation) sector will be subject to SEE and the corresponding documents shall be prepared and submitted to the responsible authorities together with the technical project documentation.

The national authority responsible for SEE in Republic of Moldova is the State Ecological Inspectorate (SIE), which is a subdivision of the Ministry of the Environment (MoE). All legal procedures on State Ecological Expertise System are described in the Chapter II of the Law on Ecological Expertise, while the organization of the SEE is detailed in the Chapter V.

In relation to the national environmental permitting procedure of various project-types and activities, there are the SEE and the EIA. The procedures, requirements and entire EIA process are detailed in the new Law on Environmental Impact Assessment.

In addition, the procedures for conducting SEE are included in the Guidelines on Performing SEE (2002). They define in detail the goals, objectives and principles of the SEE and specify the procedures for submitting project documentation, as well as reviewing procedures.

[1] Law No. 1515 of 16.06.1993 on Environment Protection, published in ”Monitorul Parlamentului” No. 10 of 01.10.1993, Art. 283, last amended by the Parliament Law No. 153 of 30.07.2015.

[2] Law No. 851 of 29.05.1996 on Ecologic Expertise and Environment Impact Assessment, published in ”Monitorul Oficial” No. 52-53 of 08.08.1996, Art. 494, last amended by the Parliament Law No. 153 of 30.07.2015.

[3] Law No. 86 of 29.05.2014 on Environment Impact Assessment, published in ”Monitorul Oficial” No. 174-177 of 04.07.2014, Art. 393. Date of entry into force: 04.01.2015.

Therefore, two project categories can be distinguished on the national level:

- Projects requiring SEE only;
- Projects requiring SEE and EIA.

In conclusion, for all selected CPV (Viable Project Concept) set-up projects as a part of the RSP (Regional Sector Program) in WSS sector, the SEE shall be conducted.

In relation to the national environmental permitting procedure of various project-types and activities, there are the SEE and the EIA. The procedures, requirements and entire EIA process for WSS project activities are detailed in the new Law on Environmental Impact Assessment.

Further, the following categories of planned activities are to be subjected of full scale EIA and for which is needed the environmental impact assessment in WSS sector.

According to the new Law No. 86 on EIA the following water supply facilities are subject to full scale EIA:

- Groundwater abstraction activities or artificial groundwater recharge schemes where the annual volume of water to be abstracted or recharged amounts to 10 million cubic metres or more;
- Deep drilling for water supply drilling (5,000 cubic metres per day and more).

And included in Annex 2:

- Installations of long-distance aqueducts (thoroughfares 5 km long and more);
- Groundwater abstraction and artificial groundwater recharge schemes (not included in Appendix no 1, with an abstraction or recharge capacity of 1 million cubic metres per year and more).

In addition waste-water treatment plants with a capacity exceeding the 150,000 population equivalent are subject to full scale EIA (Annex 1 of the New EIA Law No. 86).

Waste-water treatment plants (not included in Annex no. 1, with a capacity ranging from 50,000 to 150,000 population equivalent) are listed in Annex 2 of the new Law No. 86 and require the identification of the need for the conduct of the environmental impact assessment.

All selected VPCs in the WSS sector need only improvements of existing facilities like network repair and rehabilitation. These types of Projects do not fall into the categories that require the conduct of a full scale EIA according to national Moldovan Legislation. Consequently, this project is not subject to the new Law No. 86 and not requires an EIA evaluation.

In conclusion, the financing of programs and projects is allowed only after a positive SEE decision has been issued and following the IFI / international donor’s requirements.

8.2 Social and gender assessment in Straseni

8.2.1 Methodological approach

The main scope of the study was to assess the social and gender dimensions of the WSS project from the Centre Development Region. The objectives of the study were to

analyse the social and gender situation in Moldova and in the project zone and to develop recommendations for the action plan related to these aspects.

The **main tools** used for the assessment were both qualitative and quantitative data. A desk-based review was used to collect secondary data on various aspects on men and women features at the country as well as at the project area level. Most of the collected data[4] was based on the National Bureau of Statistics and Ministry of Economy documents; administrative data from local public administration from the first and second level, as well as studies and reports written by international organisations.

The approach applied for the current project was developed and tested in a pilot study in the town of Straseni in May 2015 where an assessment of the social and gender aspects was undertaken. Its findings were integrated in the feasibility study of the respective project. Given the scope of the proposed project ("no regrets" measures to improve service provision as part of a medium-term programme) and taking into account that social and gender needs and characteristics do not differ much from a town/project to another, the conclusions reached during the field visit in Straseni are also applied to projects of other rayons/towns of Moldova. The tools applied in the field visit to Straseni were interviews with key stakeholders and focus groups disaggregated by gender with potential beneficiaries. Based on its findings a social and gender action plan was developed.

Focus group participants were selected using the following criteria: gender dimension (men/women), education status (high/low), welfare status (low, medium to high), type of dwelling (individual/apartment), and connection to the water supply system. In the end, four focus groups discussions were conducted: 1) a focus group with women with low welfare status (women with disabilities, unemployed, retired); 2) a focus group with men with low welfare status (men with disabilities, unemployed, retired); 3) a focus group with women with medium to high welfare status; 4) a focus group with men with medium to high welfare status. In total, 28 persons (18 women and 10 men) participated in the focus group discussions.

The key stakeholders who were interviewed were selected based on groups interested in the implementation of the project. In total, seven key stakeholders were interviewed, including: the vice-mayor of Straseni, the town architect of Straseni, the person in charge of attracting investments in Straseni, the director of the district hospital, one businesswoman, the director of the district environmental inspection, and the director of the municipal enterprise, Apa-Canal Straseni.

