Modernization of local public services in the Republic of Moldova

- Intervention area 2: Regional planning and programming -

Feasibility study

for the project „Improving and extension of water supply and sanitation services in the town of Straseni”

Final report

December 2015

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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 Programming
RSP	Regional Sector Programme
RtG	”Ready-to-go” Project

SCADA	Supervisory Control and Data Acquisition
SDI	State Design Institute
SEE	State Ecological Expertise
SEI	State Ecological Inspectorate
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 the 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 authorised water consumption. **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 provide 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 pressurise 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 oxidise 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 wastewater 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 unauthorised 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: pres-

sure, 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, village, 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 - 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 qualify 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 oxidise and mineralise 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 of water or wastewater.

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

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 Public Administrations (LPAs) in extending and modernizing 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 **Straseni 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 Straseni town only. The Project includes the Straseni town as well as transmission main Micauti-Straseni.

Problem statement and Objective

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

- Insufficient area coverage of the WSS services. Only part of the town of Straseni and villages benefit of the water supply, while wastewater services are provided in a limited urban area;
- Unsatisfactory levels of service, including:
  - Continuity of service. Although central part of Straseni Town is continuously provided with water, some marginalised parts of the town have often interruptions supply due to bursts, leakages and insufficient network pressure;
  - Although the groundwater quality is compliant with the National Standards, the existing transmission main is in an obsolete condition and is imposed to high risks of water pollution through infiltrations/seepages. This Feasibility Study addresses this issue, while it is also expected that the surface water of drinking quality will be provided from Chisinau-Straseni-Calarasi pipeline in the foreseeable future.
- Poor environmental conditions due to missing wastewater treatment plant.

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

- High non-revenue water (NRW) ratio. Increased level of NRW (around 57% in 2014) results in higher energy consumption for water pumping and consequently increased water tariffs;
- Low energy efficiency rate at the existing water pumping stations;
- High 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.

The aim of the PIP for Straseni Town is to extend the coverage and connection rates of the population connected to the regionalised water supply services by 9% from 91% to 100% of coverage rate and by 6% from 85% to 91% of connection rate, as well as increase of coverage and connection rates to wastewater services by 38% from 61% to 99% of coverage rate and by 22% from 44% to 66% of connection rate.

The aim of the first phase (the Project, 2015-2018) for the town of Straseni is to extend the access of the population to the water supply services by 9% from 91% to 100% of coverage rate and by 6% from 85% to 91% of connection rate.

Legal aspects

In the process of regulating and developing the water supply and wastewater services sector the competences belong to the central public authorities; the establishment, organisation and management of this service the responsibility of local authorities and operators of public water supply and wastewater 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; institutional reforms in the sector; overcoming of the 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.

Currently, the public water supply and wastewater services are organised and operated in the town of Straseni by Municipal Enterprise ‘Apa-Canal’ Straseni. In administrative-territorial units Micauti, Sireti and Radeni the centralised water supply service is organised as well, being provided by the local operators (and for an area of Micauti by ‘Apa-Canal’ Straseni).

Taking into consideration the national WSS, and the positive aspects of regionalisation of WSS public services learnt from international experience, it is recommended to promote the joint operation of the service and development of the services and infrastructure projects. This policy was supported unanimously by the local authorities in all administrative units: Straseni, Micauti, Sireti and Radeni.

The institutional model of regionalisation of water supply and wastewater public services in Straseni Rayon, developed under the current legislation, comprises two key elements:

- Regional Operator;
- 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 Municipal Enterprise 'Apa-Canal' Straseni will require significant changes in order to cover the increasing demands of expanding service area.

Technical aspects and investment programme

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;
- 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).

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:

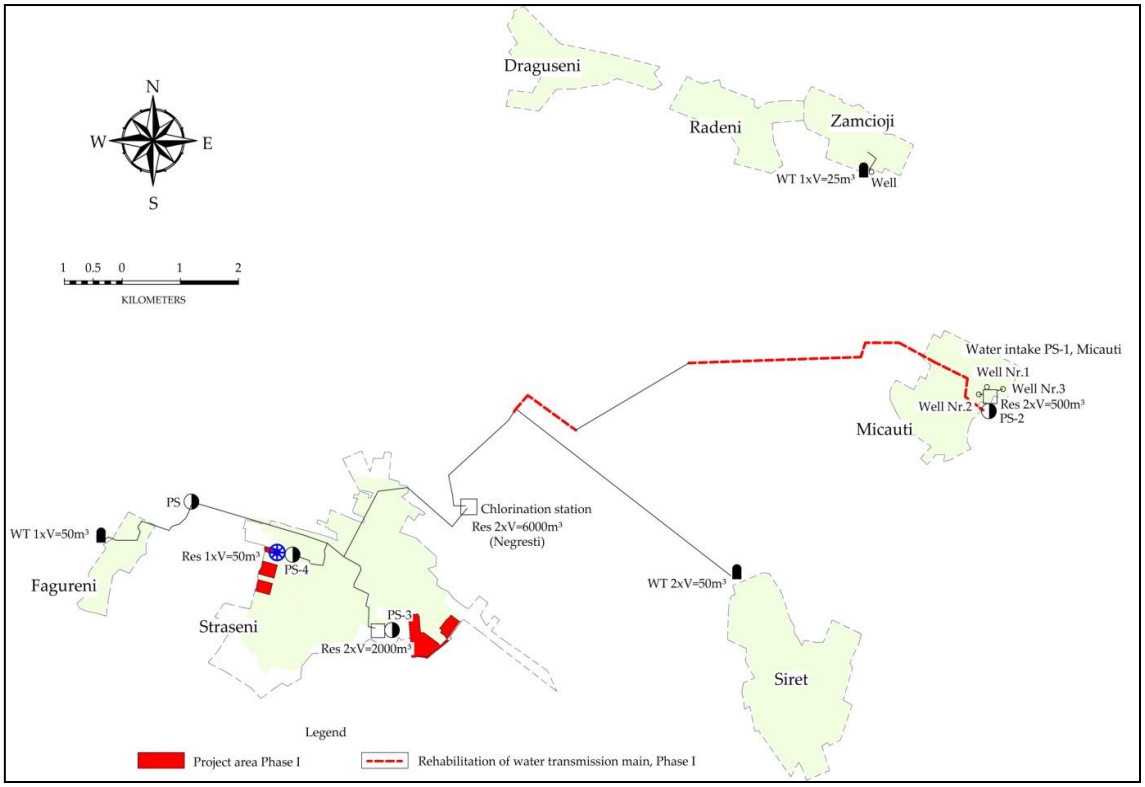
Water Supply:

Currently there are about 18,534 inhabitants connected to the existing water supply system out of which about 17,830 from Straseni Town (85% connection rate) and 704 from Fagureni Locality (79% connection rate). The localities of Micauti (population of 3,056 in 2014) and Sireti (population of 5,950 in 2014) are directly connected to the transmission main before entering the Negresti Reservoir but are not yet operated by ME 'Apa-Canal' Straseni[1]; Three localities in the vicinity of Straseni Town (Zamcioji, Radeni, Draguseni) with a total population of 3,100 (in the year 2014) are currently supplied from their own water source and the system is managed by their own municipal services. In the near future these localities should be integrated into the service area of ME 'Apa-Canal' Straseni and in the medium term they might be connected to the transmission main from Micauti to Straseni. Currently there is no supply shortage for the service area of ME 'Apa-Canal' Straseni, but in the long-term additional capacities of about 1,684 m³/day will have to be developed due to the assumed increase of per capita water consumption and additional population served. There are two possibilities to provide these additional water resources: (i) Rehabilitation of existing wells or (ii) connection to the planned regional transmission main from water treatment plant in Chisinau to Straseni and Calarasi Rayons (this option is about to be evaluated within the framework of a Feasibility Study financed by KfW "Improvement of water infrastructure in Central Moldova"). The investment measures proposed within the framework of this project include inter alia the rehabilitation and extension of the distribution network

[1] These localities are currently operated by LPA Micauti and Sireti.

in Straseni Town as well as disinfection of water. Further, rehabilitation of the transmission main from the well-field in Micauti Locality to Straseni Town (high water losses and frequent supply interruptions) will anyway be necessary to ensure reliability and supply security in the short term. If in the medium term the regional transmission main (Chisinau – Straseni - Calarasi) will be implemented, the local transmission main (well-field in Micauti to Straseni Town) will serve as a second supply source and therefore will increase supply security in FS area. Conclusively, these measures will be necessary irrespective of the future development of the regional transmission main (Chisinau – Straseni - Calarasi) and are therefore consistent with the long term infrastructure development plans ("no-regret measures"). The proposed measures would increase the water supply connection rate in Straseni Town from currently 85% (17,830 people) to 91% (19,235 people) in 2018 (after implementation of Phase 1)[2].

Figure 0-1: Scheme of proposed extensions of the water supply system in the town of Straseni and rehabilitation of the transmission main



Wastewater:

Currently only Straseni Town is partly endowed with an existing wastewater system. About 44% of the population is connected to the sewerage network, which is at the end of its life age. There is no existing wastewater treatment plant (WWTP) and the main wastewater pumping station is in poor condition. The localities in the vicinity of Straseni Town are not endowed with a sewerage network.

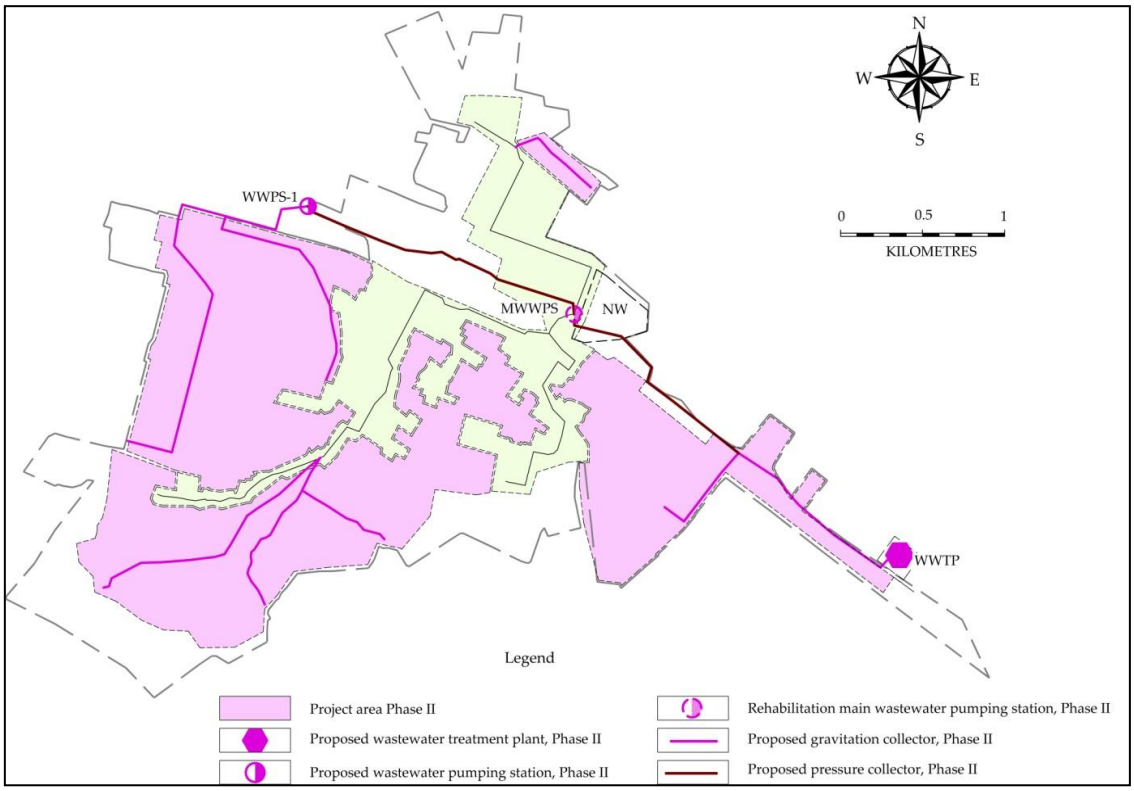
[2] The coverage rate would be 100% in 2018 but it is assumed that only part of the customers will connect immediately after project implementation while the connection rate will gradually increase until the end of the planning horizon.

The coverage rate in Straseni Town is projected to increase from currently 61% to 99% (the connection rate from 44% to 66% until the year 2021) and the wastewater load generated is projected to increase from currently 9,576 P.E. to 23,062 P.E. in 2045.

There are two options to treat wastewater from Straseni Town: (i) Conveying wastewater from Straseni Town through an existing main collector (to be rehabilitated) to Chisinau wastewater treatment plant (WWTP) and (ii) construction of a new, local WWTP in Straseni Town.

A thorough wastewater study (proposed to be included in Phase 1) has to be carried out for the entire rayon in order to assess (i) which of the two options mentioned above (conveying wastewater to the WWTP in Chisinau or local wastewater treatment) should be selected and (ii) which localities should be endowed with a sewerage network and connected to the wastewater system in Straseni Town. In case that the latter option (local WWTP in Straseni Town) is the preferred one, a staged approach for developing the capacities of the new WWTP in Straseni Town is recommended. For cost estimation purposes in this study, it was assumed that the first treatment stage should be designed for a capacity of 21,300 P.E. (90% connection rate of Straseni Town in 2030, without considering other neighbour localities).

Figure 0-2: Scheme of proposed extensions of the wastewater system in Straseni town



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 benefits of the proposed measures is presented in the table below. The total cost for the measures in Phase 1 ("The Project") amount to about 2.7 MEUR and 30,568 people will benefit from the pro-

posed measures. The total costs for measures proposed in Phase 2 amount to about 21.2 MEUR and 31,099 people will benefit from the measures. The total costs for Phase 1 and Phase 2 amount to 23.9 MEUR.

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

N°	Measure	Costs [€]	Benefit from project measures
1	**Capital Investment**		
1.1	Extension of the water distribution network in Straseni Town by 6,751 m	585,695	Water supply coverage rate in Straseni town increased from 91% to 100% (1,965 additional people served)
1.2	Rehabilitation of 8,500 m transmission main HDPE 280 "Micăuti-Străseni" and Replacement of existing connection pipes HDPE 160 at Micăuti wellfield	1,056,625	Level of service and efficiency improvement for all people covered with water supply (30,568 people in 2018). In particular, the supply security will be increased drastically and the reduction of water losses in the transmission main will permit connecting and supplying additional localities of Micauti and Sireti.
1.3	Construction of a new chlorination unit at Micăuti wellfield.	70,000	Improved bacteriological safety (water quality) for all people covered with water supply (30,568 people in 2018) including the localities of Micauti and Sireti, which are currently not supplied with disinfected water.
1.4	Equipment and tools	200,000	Level of service and efficiency improvement for all people connected to the water supply and wastewater system (26,177 people in 2018)
ST-1	**Sub-Total Capital Investment**	**1,912,320**	
2	Technical Assistance	529,478	Level of service and efficiency improvement for all people connected to the water supply and wastewater system (26,177 people in 2018)
3	Contingencies (10%)	244,180	
GT-1	**Total Costs for Phase 1**	**2,685,978**	Additional 10,409 people in Straseni Town and the localities in its vicinity will be served with water supply of compliant quality. In total 30,568 people will benefit from the water supply and wastewater measures.

Source: GIZ/MLPS

Table 0-2: Proposed investment measures Phase 2

N°	Measure	Costs [€]	Benefit from project measures
1	**Capital investment**		
1.1	Replacement of submersible pumps in the currently operated wells	45,000	Improved efficiency and supply security for 31,099 people covered with water supply services.
1.2	Extension of the sewerage network in Straseni Town by 54.3 km	10,900,384	Wastewater coverage rate increased from 61% to 99% in Straseni Town (8,137 additional people served)
1.3	Rehabilitation of 4 km sewerage network and one main	743,000	Level of service and efficiency improvement for all people covered with

N°	Measure	Costs [€]	Benefit from project measures
	wastewater pumping station in Straseni Town		wastewater (21,107 people in 2021)
1.4	Construction of a new Wastewater Treatment Plant (WWTP) with a capacity of 2,385 m^3/day (21,300 P.E.)	5,538,000	Improved environmental performance; compliance with effluent standards.
ST-1	**Sub-Total Capital investment**	**17,226,384**	
2	Technical assistance	2,067,166.08	Level of service and efficiency improvement for all people connected to the water supply and wastewater system (27,463 people in 2021)
3	Contingencies (10%)	1,929,355.01	
GT-2	**Total Costs for Phase 2**	**21,222,905**	Additional 8,137 people will be served with wastewater. In total 31,099 people will benefit from the water supply and wastewater measures.

Source: GIZ/MLPS

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

N°	Component	Costs Phase 1 EUR	Costs Phase 2 EUR	Costs Phase 1 & 2 EUR
1	Capital investments	1,912,320	17,226,384	19,138,704
2	Technical assistance	529,478	2,067,166	2,596,644
3	Contingencies	244,180	1,929,355	2,173,535
TOT	**Total costs Phase 1 & 2**	**2,685,978**	**21,222,905**	**23,908,883**

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 last three years the ME ‘Apa-Canal’ Straseni generated losses from operating activities between MDL 484.0 thousand to MDL 1.3 million, which reveals that the company encountered cash liquidity difficulties. In present 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 means that the ME ‘Apa-Canal’ Straseni has no creditworthiness capacity at the moment.

The investment costs of the project are estimated to amount of MDL 55.81 million or EUR 2.69 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 (million MDL)

Project investment outlays	2015 (MDL mil.)	2016 (MDL mil.)	2017 (MDL mil.)	Total (MDL mil.)
	10%	50%	40%	
Rehabilitation of main pipeline	2.20	10.98	8.78	21.96
Extension of water distribution network	1.22	6.09	4.87	12.17
New chlorination unit	0.15	0.73	0.58	1.45
Equipment and Tools	0.42	2.08	1.66	4.16
Detailed design and procurement	0.48	2.39	1.91	4.77
Technical assistance, supervision and capacity development	0.62	3.12	2.49	6.23
Contingency	0.51	2.54	2.03	5.07
Total	**5.58**	**27.91**	**22.33**	**55.81**

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 65.0% of the total investment costs that constitutes about EUR 1.75MEUR, while the local sources' contribution is 35.0%, which is about EUR 0.94 MEUR.

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 21.50 MDL/m^3 to approximately 25.35 MDL/m^3 in 2045. In the first years of the forecasted period, it is proposed that the depreciation cost do not be included in the tariff, because of high depreciation cost of new assets realised due to the implementation of investment project. The total costs (the operational costs and depreciation cost) will be covered by the mentioned tariff beginning with the year 2030.

The weighted average tariff for wastewater services will be about 15.50 MDL/m^3 in the period 2015-2020. After that, the tariff will be about 9.00 MDL/m^3 in average in the period 2021-2045. As well, the tariff for wastewater services will not include the full depreciation cost in the project implementation period (2015-2020). The total costs (the operational costs and depreciation cost) will be covered by the tariff beginning with the year 2021.

The tariff affordability rate in the whole projected period will be about 2.1%, 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 ME 'Apa-Canal' Straseni will be able to generate cumulative cash flow amounted to MDL 57.88 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 – 32.45 million), which emphasise 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 91.96 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

N°	Description	Estimated contract value, EUR	Contract type	Procurement method
1	**Design, engineering and supervision** for Phase 1 investments	252,426	Consulting services	Competitive
2a	**Construction Works - Lot 1** - Rehabilitation of transmission main HDPE 280 "Micăuti-Străseni", Replacement of existing connection pipes HDPE 160 at Micăuti wellfield (wells to PS-2), supply and installation of a new chlorination unit, and procurement of equipment and tools	1,239,287.50	Works	Open
2b	**Construction Works - Lot 2** - Extension of the water distribution network in the town of Straseni	644,265	Works	Open
3	**Supply of Equipment** and tools 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
T	**Total amount**	**2,685,978**		

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 State Ecological Expertise (SEE). This needs to be done in the design stage of the Project.

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. 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 Project (MLPS), 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 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.

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. Investment projects are often developed based on insufficient grounds, which leads to an increased risk of the 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.

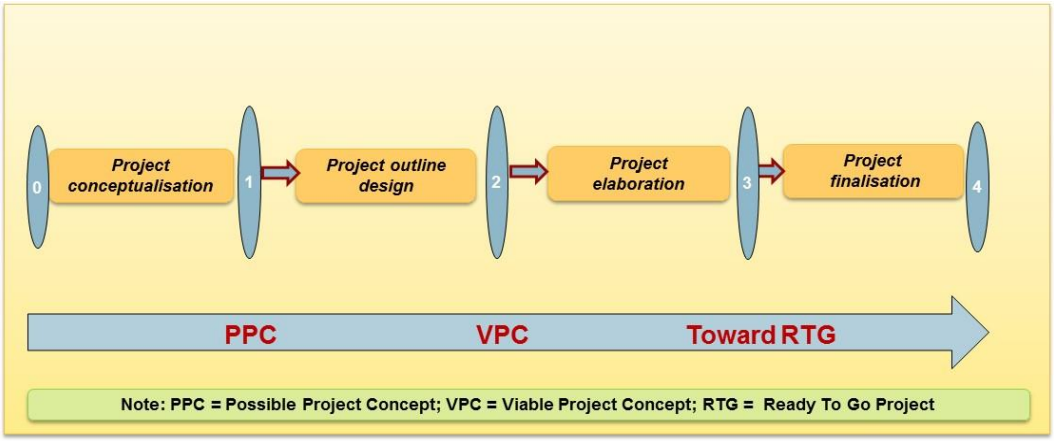
Based on the WSS sector development directions and criteria defined in the Programme, a list of possible project concepts was defined for further project development.

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 finalised 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:

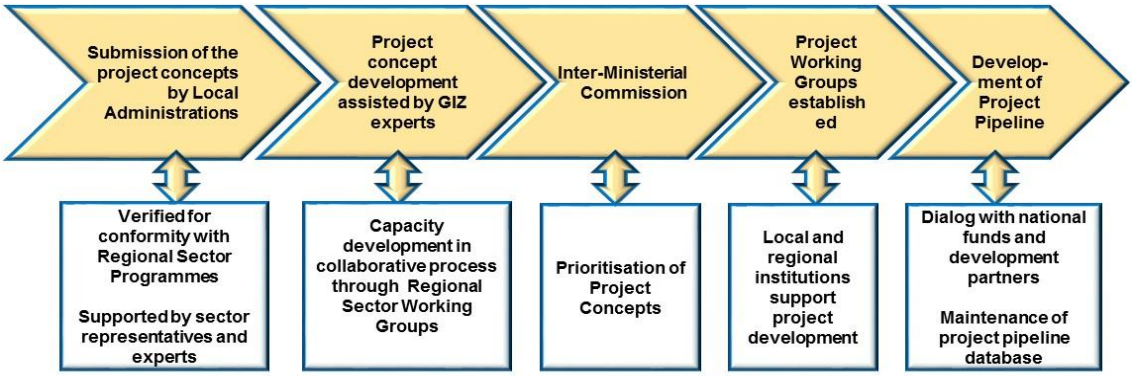
- **Stage 0 – Development of Regional Sector Programmes – Identification of Project Idea**
  In each RSP, specific process, methods, and criteria by which possible projects are identified for their contribution to the targets set out in the RSP for the sector;
- **Stage 1 – Conceptualisation (Possible 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";**
- S**tage 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 finalisation 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 selected 12 projects 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 on - 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 conceptualised 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 **Straseni 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 Centre), the Straseni 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 Straseni Rayon 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 the consumers;
- **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 organise a regionalised 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 ME 'Apa-Canal' Straseni's capacities within the existing service area shall be supported in the first place, in short term followed by extension of services, not exceeding the double size of the 'utilitie'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 Straseni Rayon, a human agglomeration satisfying the WSS development criteria was identified in the area of the Rayon capital, the **Town of Straseni**, with the following Local Public Authorities, which expressed their willingness to cooperate and benefit from regional WSS services under the PIP:

- Locality of **Micauti**;
- Locality of **Sireti**;
- Locality of **Radeni;**
- Locality of **Draguseni**;
- Locality of **Zamcioji**.

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

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

This FS Report covers the entire PIP area, having particular attention on the first phase investment Project area. In a longer term, the project service area shall be extensive, with a flexibility to include additional localities from Straseni Rayon and other neighbouring areas, where deemed technically and economically feasible.

1.4 Identified problems

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

- Insufficient area coverage of the WSS services. Only part of the town of Straseni and villages benefit of the water supply, while wastewater services are provided in a limited urban area;
- Unsatisfactory levels of service, including:
  - Continuity of service. Although central part of Straseni Town is continuously provided with water, some marginalised parts of the town have often interruptions supply due to bursts, leakages and insufficient network pressure;
  - Although the groundwater quality is compliant with the National Standards, the existing transmission main is in an obsolete condition and is imposed to high risks of water pollution through infiltrations/seepages. This Feasibility Study addresses this issue, while it is also expected that the surface water of drinking quality will be provided from Chisinau-Straseni-Calarasi pipeline in the foreseeable future.
- Poor environmental conditions due to missing wastewater treatment plant.

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

- High non-revenue water (NRW) ratio. Increased level of NRW (around 57% in 2014) results in higher energy consumption for water pumping and consequently increased water tariffs;
- Low energy efficiency rate at the existing water pumping stations;
- High 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 phases 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, 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 Programme 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 wastewater services for the Town of Straseni, as well as the villages of Micauti, Sireti, Radeni, Draguseni, Zamcioji, and to contribute to the achievement of the regional WSS sector development indicators on access to water supply and wastewater services. The aim of the PIP for Straseni Town is to extend the coverage and connection rates of the population connected to the regionalised water supply services by 9% from 91% to 100% of coverage rate and by 6% from 85% to 91% of connection rate, as well as increase of coverage and connection rates to wastewater services by 38% from 61% to 99% of coverage rate and by 22% from 44% to 66% of connection rate. Also, other major effect of the PIP is the rehabili-

tation 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 Straseni is to extend the access of the population to the water supply services by 9% from 91% to 100% of coverage rate and by 6% from 85% to 91% of connection rate.