8.2.2 Beneficiaries, needs and priorities by gender

During the focus group meetings and discussions held in Straseni, it was shown that women and men use water in different ways and for different needs. The use of water depends on the distribution of roles of men and women within households. From the table below, it can be seen that the distribution of household activities (where the water is used) between men and women in the Project area is unequal, as extrapolated from the findings from the focus group meetings.

Table 8-1: Water use by men and women

Household activities where the water is used	Men	Women	Children
Cooking		X	
Washing clothes		X	

[4] All presented data at the national level do not include the rayons from the left side of Dniester River and Bender municipality.

Household activities where the water is used	Men	Women	Children
Washing dishes		X	X
Washing children		X	
Watering crops	X	X	
Cleaning the house		X	X
Watering flowers		X	
Bathing (shower or bath)	X	X	X
Cleaning garden	X	X	
Planting garden	X	X	
Washing car	X		
Washing carpets		X	
Cleaning cesspit	X		
Cleaning animal cages	X	X	
Watering domestic animals		X	X

Thus, from the list of activities shared with the participants in focus group discussions, only a few activities are done mostly by men – washing car and, cleaning the cesspit. More than half of activities are done mostly by women, sometimes with small support from children. Those activities are the following: preparation of meals, washing clothes, washing dishes, washing children, watering flowers, cleaning the house, washing carpets, watering domestic animals. Some of the activities, like watering the crops, cleaning the garden, cleaning the animal cages, planting the garden are shared among men and women. In the households connected to the centralised water system, women are mainly those who clean the water and sanitation facilities. In the households with the outdoor sanitation facilities, roles between men and women are shared. Women usually do the daily cleaning and maintenance of the facilities and the men are responsible for the evacuation of the contents of the septic tank/collectors or of the traditional toilet.

The assessment of beneficiaries' needs and priorities by gender shows that the men and women have different needs and patterns in using the water and sanitation facilities. Therefore, these discrepancies and gaps need to be taken into consideration in the development and implementation of the Project.

The perceptions of men and women regarding the impact of the future project. Both men and women consider that as a result of Project implementation the whole population of the town will benefit. At the local level, the view is that the positive impact of the Project will result in the following:

- More business enterprises will be developed and subsequently more jobs will be created;
- The quality of water and afterwards, people's health will improve;
- The ecological situation will be improved;
- There will be more transparency in the use of water;
- The water and sanitation management will improve;
- The women will have more time to spend with their children and for their personal needs;
- Men will have more time to support their wives in household activities;
- Children will have more time for homework, reading, watching TV, playing games etc.;

- More women will use automatic washing machines and will save their time for other activities.

However, men and women consider that the implementation of the project might cause social problems and social conflicts in communities, like the following:

- Vulnerable groups of the population (pensioners, single women, households with many children, households with persons with disabilities) will still have limited access to water and sanitation system because of lack of money for an individual connection and for paying for services;
- The beneficiaries will not be willing to pay an increased tariff for WSS as they do not understand well the content of the tariff, or the factors that influence the tariff calculations;
- Many households will refuse to be connected to the sanitation system because of the need to pay more for the WSS and of lack of information regarding the positive impact of this project on their health;
- Some of the households will use in parallel the wells and will pay less for sanitation;
- The connection of some enterprises to the sanitation system will raise the cost of final products;
- The treatment plants can be located close to households and the population can suffer from bad smells;
- The streets where mostly the vulnerable groups of population live can be excluded from the project;
- Conflict of interests can arise between the city hall and the construction company, which will cause a substantial increase of the cost of the project;
- The companies will have limited interest in employing local persons during the implementation of the project;
- The staff selection for new WSS management unit could be done in a non-competitive way and qualified persons will have limited opportunities to be employed.

That is why in the elaboration and implementation project process is necessary to take into account the issues mentioned by participants and avoid or prevent the emergence of social disputes.

8.2.3 Social and Gender Action Plan

The Social and Gender Action Plan (SGAP) is based on the summary of findings during the social and gender assessment of the WSS project and provides measures that aim to increase equality in the participation of men and women during all project phases. The following activities are required for the plan:

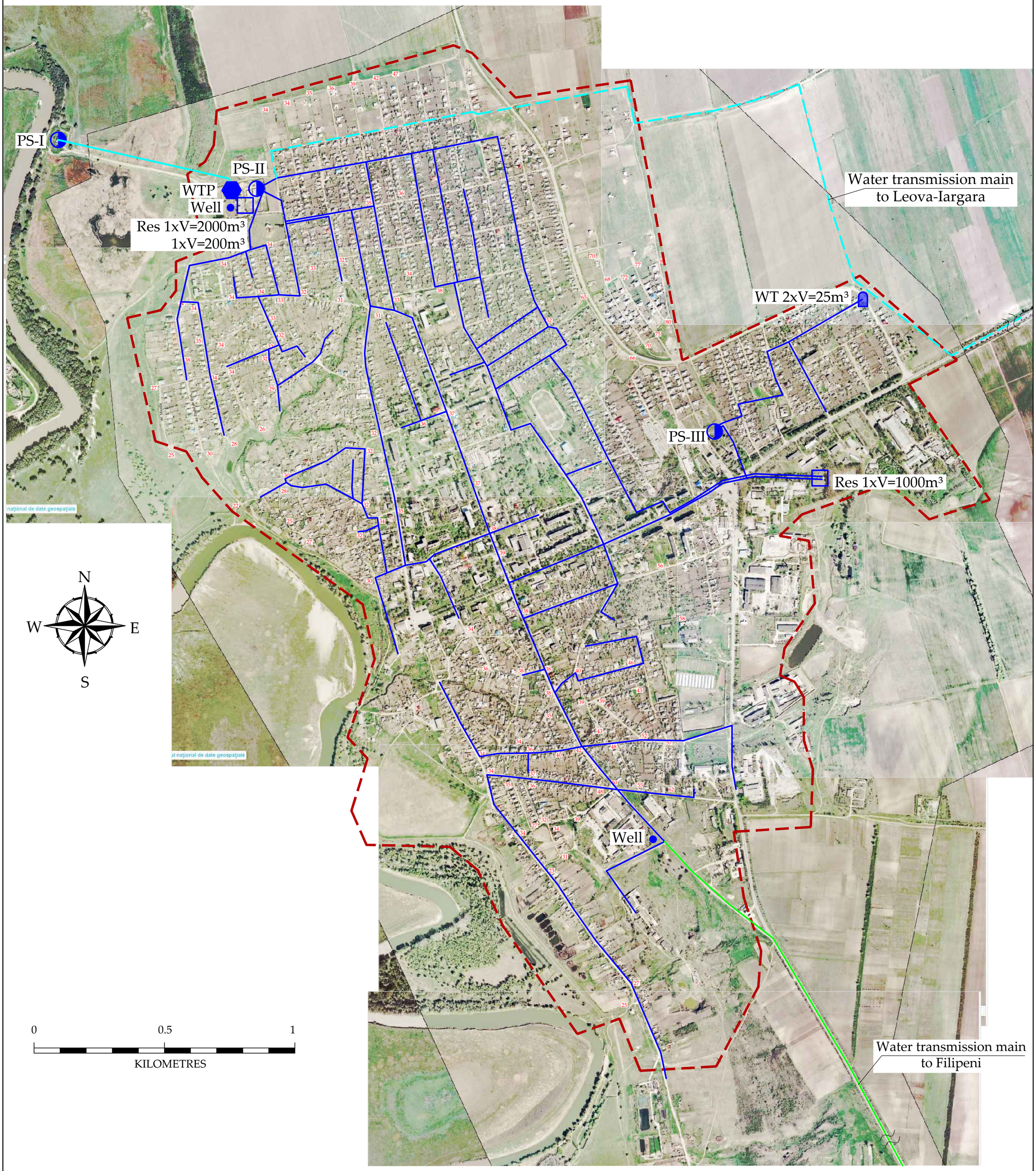
- Information of RDA staff on findings of social and gender assessment and their incorporation in the RDA plan of activities;
- Appointment of a gender focal point at the respective RDA;

- Strengthening the capacities of the RDA staff on integration of social and gender dimensions into the WSS project;
- Incorporation of the findings and recommendations of the social and gender assessment in the ToR of the company performing the detailed designs;
- Consultation of the WSS project technical design separately with women and men, according to their income, disability and age. Women will constitute at least 40% of participants at consultations. Strengthening the capacities of LPAs (rayon councils and local city halls) on the following issues: gender equity, integration of gender dimensions into the project cycle, building an accountable, affordable and qualitative WSS system and communication/information;
- Establishing monitoring committees at the local level and strengthening their capacities in social and gender issues and communication/information. At least 40% of committee members shall be women;
- Provision of information campaigns at the communities' level regarding the WSS project, including the information on SGAP that will be targeted to men/women/persons with disabilities/poor persons. 40% of participants in different communication campaigns will be women;
- Increase the access of vulnerable groups of population to WSS through their involvement at different levels of project preparation and implementation, mobilisation of community support and direct financial support;
- Change the attitudes and behaviours of population regarding the following issues: use of drinkable water for irrigation, using of permeable collectors for wastewater, sustainability of WSS services, etc. At least 40% of participants at those activities must be women.

Annex 11

Conceptual drawings

Existing water supply system in the town of Leova



Legend

Name	Symbol
Boundaries of the town Leova	
Existing water transmission main	
Decommission water transmission main Leova-Iargara	
Existing well	Well
Existing water treatment plant	WTP
Existing water supply reservoir	Res
Existing water pumping station	PS
Existing water tower	WT
Existing water distribution network	

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Modernization of local public services in the Republic of Moldova
-Intervention area 2: Regional Planning and Programming-

Feasibility study for the improvement of sewerage services in the town Leova, Leova raion

Existing water supply system in the town of Leova

Scale:	Drawing No:	Date:	Annex:
1:10 000	1/9	2015.11.18	No.10

Format A2

Under construction water supply system in the Hanasenii Noi village

N

W E

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Legend

Name	Symbol
Boundaries of the village Hanasenii Noi	
Under construction water supply reservoir	Res
Under construction water pumping station	PS
Under construction water distribution network	