Table 1-1: Main service indicators

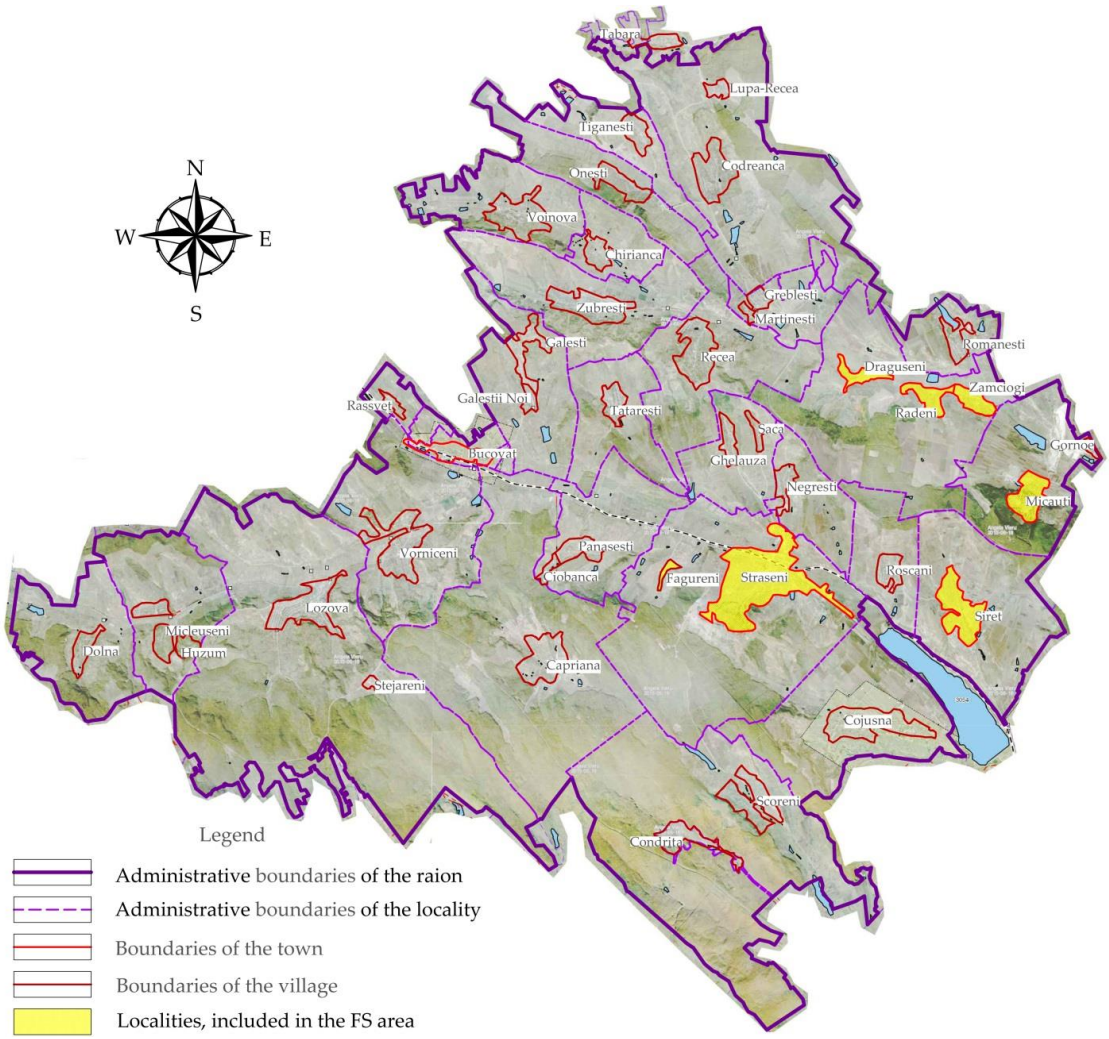
Indicator	Current connection rate	The first phase Project (2015-2018)		The second phase (2018-2021)		Priority Investment Programme (2015-2021)	
		Rehabilitation	Extension	Rehabilitation	Extension	Improvement	After PIP
Share of population directly benefitted from the rehabilitated and extended water supply services							
Urban	85%	0%	6%	0%	0%	6%	91%
Rural	5%	0%	0%	0%	0%	0%	58%
Share of population directly benefitted from the rehabilitated and extended wastewater supply services							
Urban	44%	0%	0%	13%	22%	35%	66%
Rural	0%	0%	0%	0%	0%	0%	0%
Non-Revenue Water Ratio, %	57%					17%	40%
Continuity of water service (hours/day)	24					24	24
Number of beneficiary localities covered by regional WSS services (urban/rural)	0/0	1/5	1/5	1/5	1/5		
Number of sustainable regional WSS operators instituted	0	1	1	1	1		

2 Socio-economic aspects

2.1 Service Area

This Feasibility Study covers the area that includes the territory of the town of Straseni with its locality Fagureni; village of Micauti; the commune of Radeni with its localities Radeni, Draguseni and Zamcioji; and the village of Sireti, as shown in the Figure 2-1.

Figure 2-1: Map of the FS localities



Source: www.google.com/maps/place, MLPS

2.1.1 Geographical conditions in the coverage area

Straseni rayon is situated in the central area of Republic of Moldova, bordering the rayons of Orhei to north-east, Calarasi to Nord-West, Nisporeni to west, Criuleni to east, Chisinau to south-east, Ialoveni to south and Hincesti to south-west. The rayon centre is the town of Straseni.

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

	Population	Area [km^2]
Town of Straseni	21,091	60.8
Localityof Făgureni	891	0.42
Commune of Micauti	3,056	1.27
Commune of Radeni	3,100	2.4
Village of Siret	5,950	2.43

Straseni Rayon covers an area of about about 729 km^2, out of which 34,439 ha is agricultural land area.

Straseni Rayon is composed of 39 localities, including two towns (Straseni and Bucovat), 25 communes and 12 villages.

The town of Straseni is situated in the central part of the rayon, in the Bic River valley, at a distance of approx. 30 km from Chisinau, bordering the localities of Ghelauza and Negresti to north, Roscani, Vatra and Cojusna to East, Tanasesti to west, Scoreni and Capriana to south.

The area of the town of Straseni is about 6,082 ha. Forest land is about 40% or 2,340 ha of the town's area. Surface water resources of the town are formed of the Bic River and 5 lakes with a 180 ha area and protected wetlands.

The area of land fund covers 6,082 ha, of which:

- Agricultural land – 2,340 h;
- Forest land - 83 ha;
- Water area – 180 ha.

There is one river crossing the town (Bic River) and five lakes with the total area of 18 ha on the territory of the town of Straseni.

2.2 Relief and climate conditions

Straseni Rayon is located on the Central Moldavian Plateau, and Codri forest region. Relief is hilly terrain sloping from northwest to southeast, cut by valleys and rivers. The landscape is heavily influenced by exogenous processes (landslides and erosion).

The prevailing soils in the Straseni Rayon are Chernozem, brown soils and gray forest soils having a lowest bonitation in the central region of Republic of Moldova.

The hydrological network of the Straseni Rayon comprises Bic River with the downstream located Ghidighici reservoir, Ichel River and Isnovat River. With regard to Straseni Rayon, the quality of water complies with the standards.

Climate of Straseni Rayon is temperate continental. The summer is long and warm, with average temperature of July of +22°C, the winter is mild with average temperature of January of –6°C. Precipitations vary between 550 and 650 mm. Soil freezing depth is 0.8 m. Seismicity is 7-8 degrees.

2.3 Socio-economic data

The total official number of permanent inhabitants of Straseni Rayon is about 92,200 persons, including urban population – 22,100 persons (in two towns) and rural population – about 70,100 persons[3].

The ethnical structure of population of Straseni Rayon is the following: Moldovans – 85,910 persons or 96.64%; Ukrainians – 985 persons or 1.11%; Russians – 1,576 persons or 1.77%; Gagauzians – 70 persons and others.

The most recent vital statistics for the rayon are provided in the following table. The table exemplifies the slow growth occurring in the rayon, taking into account the birth and death rates.

Table 2-2: Vital Statistics of Straseni Rayon for 2014, pers

	Born	Deceased	Natural growth
Straseni Rayon	1,152	1,063	89
Straseni Town	217	180	37
Bucovat Town	22	20	2
Rural Localities	913	863	50

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

Town of Straseni is an administrative and commercial centre of Straseni Rayon with a total population of cca. 21,091 inhabitants, of which men – cca. 9,702 persons, women - cca. 11,389 persons[4].

Currently, about 2,780 economic agents are active in the town of Straseni.

Educational system of town of Straseni includes cca. 2,733 pupils which study at 'Mihai Viteazu' Gymnasium; 'Mihai Eminescu', 'Nekrasov' and 'Ion Vatamanu' theoretical lyceums; besides that, 1,109 children frequent 5 kindergartens.

Healthcare institutions network consists of Rayon Hospital, Centre of Family Physicians, Centre of Public Health and 4 pharmacies. Health system includes 575 employees[5].

2.4 Population

Immediately after gaining its independency in 1991, Republic of Moldova faced economic hardships that affected the demographic indicators severely. The main factor that affected demography is the migration followed by a decrease of birthrate. It started with the military conflict in Transnistria in 1992, which prompted a wave of emigration from Moldova toward Russia and Ukraine, followed by migration towards European Union (mainly Italy, Poland, 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, with some estimations reaching 25% (circa 1 million). For the purpose of this feasibility study, the authors considered as a baseline the prog-

[3] Source: National Bureau of Statistics, 2015, www.statistica.md, stabile population

[4] Source: Municipal Enterprise "Apa-Canal" Straseni, Straseni Mayor's office

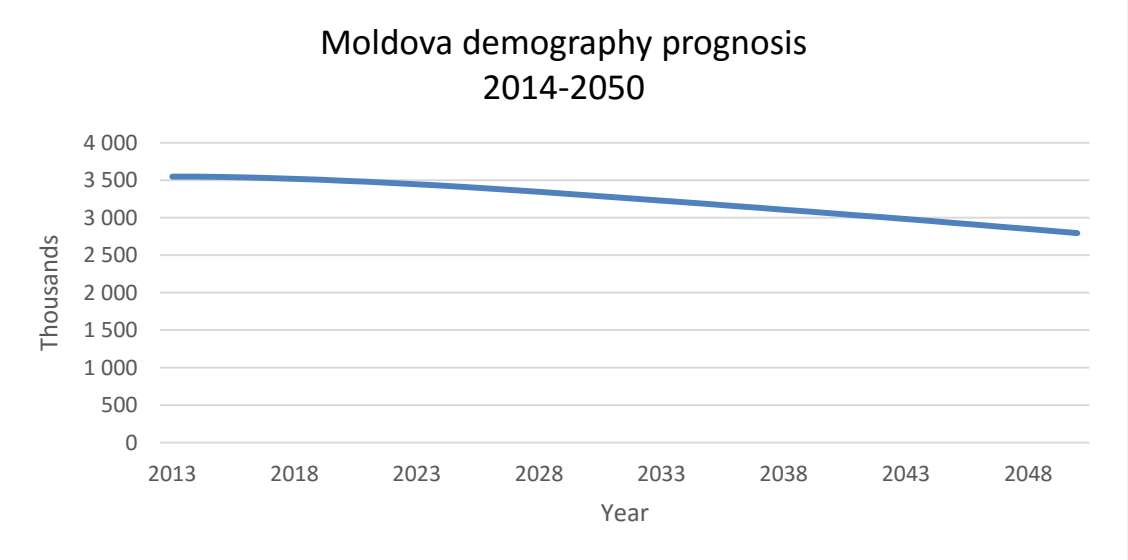
[5] Source: Municipal Enterprise "Apa-Canal" Straseni, Straseni Mayor's office

nosis of UN, which indicate a negative population growth as depicted in the graphic bellow.

Demographic assumptions

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

Figure 2-2: Moldova demography prognosis



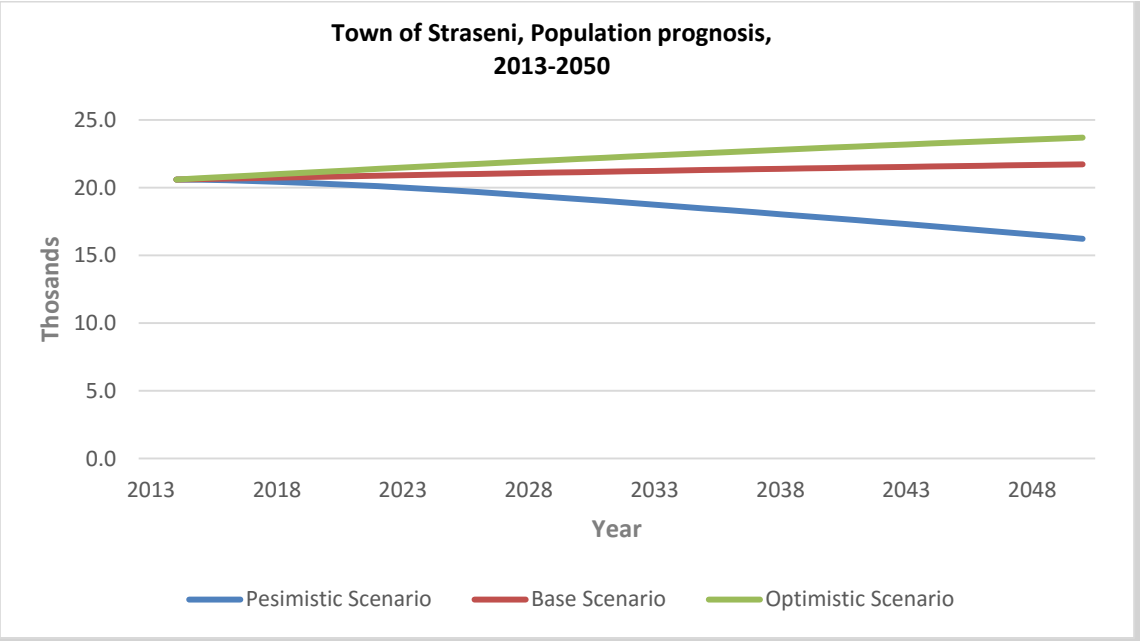
Source: UNDP, internet: esa.un.org/wpp/

In this document, it was considered 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 3 scenarios were derived:

- No internal migration: The rayon population and the rayon center 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 (the optimistic scenario).

Figure 2-3: Town of Straseni, population prognosis, 2013-2050



Source: GIZ/GOPA prognosis

In conclusion, it is expected that the population of Straseni town will increase slightly from 21,091 inhabitants in 2014 (as reported by the National Statistics Institute) to 22,206 inhabitants in 2050, despite the decrease of national population. The geographical proximity to the city of Chisinau supports such trend, and the economic developing plans (creation of free economic zone) for Straseni will contribute positively to the estimated demographic increase.

In regard to rural population, the population forecast to year 2050 does not follow the descendent national trend due to economic opportunities offered by the towns of Straseni and Chisinau. The area of interest of the project includes 6 sate: Draguseni (current population 1,010, forecasted to decrease to 754 inhabitants), Fagureni (current population 726), Micauti (current population 2,346), Negresti (current population 1,240), Radeni (current population 976), Siret (current population 6,047), Zamcioji (current population 1,082). As a result of the demographic analysis and number of permanent residents or rayon, towns and villages of Straseni, it is forecasted a constant demographic trend, both for the town and for the rural area in the vicinity of the town.

2.5 Employment

In the last 20 years the town of Straseni suffered a significant downturn due to closedown of several industrial enterprises and in particular of the largest one, refrigeration equipment factory producing "Holodmas".

However, in the present the town of Straseni is in process of recovering from the business recession by implementing a socio-economic strategy for 2014-2020, that will allow the creation of modern enterprises with application of the state of art technologies.

In general, the unemployment rate of 3% in 2014 in the town of Straseni is comparable to the one in Moldova (3.9% for 2014). During 2011 - 2014 the unemployment rate has steadily decreased and at present it is lower than the average in Moldova.

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

Year	2011	2012	2013	2014
Town of Straseni	6.7	5.6	5.1	3.0

Source: Socio-economic strategy of the town of Straseni for 2014-2020

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

Year	2011	2012	2013	2014
Town of Straseni	7,094	6,849	6,940	6,736

Source: Socio-economic strategy of the town of Straseni for 2014-2020

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

Year	2011	2012	2013	2014
Town of Straseni	486	387	371	319

Source: Socio-economic strategy of the town of Straseni for 2014-2020

The largest employers are presented in the table below. The number of employers in the area of industry y decreased considerably in the past two decades, on the market prevailing now the companies which deal with services provision and trade.

Table 2-6: The main employing companies in the town of Straseni

Company name	Company profile
”Cornelia Prim” Ltd.	Trade
”Panifcoop” Coop.	Industry (flour-and-cereals)
”Alianta Vin” Ltd.	Industry (wine making)
”Floarea Viei” Ltd.	Trade
“LCV Servicii” Ltd.	Trade
”Masfricom” Ltd.	Industry (refrigeration equipment maintenance and logistics)
”Promotab” Ltd.	Industry (tobacco)
”Mob Elita” Ltd.	Industry (furniture production)
”Dominos” Ltd.	Trade
”Silvocinegetica” state company	Forestry

Source: Socio-economic strategy of the town of Straseni for 2014-2020

However, according to the officials of the LPA Straseni, the situation has stabilised and there is a consistent trend of improvement of the situation and decreasing of the unemployed people’s number in the town of Straseni. This is explained both by the location of the town near the capital and creation of two industrial parks and Free Economic Zone/FEZ in the town of Straseni. Hence, in the next two years it is envisaged the creation of about 3,000 new jobs in enterprises resident in the two industrial parks and FEZ. Thus:

- Within the industrial park no. 1 of Straseni Free Economic Zone, an Italian company "Leoni Wiring Systems" Ltd. started its activity, being specialised on manufacturing of the medium and low voltage cabling for the automotive industry, which will create about 300 new jobs;

- Within the industrial park no. 2, another Italian company "La Triveneta Cavi Development" Ltd. shall begin its work in 2015, with the same specialisation - manufacture of medium and low voltage cabling for the automotive industry;
- Construction of the national road E 58 Chisinau - Ungheni. These investments will allow greater proximity to the capital Chisinau and, respectively, increased investors' interest as regards the town. Moreover, this project makes possible hiring of citizens from the town of Straseni and neighbouring localities.

It can be concluded that the existing situation and dynamics concerning employment in the town of Straseni is quite good and there are considerable premises for improvement in this area.

2.6 Affordability

The affordability means the population's capacity or possibility to cover the bills' costs for drinking water and wastewater disposal. Affordability rate indicates the percentage from family income which is directed to cover the cost of the water supply and wastewater services.

The key elements for affordability rate calculation represent the family income and bill cost.

For the current analysis it was used disposable average income for the Central region, based on the statistical data only (without taking into account the additional incomes from the "grey economy" or the incomes of the citizens working abroad). These incomes for 2015 were adjusted according to the incomes evolution forecasted by the Moldovan government.

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

Table 2-7: Evolution of the household average income per region (MDL)

Disposable income (MDL), prognosis				
Region	**2012**	**2013**	**2014**	**2015**
Nord	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 Statistic, 2015, www.statistica.md

According to the National Bureau of Statistics, the average households income in Moldova in 1st quarter was 1,768.23 MDL/person/month (Quarterly bulletin, I, 2015) while in the Centre region it was 1.589,76 MDL. MDL/person/month.

The average bill for water and sewage, taking into account the average consumption of 60 lcd, can be estimated as follows:

- 0,060 m^3/d x 30 days x 25.30 MDL/m^3 = 45.54 MDL.

Comparing it to the average personal income of 1,589.76 MDL, the affordability ratio reaches 2.86% which means that population can support a further increase of the tariff, as a result of the new proposed infrastructure investments.

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 minimise 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[6].

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.

[6] 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 level1I is the public authorities in towns and villages. 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 the feasibility study

3.4.1 Organisation and management of water supply and wastewater services

As stated, this feasibility study covers the town of Straseni with its locality Fagureni; the commune of Micauti with its localities Micauti and Gornoe; the commune of Radeni with its localities Radeni, Draguseni and Zamciogi and the village of Sireti.

To date, in the town of Straseni has organised water supply and wastewater services, organised and managed under the leadership, coordination, control and responsibility of the Straseni local public administrations, represented by the Straseni Local Council as deliberative authority, and Straseni mayor's office, as executive authority.

Municipal Enterprise ‘Apa - Canal’ Straseni, hereinafter ME ‘Apa - Canal’ Straseni, is the sole operator of water supply and wastewater public services within the town of Straseni. Established by the decision of Straseni Local Council the enterprise is allowed to carry only the activities regarding the abstraction/intake of the water and wastewater collection and treatment, respectively.

Within the commune of Micauti there is no centralised water supply service throughout, being provided differently within the areas of the locality. In Gornoe village, where water system was built with the financial support of the Social Investment Fund, the water supply is provided by NGO Association ‘Gura Vaii’. In Micăuti village the water supply is organised and managed as follows: the school, kindergarten, social institutions, and some households are supplied directly by the mayor’s office; a total of 36 households are supplied with water by JSC ‘Institute for selection and production in zootechny; the remaining households receive water through ME ‘Apa – Canal’ Străseni.

In the village of Sireti and the commune of Radeni, there is centralised drinking water supply service on the 60-80% of its territory. In the village of Sireti the water supply service is provided by local municipal enterprise, founded in 2014. Similarly, in the village of Radeni, operator of water supply service is the Municipal Enterprise ‘Radrazam’.

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 Straseni administrative-territorial unit.

Under right to provide water supply and sanitation service within town of Straseni, the management and operation rights of the water supply and sanitation systems were delegated to ME ’Apa-Canal’ Straseni.

In Gornoe village, Sireti village and commune of Radeni the water supply systems’ management and operation is delegated to operators which provide water supply service. No water supply systems owned by individuals or private legal entities.

3.5 Organisation and management of the ME ’Apa - Canal’ Straseni

ME ‘Apa - Canal’ Straseni was established 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 director, who is responsible for coordination of all company activities and conducting regular coordination with Straseni mayor’s office, being personally responsible to the company’s board for meeting the performance indicators.

Four key-specialists and three departments report directly to director:

- Chief engineer, who carry out day-to-day management on technical issues regarding all company’s activities (water system, sewerage, repairing and construction), elaboration of proposals for development, development of technical conditions for connection to water supply and sewerage network;
- Chief of Accounts receivable department, responsible for control and accounting of the consumers’ payments and keeping their records;

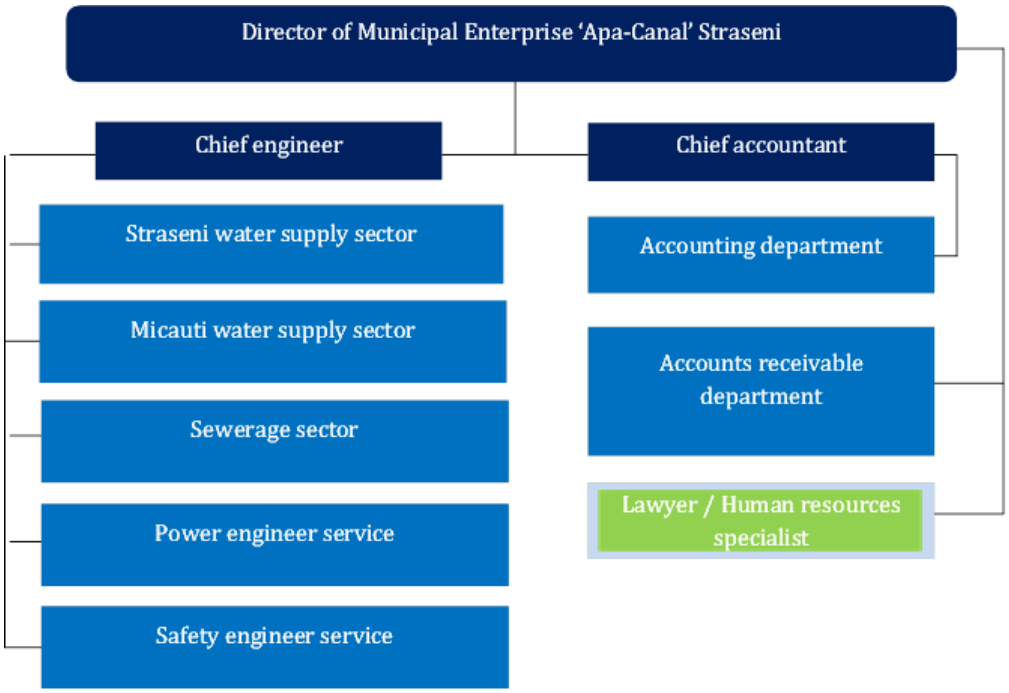
- Chief accountant, responsible for accounting records management and working out of the accounting reports;
- Lawyer, responsible for ensuring compliance with legislation and contracts concluding. He carries out the duties of Human resources specialist as well, in charge of personnel policy.

Five specialists are subordinated to chief engineer:

- Head of Straseni water supply sector;
- Head of Micauti water supply sector;
- Head of sewerage sector;
- Power engineer;
- Safety engineer.

The organisation chart of ME 'Apa - Canal' Straseni is shown below.

Figure 3-1: Municipal Enterprise 'Apă-Canal' Straseni Organisation chart



Source: ME 'Apa-Canal' Straseni

3.6 Company staff and training needs

The organisational structure of the company includes 64 positions (according to the staff list) and actual 64 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 100%, while the staff turnover rate remains at a fairly low level - 3% in 2012 and 5% in 2014, respectively. Only once, in 2013, this indicator reached 25%, due to the internal restructuring of the company, job cut and announcement of new job vacancies.

The years of service at the company of the technical and financial staff shows a stable situation. One quarter of staff members (16 or 25% of the total) have more than 10 years of employment in the position, with an average of cca 12 years. Three key persons in the company superior technical staff (chief engineer, sewerage sector foreman and chief of accounting and control sector) graduated in the field of water and sanitation. In general, 16% of the staff has a higher education, 42% - 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.

ME 'Apa - Canal' Straseni has a Development and Business Improvement Plan worked up in 2014 with the support of USAID, provides a series of measures designed to increase staff professional.

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 and those from the Plan mentioned above.

Table 3-1: ME 'Apa - Canal' Straseni staff training needs

Training topic	Beneficiary
Strategic planning	Director; chief engineer; chief accountant
Investment planning and analysis of investment projects	Director; chief engineer; heads of departments; chief accountant
Human resources planning and development	Director; human resources officer; chief accountant
Performance indicators and staff motivation	Director; chief engineer; heads of departments; human resources officer
Customer service management, public relations	Accounts receivable department employees
Tariffs and costs calculation	Chief accountant; head of Accounts receivable department
Financial planning	Accounting department employees
Management and maintenance of equipment	Chief engineer; heads of the related departments
Wastewater treatment and sludge management	Chief engineer; heads of the related departments
Water supply and sewerage networks management	Chief engineer; heads of the related departments
Energy management in water supply and wastewater systems operation	Chief engineer; heads of relevant departments
Quality management in water supply and wastewater systems operation	Chief engineer; heads of relevant departments
Meter checking and reading	Head of accounts receivable department; controllers
Job retraining on 'Operation of water supply and wastewater systems', specialty 'Intervention and reconstruction works'	Plumbers/operators
Project management	Director; chief engineer
Legislative aspects and standards in water supply and sanitation	Director; chief engineer; lawyer
Economic analysis in the field of water supply and sanitation	Chief accountant; Accounting department employees
Integrated accounting software use	Accounting department employees

4 Technical aspects – Existing situation

4.1 General information

The assessment of the existing water supply and sanitation situation in the town of Straseni has been conducted by the GIZ/MLPS experts in collaboration with members of Project Working Group (PWG, described in chapter 1).

For assessment of existing situation, the necessary information was obtained from the following sources:

- Water supply and sewerage questionnaire prepared and distributed by GIZ/MLPS experts, and completed by Local Public Authorities (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 wastewater 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 Straseni and Fagureni locality are provided by a single operator – the ME 'Apa-Canal' Straseni.

The water supply services in Micauti locality are provided by the ME 'Apa-Canal' Straseni, LPA Micauti and JSC “Institute for selection and breeding”.

The water supply services in Siret locality are provided by the local municipal enterprise.

The water supply services in the villages of Radeni, Draguseni and Zamcioji are provided by a single operator – ME 'Radrazam'

General information about service area of localities included in the feasibility study is provided in Table 4-1.

Table 4-1: General information about feasibility study 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.	Straseni	21,091	The coverage area of water supply system is about 91%. The connection rate is about 85%.	19,268	17,830	The coverage area of wastewater system is about 61%. The connection rate is about 44%. There is no wastewater treatment plant.	12,883	9,207
2.	Fagureni	891	The water distribution network is con-	891	704	No centralised wastewater system	0	0

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
			nected to the water supply system of the town of Straseni. The coverage area of water supply system is about 100%. The connection rate is about 79%.					
3.	Micauti	3,056	The coverage area of water supply system is about 100%. The connection rate is about 81%.	3,056	2,466	No centralised wastewater system	0	0
4.	Siret	5,950	The coverage area of water supply system is about 49%. The connection rate is about 34%.	2,899	2,030	No centralised wastewater system	0	0
5.	Radeni commune (villages of Radeni, Dragusseni, Zamcioji)	3,100	The coverage area of water supply system is about 80%. The connection rate is about 56%.	2,470	1,729	No centralised wastewater system	0	0

Source: LPA Straseni, ME 'Apa-Canal' Straseni

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 Straseni is provided in Annex 4.

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

N°	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.	Straseni					
	Kindergartens	5	1,109	221	yes	yes
	Schools	4	2,733	258	yes	yes
	Healthcare institutions	3	820	575	yes	yes

N°	Locality/Public institution name	No. of institutions	Pupils/children/ places/beds	No. of employees	Connected to water supply system	Connected to centralised wastewater system
2.	Fagureni	2	n/a	15	n/a	n/a
3.	Micauti	6	n/a	42	n/a	n/a
4.	Sireti	8	n/a	71	n/a	n/a
5.	Radeni	n/a	n/a	n/a	n/a	n/a
6.	Draguseni	n/a	n/a	n/a	n/a	n/a
7.	Zamcioji	n/a	n/a	n/a	n/a	n/a

Source: LPA Straseni, ME 'Apa-Canal' Straseni

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 Straseni 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.	Straseni				
	Commerce	4	64	n/a	n/a
	Industry	5	296	partly	partly
	Forestry	1	136	da	n/a
2.	Fagureni	2	4	n/a	n/a
3.	Micauti	32	182	n/a	n/a
4.	Siret	35	215	n/a	n/a
5.	Radeni	n/a	n/a	n/a	n/a
6.	Draguseni	n/a	n/a	n/a	n/a
7.	Zamcioji	n/a	n/a	n/a	n/a

Source: LPA Straseni, ME 'Apa-Canal' Straseni

4.3 Water supply system

4.3.1 Water supply system in the town of Straseni

Water is supplied 24 hours/day in the town of Straseni. Water supply services are provided to about 17,830 consumers out of 21,091 inhabitants (85% water supply connection rate).

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

- Water source (water intake from the Micauti village), first level pumping station (PS-1), two (2) underground water reservoirs with a volume of 500 m^3 each;
- Second level pumping station (PS-2);
- Transportation/pumping of water, to underground water reservoirs with a volume of 6,000 m^3 each located in Negresti village, and further from underground water reservoirs pumped by gravity to the water distribution network (raw and drinking water transmission main);

- Two(2) underground water reservoirs with a volume of 2,000 m^3 each 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 fire fighting purposes;
- Water pumping stations (PS-3 and PS-4), to ensure the pressure in the water distribution network; and
- Looped water distribution network, combined with branched one.

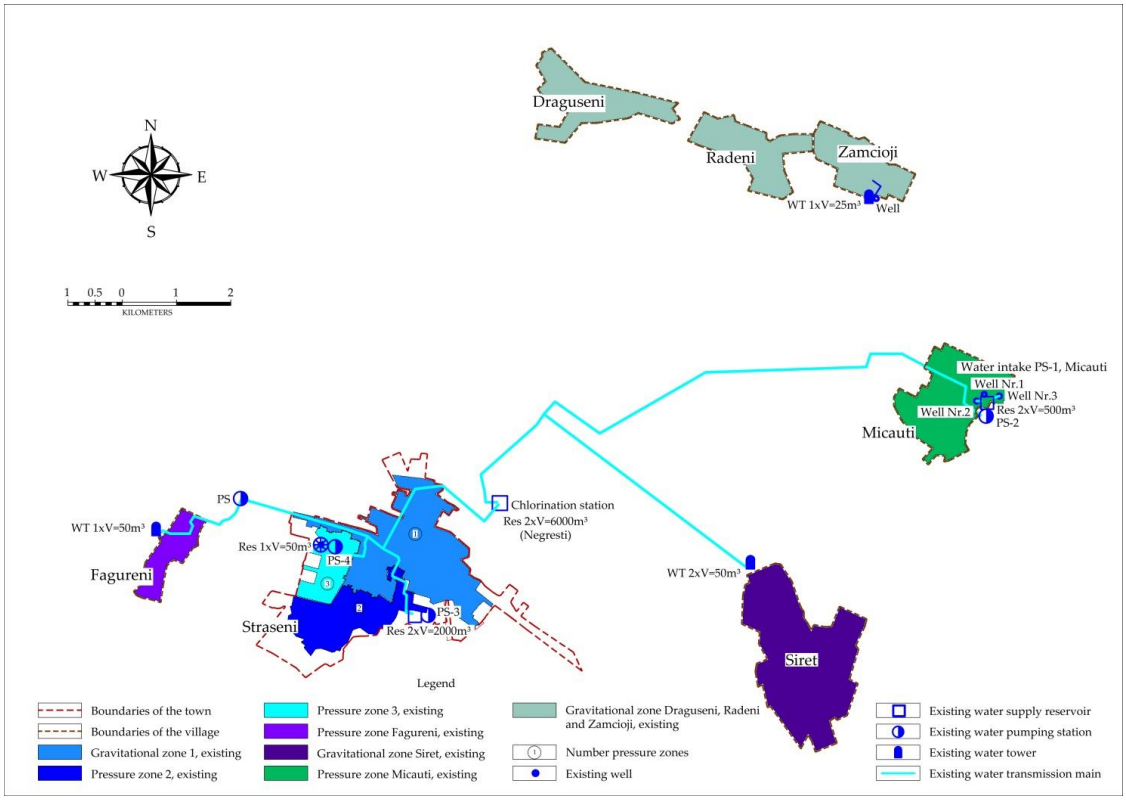
The raw water is pumped from deep wells in the Micauti locality and stored in two (2) underground water reservoirs with a volume of 500 m^3 each, further by a water transmission main, through second level pumping station (PS-2) pumped and stored in two (2) underground drinking water reservoirs with a volume of 6,000 m^3 each located in the Negresti village, and subjected to disinfection by sodium hypochlorite injection.

The water from underground water reservoirs located in the locality Negresti is delivered by gravity for the Straseni northern and centre districts, while it is stored in two (2) underground drinking water reservoirs with a volume of 2,000 m^3 each located in the Ion Iachir street.

In order to increase the water pressure in the Ion Iachir and Vaselovschi streets, have been constructed the third level pumping stations (PS-3 and PS-4).

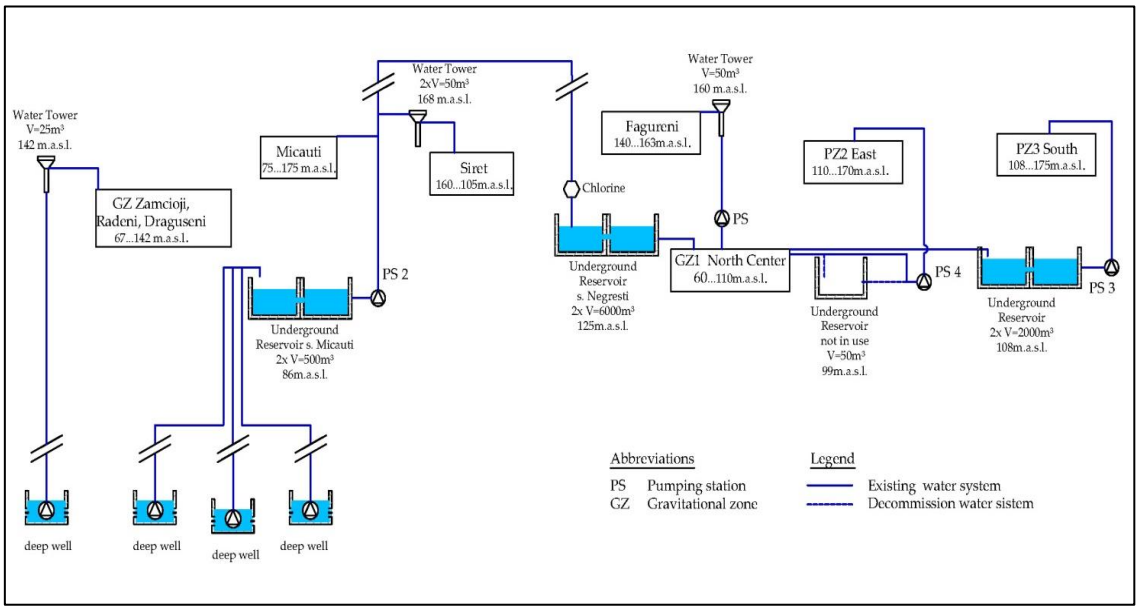
The existing water supply system in the town of Straseni is represented in figure 4-1. More detailed information about the water supply system in the town of Straseni is provided in Annex 11.

Figure 4-1: Water supply scheme of the town of Straseni



Source: GIZ/MLPS

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



Source: GIZ/MLPS

4.3.1.1 Water source

In the Micauti village, the water intake includes eleven (11) deep wells, of which only three (3) are in operation and used to supply the town of Straseni, including Fagureni locality and localities connected to the water transmission main (Micauti and Sireti).

The main technical data on the deep wells in operation are presented in Table 4-4.

Table 4-4: Available water sources at the existing water intake

No. acc. to the figure 4-1	Well no. in technical passport	Year of installation	Present status	Yield capacity (l/s)	
				l/s	m^3/day
1	3941	1979	in operation	19.5	1,685
2	4806	1979	in operation	19.5	1,685
3	4807	1979	in operation	19.5	1,685
Total				**58.5**	**5,055**

Source: ME 'Apa-Canal' Straseni

At the time of site visits conducted by GIZ/MLPS, the lack of fence in the strict regime sanitary protection areas for deep wells in operation has been found out.

According to the obtained data, the quality of the raw water at the well /intake complies with 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 water quality provided by the ME 'Apa-Canal' Straseni, is presented in Table 4-5.

Table 4-5: Raw water quality indicators

No.	Indicator	Unit	Max. concentration acc. to G.D. No 934	Raw water concentration (deep well no. 4672 (9a))
1.	Smell	degree	acceptable for customers	-
2.	Taste	degree	acceptable for customers	-
3.	Colour	degree	acceptable for customers	-
4.	Hydrogen Index pH		≥ 6.5 ≤9.5	7.4
5.	Ammonia NH_4	mg/l	0.5	0.37
6.	Nitrites (NO_2)	mg/l	0.5	0.05
7.	Nitrates (NO_3)	mg/l	50	2.58
8.	Total hardness	degree	5 German degree	10.3
9.	Total dissolved solids	mg/l	1,500	804
10.	Chlorine	mg/l	250	37.2
11.	Sulphates	mg/l	250	217.4
12.	Fluorides	mg/l	1.5	0.49
13.	Iron	mg/l	0.3	< 0.1
14.	Copper	mg/l	1	< 0.1

Source: ME 'Apa-Canal' Straseni

4.3.1.2 Water abstraction

Water abstraction facilities comprise:

- Deep wells and first level pumping station (PS-1);
- Water storage reservoirs.

The raw water from each deep well in operation, through submersible pumps (first level pumping station (PS-1)), by individual pressure pipes is pumped and stored in two (2) underground water reservoirs with a volume of 500 m^3 each installed on the second level pumping station area (PS-2).

The main technical parameters of submersible pumps are presented in Table 4-6. The main technical parameters of underground water reservoirs with a volume of 500 m^3 each are presented in Table 4-8.

Table 4-6: Main technical parameters of submersible pumps

No. acc. to figure 4-3	No. in technical passport	Type	Flow rate (m^3/h)	Head (m)	Power (kW)	Energy specific consumption [kwh/m^3]	Condition
1	3941	ЭЦВ 10-65-150	65	150	45	0.8	in operation
2	4806	ЭЦВ 10-65-150	65	150	45	0.8	in operation
3	4807	ЭЦВ 10-65-150	65	150	45	0.8	in operation

Source: ME 'Apa-Canal' Straseni

Figure 4-3: Water intake in Micauti village– deep well no.1 (3941) and pressure pipe to underground water reservoirs

Source: GIZ/MLPS

Figure 4-4: Water intake in Micauti village– underground water reservoirs with a volume of 500 m^3 each

Source: GIZ/MLPS

4.3.1.3 Water transmission main

The raw water, through the second level pumping station (PS-2)), is pumped and stored in two (2) underground drinking water reservoirs with a volume of 6.000 m^3 each located in the Negresti locality(raw water transmission main), further, by a drinking water transmission main is supplied by gravity to the northern and centre areas of Straseni town.

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

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

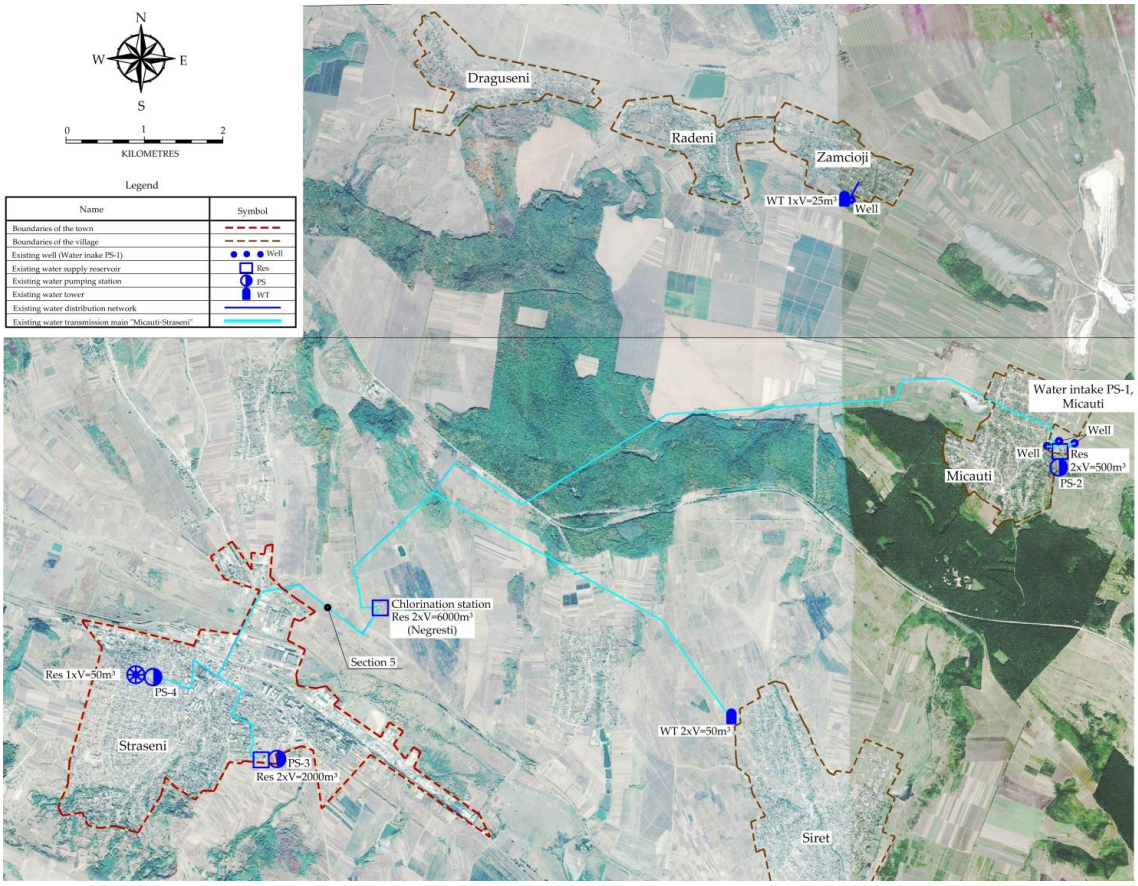
Portion	Type of water transmission main	Pipe material	Diameter (mm)	Length (m)	Current technical condition
1	raw water transmission main	Steel	500	8,500	unsatisfactory
2	raw water transmission main	HDPE	280	5,600	satisfactory, reconstruct-

Por-tion	Type of water transmission main	Pipe material	Diameter (mm)	Length (m)	Current tech-nical condition
					ed/rehabilitate d in 2012
Total			**14,100**		
3	drinking water trans-mission main	HDPE	250	2,900	satisfactory, reconstruct-ed/rehabilitate d in 2012
Total			**2,900**		
TOTAL			**17,000**		

Source: ME 'Apa-Canal' Straseni

Within the framework of previous designs, the raw water transmission main have been rehabilitated with a length of cca. 8,500 m by reducing the diameter from 500 mm to 280 mm and 250 mm, and by changing the pipe material from steel to high-density polyethylene, as provided in Figure 4-5.

Figure 4-5: Water transmission main



Source: GIZ/MLPS

4.3.1.4 Water disinfection

The water disinfection is a process of removal or neutralising bacteria and pathogenic viruses from the water. The raw water is subjected to disinfection with sodium hypochlorite solution (NaOCl) only in the underground water reservoirs located in Negresti village.

Figure 4-6: Sodium hypochlorite dosing station, Negresti village

Source: GIZ/MLPS

4.3.1.5 Water storage facilities

The capacity of water storage facilities for existing water supply system in the town of Straseni can be considered as enough and in satisfactory condition. The main technical data on the existing underground reservoirs are provided in Table 4-8.

Table 4-8: 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.	Water intake in Micauti locality	1979	rectangular	500	2	satisfactory
2.	Negresti village	1979	rectangular	6,000	2	satisfactory
3.	Ion Iachir street, town of Straseni (PS-3)	1986	rectangular	2,000	2	satisfactory
4.	Vaselovschi street, town of Straseni (PS-4)	1986	circular	50	1	out of operation

Source: ME 'Apa-Canal' Straseni

4.3.1.6 Booster pumping stations

The private sector from the southern area of the town of Straseni is supplied by pressure from underground reservoirs with a volume of 2,000 m^3 each located in the Ion Iachir street, by means of a set of pumps type WILO Tip Helix V 22-36-52, installed at third level pumping station (PS-3). Also, the pressure increase for supplying water in

two (2) nine-storey apartment buildings is carried out through a set of booster pumps type WILO Tip Helix V 22-36-52, installed at third level pumping station (PS-3).

Private sector from the eastern area of the town of Straseni is supplied by pressure through a group of pumps type HIDROVAR, installed at the third level pumping station (PS-4) located in the Vaselovschi street. Following the rehabilitation of water pumping station carried out in 2008, the reservoir with the volume of 50 has been out of operation.

The main technical data of the existing pumping stations are provided in Table 4-9.

Table 4-9: Main technical parameters of water pumping stations

No.	PS name	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.	PS-2	1979		ЦНС 400/210 (reserve)	268	120	250	0.9
			2014	WILO Type Helix V 5209-2-3/25/E/K/400-50	47.2	176	37	0.78
2.	PS-3	1980		WILO Type Helix V 22-36-52	25	120	3x15	0.6
			2008	WILO Type Helix V 22-36-52	7.5	18	2x1.1	0.15
3.	PS-4	1979	2008	HIDROVAR	27.2	110	15	0.55

Source: ME 'Apa-Canal' Straseni

Figure 4-7: Second level pumping station (PS-2): set of pumps WILO Type Helix V 5209-2-3/25/E/K/400-50 and reserve pump ЦНС 400/210

Source: GIZ/MLPS

Figure 4-8: Third level pumping station (PS-3)

Source: GIZ/MLPS

Figure 4-9: Third level pumping station (PS-4)

Source: GIZ/MLPS

4.3.1.7 Water distribution network

The water distribution network consists of steel and high density polyethylene (HDPE) pipes with diameters of between 20 mm and 400 mm. The total length of water distribution network is about 80,000 m. The main technical parameters of the distribution network are presented in Table 4-10. The length of water distribution network for different diameters expressed as a percentage is provided in Table 4-11.

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

No	Material	Length (m)/diameter (mm)									Length (m)	Total length (m)
		400	315	250	110	90	86	50	40	20		
1.	Steel	7,830					2,200	300			10,330	80,000
2.	HDPE		10,000	8,000	2,000	3,200		15,600	8,300	22,570	69,670	

Source: ME 'Apa-Canal' Straseni

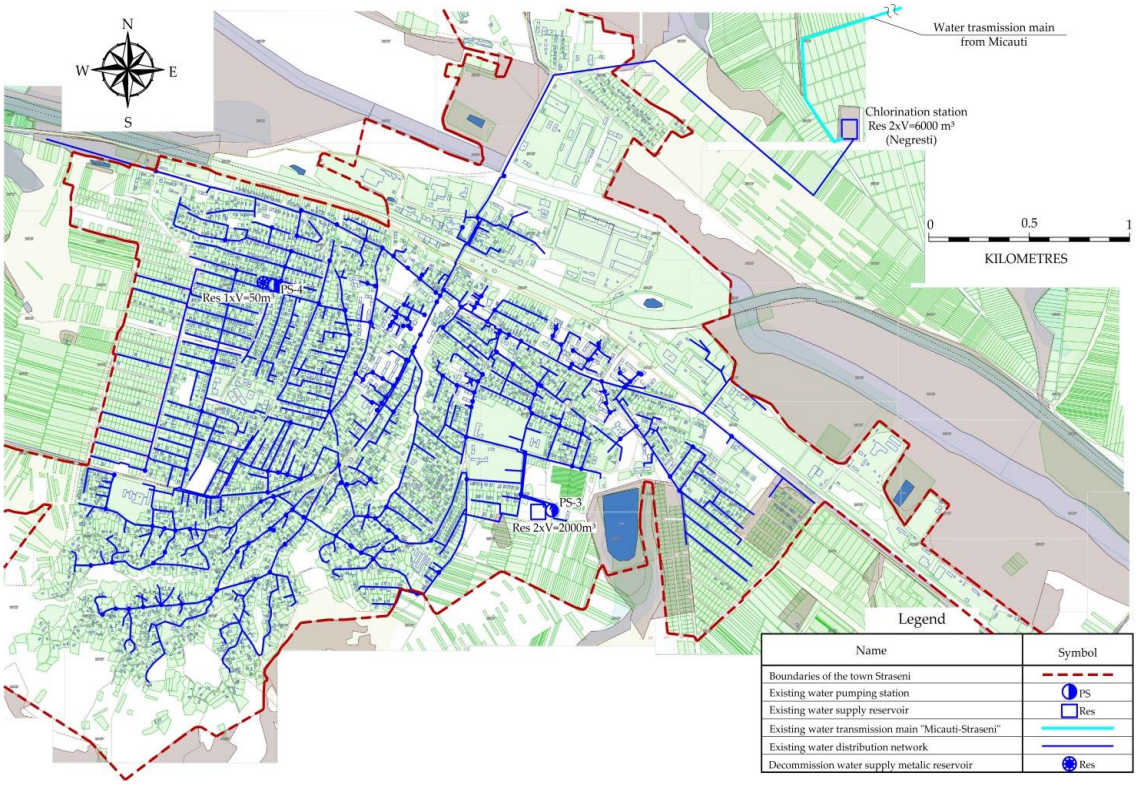
Table 4-11: Percentage of water distribution network by diameter size

No.	Material	Network length (m) by diameter size (mm)			Length (m)	Age (years)	Total (%)
		400 – 250 mm	110 – 90 mm	50 – 20 mm			
1.	HDPE	18,000	5,200	46,470	69,670	9-10	87
2.	Steel	7,830	2,200	300	10,300	> 30	13
	Total	**25,830**	**7,400**	**46,770**	**80,000**		**100**

Source: ME 'Apa-Canal' Straseni, GIZ/MLPS assessments

The water distribution network in the town of Straseni is provided in figure 4-10. More detailed information about water distribution network in the town of Straseni is provided in Annex 11.

Figure 4-10: Water distribution network in the town of Straseni



Source: GIZ/MLPS

According to the information provided by the ME 'Apa-Canal' Straseni, the rehabilitation works of the water distribution network in the Stefan cel Mare street (the street with the most obsolete pipes) with a length of about 1,000 m have been completed in April 2015. Following these works fulfilment, a continuous water supply of the residents from mentioned above area will be ensured.

4.3.2 Water supply system in Fagureni locality

Localityo f Fagureni is administrated by the town of Straseni and it is located 3.5 km from the town centre. In 2014 construction-installation works of water distribution network, of water pumping station and water tower located in Fagureni locality were carried out and the water tower was put into operation in 2015.