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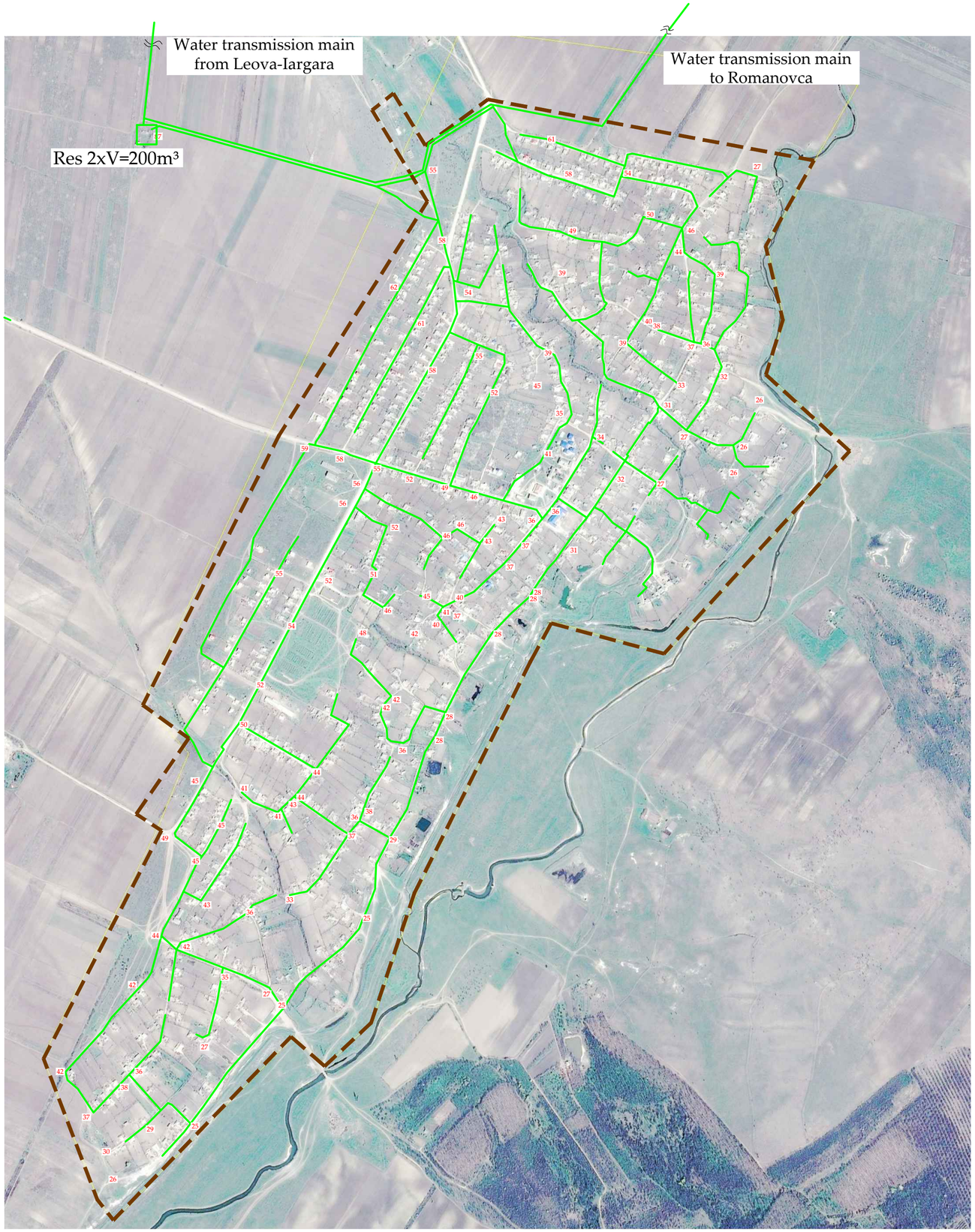
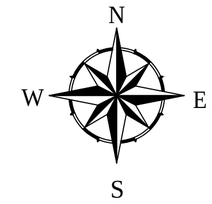
Under construction water supply system in the Hanasenii Noi village

Scale:	Drawing No:	Date:	Annex:
1:10 000	2/9	2015.11.18	No.10

Format A2

Under construction water supply system in the Filipeni village





0 0.5 1

KILOMETRES

Legend

Name	Symbol
Boundaries of the village Hanasenii Noi	
Under construction water supply reservoir	Res
Under construction water distribution network	