The water distribution network of the town of Straseni represents the supply source for Fagureni village, by use of a manhole located in the 245, Stefan cel Mare street as connection. Water supply scheme foresees the pumping of water through pumping station into water tower with a volume of 50 m^3, from which further water will be distributed by gravity into the water distribution network in Fagureni locality (as provided in Figure 4-1).

4.3.3 Water supply system in Micauti locality

About 202 households or 505 consumers are connected directly to the raw water transmission main from water intake in Micauti locality to underground water reservoirs located in Negresti locality (managed by the ME 'Apa-Canal' Straseni).

The raw water from three (3) deep wells is pumped and stored in one (1) water tower with a vat volume of 25 m^3 further distributed by gravity into water distribution network for about 655 households or 1,876 consumers (under direct management of LPA Micauti).

The raw water from a private deep well is pumped and stored in one (1) water tower with a vat volume of 25 m^3 further distributed by gravity into water distribution network for about 30 households or 85 consumers (managed by the JSC “Institute for selection and breeding”).

Water supply services are provided to about 2,466 consumers out of 3,056 inhabitants (81% water supply connection rate). The scheme of water supply systems in Micauti locality is provided in Figure 4-1.

4.3.4 Water supply system in Sireti locality

Sireti localityis connected to the raw water transmission main from the water intake in Micauti localityup to the underground water reservoirs located in Negresti village. Instead of pipeline connection, it is foreseen a water connection chamber. From the connection chamber, by a water transmission main of high-density polyethylene (HDPE) pipes with a diameter of about 110 mm and the length of cca. 4,000 m, the water is stored in two (2) water towers with 50 m^3 each installed in the north of the locality and further distributed by gravity into water distribution network. Water is supplied 24 hours/day in the Sireti village. Water supply services are provided to about 2,030 consumers out of 5,950 inhabitants (34% water supply connection rate). Scheme of water supply system in Siret locality is presented in Figure 4-1.

4.3.5 Water supply system in villages of Radeni, Draguseni and Zamcioji

The villages of Radeni, Draguseni and Zamcioji are supplied from a deep well located in Zamcioji village. The raw water is pumped and stored in one (1) water tower with a vat volume of 25 m^3, further pumped distributed by gravity into water distribution network of above mentioned villages.

Water is supplied 24 hours/day in the Radeni village. Water supply services are provided to about 1,729 consumers out of 3,100 inhabitants (56% water supply connection rate). Scheme of water supply system in the locality of Radeni, Draguseni and Zamcioji is presented in figure 4-1.

4.4 Water balance

The data necessary for water balance calculation were provided by the ME 'Apa-Canal' Straseni 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 Straseni was determined.

4.4.1 The monthly volume of abstracted raw water

According to the information provided by the ME 'Apa-Canal' Straseni, due to the lack of water meters on the rising pipe at the first level pumping station (PS-1), the monthly volume of the abstracted raw water is determined according to the following method: the underground water reservoirs with the volume of 500 m^3 each installed at the second level pumping station area (PS-2), are automated to the minimum and maximum level. During the filling of the mentioned reservoirs the raw water pumping is interrupt-

ed. Knowing the capacity of submersible pumps and time for filling the reservoirs, the monthly volume of the abstracted raw water is determined with a certain margin of error.

Considering that the consumers of villages of Micauti and Sireti and the town of Straseni are connected to the raw water transmission main, the monthly volume of abstracted raw water is determined for these three (3) localities, as provided in Table 4 - 12.

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 from the town of Straseni and villages of Micauti and Sireti.

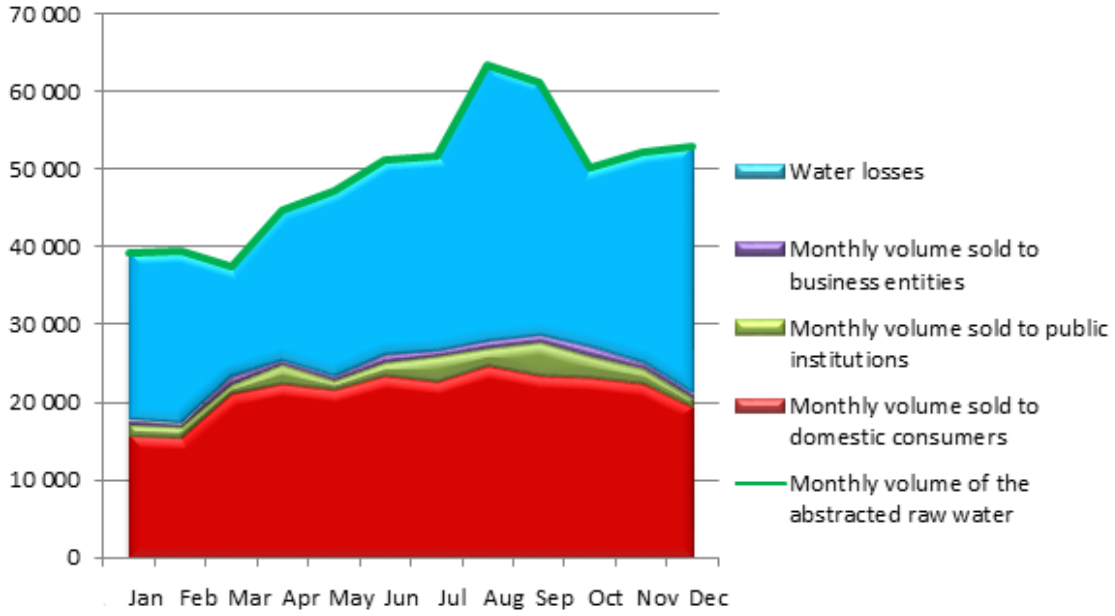
Operational indicators for 2014, presented by the ME 'Apa-Canal' Straseni and Local Municipal Enterprise, are provided in Table 4-12.

Table 4-12: Operational indicators for 2014

N^{o}	Month	Monthly volume of the abstracted raw water from Micauti water intake (m^3)	Monthly volume of water sold in the town of Straseni, in villages of Micauti and Sireti (m^3)		
			To domestic customers	To public institutions	To business entities
1.	January	39,128	15,681	1,489	499
2.	February	39,396	15,441	1,510	425
3.	March	37,520	20,944	1,357	1,034
4.	April	44,756	22,214	2,516	558
5.	May	47,168	21,408	1,264	469
6.	June	51,188	23,150	1,895	1,023
7.	July	51,724	22,540	3,272	633
8.	August	63,516	24,608	2,132	969
9.	September	61,104	23,340	4,266	887
10.	October	50,116	22,914	2,758	1,267
11.	November	52,260	22,149	2,210	747
12.	December	53,064	19,225	1,269	565
	Total	**590,940**	**253,614**	**25,938**	**9,076**

Source: ME 'Apa-Canal' Straseni

Figure 4-11: Operational indicators



Source: ME 'Apa-Canal' Straseni, 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 4-13.

In the last three (3) years (2012-2014), the annual volume of abstracted raw water increased, but the annual volume of water sold to domestic consumers in the town of Straseni is relatively small.

Table 4-13: The real water consumption

No.	Indicator	Unit of measurement	Year		
			2012	2013	2014
1.	Number of domestic customers	pers.	12,100	12,600	17,830
2.	The annual volume of abstracted raw water	m³	368,433	419,602	590,940
3.	Total water sold by the utility, of which: • Domestic consumers • Public institutions and business entities	m³ m³ m³	169,799 147,373 22,426	191,700 170,000 21,700	251,444 217,218 34,226
4.	Real water consumption (based on daily sold water)	l/c/d	38	42	39
5.	Real water consumption (based on daily water sold to domestic consumers)	l/c/d	33	37	43

Source: ME 'Apa-Canal' Straseni, 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.

In the town of Straseni, the water supply system is equipped with measuring and control devices, and for this reason the data necessary for exact water balance calculation are based only on assessments.

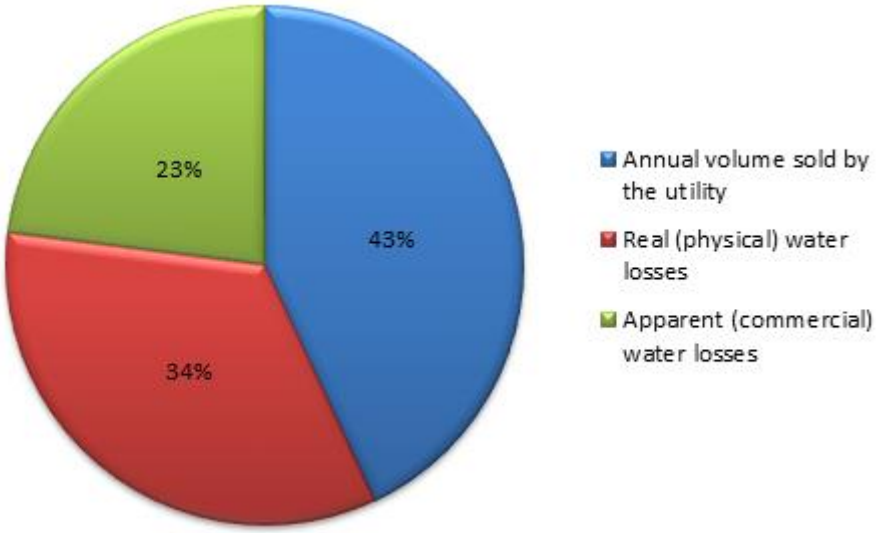
The water balance for water supply system in the town of Straseni is provided in Table 4-14.

Table 4-14: Water balance

No	Indicator	Unit of measurement		2014	
1.	Number of domestic consumers	pers.		17,830	
2.	Annual volume of abstracted raw water	m³		590,940	
3.	Annual volume of water sold	m³		251,444	
4.	The annual volume of NRW, including:	m³	%	339,496	57
	• Real (physical) water losses (60% of NRW)	m³	%	203,698	34
	• Apparent (commercial) water losses (40% of NRW)	m³	%	135,798	23

Source: ME 'Apa-Canal' Straseni, GIZ/MLPS assessments

Figure 4-12: Water balance



Source: ME 'Apa-Canal' Straseni, 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;

- System automation related to water level in underground water reservoirs;
- Identify unauthorised connections to the water distribution network.

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

- Install high precision water meters;
- Install flow meters on rising pipe at the second level pumping station (PS-2);
- Install flow meters on water transmission main pipeline to villages of Micauti and Sireti;
- Install flow meters on rising pipe at two (2) underground drinking water reservoirs with a volume of 6,000 m³ each located in Negresti village;
- Install flow meters on rising pipes at the third level pumping station (PS-3 and PS-4);
- Identify and replace defective water meters;
- Water meters installed for business entities and public institutions have to be subjected to the metrological control at each two (2) years and as appropriate to be replaced.

4.4.5 Water metering

During the period 2008-20010, a water metering programme was implemented, resulting in a metering rate of about 96% of customers in single-family dwellings, about 95% of multi-storey apartment building customers, and 100% of public institutions and business entities in the town of Straseni. The installed water meters are of class "A" and “B” class.

4.4.6 Equipment and facilities

The ME 'Apa-Canal' Straseni owns and operates the following equipment and facilities:

- Water transportation truck GAZ-53 (one (1) unit);
- Excavator.

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 Straseni. The statistics on damages and repairs in the period 1 January 2014 – 31 December 2014 are provided in Tables 4-15 and 4-16.

Table 4-15: Statistics on pipe damage, 01 January - 31 December, 2014

No.	Location	Pipeline breakdowns
1.	On water transmission main (Micauti-Negresti road)	23
2.	On Stefan cel Mare street, town of Straseni	17
3.	On distribution network	19

Source: ME 'Apa-Canal' Straseni

Table 4-16: Statistics on repairs made, 01 January - 31 December 2014

No.	Type of repair	Repairs made
1.	Current repairs	59
2.	Capital repairs	PS-2 (water intake in Micauti village)
	Water losses on water transmission main	339,496 m³

Source: ME 'Apa-Canal' Straseni

4.5.2 Water disinfection

According to the information provided by the ME 'Apa-Canal' Straseni the raw water is treated only in the underground water reservoirs in Negresti locality by injecting sodium hypochlorite solution (NaOC).

4.6 Wastewater system

4.6.1 Wastewater system in the town of Straseni

About 9,207 domestic consumers out of 21,091 inhabitants from the town of Straseni are connected to the centralised wastewater system, connection rate for wastewater services is about 44%, including the connection rate for wastewater services in the town centre area for consumers of multi-storey apartment buildings is about 38% and the consumers of private district is about 6%.

The wastewater system in the town of Straseni 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 Straseni are the following:

- Gravity and pressure sewerage networks;
- Main wastewater pumping station (MWWPS).

Scheme of wastewater system in the town of Straseni is presented in Figure 4-13. More detailed information about wastewater system in the town of Straseni is provided in Annex 11.

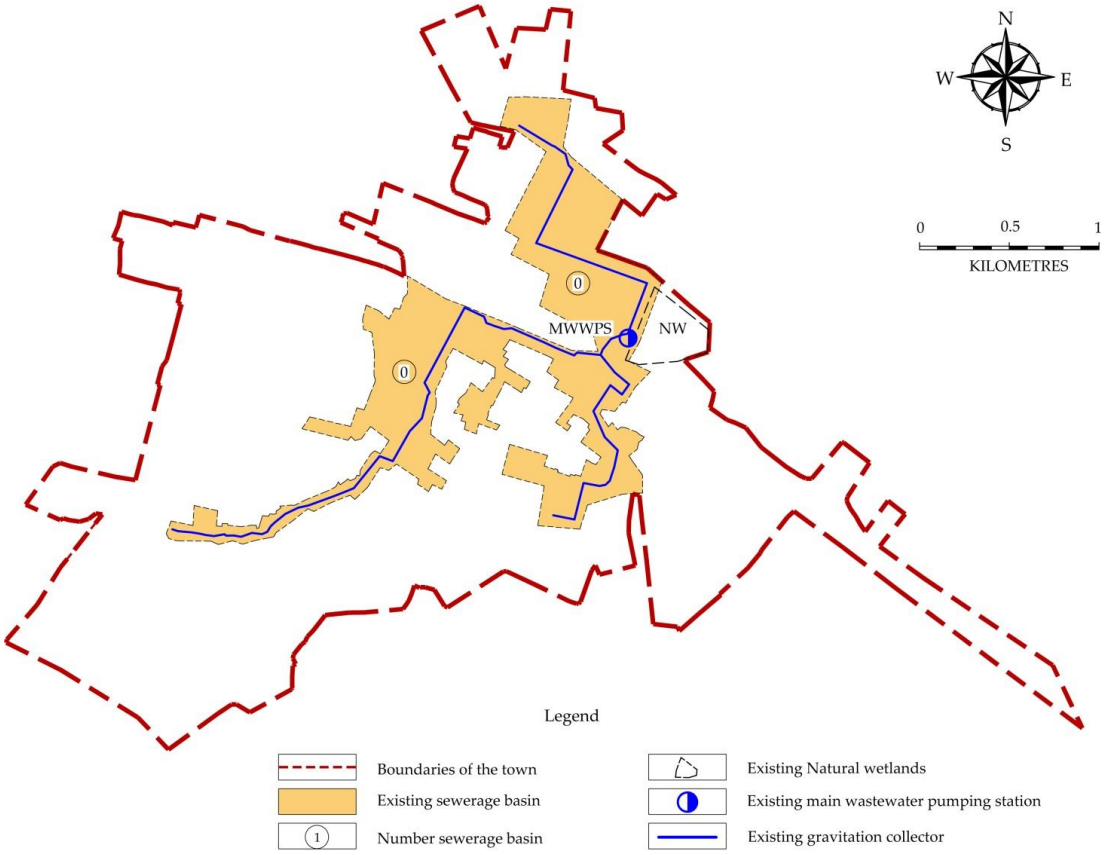
The wastewater basin represents a defined territory, from which the wastewater is collected to a sewerage network.

In the town of Straseni, the collection of wastewater is carried out by gravity to the main wastewater pumping station (MWWPS), further pumped to natural wetlands of the Bic River.

The wastewater collection from three (3) apartment buildings close to petrol station is performed by gravity into a cesspit, which is transported daily to the main wastewater pumping station.

According to the previous detailed design, the wastewater from town of Straseni was collected by gravity to the main wastewater pumping station (MWWPS) and further pumped through pressure main into the wastewater system of town of Chisinau. Because of damaged pressure sewer collector nearby the locality of VatraF, the pumping of wastewater from the town of Straseni became impossible.

Figure 4-13: The scheme of wastewater system in the town of Straseni



Source: ME 'Apa-Canal' Straseni, GIZ/MLPS

4.6.1.1 Sewerage network

The total length of gravity sewerage network is about 12,010 m. The main technical parameters of the gravity sewerage network are provided in Table 4-17. The length of sewerage network for different diameters expressed as a percentage is provided in Table 4-18.

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

No.	Material	Length (m)/diameter (mm)						Length (m)	Total length m)
		500	400	320	250	200	100		
1.	Steel	1,300	800					2,100	12,010
2.	Ceramic			3,200	5,080	260	1,370	9,910	

Source: ME 'Apa-Canal' Straseni

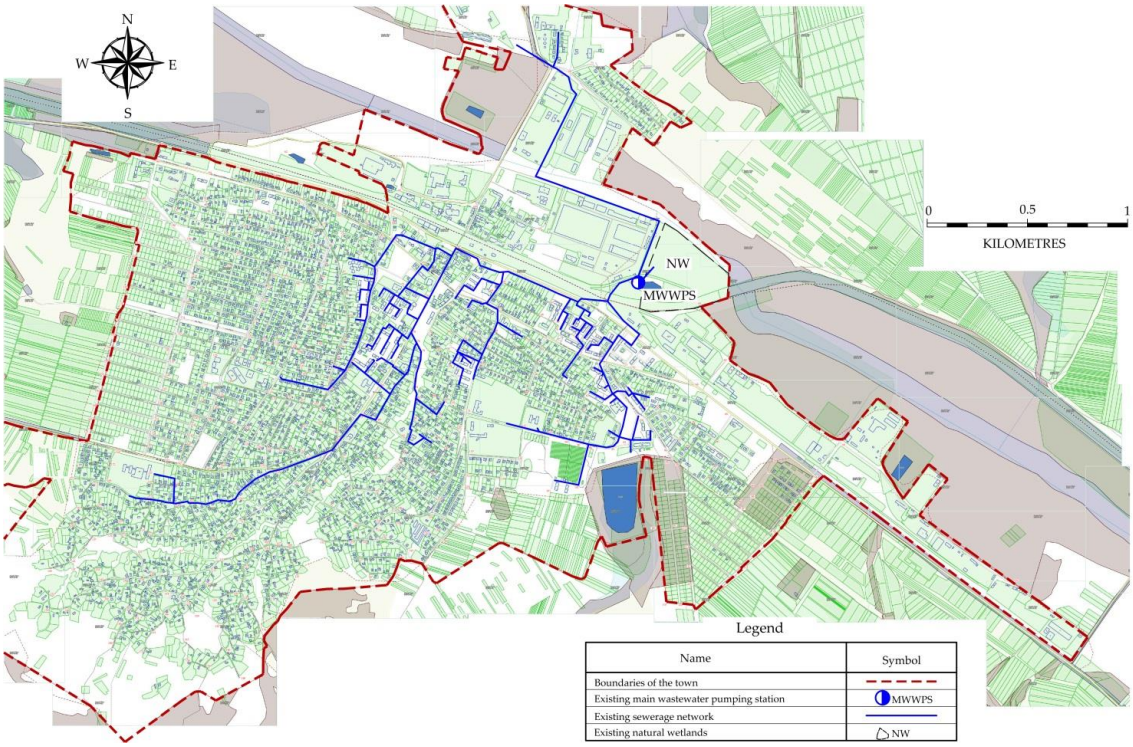
Table 4-18: Percentage of water distribution network by diameter size

No.	Material	Length (m)/diameter (mm)		Length (m)	Age (years)	Total (%)
		500 – 300 mm	250 – 100 mm			
1.	Steel	2,100		2,100	35	17
2.	Cheramics	3,200	6,710	9,910	35	83
	Total	5,300	6,710	12,010		100

Source: ME 'Apa-Canal' Straseni

The sewerage network in the town of Straseni is provided in Figure 4-14. More detailed information is provided in Annex 11.

Figure 4-14: Sewerage network in the town Straseni



Source: GIZ/MLPS

4.6.1.2 Main wastewater pumping station

The wastewater pumping station is located in the lower part of wastewater basin, where the gravity collection is impossible because of the topography in the area. The nominal parameters of the main wastewater pumping station and pumps are presented in Table 4-19.

Table 4-19: Nominal parameters of the main wastewater pumping and pumps

No.	PS name	Year of installa-tion	Year of rehabil-itation	Pump type	Pump flow rate (m^3/h)	Head (m)	Pump power (kW)	Condition
1.	MWWPS	1977	2012	FA10-78Z	161.7	31.7	26.0	unsatisfacto-ry

Source: ME 'Apa-Canal' Straseni

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, due to the lack of wastewater treatment plant.

Figure 4-15: Main wastewater pumping station

Source: GIZ/MLPS

Figure 4-16: Natural wetlands

Source: GIZ/MLPS

4.6.2 Wastewater systems in localities of Fagureni, Micauti, Sireti, Radeni, Draguseni and Zamcioji

There are no centralised wastewater systems in the localities of Fagureni, Micauti, Sireti, Radeni, Draguseni and Zamcioji.

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 4-20.

Table 4-20: Available studies and technical documentation

N^{o}	Project Name	Type of document	Financing Agency
1.	„Development of wastewater system and wastewater treatment in the town of Straseni, Construction of Wastewater Treatment Plant (”PROJECT CONSULTING NETWORK”, ltd., ECOLOGIE-EXPERT, Ltd., 2013),	Feasibility Study	N.A.
2.	„Wastewater treatment and solid waste management, town of Straseni, Moldova (“Aqua Consult” Ingenieur GmbH, 2014)	Feasibility Study	N.A
3.	Consulting Project: Diagnostic analysis, Municipal Enterprise, Production Department “Apă - Canal” town of Straseni (”PROJECT CONSULTING NETWORK” ltd., USAID, 2014)	Report	N.A
4.	The reconstruction with partial relocation of sewerage network of town of Straseni with road crossing R1 Chisinau - Ungheni-Sculeni and V. Micle Street	Implemented technical design	NEF
5.	Water main section construction in the town of Straseni; construction of Water Supply System, pumping station and water tower in Fagureni village, town of Straseni as well as modernization of pumping station at the water intake of "Micauti" sector – first and second phase, 2014	Implemented technical design	NEF
6.	Water main section construction in the town of Straseni and Fagureni village. Sewerage section rehabilitation as well as relocation of a wastewater system segment in the town of Straseni – phase III,2014	Implemented technical design	NEF
7.	Water main section rehabilitation in the town of Straseni, water main extension in Fagureni locality and rehabilitation of pumping station in Micauti village– phase IV, 2014	Implemented technical design	NEF
8.	Drinking water supply and construction of sewerage network in Sireti village, phase II	Implemented technical design	NEF
9.	Micauti-Cojusna Water main construction, phase I	Implemented technical design	NEF
10.	Reconstruction of kindergarten water main and water supply system of in Panasesti village, Straseni rayon - phase I	Implemented technical design	NEF
11.	Construction of connecting pipe to Micauti-Straseni pipe-line for water supply of Radeni village, phase I, 2011	Implemented technical design	NEF

Source: LPA Straseni

4.8 Conclusions

In the town of Straseni, the water supply service area is about 91% and water supply connection rate is about 85%.

High real (physical) and apparent (commercial) water losses (annual volume of NRW is about 57%).

The localities of Micauti and Sireti are connected to the raw water transmission main from Micauti village locality to Negresti village, it is necessary to disinfect the raw water before the underground water reservoirs with a volume of 500 m³ each installed at the second level pumping station (PS-2) and installation of water disinfection unit.

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 Straseni.

In Fagureni locality, the water supply service area is about 100% and water supply connection rate is about 79%.

In Micauti locality, the water supply service area is about 100% and water supply connection rate is about 81%.

In Siret locality, the water supply service area is about 49% and water supply connection rate is about 34%.

In commune Radeni (Radeni, Draguseni, Zamcioji localities) the water supply service area is about 80% and water supply connection rate is about 56%.

In the town of Straseni, the wastewater coverage area is about 61% and wastewater 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.

In the town of Straseni, the wastewater collection is carried out by pumping to the natural wetlands of the Bic River, and thus the construction of wastewater treatment plant is required.

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 service 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[7] 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 Straseni 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);
- Comparison of results and assessment of initial conditions with the Regional Sector Programme and the National Water Supply and Sanitation Strategy 2014-2028 (GD nr.199 of 20.03.2014);
- Strategies, goals and priorities defined by the Mayor’s Office of the town of Straseni and ME 'Apa-Canal' Straseni (see Chapter 5.2);
- 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;
- 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

[7] A Project Working Group (PWG), established by decision of the local council and comprising members from the Regional Development Agency Centre (RDA Centre), the 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 Straseni local council.

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 have been described (irrespective of their phasing);
- In Chapter 5.8 the identified measures have been 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 the water supply and wastewater services

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

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

Strategic goal

A strategic document has been developed for the water sector in the town of Straseni in 2014[8]. The Mayor Office and ME 'Apa-Canal' Straseni are well aware of the actual situation regarding to water supply and wastewater services and are willing to improve its quality. The general strategic goal of the Mayor Office and ME 'Apa-Canal' Straseni is to achieve a viable and high quality management of the centralised water supply and sanitation systems. In order to further improve the efficiency of the services and to make use of economies of scale, neighbouring localities should be integrated into the services area of ME 'Apa-Canal' Straseni.

It is noteworthy that the National WSS Strategy (2014-2028) includes the regional transmission main from Chisinau to Straseni and Calarasi as a priority investment for the Government of Moldova (RM). Local and regional strategies are therefore aligned to this national objective since the local strategy foresees the regionalisation of water supply and sanitation (WSS) services whilst the Regional Sector Programme (RSP) provides the framework for improving the conditions of local operators so that they can

[8] Development and improvement action planME "Apa-Canal" Straseni, Pro Consult/USAID, 2014

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 only a slight increase in population of Straseni Town can be expected (see Chapter 2.4 - Population). Therefore, no major plans for large scale extensions of residential areas in the town of Straseni are foreseen. However, there are high expectations that economic activities in the town of Straseni will increase by development of new industrial parks.

Generally, the existing water supply system has enough capacity to extend service area up to the boundaries of the town. There is a possibility that the service area for the town of Străseni will expand geographically and that the neighbouring localities of Radeni, Draguseni and Zamcioji will be connected (in addition to those already connected).

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 ME 'Apa-Canal' Straseni 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 with sufficient quantity to all customers;
- Extend the water supply and sewerage service area in the town of Straseni;
- Extend the water supply and sewerage service area to the neighbouring localities and connect new consumers of Micauti, Sireti, Radeni, Draguseni and Zamcioji localities;
- Treat effluents from the wastewater system in compliance with the current national 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;
- Decrease number of break-downs in the transmission main and therefore increase supply security and reliability of service;
- Improve efficiency of service provision by enhancing operation and maintenance practices for the Mayor Office and ME 'Apa-Canal' Straseni;
- 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. Nevertheless, an increase in future industrial development is likely because of the planned redevelopment of the industrial area. Development of water demand including water losses and wastewater flow projection is presented in the following chapter.

Metering policy

Currently metering is performed inadequately and therefore the water balance and water loss analysis cannot be carried out for the following reasons:

- Water meter accuracy is low (insufficient calibration and/or replacement of water meters) which leads to under registration of consumed water;
- Water flow is neither metered at the water intake nor at pumping stations and reservoirs (see Chapter 4).

Overall, improvement of the system knowledge (water flow, pressure and water losses) is of utmost importance and will be given high priority in the Investment Programme. The measures should reduce water wastage in households and at the same time will increase water sales due to reduction of commercial water losses.

Customer metering

In general the customer metering rate is at high level (above 95% in average). About 96% of the individual households (private houses) and 95% of the apartments are metered, but there are no master water meters (meter at the entrance of the building) installed at multi-storey apartment buildings. Further, all non-domestic customers are metered.

For domestic and non-domestic water meters, meter accuracy is low due to the fact that water meters in most of apartments and private houses are of “A and B” accuracy class (medium to low accuracy). Therefore, part of the water meters have to be replaced (13% of meters at individual households and 60% of apartment water meters, 10% of non-domestic water meters).

Installation of master water meters in multi-storey apartment buildings is given high priority, which will permit the assessment of the level of water losses and illegal consumption (Non-Revenue Water).

Tariff policy

Water tariff policy and strategy (level of average tariff and tariff structure) has a significant impact on (i) water consumption (demand elasticity results in reduction of consumption when tariffs increase), (ii) 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;
  - The 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); 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 increase 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"[9], 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[10]: During the last decades economy study area has slowed down and many industries closed, which resulted in a steep decline in industrial water consumption. Based on the information provided by the local authorities it is assumed that industrial water consumption is expected to increase again in the future increase after re-organisation of the industrial sector (see Chapter 2). 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[11] linearly to 10 l/c/day until 2030 (in line with the National WSS Strategy) and will then remain constant until

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

[10] Including all commercial entities

[11] According to data from ME 'Apa-Canal' Straseni's sales department

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 wastewater 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 Straseni

Within the framework of this study the localities of Draguseni, Zamcioi and Radeni are considered to be connected until 2018 (Phase 1), which is supported by technical assistance. Due to the fact that the remaining localities in the neighbourhood of the town of Straseni are currently not sufficiently provided with water supply and wastewater services and their potential for developing its own WSS systems are limited, it is assumed that all localities will be in the future supplied by ME 'Apa-Canal' Straseni and thus will be connected to its water supply system until 2030. Existing situation for all localities, see Chapter 4, Table 4-1.

5.3.4 Water losses

Currently non-revenue water (NRW) in the water supply system of the town of Straseni is very 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[12] (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 transmission main 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[13]) proposed in Phase 1. Further, in the long-term it is assumed that continuous renovation of the network[14] will further reduce real water losses;
- Overall, NRW is therefore assumed to decrease to 25% until the year 2045.

[12] Including unbilled authorised consumption

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

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

5.3.5 Sewerage infiltration rate

The sewerage infiltration rate (as % of total wastewater discharged to the wastewater system) is assumed to decrease if measures for rehabilitation of the sewerage network are foreseen. The development of this parameter is based on expert assessment, separate for each sewerage network, depending on (i) the condition of the sewerage network, (ii) the share of new and old sewerage network, (iii) the type of sewer (separate or combined system), (iv) information about groundwater table if available, (v) data of wastewater concentration at the outflow of the wastewater system if available.

There is no information on the current infiltration rate available for Straseni sewerage network (see Chapter 4) and therefore a typical[15] infiltration rate for sewerage networks in the region has been applied in the model (see table below). As no sewer rehabilitation is foreseen in Phase 1 it is assumed that the rate will remain constant until 2018 and the rate will decrease after implementation of measures for rehabilitation of sewerage network or extension of the sewerage network in accordance with the ratio of “new sewerage network”[16] and “old sewerage network”[17] (see table below). Thereafter, it is assumed that the sewer infiltration rate will be maintained at constant level until the end of the planning horizon[18].

5.3.6 Wastewater flow and load

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

- Specific domestic wastewater load: 60 gBOD5/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 sewerage network;
- Peak Storm Water Factor: 1.3 for allowance for storm water entering into the sewerage network from “inappropriate”[19] 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).

[15] Outworn and obsolete wastewater system

[16] An infiltration rate of 10% is assumed for new sewerage networks

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

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

[19] 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 sewerage network cannot be avoided.

Table 5-1: Design parameter

N°	Design Parameter	Unit	2015[20]	2018[21]	2021[22]	2030	2045
0	**Service coverage rate for domestic customers, disaggregated for urban and rural localities**						
0.1	Water Supply - total	%	59	89	90	94	100
0.2	Wastewater - total	%	38	38	61	62	63
0.3	Water supply – urban	%	91	100	100	100	100
0.4	Water supply – rural	%	7	72	75	84	100
0.5	Wastewater - urban	%	61	61	99	100	100
0.6	Wastewater - rural	%	0	0	0	0	0
1	**Service connection rate for domestic customers, disaggregated for urban and rural localities**						
1.1	Water - total	%	54	76	80	90	100
1.2	Wastewater - total	%	27	27	41	56	60
1.3	Water supply – urban	%	85	91	93	100	100
1.4	Water supply – rural	%	5	53	58	74	100
1.5	Wastewater - urban	%	44	44	66	90	95
1.6	Wastewater - rural	%	0	0	0	0	0
2	**Volume of water sold for domestic consumers**						
2.1	In urban localities	l/c/d	32	40	48	71	110
2.2	In rural localities	l/c/d	32	44	48	60	80
3	**Volume of water sold for non-domestic consumers, disaggregated for urban and rural localities**						
3.1	Industrial and commercial - urban	l/c/d	1.3	4.0	6.8	15.0	15.0
3.2	Industrial and commercial - rural	l/c/d	0.0	0.0	0.0	0.0	0.0
3.3	Institutional entities - urban	l/c/d	3.8	5.0	6.3	10.0	10.0
3.4	Institutional entities - rural	l/c/d	3.8	1.9	3.9	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	%	57	45	40	34	25
5.2	Apparent losses	%	23	15	15	11	5
5.3	Real losses (physical losses)	%	34	30	25	23	20
6	**Sewer Infiltration rate as share of total water discharged to the wastewater system**						
6.1	Sewerage infiltration rate	%	50	50	17	16	15
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					1.64
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	gBO D_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

[20] Existing situation

[21] 1st year of operation Phase 1 investments

[22] 1st year of operation Phase 2 investments

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 (Rehabilitation of Transmission main and 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 below (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[23]	2018[24]	2021[25]	2030	2045
1	**Population in the study area served with water**						
1.1	Total population serviced	N°	18,534	26,177	27,463	31,363	35,395
1.2	In urban localities	N°	17,830	19,235	19,834	21,660	22,195
1.3	In rural localities	N°	704	6,942	7,629	9,703	13,200
2	**Volume of water sold in total and disaggregated for different consumers**						
2.1	Total volume sold	m³/y	251,444	458,850	583,123	1,006,484	1,527,270
2.2	Domestic customers	m³/y	217,218	390,548	477,851	773,421	1,276,562
2.3	Industrial customers	m³/y	8,585	28,190	48,948	118,589	121,517
2.4	Institutional customers	m³/y	25,641	40,112	56,324	114,474	129,191
3	**Total water sold disaggregated for urban and rural areas**						
3.1	Urban localities	m³/y	241,893	343,638	439,592	759,402	1,093,651
3.2	Rural localities	m³/y	9,223	115,213	143,531	247,083	433,619
4	**Non-Revenue Water (NRW) volume disaggregated for total NRW, apparent losses, and real losses**						
4.1	Total NRW	m³/y	339,496	375,423	388,749	527,206	509,090
4.1	Apparent losses	m³/y	135,798	125,141	145,781	172,540	101,818
4.2	Real losses (physical losses)	m³/y	203,698	250,282	242,968	354,666	407,272
5	**Water demand figures considering the demand variation factors**						
5.1	Yearly water demand/production	m³/y	590,940	834,273	971,872	1,533,690	2,036,360
5.2	Average daily water demand	m³/d	1,619	2,286	2,663	4,202	5,579

[23] Existing situation

[24] 1st year of operation Phase 1 investments

[25] 1st year of operation Phase 2 investments

N°	Parameter	Unit	2014[23]	2018[24]	2021[25]	2030	2045
5.3	Maximum daily water demand	m³/d	1,688	2,411	2,822	4,478	5,997
5.4	Average hourly water demand	m³/h	67	95	111	175	232
5.5	Maximum hourly water demand	m³/h	90	137	164	267	372

Source: GIZ/MLPS

Wastewater flow and load projections are presented in the table below (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, which will be the basis for design calculation (design year) of sewerage network and wastewater treatment plant (if applicable).

Table 5-3: Wastewater flow and load projection

N°	Parameter	Unit	2014[26]	2018[27]	2021[28]	2030	2045
1	**Population in the study area served with sewerage**						
1.1	Total population serviced	N°	9,207	9,269	14,159	19,494	21,085
1.2	In urban localities	N°	9,207	9,269	14,159	19,494	21,085
1.3	In rural localities	N°	0	0	0	0	0
2	**Volume of wastewater charged in total and disaggregated for different customers**						
2.1	Total volume of wastewater generated	m³/y	149,446	185,930	338,199	689,463	1,038,968
2.2	By domestic customers	m³/y	113,579	140,127	253,425	511,580	846,567
2.3	By industrial customers	m³/y	9,217	17,573	39,513	106,730	115,441
2.4	By Institutional customers	m³/y	26,650	28,230	45,261	71,153	76,961
3	**Total wastewater charged disaggregated for urban and rural areas**						
3.1	in urban localities	m³/y	149,446	185,930	338,199	689,463	1,038,968
3.2	in rural localities	m³/y	0	0	0	0	0
4	**Sewer infiltration water based on the determined infiltration rate**						
4.1	Sewer infiltration water	m³/y	74,723	92,965	57,494	112,038	155,845
5	**Wastewater generation figures considering variation factors**						
5.1	Average wastewater flow (dry weather)	m³/y	224,169	278,896	395,693	801,501	1,194,814
5.2	Maximum daily dry weather flow (Qdmax)	m³/d	655	815	1,177	2,385	3,558
5.3	Maximum hourly dry weather flow (QDWF)	m³/d	43	54	85	173	259
5.4	Maximum hourly storm water flow (QSWF)	m³/d	56	70	111	225	337
6	**Population equivalents in total and disaggregated for different customers**						
6.1	Total population equivalent	PE_{60}	9,576	9,740	15,030	21,322	23,062
6.2	By domestic customers	PE_{60}	9,207	9,269	14,159	19,494	21,085
6.3	By Industrial and institutional customers	PE_{60}	368	471	871	1,828	1,977

[26] Existing situation

[27] 1st year of operation Phase 1 investments)

[28] 1st year of operation Phase 1 investments)

N°	Parameter	Unit	2014[26]	2018[27]	2021[28]	2030	2045
7	**Pollution load – BOD in total and disaggregated for different customers**						
7.1	Total BOD_5 load	kg/d	575	584	902	1,279	1,384
7.2	By domestic customers	kg/d	552	556	850	1,170	1,265
7.3	By industrial and institutional customers	kg/d	22	28	52	110	119

Source: GIZ/MLPS

5.5 Water demand projection versus available water resources and production capacities

As presented in Chapter 4, the available production capacities of the well field in Micauti are 214.5 l/s (11 wells with a capacity of 19.5 l/s each) or 18,533 m³/day. Since only 3 wells are operational, the current capacity of the wells is 58.5 l/s or 5,054 m³/day. Due to the installed pumps the current abstraction capacity is 17.5 l/s per well or 4,536 m³/day.

The long term water demand projection for Straseni Town and all the envisaged connections of localities (see Chapter 5.4) presents an increase of the water demand with the peak water demand in the year 2045.

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

N°	Parameter	Unit	Quantity
1	Currently available water resources (Production capacity of 3 existing wells)	m³/d	5,055
2	Maximum daily water demand (Qdmax) in year 2045	m³/d	5,997
3	Additionally required water production capacities (2 – 1)	m³/d	942

Source: GIZ/MLPS

This projected water demand can be covered with the three currently operated wells until the year 2035. In order to cover the water demand in the following period one additional well with a capacity of 19.5 l/s needs to be rehabilitated and put into operation by 2036. The peak water demand is projected for the year 2045.

The submersible pumps in the three currently operated wells shall be replaced by 2021 in order to use the full capacities of these wells.

Table 5-5: Water demand projection and future production capacities

N°	Parameter	Unit	2014[29]	2018[30]	2021[31]	2030	2045
1	Average daily water demand	m³/d	1,619	2,286	2,663	4,202	5,579
2	Maximum daily water demand	m³/d	1,688	2,411	2,822	4,478	5,997
3	Available water source/well capacities	m³/d	5,055	5,055	5,055	5,055	6,739
4		l/s	58.5	58.5	58.5	58.5	78.0
5	Number of well in operation	n°	3	3	3	3	4

Source: GIZ/MLPS

Another relevant aspect for the water provision is the transmission main from the well field in Micauti to the network in Straseni. It is planned to rehabilitate parts of this main.

Part of the transmission main with a diameter from 500 mm steel to 280 mm has been replaced recently. The replacement of the remaining part proposed in the investment plan in Phase 1 is also planned to be carried out with a diameter of 280 mm.

In order to verify the capacities of the rehabilitated parts of the transmission main and the part which shall be replaced in the frame of Phase 1, hydraulic calculations have been conducted.

The verification of the capacity is done according the allowed water flow velocity. According to the SNIPs the maximum acceptable velocity for water in a transport line with diameters OD 250-800 mm is limited to 3 m/s, although for smaller diameters the velocity is limited to 1.5 m/s, which may be considered optimum for the 280 mm HDPE (the interior diameter of a 280 mm HDPE 100 pipe SDR 17/PN 10 is circa 247 mm). This results in an optimal maximal flow of 72 l/s, which is higher than the daily average forecast for the planning horizon, although it will be exceed for some days during the peak season starting with year 2030. The peak for water production is achieved in 2045 with an average flow of 65 l/s or maximum of 103 l/s in peak seasons, this includes all localities considered to be connected to the Micauti source. The water demand and water production are projected to decrease after 2045.

The maximal acceptable flow which results in a velocity of 3 m/s would be 144 l/s and will by far not be achieved. Consequently the capacity of the transmission main of OD 280mm is sufficient for the future layout of the water supply system of the town of Straseni including the localities planned to be connected to the system.

[29] Existing situation

[30] 1st year of operation Phase 1 investments

[31] 1st year of operation Phase 2 investments

Table 5-6: Hydraulic verification of the transmission main, projected flow vs. flow velocity

N°	Parameter	Unit	2014[32]	2018[33]	2021[34]	2030	2045
1	Average water demand	l/s	18.7	26.5	30.8	48.6	64.6
2	Flow velocity[+] - av, h, water dem,	m/s	0.39	0.550	0.64	1.01	1.35
3	Max, water demand	l/s	25.1	38.1	45.6	74.2	103.4
4	Flow velocity[+] - max, h, water dem,	m/s	0.52	0.79	0.95	1.54	2.15
5	Max, capacity of the transm, main[++]	l/s, m³/d					144 12,441

+ optimum flow velocity 1.5 m/s, max, according SNIPs 3.0 m/s
++ at the flow velocity of 3.0 m/s

In order to avoid pressure hammer effects due to higher water flow velocities (>1.5 m/s) surge tanks or similar devices shall be installed on the transmission main by 2030.

Resulting from the increasing water volume transmitted through the main and increasing friction losses, the transmission main feeding pumping station SP-2 (at Micauti well field) needs to be upgraded and adjusted to the increasing water production. As more wells will be put into operation, the pump capacity along the transport line needs to increase to compensate for higher flow and head pressure resulting from friction in the pipe.

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 water supply

The table below show the unit costs for the relevant water supply components applied for the cost estimations for the investment measures proposed for the Phase 1 and Phase 2.

Table 5-7: Unit costs for water supply facilities

N°	Item	Dimension		Investment costs	
				Unit	Unit cost
1	**Water network**, distribution or transmission pipe, PE100, SDR17, PN10, Incl. all earth, works, installation works, pipes and fittings				
1.1	Pipe	OD	75	EUR/m	60
1.2	Pipe	OD	90	EUR/m	62
1.3	Pipe	OD	110	EUR/m	65
1.4	Pipe	OD	125	EUR/m	67
1.5	Pipe	OD	140	EUR/m	70
1.6	Pipe	OD	160	EUR/m	75
1.7	Pipe	OD	180	EUR/m	82
1.8	Pipe	OD	200	EUR/m	90
1.9	Pipe	OD	225	EUR/m	97
1.10	Pipe	OD	250	EUR/m	104

[32] Existing situation

[33] 1st year of operation Phase 1 investments

[34] 1st year of operation Phase 2 investments

N°	Item	Dimension		Investment costs	
				Unit	Unit cost
1.11	Pipe	OD	280	EUR/m	124
1.12	Pipe	OD	315	EUR/m	139
1.13	Pipe	OD	355	EUR/m	154
1.14	Pipe	OD	400	EUR/m	174
2	**Manhole** for distribution system, Incl. all earth works, installation works and fittings				
2.1	Manhole	Dia. mm	1500	EUR/pc	423
3	**House connection**, Incl. all earth works, installation works, pipes and fittings				
3.1		pc	1	EUR/pc	250
4	**Disinfection facility**, Investment costs: incl. Container or small building, technical equipment, electric installations				
4.1	Device	m³/d	100	EUR	20,000
4.2	Device	m³/d	200	EUR	23,000
4.3	Device	m³/d	500	EUR	30,000
4.4	Device	m³/d	1,000	EUR	40,000
4.5	Device	m³/d	2,500	EUR	55,000
4.6	Device	m³/d	5,000	EUR	65,000
4.7	Device	m³/d	6,000	EUR	70,000
5	**Submersible pumps**, Pumps, technical equipment, electric installations, control system				
5.1	Submersible pump	l/s/ m	19.5/100	EUR	15,000
6	**Water Supply Reservoirs**				
6.1	Underground Reservoirs				
6.1.1	Reservoir Volume	m³	100	EUR	60,000
6.1.2	Reservoir Volume	m³	150	EUR	85,000
6.1.3	Reservoir Volume	m³	200	EUR	110,000
6.1.4	Reservoir Volume	m³	250	EUR	140,000
6.1.5	Reservoir Volume	m³	500	EUR	200,000
6.1.6	Reservoir Volume	m³	1,000	EUR	320,000
7	**Pressure reducing valves (material incl. installations)**				
7.1	For pipe diameter	OD	100	EUR/PC	3,500
7.2	For pipe diameter	OD	150	EUR/PC	5,300
7.3	For pipe diameter	OD	200	EUR/PC	6,830
7.4	For pipe diameter	OD	250	EUR/PC	8,770
7.5	For pipe diameter	OD	300	EUR/PC	10,670
7.6	For pipe diameter	OD	400	EUR/PC	18,295
7.7	For pipe diameter	OD	500	EUR/PC	26,020
7.8	For pipe diameter	OD	600	EUR/PC	37,440

Source: GIZ/MLPS

5.6.2 Unit costs wastewater

The table below show 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 5-8: Unit costs for wastewater facilities

N°	Item	Dimension		Investment costs	
				Unit	Unit cost
1	**Sewerage 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

N°	Item	Dimension		Investment costs	
				Unit	Unit cost
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
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
4	**Wastewater pumping stations**, Incl. all electro- mechanical equipment, pipes, fittings, housing and installation works				
4.1	Facility	N° of pop.	500	EUR	28,000
4.2	Facility	N° of pop.	1,000	EUR	32,000
4.3	Facility	N° of pop.	2,000	EUR	40,000
4.4	Facility	N° of pop.	5,000	EUR	50,000
4.5	Facility	N° of pop.	10,000	EUR	63,000
4.6	Facility	N° of pop.	15,000	EUR	75,000
4.7	Facility	N° of pop.	20,000	EUR	83,000
5	**Wastewater Treatment Plant**, according to the EC Directive for urban wastewater treatment 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	P.E.	1,000	EUR/P.E.	500
5.2	Plant	P.E.	2,500	EUR/P.E.	390
5.3	Plant	P.E.	5,000	EUR/P.E.	340
5.4	Plant	P.E.	10,000	EUR/P.E.	300
5.5	Plant	P.E.	20,000	EUR/P.E.	260
5.6	Plant	P.E.	30,000	EUR/P.E.	250
5.7	Plant	P.E.	35,000	EUR/P.E.	240

Source: GIZ/MLPS

5.7 Proposed investment measures

5.7.1 General

In order to meet the local development objectives and goals (see Chapter 5.2) 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 – Existing situation and Chapter 5.4 - Water demand and wastewater flow projection).

This chapter contains (i) the main drivers for development of the investment framework, (ii) a detailed description of the proposed investment measures, (iii) prioritisation and phasing of investment measures, (iv) an option analysis for priority investment measures Phase 1 and (v) 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 18,534 people connected to the existing water supply system (see table below) out of which about 17,830 from Straseni Town and 704 from Fagureni locality (supplied from Negresti reservoir). The localities of Micauti (population of 3,056 in 2014) and Siret(population of 5,950 in 2014) are directly connected to the transmission main before entering the Negresti Reservoir but are not yet operated by ME 'Apa-Canal' Straseni[35];
- Three localities in the vicinity of Straseni Town (Zamcioji, Radeni, Draguseni) with a total population of 3,100 (in the year 2014) are currently supplied from their own water source and the system is managed by their own municipal services. In the near future (2018) these localities should be integrated into the service area of ME 'Apa-Canal' Straseni and in the medium term they might be connected to the transmission main from Micauti to Straseni. Therefore, these localities have been taken into consideration in the water demand calculation and in the financial model, although they are not included in the study area (Reference is made to Chapter 2);
- Currently there is no supply shortage for the service area of ME 'Apa-Canal' Straseni (including the localities in the vicinity of Straseni Town);
- On-going investment projects (see Chapter 4) for renovation of the internal network in the localities currently connected to the water supply system (Sireti, Micauti, Fagureni) will be completed in 2018 (before implementation of measures of the subject project). Therefore no measures have been proposed for these localities;
- Two extension areas in Straseni Town (1,965 additional people covered) are envisaged to be supplied with water (extension from water supply system of Straseni Town);
- The existing production capacities would cover the projected water demand (considering an increase of per capita water consumption and additional population connected as defined in the table below) until the year 2035 assuming that water losses in the transmission main and in the distribution network will be reduced substantially (see Table 5-2 Water demand projection);
- In order to cover the future water demand for the supply of all localities in the project area (until the end of the planning horizon), additional water production capacities of 1,685 m³/day (one additional well with a capacity of 19.5 l/s) will have to be developed;
- The capacity of the transmission main from Micăuti to the town of Straseni allows connecting additional localities (which might be willing to join ME 'Apa-Canal' Straseni as a service provider in the medium term) with a total quantity of 12,444 m³/day with water;
- There are two possibilities to provide these additional water resources: (i) Rehabilitation of existing wells (there are in total 11 existing wells out of which only three are in operation) or (ii) connection to the planned regional transmission main from water treatment plant at Apa-Canal Chisinau to Straseni and Calarasi Rayons *(below referred to as Regional Transmission Main)*:

[35] As these localities are currently operated by LPA Micauti and Sireti they do not show up in the table below asbeing currently connected.

  - *Option 1 - Rehabilitation of the existing wells:* Rehabilitation works can be carried out with relatively small investment amounts and can be adjusted to the future water consumption requirements;
  - *Option 2 – Connection to the Regional Transmission Main:* This option is about to be evaluated within the framework of a Feasibility Study financed by KfW "Improvement of water infrastructure in Central Moldova". Considering the difficult institutional set-up and large investment amounts needed, it is assumed that this transmission main will realistically not be operational before 2021 (end of Phase 2).
- **The Priority Investment Plan (reference is made to Chapter 5.10 – Priority investment plan) proposed in this study** took into consideration that in the medium term (after the year 2021) the regional transmission main (Option 2) may[36] be implemented. Therefore no measures were proposed, which might contradict to this possible development scenario. The investment measures proposed within the framework of this project (see Chapter 5.7.3 – Investment measures – water supply system) include inter alia the renovation of the transmission main from Micauti to Strașeni and the renovation of the well-field in Micauti, which are justified for the following reasons:
  - These measures will anyway be necessary to cover the water demand in the short- and medium-term (before completion of the Regional Transmission Main);
  - Further, the proposed measures within this project will ensure that water quality will be compliant (disinfection).
  - If the Regional Transmission Main will be implemented, water will have to be distributed to the localities in the vicinity of Strașeni Town and therefore the transmission main from Micauti to Straseni proposed within this project will anyway be necessary;
  - Finally, the measures will also increase supply security (second supply source) in the medium and long-term (water provided from Chisinau regional transmission main and Micauti well-field).
- Considering the above, it is concluded that the investment measures proposed within this project will be necessary irrespective of the future development of the Regional Transmission Main (Chisinau-Straseni-Calarasi) and are therefore consistent with the long-term infrastructure development plans ("no-regret" measures);
- In the medium-term, it is recommended to optimise the 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 of this project (reference is made to Chapter 5.7.6-Technical assistance). These measures might inter alia include:
  - Replacement of 30% of the water supply network older than 30 years in the medium-term;
  - Establishment of adequate system operation and control comprising pressure zoning, district metering and leakage monitoring with installation of permanent

[36] Although currently the results of the feasibility cannot be anticipated.

and temporary measure and control spots incl. chambers, measuring and control equipment, valves etc.;

- Installation of a SCADA system.