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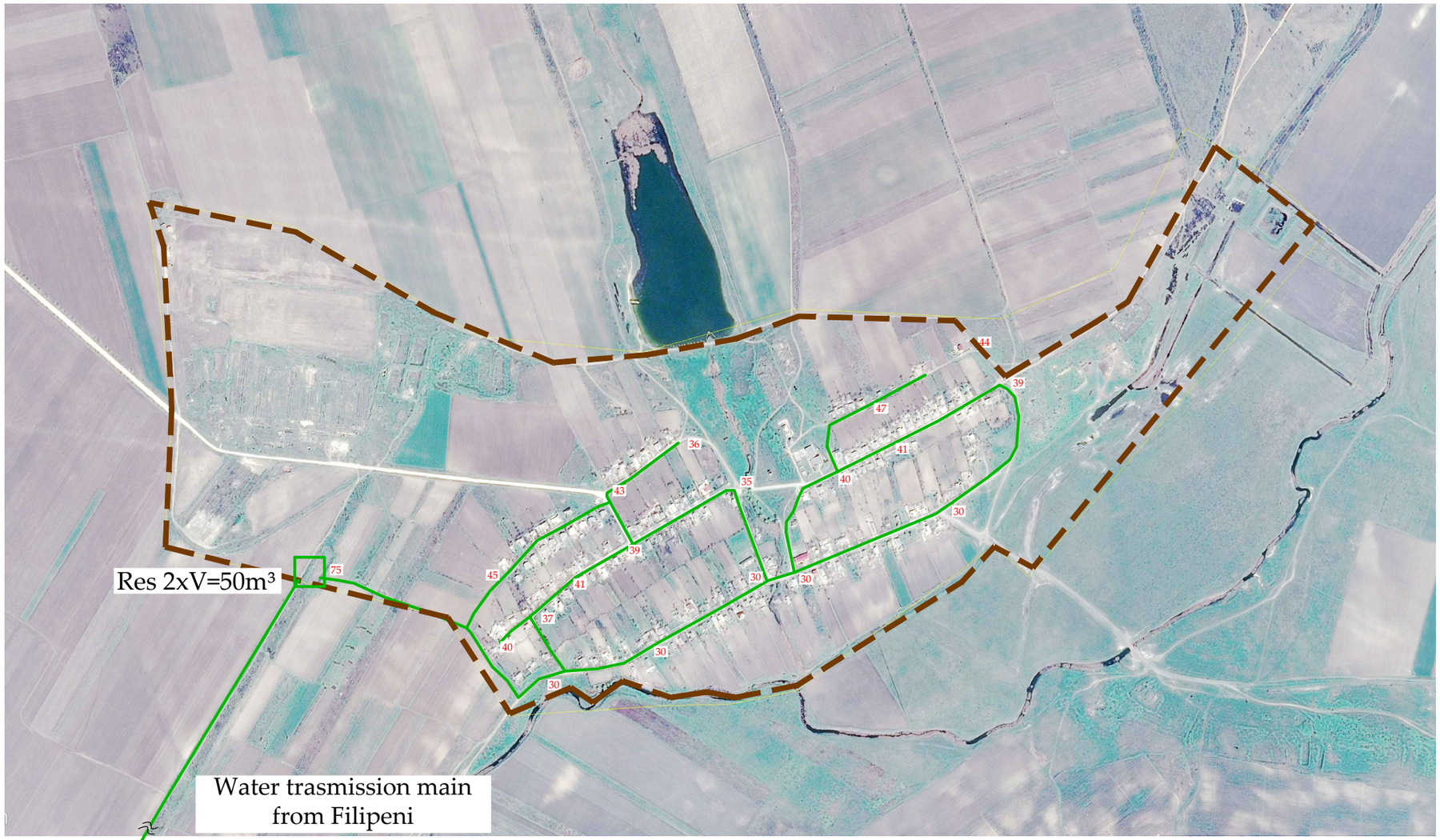
Under construction water supply system in the Filipeni village

Scale:	Drawing No:	Date:	Annex:
1:10 000	3/9	2015.11.18	No.10

Format A2

Under construction water supply system in the Romanovca village



N
W E
S

0 0.5 1

KILOMETRES

Legend

Name	Symbol
Boundaries of the village	
Under construction water supply reservoir	Res
Under construction water distribution network	

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Under construction water supply system in the Romanovca village

Scale:	Drawing No:	Date:	Annex:
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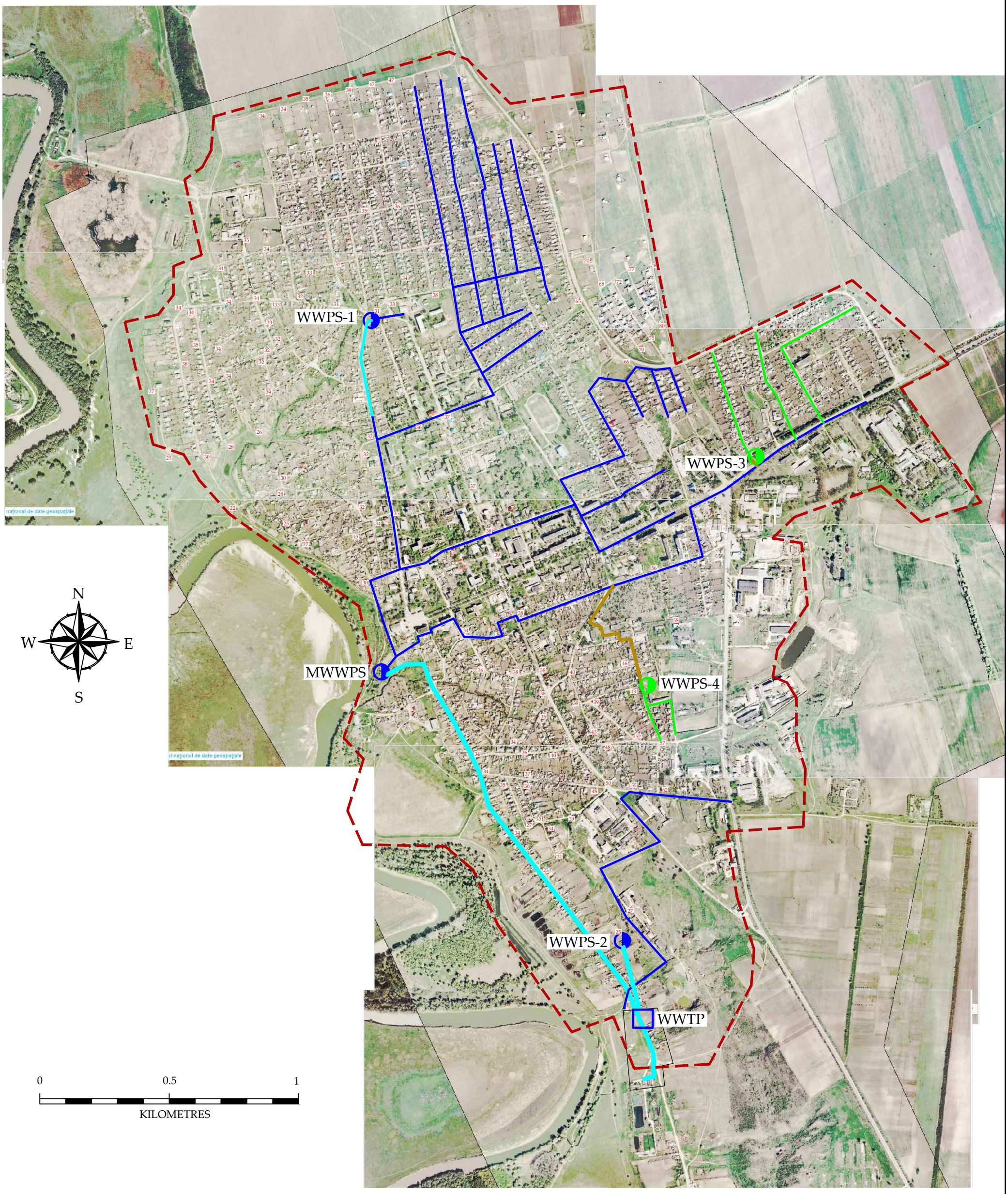
Format A3