The table below shows the development of service connections for the water supply network (existing situation and additional connections for the year 2018 and 2021 as well as for 2030 and 2045). For more detailed projection tables reference is made to Annex 5.3 and Annex 5.4.

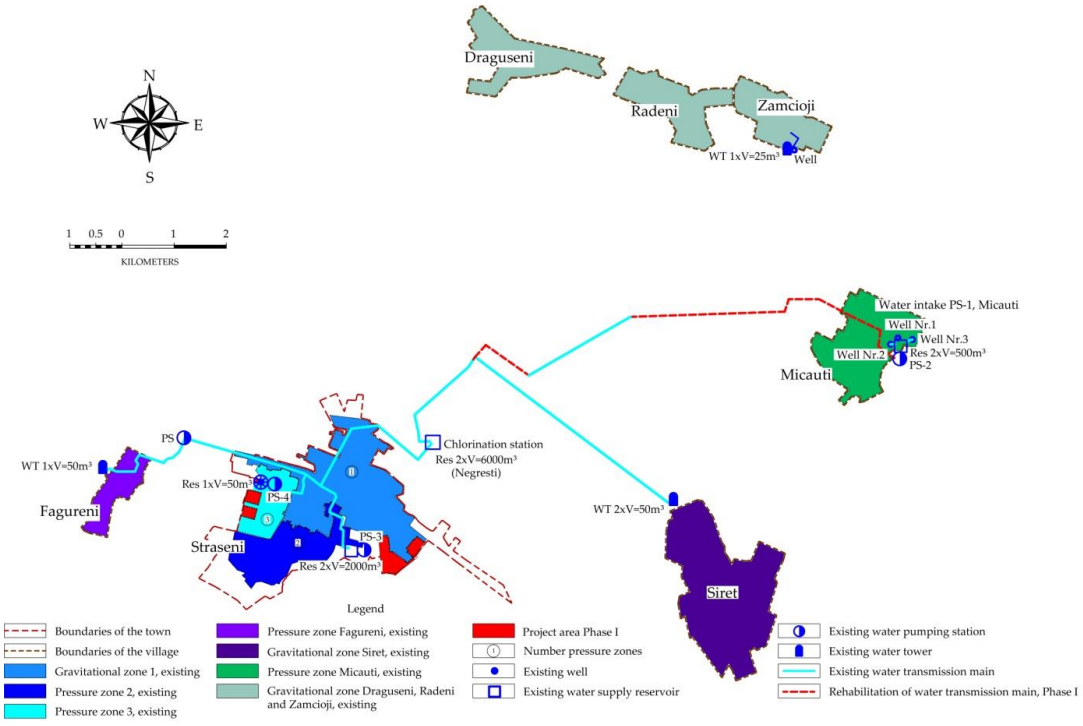
Table 5-9: Development of connection rates water supply

Code	Locality	Population connected to the water supply system									
		2014		2018		2021		2030		2045	
		n°	%	n°	%	n°	%	n°	%	n°	%
1	Straseni	17,830	85	19,235	91	19,834	93	21,660	100	22,195	100
2	Fagureni	704	79	705	79	727	81	793	88	905	100
3	Micauti	0	0	2,471	81	2,540	83	2,750	89	3,104	100
4	Sireti	0	0	2,034	34	2,474	41	3,802	63	6,043	100
5	Radeni+ Draguseni+ Zamcioji	0	0	1,732	56	1,888	61	2,357	75	3,148	100
TOT	**Total**	**18,534**	**54**	**26,177**	**76**	**27,463**	**80**	**31,363**	**90**	**35,395**	**100**

Source: GIZ/MLPS

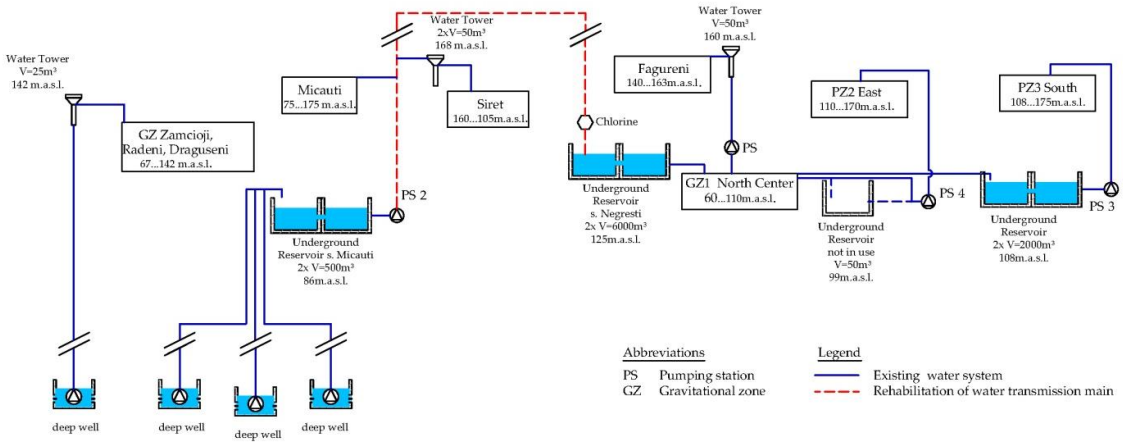
A scheme of the existing and proposed water supply system in the town of Straseni is presented in the figures below. More detailed maps are provided in Annex 11.

Figure 5-1: Scheme of existing and proposed extensions of the water supply system in the town of Straseni and neighbouring localities



Source: GIZ/MLPS

Figure 5-2: Hydraulic scheme of existing and proposed extensions of the water supply system in the town of Straseni



Source: GIZ/MLPS

5.7.2.2 Wastewater:

- Currently only Straseni Town is partly endowed with an existing wastewater system (see Chapter 4). In Straseni Town the coverage rate is projected to increase from currently 61% to 99% and the connection rate from 44% to 66% until the year 2021[37];
- The localities in the vicinity of Straseni Town are not endowed with a sewerage network;
- Wastewater generated will increase from currently 9,576 P.E. to 15,030 P.E. in 2021 and is then projected to increase to 23,062 P.E. in 2045 (see Chapter 5.4 Water demand and wastewater flow projection);
- 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 waste water 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 in the vicinity of Straseni Town 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 (i) below 2,000 P.E., (ii) above 2,000 P.E. to 10,000 P.E. and (iii) above 10,000 P.E. Among the agglomerations in the project area (outside of Straseni Town) there are several localities above 2,000 P.E. with

[37] After implementation of Phase 2 of the proposed project measures

a total pollution load of about 12,100 P.E.[38] to be either endowed with a sewerage network and connected to a WWTP in the medium and long-term, or alternative sanitation systems (e.g. on-site sanitation) have to developed in order to ensure adequate wastewater treatment;

- 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 Straseni Rayon the design capacity could be from about 21,300 P.E. in 2030 (only Straseni Town) but could be much higher if additional localities should be connected (up to 33,400 P.E. including the above mentioned localities). Therefore the design capacity can only be roughly estimated at this stage. Further planning shall be based on results of the technical assistance study to be carried out in Phase 1. A staged approach is recommended in order to avoid over capacities. The first treatment stage would thus be designed for a capacity of 21,300 P.E. (90% connection rate of Straseni Town in 2030, without considering other localities in the vicinity of Straseni Town). Further treatment stages should be designed based on the results of a thorough wastewater study (incl. definition of agglomerations and option analysis) to be included in Phase 1;
- There is a possibility to convey wastewater from Straseni Town through an existing main collector (to be rehabilitated) to Chisinau wastewater treatment plant (WWTP-Chisinau). This option should be assessed in the above mentioned wastewater study (see Chapter 5.7.6 - Technical assistance);
- Conclusively, only the sewerage network (including necessary pumping stations and pressure mains) for Straseni Town can be included in the Priority Investment Plan, while the sewerage network of other localities outside of Straseni Town and investments for wastewater treatment (or a collector to Chisinau WWTP) can only be roughly estimated (based on a capacity of 21,300 P.E.) and should be assessed in detail in a comprehensive wastewater study (technical assistance component in Phase 1).

The table below shows the development of service connections for the wastewater network (existing situation and additional connections for the year 2018 and 2021 as well as for the years 2030 and 2045). For more detailed projection tables reference is made to Annex 5.5 and Annex 5.6.

Table 5-10: Development of connection rates wastewater

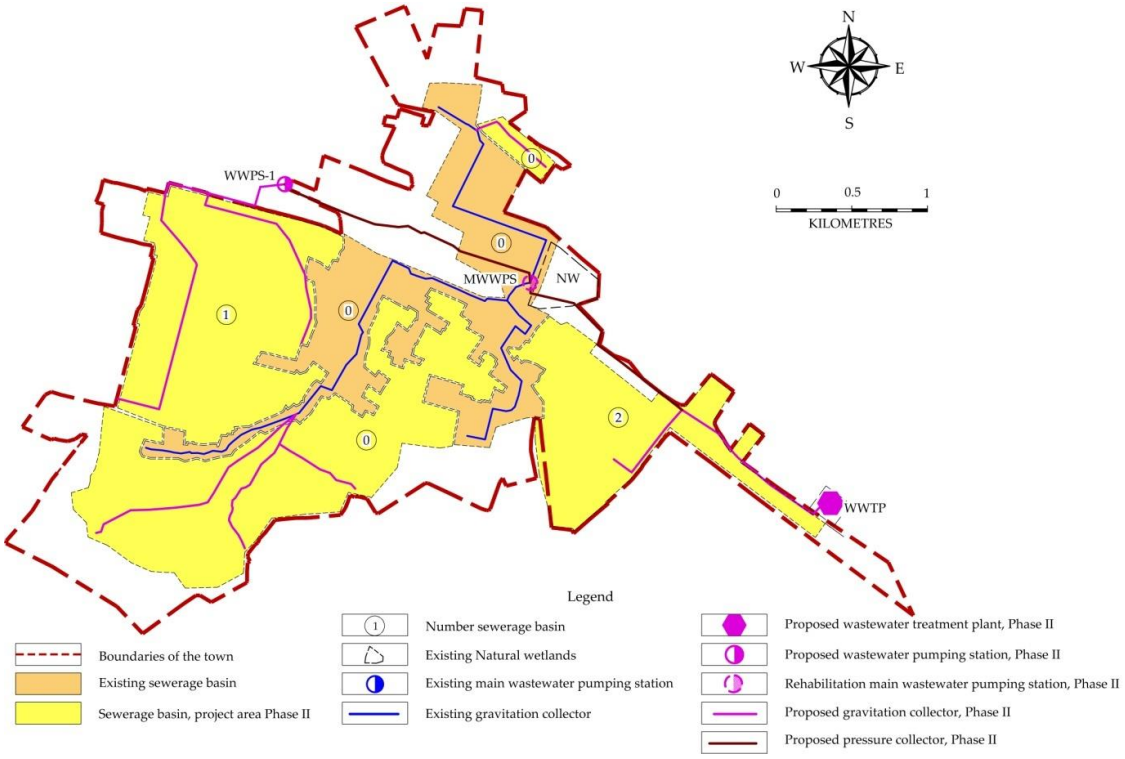
N°	Locality	Population connected to the wastewater system									
		2014		2018		2021		2030		2045	
		n°	%	n°	%	n°	%	n°	%	n°	%
1	Straseni	9,207	44	9,269	44	14,159	66	19,494	90	21,085	95
2	Fagureni	0	0	0	0	0	0	0	0	0	0
3	Micauti	0	0	0	0	0	0	0	0	0	0
4	Sireti	0	0	0	0	0	0	0	0	0	0
5	Radeni+ Draguseni+ Zamcioji	0	0	0	0	0	0	0	0	0	0
TOT	**Total**	**9,207**	**27**	**9,269**	**27**	**14,159**	**41**	**19,494**	**56**	**21,085**	**60**

Source: GIZ/MLPS

[38] Population of the localities of Micauti, Sireti, Radeni, Draguseni, Zamcioji

A scheme of the existing and proposed wastewater system in the town of Straseni is presented in the figure below. More detailed maps are provided in Annex 11.

Figure 5-3: Scheme of existing and proposed extension of the wastewater system in Straseni Town



Source: GIZ/MLPS

5.7.3 Investment measures - water supply system

5.7.3.1 General description of the proposed system

The main deficiencies in the water supply system are as follows (see Chapter 4 of this study):

- Low connection rate in Straseni Town (85%) and Fagureni (79%);
- High real and apparent water losses (NRW of 57%);
- High number of pipe bursts and high water losses due to old and obsolete water transmission main between Micauti well-field and the reservoir in Negresti (about 50% of the main has been renovated and the remaining 50% need to be replaced);
- Absence of disinfection in Pumping Station N°2 (water for localities connected directly to the transmission main is currently not disinfected);
- Highly corroded connection pipes at Micauti well-field (from wells to pumping station n°2);
- Outworn and inefficient submersible pumps at Micauti well-field;
- No or inadequate metering of water production and water consumption as well as inadequate operational equipment.

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

- Construction of a new chlorination plant at Micauti well-field;
- Replacement of existing connection pipes at Micauti wellfield;
- Replacement of submersible pumps in the currently operated wells;
- Renovation of additional wells for future connection of localities;
- Rehabilitation of the transmission main "Micauti-Straseni Town";
- Upgrading of the capacities at pumping station n° 2 (PS-2);
- Extension of the water distribution network in Straseni Town.

5.7.3.2 Proposed investment measures

Construction of a new chlorination unit at Micauti well-field

Currently disinfection is carried out at the reservoir in the locality of Negresti and thus water supplied to the localities directly connected to the transmission main (Siret and Micauti locality) is not disinfected. In order to ensure adequate disinfection and compliance with bacteriological water quality requirements, it is proposed to abandon the existing chlorination unit (which is anyway at the end of its life time) and to construct a new one at the water intake in Micauti Locality.

A new chlorination unit with a capacity for a daily water production of about 4,500 m³/d is proposed to be installed in the existing building. Renovation work for the building will be necessary in order to meet safety requirements (air ventilation system, etc.).

Replacement of existing connection pipes at Micauti wellfield

As can be seen in photographs in Chapter 4, the connection pipes from the wells to the reservoir at second lift pumping station (PS-2) are corroded and as there is a high risk for supply interruption a pipe with a total length of 35 m have to be replaced.

Replacement of submersible pumps in the currently operated wells

In order to increase reliability and efficiency of the three currently operated wells, the submersible pumps in these wells shall be replaced.

Renovation of additional wells for future connection of localities

Although the capacity of the three wells currently under operation is sufficient to cover water demand until the year 2035, it is recommended to add additional wells in the long-term. For this purpose, one existing well (currently in reserve) with a capacity of 19.5 l/s should be renovated. Additional wells can be renovated in the long-term if ME 'Apa-Canal' Straseni decides to connect additional settlements (e.g. Radeni, Dragu$eni and Zamcioji). As the well-field capacity has been initially designed for a much higher capacity as currently in use, it is assumed that there is no limitation from hydro-geological point of view (sufficient safe-yield).

Rehabilitation of the transmission main "Micauti-Straseni Town"

The existing transmission main between the Micauti wellfield and the reservoir in Negresti (Straseni Town) consists of steel pipes with a diameter DN 500 mm and is highly corroded. Therefore frequent pipe breaks causes high water losses and supply interruptions. Part of the transmission main has already been replaced recently (with HDPE DN 250 mm). It is necessary to replace 8,500 m of the water transmission main from the water intake in Micauti locality to Straseni Town with a new main HDPE DN 280

mm. This investment is considered as a high priority measure and will reduce water losses and pipe breaks and at the same time will increase supply security (less supply interruptions).

The figure below shows the location of the existing transmission main and the sections proposed for its replacement.

Upgrading the capacities at pumping station n° 2 (PS-2)

In the long-term additional capacities at the well-field need to be developed in order to cover the future water demand in the project area. This will require upgrading of pumping station n° 2 (PS-2) to the respective capacities needed.

Extension of the water distribution network in Straseni Town

It is planned to extend the existing water supply system in Straseni Town to two new supply areas located east and west of the town centre. The total network length for this extension area is 6,751 m and 633 service connections (1,965 additional consumers supplied) will be connected to the water supply system by implementing this measure. The name of the streets proposed for extension of the water supply network in Straseni Town is given in the table below.

Table 5-11: Name of the streets planned for extension of water supply network in Straseni Town

N°	Street's name	N°	Street's name	N°	Street's name
1.	8 Martie str.	8.	1 iunie str.	15.	Tarancuta str.
2.	Mihail Cogălniceanu str.	9.	Tineretului str.	16.	Victoriei str.
3.	Ion Vatamanu str.	10.	Calea Basarabiei str.	17.	Independentei str.
4.	Păcii bd.	11.	Bănulescu-Bodoni str.	18.	New residential sector
5.	Trandafirilor str.	12.	Nicolae Sulac str.	19.	Industrial Sector of Chisinau road
6.	Mitropolitul Varlaam str.	13.	Mihai Volontir str.		
7.	Aleco Russo str.	14.	Miorita str.		

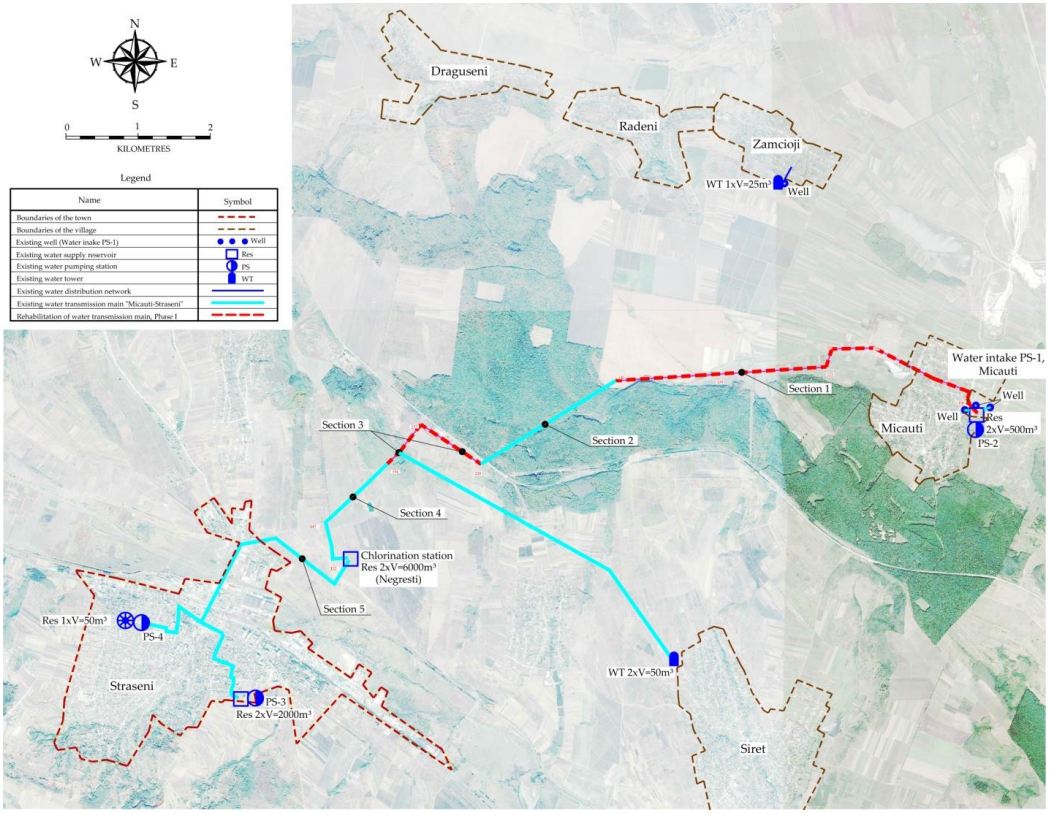
Source: ME 'Apa-Canal' Straseni

Rehabilitation of the water supply system in Straseni Town

It is recommended to optimise 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 TA measures in Phase 1. These measures might inter alia include (i) Replacement of water supply network (30% of the network older than 30 years), (ii) Establish adequate system operation and control, (iii) installation of SCADA.

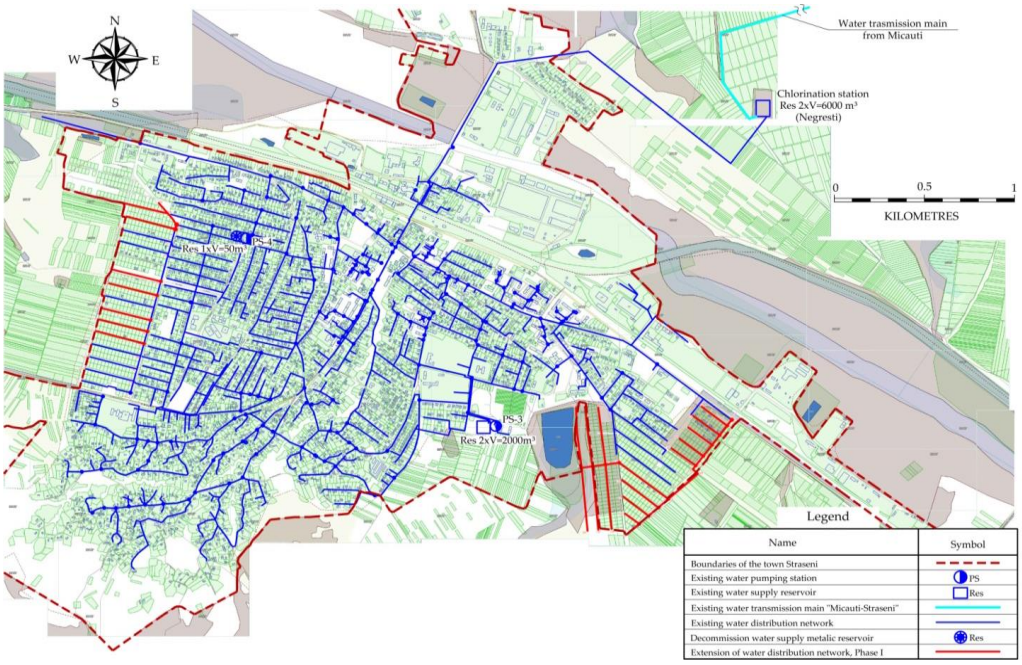
The existing and proposed water supply system in the town of Straseni is presented in the figure below. More detailed maps are provided in Annex 11.

Figure 5-4: Proposed rehabilitation of the water transmission main from water intake in Micauti locality to the reservoirs in Negresti locality



Source: https://www.google.com/earth/; GIZ/MLPS

Figure 5-5: Existing and proposed extension of the water supply system, town of Straseni



Source: GIZ/MLPS

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 61% in Straseni Town;
- Existing sewerage network in Straseni Town at the end of its life age;
- The main wastewater pumping station is in poor condition and the capacity is insufficient to pump wastewater from the future extension areas to the future wastewater treatment plant;
- Absence of sewerage network in the localities in the vicinity of Straseni Town;
- Lack of wastewater treatment.

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

- Extension of the sewerage network in Straseni Town;
- Rehabilitation of the existing sewerage network in Straseni Town;
- Rehabilitation of the existing main wastewater pumping station (MWWPS);
- Construction of a new wastewater treatment plant (WWTP) in Straseni Town (or connection to the wastewater treatment plant in Chisinau Town);
- Extension of the sewerage network in the neighbouring localities of Straseni Town.

5.7.4.2 Proposed investment measures

Extension of the sewerage network in Straseni Town:

In order to increase the service coverage for Straseni Town from currently 61% to 99% coverage rate in 2021 the sewerage network (separate system) has to be extended by 54,303 m (gravity system pipe diameter 160 – 200 mm) and 2,770 new service connections. Additionally, construction of pressure mains with a total length of 3,232 m as well as construction of a new wastewater pumping station (WWPS-1) will be necessary. The extension areas are described below (see Figure 5-6).

- Wastewater from the western part of the town (extension in drainage area n°1) will be discharged by gravity to the proposed new waste water pumping station n° 1 (WWPS-1);
- Wastewater from WWPS-1 will be conveyed by a new pressure sewer to the main wastewater pumping station (MWWPS);
- Wastewater from the southern part (and a small extension in the northern part) of the town (extension in drainage area n° 0) will be discharged by gravity to the main wastewater pumping station (MWWPS);
- Wastewater from the main wastewater pumping station (MWWPS) will be pumped through a newly proposed pressure sewer to a main gravity collector and from there to the proposed new wastewater treatment plant (WWTP);
- Wastewater from drainage area n° 2 in the south-eastern part of the town will be discharged by gravity to the wastewater treatment plant (WWTP);

Rehabilitation of the existing sewerage network in Straseni Town

The existing sewerage network with a length of about 12 km is older than 35 years and needs to be rehabilitated. It is recommended to conduct a CCTV inspection of the sewerage network in Phase 1 (see Chapter 5.7.6 Technical assistance) and based on its result the needs for further rehabilitation of the sewerage network will be identified. For the purpose of cost estimation in this study, it was assumed that about 30% of the sewerage network older than 30 years should be rehabilitated (about 4 km).

Rehabilitation of the existing main wastewater pumping station (MWWPS)

The existing main wastewater pumping station (MWWPS) is in poor condition and the capacity is insufficient to pump wastewater from the extended drainage areas to the wastewater treatment plant. Therefore the MWWPS has to be rehabilitated.

Construction of a new wastewater treatment plan (WWTP) in Straseni Town

There is no existing wastewater treatment plant in Straseni Town. Wastewater used to be discharged through a collector, which is out of operation, to the wastewater treatment plant in Chisinau. As mentioned above in Chapter 5.7.2 – Investment framework, there are two options to be assessed with regard to wastewater treatment:

- Option 1 – Wastewater treatment locally in Straseni Town;
- Option 2 – discharge to the wastewater treatment plant (WWTP) in Chisinau (through an existing collector which needs to be rehabilitated).

Further, the required capacity of the future WWTP is currently unknown (has to be determined in a comprehensive wastewater study including assessment of agglomerations in the entire rayon). For the purpose of investment cost estimation in this study, it was assumed that a new wastewater treatment plant in Straseni Town with a capacity of 21,300 P.E. (Qdmax of 2,385 m^3/day) will be constructed to treat wastewater flow and load until the year 2030.

Extension of the sewerage network in the neighbouring localities of Straseni Town.