Existing sewerage system in the town of Leova



N
W E
S

0 0.5 1
KILOMETRES

Legend

Name	Symbol
Boundaries of the town Leova	
Existing wastewater treatment plant	WWTP
Existing wastewater pumping station	WWPS
Existing sewerage network	
Existing pressure sewerage network	
Under construction wastewater pumping station	WWPS
Under construction sewerage network	
Under construction pressure sewerage network	

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-Intervention area 2: Regional Planning and Programming-

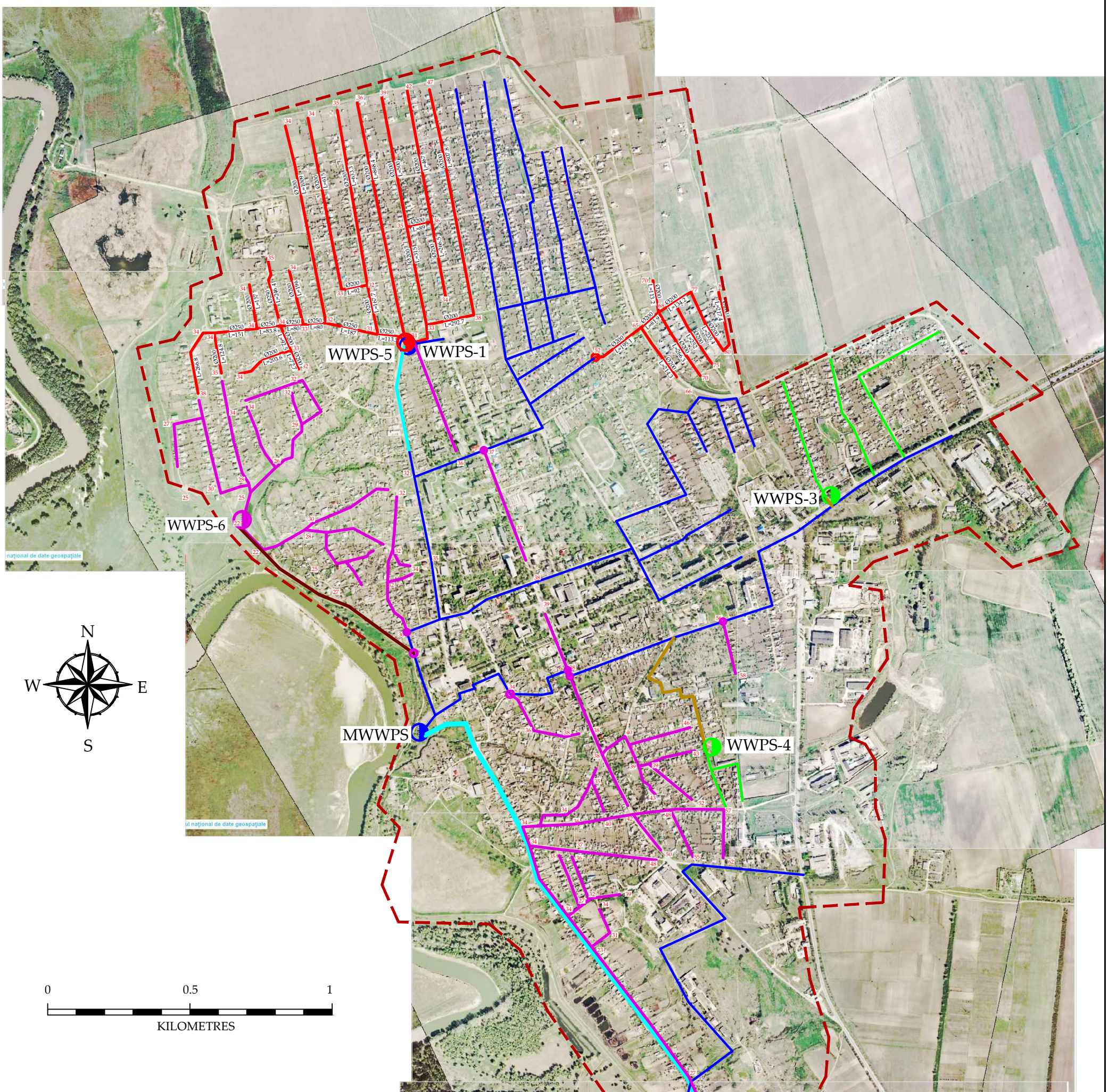
Feasibility study for the improvement of sewerage services in the town Leova, Leova raion

Existing sewerage system in the town of Leova

Scale:	Drawing No:	Date:	Annex:
1:10 000	5/9	2015.11.18	No.10

Format A2

Existing and proposed sewerage system in the town of Leova



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KILOMETRES

Legend

Name	Symbol
Boundaries of the town Leova	
Existing wastewater treatment plant	WWTP
Existing wastewater pumping station	WWPS
Existing sewerage network	
Existing pressure sewerage network	
Under construction wastewater pumping station	WWPS
Under construction sewerage network	
Under construction pressure sewerage network	
Point of connection	
Extension of sewerage network , Phase I	
Extension of pressure sewerage network , Phase I	
Proposed wastewater pumping station, Phase I	WWPS
Rehabilitation wastewater treatment plant, Phase II	WWTP
Extension of sewerage network, Phase II	
Extension of pressure sewerage network , Phase II	
Proposed wastewater pumping station, Phase II	WWPS

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-Intervention area 2: Regional Planning and Programming-

Feasibility study for the improvement of sewerage services in the town Leova, Leova raion

Existing and proposed sewerage system in the town of Leova

Scale:	Drawing No:	Date:	Annex:
1:10 000	6/9	2015.11.18	No.10

Format A2

Proposed sewerage system in the Hanasenii Noi village

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KILOMETRES

Legend

Name	Symbol
Boundaries of the village	
Proposed wastewater treatment plant, Phase II	WWTP
Proposed wastewater pumping station, Phase II	WWPS
Construction of sewerage network, Phase II	
Construction of pressure sewerage network , Phase II	

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-Intervention area 2: Regional Planning and Programming-

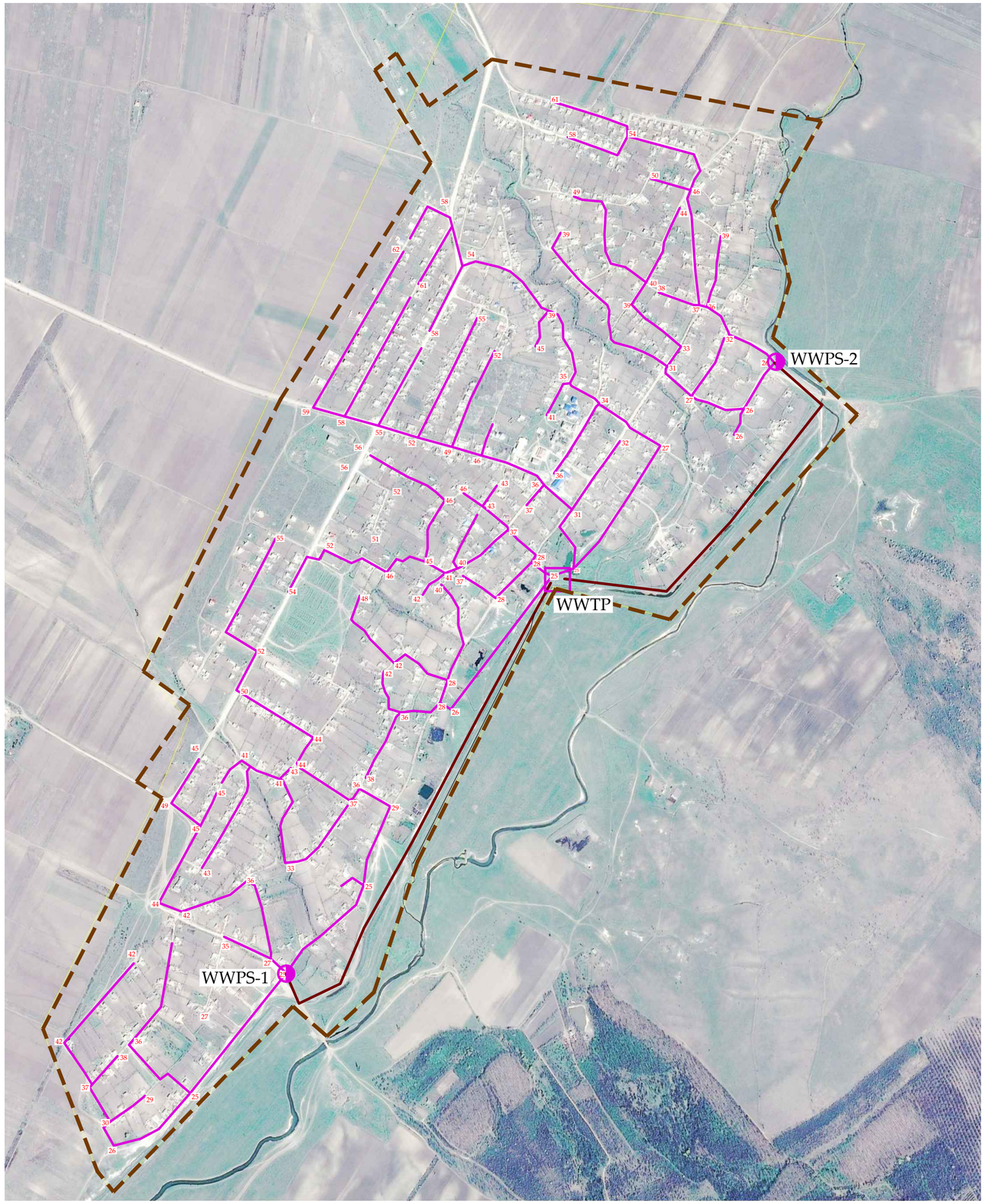
Feasibility study for the improvement of sewerage services in the town Leova, Leova raion