In the localities of Fagureni, Micauti Siret, Radeni, Dragu**s**eni and Zamcioji there is no existing wastewater system. It is assumed that in the medium to long-term a sewerage network will be constructed in order to meet with the national requirements for wastewater collection and treatment as well as probably in the future with the requirements of EU environmental legislation (Urban Wastewater Treatment Directive 91/271/EEC). A thorough assessment of the proposed networks and the wastewater treatment options for these localities has to be carried out within the framework of the proposed “Medium to Long-term Sanitation Study” (see Chapter 5.7.6 – Technical assistance).

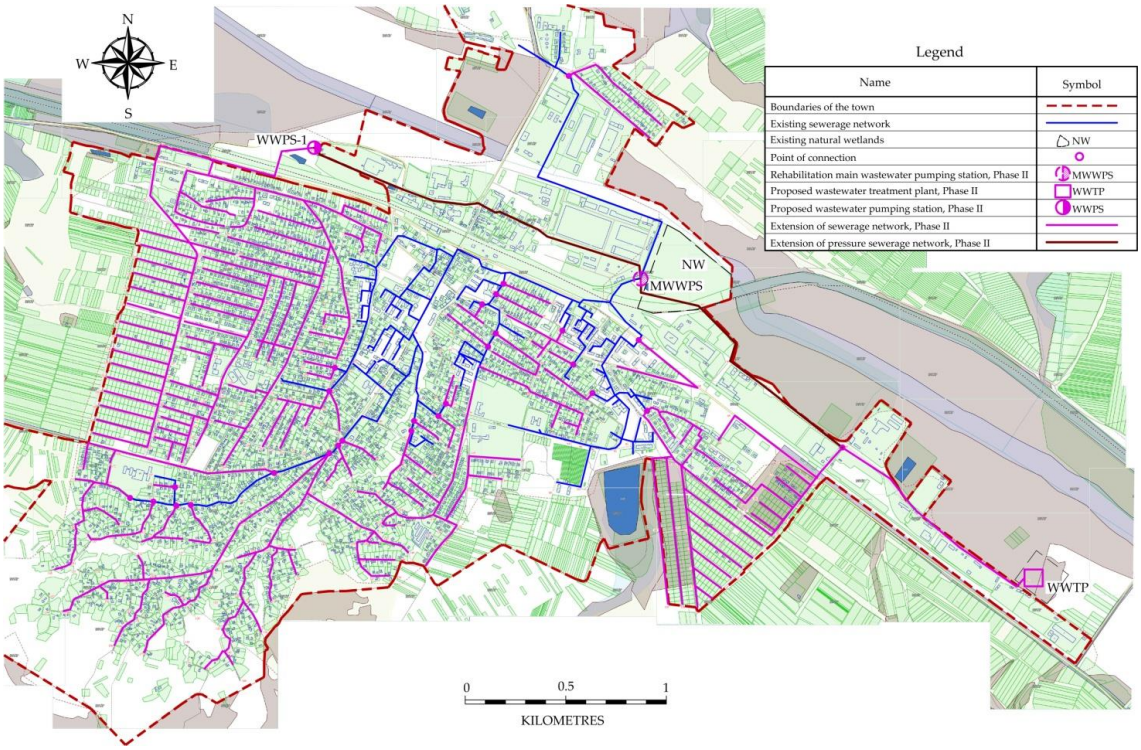
The wastewater investments proposed in this feasibility study are summarised as follows:

- Extension of the existing sewerage network in Straseni Town and construction of 54,303 m of PVC/PP pipes with diameters between 160 mm and 200 mm including:
  - Construction of a pressure main from WWPS 1 to the MWWPS and further to the WWTP with a length of 3,232 m and a diameter between 90 and 110 mm;

- Construction of a new wastewater pumping station (WWPS-1) aiming to pump wastewater from service area 1 to the existing main wastewater pumping station (MWWPS);
- Rehabilitation of 4 km of the existing sewerage network;
- Rehabilitation of the existing main wastewater pumping station (MWWPS);
- Construction of a new wastewater treatment plant (WWTP) with an estimated capacity of 21,300 P.E. in the south-east of the town centre;
- Extension of the sewerage network in the neighbouring localities of Straseni Town.

The existing and proposed wastewater system in the town of Straseni is presented in the figure below. More detailed maps are provided in Annex 11.

Figure 5-6: Existing and proposed extension of the wastewater system, town of Straseni



Source: GIZ/MLPS

5.7.5 Operational improvement

5.7.5.1 Water supply (Water metering and equipment for operational improvement)

Production water metering:

Currently, water production is not metered at all (volume of water is estimated based on the capacity of pumps and pumping hours). Therefore, data for calculation of the water balance, which are the basis for any water loss reduction and leakage detection campaign, are not available. Further, metering at all connection points to the transmission main will be necessary to differentiate the service areas (Town of Strseni and localities supplied from the transmission main) and to calculate a separate water balance

for each of the localities. Installation of flow meters is therefore considered as a high priority measure. In the medium term, a SCADA system with more advanced features for flow measuring and operation control will have to be installed.

Ultrasonic flow meters are proposed at the following locations:

- Outflow of pumping station 2nd level (PS-2) at Micuti locality;
- Inflow to two reservoirs at Negresti locality;
- Outflow of two reservoirs at Negresti locality;
- Outflow from pumping station 3rd level (PS-3);
- Connection points for supply pipelines to the localities of Sireti and Micauti.

*C***ustomer water metering:**

Currently more than 95% of the customers are endowed with water meters. However, as the accuracy is insufficient it is recommended to replace part of the water meters as follows:

- 400 pieces water meters for customers in individual households;
- 1,700 pieces water meters in apartments;
- 95 pieces master water meters[39] for multi-storey buildings;
- 10 pieces water meters for non-domestic customers.

Equipment:

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

- Portable ultrasonic flow meter;
- Pressure loggers;
- Manometer (manual pressure measurement in the network);
- Leak Detection Equipment including acoustic detection equipment and correlator;
- Metal pipe detection/localisation equipment;
- Truck for flushing/cleaning of water supply network and transport of water;
- Water meter calibration unit;
- Laboratory for water quality analysis;
- 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 (equipment for operational improvement)

ME 'Apa-Canal' Straseni is not endowed with any equipment for wastewater operation. In order to ensure adequate Operation and Maintenance (O&M) for the wastewater system, procurement of the following equipment is proposed:

[39] Currently no master water meters are existing

- Laboratory equipment for measuring key parameters (BOD_5, COD, Nitrogen, Phosphor, 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 WWTP;
- Sewer cleaning trucks (e.g. combined jetting and suction trucks) and other equipment needed in order to maintain the sewerage network according to best practice;
- CCTV inspection equipment in order to assess in details the condition of the sewerage network and based on these results to plan sewer rehabilitation works. During the detailed design stage in Phase 1 it should be decided if a CCTV inspection equipment should be procured or if the services for sewer inspection should be outsourced (a combination of procurement of simple manual CCTV inspection cameras is possible and outsourcing of inspection of the main sewers inspection would be a possible option).

5.7.6 Technical assistance

Technical Assistance (TA) measures will be necessary aiming 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 sewerage network rehabilitation;
- Ensuring high quality standard for implementation of works (detailed designs[40], tender documents and supervision of works).

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

Table 5-12: Technical Assistance

Component	Objectives	Measures
Design and Engineering for Phase 1 investments	To ensure high quality and timely implementation of works and TA-measures through support of the Project Implementing Agency[41] (i) in preparing all necessary documentation for tendering of the works for Phase 1 Investment measures, (ii) in tendering procedures, (iii) during the implementation period in project management, works supervi-	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 TA 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 in accordance with the national legislation. B) Support during **tendering** of contracts including (i) preparation of reports and minutes of meetings

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

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

Component	Objectives	Measures
	sion and monitoring of TA-measures	(ii) communication, (iii) 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 (i) establishment of adequate project management structures, (ii) preparation of detailed layout designs, construction designs (structural designs, shop drawings, etc.) and detailed pipeline routings, (iii) supervision of works, (iv) preparation of all necessary reports requested by the donor and the Project Implementing Agency (e.g. cash-flow reports, etc.), (v) training in project management and other areas identified as capacity weakness.
Corporate Development Programme	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 procedures, (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 Programme	To ensure that all stakeholders are committed to the investment project and are involved during preparation and implementation phase. In particular the measures aims 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; • To encourage transparency in decision-making; • Sustainability of dialogue.
Water Supply Net-	To improve the	A) **Network analysis**: Carry out comprehensive

Component	Objectives	Measures
work Analysis and Water Loss reduction Programme	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.	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 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 sanitation (Master Plan for Sanitation) and define number and capacity of WWTPs.	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[42], (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

[42] Procurement strategy for CCTV inspection of sewerage 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 recommendations a detailed action plan and draft specifications for a work contract should be prepared.

Component	Objectives	Measures
		analysis for wastewater treatment in Straseni Town and the localities in its vicinity. As mentioned above in Chapter 5.7.2 – Investment framework, there are two options to be assessed with regard to wastewater treatment: • Option 1 – Wastewater treatment locally in Straseni Town; • Option 2 – discharge to Chisinau WWTP (through an existing collector which needs to be rehabilitated). Further, the study should assess if other localities in the vicinity of Straseni Town should be connected to the WWTP of Straseni Town. 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).

Source: GIZ/MLPS

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 Consultant applied these criteria in a qualitative manner (descriptive) as depicted below:

Table 5-13: Proposed investment measures and phasing

N°	Investment measures	Proposed Phase[43]	Justification for phasing
1	**Water supply system**	PH 1	High priority due to all criteria: (i) Water supply has to be implemented before wastewater system[44] (ii) Capacity of operator sufficient (no complex systems); (iii) Affordability is ensured (comparatively low cost per capita); (iv) high contribution to public health improvement (water quality)
1.1	New chlorination unit	PH 1	High priority to ensure compliance with national drinking water standards for all customers (mandatory investment)
1.2	Replacement of existing connection pipes	PH 1	High priority in order to increase of supply security (corroded pipes)
1.3	Replacement of submersible pumps in the currently operated wells	PH 2	Replacement of submersible pumps shall be done in Phase 2 (pumps are still operational and can still be used until 2021)
1.4	Renovation of additional wells for future connection of localities	LT	The currently available production capacities are sufficient to cover short- and medium-term water demand up to the year 2035. Renovation of additional wells will be needed to cover water demand beyond the year 2035 and if additional localities shall be supplied from Micauti well-field.
1.5	Rehabilitation of transmission main	PH 1	Highest priority in order to increase supply security for Straseni Town and efficiency of operation. Has to be implemented irrespective of on-going studies for regional transmission main Chisinau to Calarasi.
1.6	Upgrading the capacities at pumping station n° 2	LT	The capacities of the pumping station n° 2 have to be adjusted to the projected water demand for the period beyond 2035.
1.7	Extension of the water distribution network in the town of Straseni	PH 1	High priority is given to this measure in order to reach 100% coverage rate for the town of Straseni.
1.8	*Rehabilitation* of the water supply system in Straseni Town	MT	Implementation of the measures will require substantial input from the operator (high investment needs and complexity of measures). In order to avoid overloading of the operator during the relatively short project period, a gradual development in the medium-term (stretched over several years) is proposed.
2.	**Wastewater system**	PH 2/MT/LT	Should be implemented after completion of water supply improvements for technical reason; (ii) Capacity of operator to implement and manage the system is insufficient to carry out wastewater investments at the same time with water supply investment measures; (iii) Immediate implementation in Phase 1, would by far exceed affordability limits; (iv) Design of the WWTP can only be made after sound wastewater study for the rayon (agglomeration definition and option analysis). Therefore, most of the wastewater measures are proposed to be

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

[44] Without functioning water supply system the wastewater system cannot be functional

N°	Investment measures	Proposed Phase[43]	Justification for phasing
			implemented in Phase 2, while an extension of the sewerage network[45] to the localities in the neighbourhood of Straseni Town should be implemented in the medium- to long-term.
2.1	Extension of sewerage network in Straseni Town	PH 2	Due to the size of the agglomeration (above 10,000 P.E.) ME 'Apa-Canal' Straseni gives priority for extension of the sewerage network in Straseni Town (including construction of a new wastewater pumping station (WWPS-1) and a new pressure main) to reach the target of 99% coverage rate. In order to avoid overloading of the capacities of the operator the measure is proposed to be implemented in Phase 2.
2.2	Rehabilitation of the existing sewerage network	Ph 2	12 km (100%) of the existing sewerage network (ceramic and steel pipes) are at the end of its service life (see Chapter 4) and need to be replaced in the short- and medium-term. It was assumed that about 30% (4 km) of the sewerage network older than 30 years should be rehabilitated in the short-term. Rehabilitation works for the sewerage network should be based on the results of CCTV inspection (proposed in TA measures in Phase 1) and are proposed to be implemented in Phase 2.
2.3	Rehabilitation of the existing main wastewater pumping station (MWWPS)	PH 2	The MWWPS has to be rehabilitated in parallel to the construction of the new WWTP[46] in Phase 2.
2.4	Construction of a new WWTP	PH 2	The selected option (treatment locally in Straseni Town or treatment in Chisinau Town) and the design capacity of the WWTP can only be determined by the wastewater study proposed in Phase 1 (see Chapter 5.7.6 - Technical assistance). Therefore for cost estimation purposes construction of a new wastewater treatment plant (WWTP) with an estimated capacity of 21,300 P.E. in the south-east of the town center has been proposed for Phase 2.
2.5	Extension of the sewerage network in the neighbouring localities of Straseni Town	MT/LT	Based on the result of the “Medium to Long-term Sanitation Study” the sewerage network and wastewater treatment in the localities of Fagureni, Micauti, Siret, Radeni, Dragu̧seni and Zamcioji should be implemented in the medium- to long-term.
3	**Equipment** for operational performance improvement (water supply and wastewater)	PH 1	Water Supply: High priority is given to the reduction of 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. In-

[45] Including wastewater treatment

[46] If the option of local treatment in Straseni will be retained.

N°	Investment measures	Proposed Phase[43]	Justification for phasing
			stallation of production water meters shall be included in Phase 1. Replacement of customer water meters might be carried out in the medium and long-term. Wastewater: ME 'Apa-Canal' Straseni is not endowed with any equipment for wastewater operation. Therefore high priority is given to the procurement of equipment which would improve operational performance. Final prioritisation of equipment to be procured shall be done during the detailed design stage (see Chapter 5.7.6 - Technical assistance).
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 Programme	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 Programme	PH 1	Should be implemented before and in parallel to the works contracts of Phase 1 (start as early as possible during the 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 in order to ensure that part of its results are available for designing Phase 1 investments. In case of insufficient budget, this measure could 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.

Source: GIZ/MLPS

Conclusively, all measures for improvement of the water supply system (except measure 1.3-renovation of additional wells) as well as all Technical Assistance Measures should be implemented in Phase 1, while all wastewater measures should 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

The identified options are described below:

Water Supply of the rayon through the regional transmission main Chisinau – Calarasi versus supply from well-field in Micauti locality

Although there is no supply shortage in Straseni Town at the moment and water quality meets the national standards, it is recommended to develop a second supply source in the medium and long-term. There are two options to supply the Town and Staseni and the localities in the vicinity with additional water: *(i) Water Supply through the planned regional transmission main Chisinau – Straseni – Calarasi; (ii) supply from well-field in Micuti locality*. This strategic option cannot be analysed within the framework of this study (the study area is limited to Straseni Town and some localities in its vicinity) as regional data would be necessary to compare these options. This option is about to be evaluated within the framework of a feasibility study financed by KfW "Improvement of water infrastructure in Central Moldova". Considering the difficult institutional set-up and large investment amounts needed, it is assumed that this transmission main will realistically not be operational before 2020 (end of Phase 2 of this project). As mentioned above, the result of this option analysis will have no impact on the investments for Phase 1 and 2. In order to increase supply security both systems should be developed in the future (see also Chapter 5.7.2 - Investment framework). In case that the regional transmission main will be implemented, Micauti well-field should be maintained as second supply source. The above financed feasibility study financed by KfW will contain a strategic component for development of the water supply systems in the rayon (localities proposed to be connected directly to the regional transmission main) and it is assumed that also those localities which should in the future be supplied from Micauti well-field will be identified. In the technical assistance component in Phase 1 the results of the KfW financed feasibility study will be analysed and the planned investments for Phase 2 and medium term investments will be adjusted accordingly.

Chlorine gas (conventional liquid chlorine dosing unit) versus electrolytic hypochlorite plant

A summary of advantages and disadvantages comparing chlorine gas (liquid chlorine dosing units) with electrolytic hypochlorite plants is given in the table below:

Table 5-14: Comparison of chlorine gas (liquid chlorine) with electrolytic hypochlorite plant

Disinfection Option	Advantages	Disadvantages
Chlorine gas (Liquid chlorine dosing unit)	• Low investment costs; • Low costs for procurement of chlorine; • Simple and well know technology for the chlorine dosing units.	• High safety risk during transportation of liquid chlorine (high concentration of chlorine); • High safety risk for storage of chlorine; • Neutralisation of chlorine with sodium hydroxide solution (reservoir) in case of accident (state of the art safety standard in most of the bigger plants); • Import of chlorine may be getting more and more difficult due to boarder restrictions.
Electrolytic Hypochlorite Plant	• As only water, common salt (NaCl) and electricity is needed for the electrolysis – comparatively moderate operating costs (depending on the electricity tariff and price for salt); • Common salt is the raw mate-	• High capital investment costs; • More complex technology compared to simple liquid chlorine units, requires well trained staff for maintenance and reliable supplier's support in Moldova; • High electricity consumption (operation costs highly depending on the future devel-

Disinfection Option	Advantages	Disadvantages
	rial – which is nontoxic and easy to store (low safety risk); • World-wide used with positive examples in some Russian, Tajik and Kyrgyz towns; • Fresh hypochlorite is always on hand – the disinfectant solution does not dissociate like commercial hypochlorite solutions; • Less safety requirements compared to chlorine-gas-based systems.	opment of electricity tariffs); • Requires reliable power supply; • Requires constant room temperature for operation (highly productive ventilation system); • Requires specific ventilation system for hydrogen; • Requires water temperature between 5° – 15° Celsius (Heating/Cooling systems might be necessary); • Salt with adequate quality is needed (eventually high transport costs); • High storage capacity for salt (30-40 days); • Operation cost are highly depending on the development of electricity and salt prices.

Selected option

In conclusion, the use of chlorine gas has several disadvantages, in particular the high security and health risk. On the other hand, the use of electrolytic sodium hypochlorite is related to high investment costs, complex technology, requiring experienced staff for maintenance of equipment. The selection of the option for disinfection technology shall be done within the framework of the technical assistance component in Phase 1.

Identified Options for Phase 2

The following options have been identified for investment measures proposed for Phase 2. It is recommended that analysis of these options should inter alia be included in subsequent studies (technical assistance components).

- Wastewater treatment of sewerage from Straseni at new wastewater treatment plant (WWTP) in Straseni Town versus Wastewater conveyed to the existing WWTP in Chisinau (see Chapter 5.7.2 – Investment framework).

There are two main strategic options for treatment wastewater in Straseni Town: (i) treatment of sewerage locally and construction of a new wastewater treatment plant (WWTP) in Straseni Town, or (ii) convey wastewater from Straseni Town through an existing main collector (to be rehabilitated) to Chisinau wastewater treatment plant (WWTP-Chisinau). These options should be assessed within the framework of the above mentioned wastewater study (see Chapter 5.7.6 - Technical assistance).

- Option analysis for assessing the capacity of the wastewater treatment plant.

In order to define the required capacity of the WWTP (extensions) an assessments of the agglomerations (localities in the vicinity of Straseni Town) to be connected to the central WWTP in Straseni 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 sewerage network and which part of the

service area should better be served through on-site sanitation (e.g. septic tanks, etc.). Additionally, sludge management options (agricultural reuse, municipal landfill, in line with sludge treatment options) and process options for WWTPs should be analysed (extended aeration, activated sludge, etc.). This assessment should be carried out at least at rayon level (or even beyond administrative borders of the rayon) and should include ALL localities in a defined study area (approach as typically carried out 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).

5.10 Proposed priority investment plan

The phased priority investment plan is presented in the tables below. The total investment costs for Phase 1 have been estimated at 2.7 MEUR and for Phase 2 at 21.2 MEUR (see summary table below).

Table 5-15: Investment plan for Phase 1

N°	Component	Units	Quantity	Unit costs EUR	Total cost EUR
1	**Water supply**				
1.1	New chlorination unit - (building, technical equipment, electric installations)	pcs	1	70,000	70,000
1.2	Replacement of existing connection pipes HDPE 160 at Micauti wellfield (wells to PS-2)	m	35	75	2,625
1.3	Rehabilitation of transmission main HDPE 280 "Micuti-Straseni"	m	8,500	124	1,054,000
1.4	Extension of the water distribution network in the town of Straseni				
1.4.1	• HDPE DN 90	m	6,751	62	418,562
1.4.2	• Manholes, ϕ 1.500	pcs	21	423	8,883
1.4.3	• Service connections	pcs	633	250	158,250
ST-1.4	Subtotal 1.4				585,695
ST-1	**TOTAL water supply** (1.1+1.2+1.3+1.4)				**1,712,320**
2	**Equipment and tools** for operational performance improvement (water supply and wastewater)	LS	1	200,000	200,000
3	**Technical assistance**				
3.1	Design, engineering and supervision (12% of investment costs)				229,478
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)				529,478
4.	**Contingencies (10% of 1+2+3)**				244,180
GT	**Total costs for Phase 1 (1+2+3+4)**	**2,685,978**			

Source: GIZ/MLPS

Table 5-16: Investment plan for Phase 2

N°	Component	Units	Quantity	Unit costs	Total cost
				EUR	EUR
1	**Water supply**				
1.1	Replacement of submersible pumps in the currently operated wells	pcs	3	15,000	45,000
ST-1	**Sub-total 1 – Water Supply**				**45,000**
2	**Wastewater**				
2.1	**Extension of the sewerage network in the town of Straseni**				
2.1.1	Sewerage network PP/PVC pipe OD 160 -200	m	54,303	140	7,602,420
2.1.2	Manholes, ϕ 1000	pcs	1,086	1030	1,118,580
2.1.3	Pressure main PE OD 90-110	m	3,232	62	200,384
2.1.4	Service connections	pcs	2,770	700	1,939,000
2.1.5	Construction of a new wastewater pumping station (WWPS-1)	LS	1	40,000	40,000
ST-2.1	**Subtotal 2.1**				**10,900,384**
2.2	Rehabilitation of sewerage network in the town of Straseni (OD 200-250)	m	4,000	165	660,000
2.3	Rehabilitation of the existing main wastewater pumping station (MWWPS)	LS	1	83,000	83,000.00
2.4	Construction of a new wastewater treatment plant (WWTP)	P.E	21,300	260	5,538,000
ST-2	**Sub-total 2 - wastewater** (2.1+2.2+2.3+2.4)				**17,181,384**
ST-1&2	**Sub-total water supply and wastewater** (St-1 + St-2)				**17,226,384**
3	**Technical Assistance**				
3.1	Design, engineering and supervision (12% of investment costs)				**2,067,166**
4.	**Contingencies (10% of 1+2+3)**				**1,929,355**
GT – 2	**Total costs for Phase 2 (1+2+3+4)**				**21,222,905**

Source: GIZ/MLPS

Table 5-17: 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	Water Supply	1,712,320	45,000	1,757,320
1.2	Wastewater		17,181,384	17,181,384
1.3	Equipment and tools	200,000		
ST-1	Sub-total capital investments Water Supply and Wastewater	1,912,320	17,226,384	19,138,704
2	Technical assistance	529,478	2,067,166	2,596,644
3	Contingencies	244,180	1,929,355	2,173,535
Total	**Total costs Phase 1 & 2**	**2,685,978**	**21,222,905**	**23,908,883**

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[47] scenario[48], 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 extended with 633 households in Straseni in 'with project' scenario and no extension of the service area is forecasted for the BAU scenario;
- The wastewater service area will not be extended and will be the same in both scenarios;
- 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 villages) to the 100% in 2045;
- Apparent losses (Commercial losses) will decrease up to the target set of 5% until 2030;
- Physical losses will decrease up to the target set 25% until 2021 and up to 5% in 2045;
- 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 water supply;
- Table 3. Depreciation rates for water supply;
- Table 4. Summary of investment costs for water supply;
- Table 5. Depreciation for water supply;
- Table 6. Gross value of new assets for water supply

[47] Business as Usual

[48] 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 water supply;
- Table 8. Depreciation costs for water supply;
- 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[49].

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[50].

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

[49] Source: https://www.bnm.md/en/content/official-exchange-rates

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

priorities for country development for the time horizon 2012-2020. At the same time the 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 scenario, %	2.35	2.30	2.33	2.35	2.33	2.35

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 1-1 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: Gross Domestic Product 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	3.0	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 1-4. In the optimistic scenario, the GDP growth will remain higher, while in the pessimistic scenario there will be stagnation.

Table 6-4: Gross Domestic Product 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	1.8	1.5	1.35
Optimistic scenario, %	10.5	7.6	6.3	5.6	5.0	4.7

Source: GIZ/MLPS

The base case scenario was used in this feasibility study.

6.1.3 Households 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[51].

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 tables present the forecast for disposable household income for the period 2015-2020 and 2020-2045.

Table 6-9: Forecast of disposable household income[52]

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[53]

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.

[51] 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

[52] For the period 2015-2020, per capita per month (MDL)

[53] For the period 2020-2045, per capita per month (MDL)

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:

- 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 subsidised 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 summarises 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	2.0	4.0
Pessimistic scenario, %	0.0	37.0	2.3	2.4	2.3	2.4	4.0	3.0
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 an increase of the fixed assets in 2014 (see Table 6-12).