Proposed sewerage system in the Hanasenii Noi village

Scale:	Drawing No:	Date:	Annex:
1:10 000	7/9	2015.11.18	No.10

Format A2

Proposed sewerage system in the Filipeni village



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KILOMETRES

Legend

Name	Symbol
Boundaries of the village	
Proposed wastewater treatment plant, Phase II	WWTP
Proposed wastewater pumping station, Phase II	WWPS
Construction of sewerage network, Phase II	
Construction of pressure sewerage network , Phase II	

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-Intervention area 2: Regional Planning and Programming-

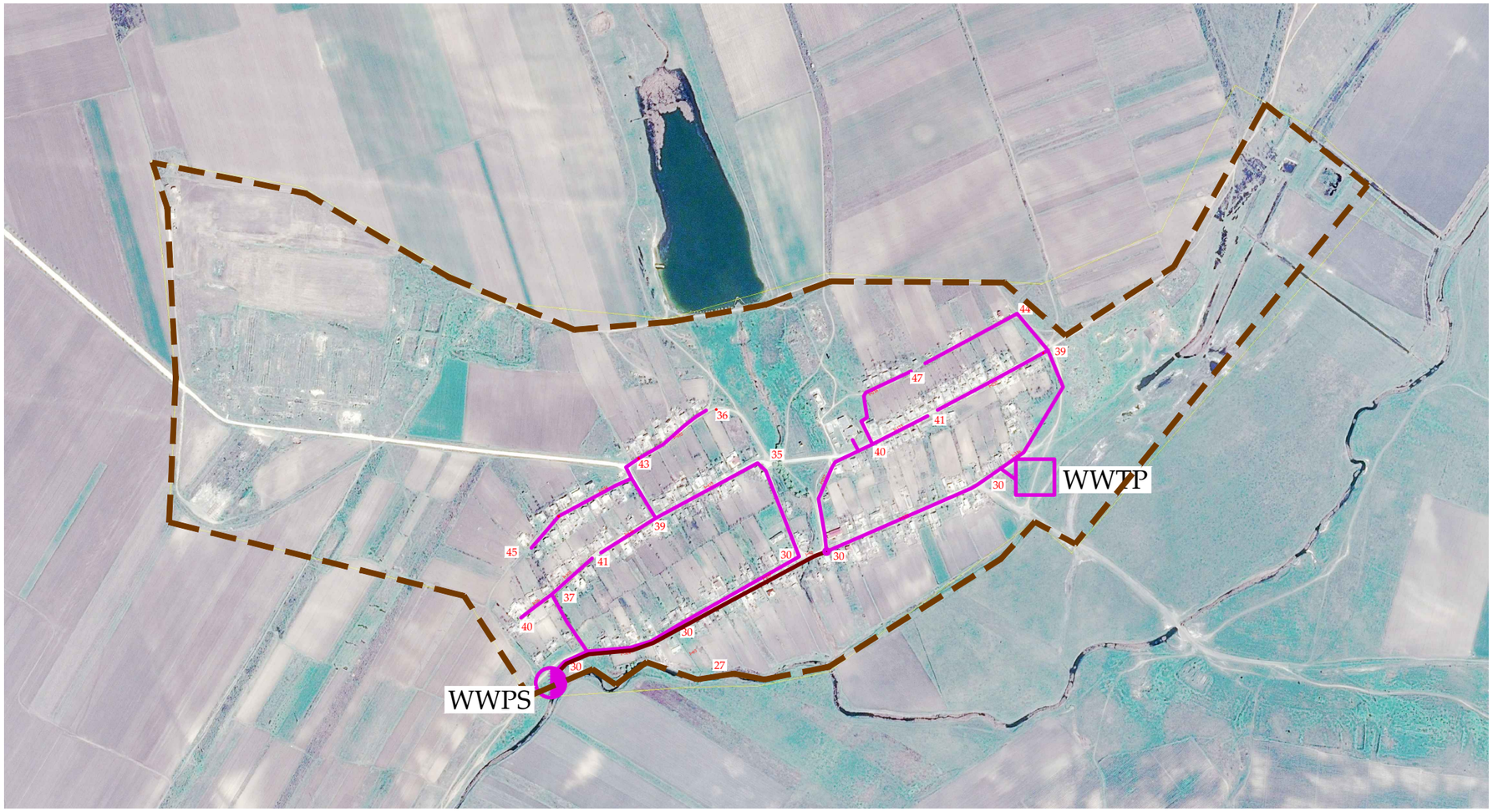
Feasibility study for the improvement of sewerage services in the town Leova, Leova raion

Proposed sewerage system in the Filipeni village

Scale:	Drawing No:	Date:	Annex:
1:10 000	8/9	2015.11.18	No.10

Format A2

Proposed sewerage system in the Romanovca village



Legend

Name	Symbol
Boundaries of the village	
Proposed wastewater treatment plant, Phase II	WWTP
Proposed wastewater pumping station, Phase II	WWPS
Construction of sewerage network, Phase II	
Construction of pressure sewerage network , Phase II	

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Proposed sewerage system in the Romanovca village

Scale:	Drawing No:	Date:	Annex:
1:10000	9/9	2015.11.18	No.10

Format A3