Table 6-12: Balance Sheet of ME 'Apa-Canal' Straseni

Balance Sheet	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
ASSETS				
LONG-TERM FIXED ASSETS				
Intangible assets	010	0	0	9,197
Incomplete fixed assets	040	5,259,027	5,344,604	5,285,704
Fixed Assets	060	9,694,294	10,235,290	15,120,116
Depreciation and depletion of long-term fixed assets	080	-5,132,169	-6,110,827	-6,842,027
Long-term fixed assets' book cost	090	9,821,152	9,469,067	13,563,793
Total Non-Current Assets	180	9,821,152	9,469,067	13,572,990
CURRENT ASSETS				
Raw materials	190	0	0	36,269
Inventory	210	0	0	45,900
Trade accounts receivables	260	1,653,560	1,839,659	1,708,475
Receivables from staff	320	0	0	36,770
Short-term receivables	350	1,653,560	1,839,659	1,745,245
Cash	400	0	0	15,727
Settlement Account	410	30,698	66,436	3,215
Cash and equivalents	440	30,698	66,436	15,727
Total Current Assets	460	1,684,258	1,906,095	1,846,356
TOTAL - ASSETS	**470**	**11,505,410**	**11,375,162**	**15,419,346**
LIABILITIES AND OWN EQUITY				
EQUITY				
Share capital and capital surplus				
Share capital	480	2,508,308	2,508,308	2,505,308
Share capital and capital surplus	520	2,508,308	2,508,308	2,505,308
Legal provisions	550	2,698,982	2,698,982	2,698,982
Reserves	560	2,698,982	2,698,982	2,698,982
Retained profit (uncovered loss) of previous years	580	3,001,171	937,068	937,061
Net income (loss) of the reporting period	590	0	0	-93,885
Retained earnings (uncovered loss)	610	3,001,171	937,068	843,176
Total Equity	650	8,208,461	6,144,358	6,047,466
LONG-TERM LIABILITIES				
Other long-term accrued liabilities	750	0	1,676,065	5,735,133
Total Long Term Liabilities	770	0	1,676,065	5,735,133
SHORT-TERM LIABILITIES				
Short-term accounts payables	830	1,391,573	1,323,322	1,411,951
Commercial account payables	860	1,391,573	1,323,322	1,411,951
Wages owed	870	202,370	303,127	557,620
Insurance	890	1,318,522	1,323,395	614,293
Budget payables	900	0	0	1,052,883
Other current liabilities	950	384,484	604,895	0
Short-term accrues liabilities	960	1,905,376	2,231,417	2,224,796
Total Short Term Liabilities	970	3,296,949	3,554,739	3,636,747
TOTAL – EQUITY and LIABILITIES	**980**	**11,505,410**	**11,375,162**	**15,419,346**

Source: ME 'Apa-Canal' Straseni

The following conclusions results from the Balance Sheet analysis:

- The largest assets category is long-term assets, which constituted 88.1% of the total in 2014. It should be mentioned that the operator's assets increased from MDL 11.5 million in 2012 to MDL 15.4 million in 2014;

- Liabilities show that the operator is financed mainly from permanent capital where we observe an increase of long-term loans that were offered to rehabilitate the WSS systems. However it should be mentioned the decrease of the total equity from MDL 8.2 million in 2012 to MDL 6.1 million in 2014;
- The share of short-term debts in 2014 is 23.4% from the 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 ME'Apa-Canal' Straseni

Income Statement	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Income from sales	**010**	**4,650,790**	**5,253,937**	**6,250,517**
Cost of sales	**020**	**4,097,859**	**4,076,280**	**5,718,884**
Gross profit (gross loss)	**030**	**552,931**	**1,177,657**	**531,633**
Other operating income	040			71,300
Commercial expenses	050	289,596	459,574	434,019
General and administrative expenses	060	1,216,262	1,041,270	1,019,173
Other operating expenses	070	374,781	160,816	117,258
Result from operating activities: profit (loss)	080	-1,327,708	-484,003	-967,517
Result from investing activities: profit (loss)	090			
Result from financial activities: profit (loss)	100	235,182	281,700	873,632
Result from financial and economic activities: profit (loss)	**110**	**-1,092,526**	**-202,303**	**-93,885**
Extraordinary result: profit (loss)	120			
Profit (loss) before tax	**130**	**-1,092,526**	**-202,303**	**-93,885**
Income tax	**140**			
Net profit (net loss)	**150**	**-1,092,526**	**-202,303**	**-93,885**

Source:ME 'Apa-Canal' Straseni

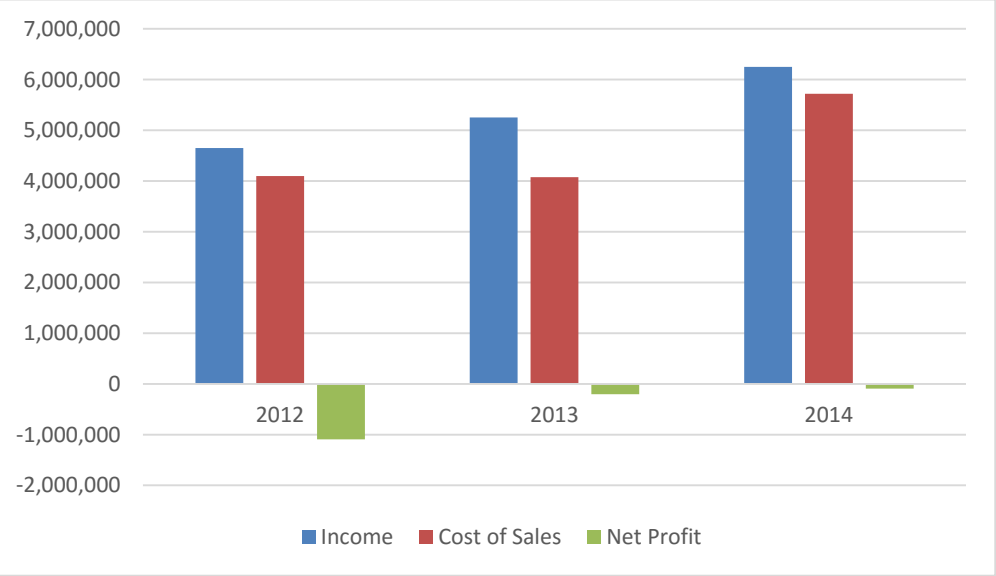
It should be mentioned that the income from sales increased by MDL 996.6 thousand in 2014 due to the connection of the Sireti locality to the Straseni town water network in the 3d quarter of 2014.

However, the operator has losses from operating activities in 2012-2014, which supposes financial risks and does not contribute to provisions accumulation.

The operator did not have sufficient resources to cover the current costs. Nevertheless, it can be observed that the deficit of the resources to cover the current cost decreased by MDL 843.7 thousand in 2013, which demonstrates the capability of the operator to optimise the costs structure in the future, however MDL 93.9 thousand losses was registered in 2014.

The evolution of the operator's income, cost of sales and net profit for the period of 2012-2014 is presented in the Figure 2-1.

Figure 6-1: Operator's 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 'Apa-Canal' Straseni

Cash Flow Statement	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Operating activities				
Cash inflows from sales	010	4,866,556	5,736,248	3,234,208
Cash paid to suppliers and contractors	020	2,140,476	1,760,474	2,469,226
Cash payments to employees and social security contributions	030	1,700,683	2,537,291	1,053,930
Interest payments	040			
Income tax payments	050	27,531		56,839
Other cash receipts	060		80,881	435,810
Other cash payments	070	1,335,170	1,533,626	7,860
Net cash flow from operating activities	080	-337,304	-14,262	82,163
Financing activities				
Other cash receipts (payments)	200	136,600	50,000	
Net cash flow from financial activity	210	136,600	50,000	
Net cash flow before extraordinary items	220	-200,704	35,738	82,163
Net cash flow	**240**	**-200,704**	**35,738**	**82,163**
Positive (negative) foreign exchange differences	250			
Cash balance at the beginning of the year	**260**	**231,402**	**30,698**	**66,436**
Cash balance at the end of the reporting period	**270**	**30,698**	**66,436**	**148,599**

Source:ME 'Apa-Canal' Straseni

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	0.51	0.54	0.51	1.0 – 2.0
2	ROE, %	-13.3	-3.3	-1.6	
3	ROA, %	-9.5	-1.8	-0.6	
4	Operating Profitability, %	-28.5	-9.2	-15.5	> 0
5	Debts Service Converge Ratio	0.71	0.54	0.39	<1.2
6	Financial Ratio	0.29	0.46	0.61	
7	Accounts Receivable Turnover, days	130	121	106	< 30
8	Accounts Payable Turnover, days	124	122	86	< 30

Source: GIZ/MLPS

- The profitability indicators (2, 3, 4) have oscillating values, but are generally negative for 2012-2014. This means that operator covers its current costs partially;
- Debt ratio indicators (5, 6) show a reduced weight of debt for the short-term period, promoting a short-term strategy. Also it should be mentioned the continuous level of reserves, which is positive fact;
- Liquidity indicator (1) shows a constant capacity of paying in the short-term, but demonstrates low cash reserves;
- The ability to collect receivables demonstrates the shortening of the collecting period from 130 days in 2012 to 106 days in 2014. The accounts payable period significantly decreased from 124 days in 2012 to 86 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 ME 'Apa-Canal' Straseni, 2014

Consumers	Revenues		Volumes	
	(MDL)	(%)	(m^3)	(%)
WATER SUPPLY	**4,198,163**	**100.0**	**251,444**	**100.0**
Population	3,171,383	75.5	217,218	86.4
Budgetary Consumers	769,230	18.3	25,641	11.8
Private Entities	257,550	6.2	8,585	1.8
WASTEWATER SERVICES	**2,076,103**	**100.0**	**149,446**	**100.0**
Population	1,215,295	58.5	113,579	76.0
Budgetary Consumers	639,600	30.8	26,650	17.8
Private Entities	221,208	10.7	9,217	6.2

Source:ME 'Apa-Canal' Straseni

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.

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

Tariffs for consumers	2013 (MDL/$1m^3$)	2014 (MDL/$1m^3$)	2015 (MDL/$1m^3$)
Budgetary Consumers	54.00	54.00	54.00

Tariffs for consumers	2013 (MDL/1m^3)	2014 (MDL/1m^3)	2015 (MDL/1m^3)
• Water supply	30.00	30.00	30.00
• Wastewater services	24.00	24.00	24.00
Private Entities	54.00	54.00	54.00
• Water supply	30.00	30.00	30.00
• Wastewater services	24.00	24.00	24.00
Population	25.30	25.30	25.30
• Water supply	14.60	14.60	14.60
• Wastewater services	10.70	10.70	10.70
Weighted average		30.59	
• Water supply		16.70	
• Wastewater services		13.89	

Source:ME 'Apa-Canal' Straseni

In the period of 2013 - 2015, the tariffs for WSS services did not change. This fact demonstrates that the operator's activity is not based on the principle of cost recovery. 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. It can be noticed that the majority of the costs are for salaries and electricity.

Table 6-18: Detailed cost structure of ME'Apa-Canal' Straseni, 2014

Cost category	Amount (MDL)	Percentage (%)
WATER SUPPLY	**4,192,145**	**100.0**
Electricity (for pumping)	1,753,711	41.8
Salaries of employees working at water supply	1,355,112	32.3
• Number of employees (pers.)	33	-
• Average monthly salary per employee	3,422	-
Social benefits (pension fund/insurance)	365,880	8.7
Depreciation	504,528	12.0
Tax for water capturing	104,458	2.5
Other costs	108,456	2.7
WASTEWATER SERVICES	**2,078,017**	**100.0**
Electricity (for wastewater treatment)	126,294	6.1
Salaries of employees working at wastewater services	698,088	33.6
• Number of employees (pers.)	17	-
• Average monthly salary per employee	3,422	-
Social benefits (pension fund/insurance)	188,484	9.1
Depreciation	226,672	10.9
Other costs	838,479	40.3
ADMINISTRATION AND OVERHEAD	**1,019,173**	**100.0**
Salaries of employees working in administration	554,958	54.5
• Number of employees (pers.)	14	-
• Average monthly salary per employee	3,303	-
Social benefits (pension fund/insurance)	149,838	14.7
Other costs	236,828	30.8

Source:ME 'Apa-Canal' Straseni

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)
Reparation of the Pumping Station in Straseni town	NEF	2008	2,500,000
Rehabilitation of the water intake in Micauti village	NEF	2009	14,000,000
Construction of a portion of a pipe-line in Straseni town	FIS	2012	3,057,000
Total			**19,557,000**

Source:ME 'Apa-Canal' Straseni; National Ecological Fund

6.2.2 Information on existing loans (if any)

No long-term or short-term loans are in operation for the moment.

6.2.3 Creditworthiness' capacity of the Operator

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 55.81 million (EUR 2.69 million). The outlays include:

- Rehabilitation of the water transmission main pipeline – 8.5 km;
- Extension of the water network in the town of Straseni – 6.75 km;
- New chlorination unit
- Equipment and tools;
- 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.

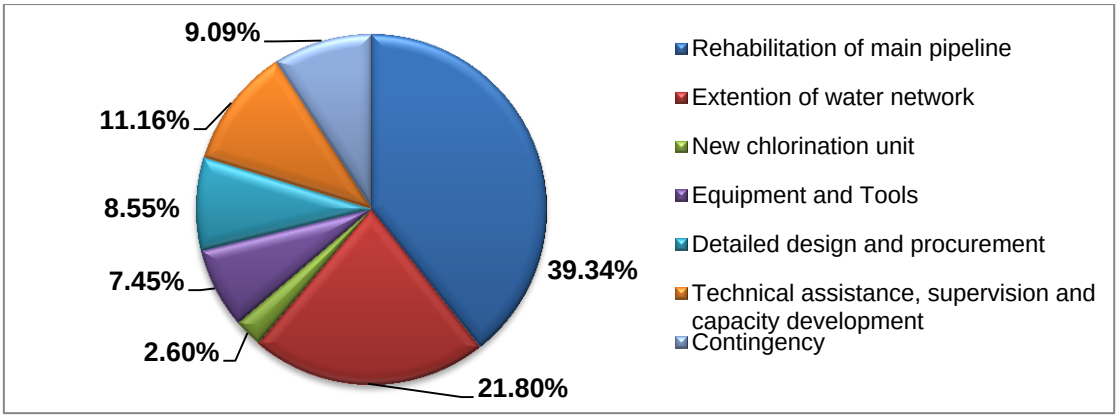
Table 6-20: Summary of the investment costs (MDL mil.)

Project investment outlays	Amount (MDL mil.)	Percentage (%)
Rehabilitation of main pipeline	21.96	39.34
Extension of water network	12.17	21.80
New chlorination unit	1.45	2.60
Equipment and Tools	4.16	7.45
Detailed design and procurement	4.77	8.55
Technical assistance, supervision and capacity development	6.23	11.16
Contingency	5.07	9.09
Total	**55.81**	**100.00**

Source: GIZ/MLPS

The main part of investment costs about 39.3% will be for the rehabilitation of the transmission main pipeline Micauti – Straseni. Also, the extension of water distribution network of the town Straseni is about – 21.8%. Capacity development and technical assistance will be around 20% 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 (%)



Source: GIZ/MLPS

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[54].

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 al-

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

ready 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 443 households will be connected to the water supply system in the first year of the project realisation. The estimation of the citizens contribution is amounted to MDL 0.44 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 realised through loans, than the tariffs calculated, will exceed the affordable constrains. In addition, the ME 'Apa-Canal' Straseni currently has no creditworthiness capacity.

As indicated when calculating the financial gap (see Chapter 6.3.7 'Financial performance of the project - NPV and IRR calculation'), project is not profitable (FNPV(K)~=0) when own contribution achieve MDL 19.53 million. This means that apart from citizen contributions of MDL 0.44 million, the additional MDL 19.09 million needs to be provided from other sources.

6.3.2.2 Financial plan

The total investment outlays will be financed by:

- 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'[55]. 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' Straseni has no creditworthiness capacity.

Source: GIZ/MLPS

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

The following table presents the investment outlays and their financing:

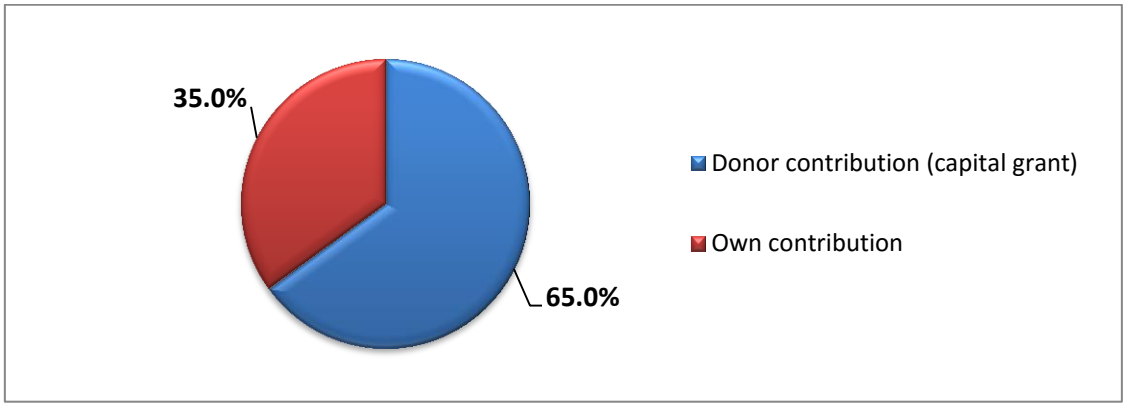
Table 6-22: Summary of the financing sources (MDL mil.)

Project financing sources	Amount (MDL mil.)	Percentage (%)
Citizens providing local contribution	0.44	0.79
Domestic and International donors	36.28	65.00
Other domestic sources	19.09	34.20
Water utility	0.00	0.00
Total	**55.81**	**100.00**

Source: GIZ/MLPS

The donor contribution was estimated as 65.0% of the total investment costs, while the local sources' contribution is 35.0%.

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%	
Rehabilitation of main pipeline	2.20	10.98	8.78	21.96
Extension of water network	1.22	6.09	4.87	12.17
New chlorination unit	0.15	0.73	0.58	1.45
Equipment and Tools	0.42	2.08	1.66	4.16
Detailed design and procurement	0.48	2.39	1.91	4.77
Technical assistance, supervision and capacity development	0.62	3.12	2.49	6.23
Contingency	0.51	2.54	2.03	5.07
Total	**5.58**	**27.91**	**22.33**	**55.81**

Source: GIZ/MLPS

6.3.3 Forecast of operating costs

A detailed cost structure of 'Apa-Canal' Straseni for the year 2014 was presented in Section 6.2.1.6 (**Error! Reference source not found.**). 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, the costs are estimated to be 0.18 MDL/m^3 of water treated. No real cost increase is forecasted;
- **Direct costs (electricity).** The following assumptions were used for unit consumption:
  - **For water pumping stations**. The electricity consumption for the water pumping stations and water treatment plant is estimated to be 2.34 kWh/m^3;
  - **For wastewater pumping station**. The electricity consumption for the wastewater pumping station is estimated to be 0.40 kWh/m^3.

Electricity costs are estimated taking into account the electricity prices and the electricity consumption. Price of energy[56] 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 1.02 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 0.73 million annually. However, depreciation costs will increase to about MDL 2.40 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.

[56] It has to be noted that current electricity price for all pumping station is 1.57 MDL/kWh.

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 M	1.86	2.08	2.83	2.88	4.04	4.25	6.04	11.44	19.09
Electricity for pumping	MDL M	1.75	1.97	2.73	2.77	3.90	4.10	5.85	11.17	18.78
Water treatment costs	MDL M	0.10	0.10	0.11	0.11	0.15	0.15	0.20	0.27	0.31
Fixed costs water		3.02	3.02	3.30	4.52	8.06	8.23	8.88	10.69	13.15
Salaries and related costs	MDL M	1.72	1.72	1.77	1.85	2.58	2.68	3.11	4.61	6.26
Maintenance - old assets	MDL M	0.00	0.00	0.00	0.00	2.00	2.04	2.25	2.75	3.20
Maintenance - new assets	MDL M	0.00	0.00	0.06	0.33	0.56	0.56	0.56	0.56	0.56
Depreciation of fixed assets	MDL M	0.50	0.50	0.67	1.51	2.17	2.17	2.17	1.67	1.67
General and administrative expenditures	MDL M	0.68	0.68	0.69	0.72	0.64	0.67	0.68	1.00	1.36
Other costs	MDL M	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Total costs for water	MDL M	4.87	5.10	6.13	7.40	12.10	12.48	14.93	22.14	32.24
Wastewater service	**Unit**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2024**	**2034**	**2044**
Variable costs wastewater		0.13	0.13	0.19	0.20	0.22	0.22	0.49	1.09	2.07
Electricity for pumping	MDL M	0.13	0.13	0.19	0.20	0.22	0.22	0.49	1.09	2.07
Wastewater treatment costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed costs water		2.29	2.29	2.32	2.38	2.99	3.06	4.10	5.41	6.83
Salaries and related costs	MDL M	0.89	0.89	0.91	0.96	1.05	1.10	2.00	2.96	4.02
Maintenance - old assets	MDL M	0.00	0.00	0.00	0.00	0.50	0.51	0.56	0.69	0.80
Depreciation of fixed assets	MDL M	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
General and administrative expenditures	MDL M	0.34	0.34	0.34	0.36	0.37	0.39	0.47	0.69	0.94
Other costs	MDL M	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Total costs for wastewater	MDL M	2.42	2.41	2.51	2.58	3.21	3.27	4.59	6.50	8.90
TOTAL COSTS	**MDL M**	**7.29**	**7.51**	**8.64**	**9.98**	**15.31**	**15.75**	**19.51**	**28.63**	**41.13**

Source: GIZ/MLPS

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 service 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 project' (MDL mil.)

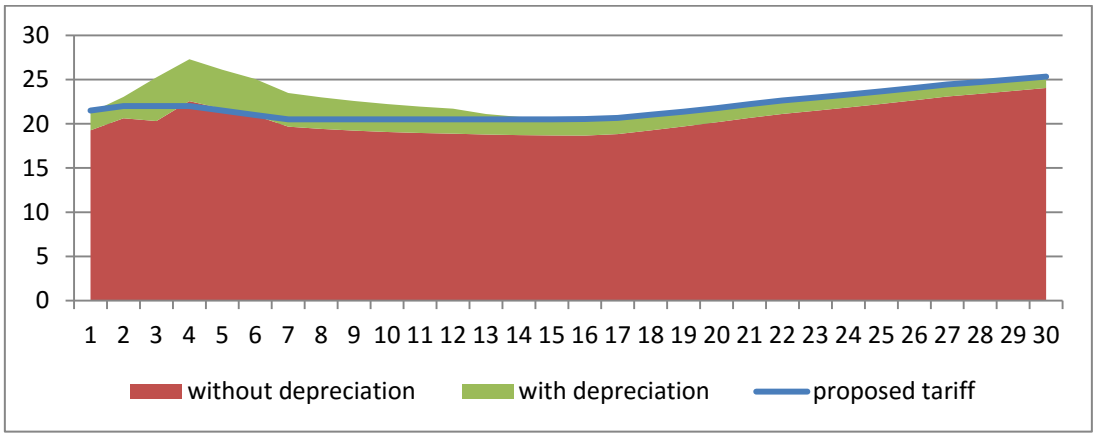
Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Variable and fixed costs	MDL M	4.37	4.59	5.46	5.89	9.93	10.31	12.75	20.47	30.57
Depreciation	MDL M	0.50	0.50	0.67	1.51	2.17	2.17	2.17	1.67	1.67
Interest and financial costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reserve for irregular receivables	MDL M	0.00	0.25	0.28	0.30	0.42	0.37	0.37	0.55	0.81
Sale of water	ths m^3	251	252	278	305	459	492	688	1,042	1,304
Tariff without depreciation	MDL/ m^3	17.38	19.26	20.63	20.31	22.56	21.70	19.07	20.17	24.05
Tariff with depreciation	MDL/ m^3	19.38	21.27	23.04	25.26	27.30	26.12	22.23	21.77	25.33
Proposed average tariff	MDL/ m^3	16.70	21.50	22.00	22.00	22.00	21.50	20.50	21.77	25.33
Wastewater service	**Unit**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2024**	**2034**	**2044**
Variable and fixed costs	MDL M	2.19	2.19	2.28	2.35	2.98	3.05	4.36	6.27	8.67
Depreciation	MDL M	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Interest and financial costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reserve for irregular receivables	MDL M	0.00	0.12	0.11	0.10	0.11	0.10	0.11	0.16	0.22
Sale of	ths m^3	149	150	162	174	186	198	475	770	1,003

Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
wastewater										
Tariff without depreciation	MDL/ m^3	14.64	15.42	14.79	14.12	16.64	15.88	9.43	8.36	8.86
Tariff with depreciation	MDL/ m^3	16.16	16.94	16.19	15.42	17.86	17.03	9.90	8.65	9.09
Proposed average tariff	MDL/ m^3	13.89	15.50	15.50	15.50	15.50	15.50	9.90	8.65	9.09

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 full cost recovery tariff can be applied starting with year 13 of the forecast for water supply service and in year 7 for sanitation system.

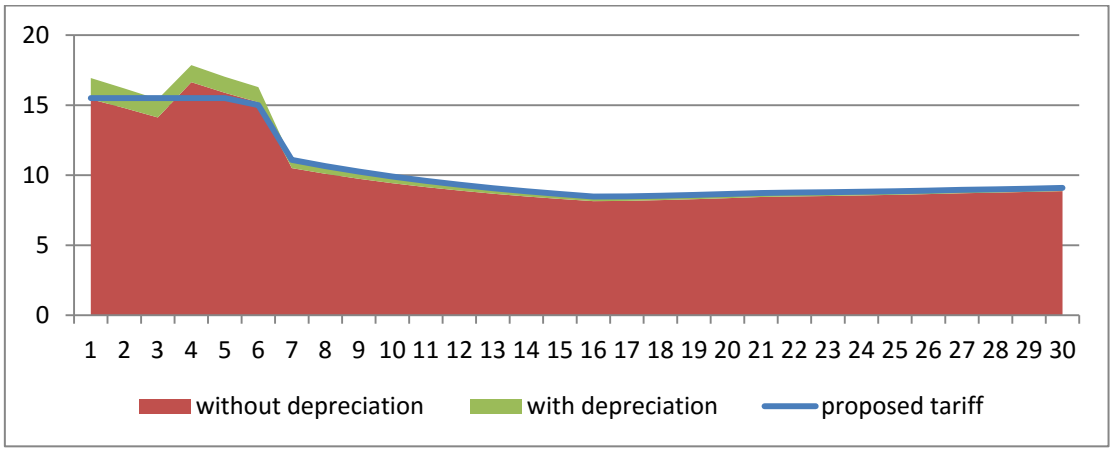
Figure 6-4: Forecast of the tariff for water (MDL/m^3)



Source: GIZ/MLPS

The tariff of water is forecasted to be about MDL 22.00 per m^3 for the whole projected 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 15.50 per m^3 for the first 6 years of the projected period, and about MDL 9.00 per m^3 in the period 2021-2045. 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

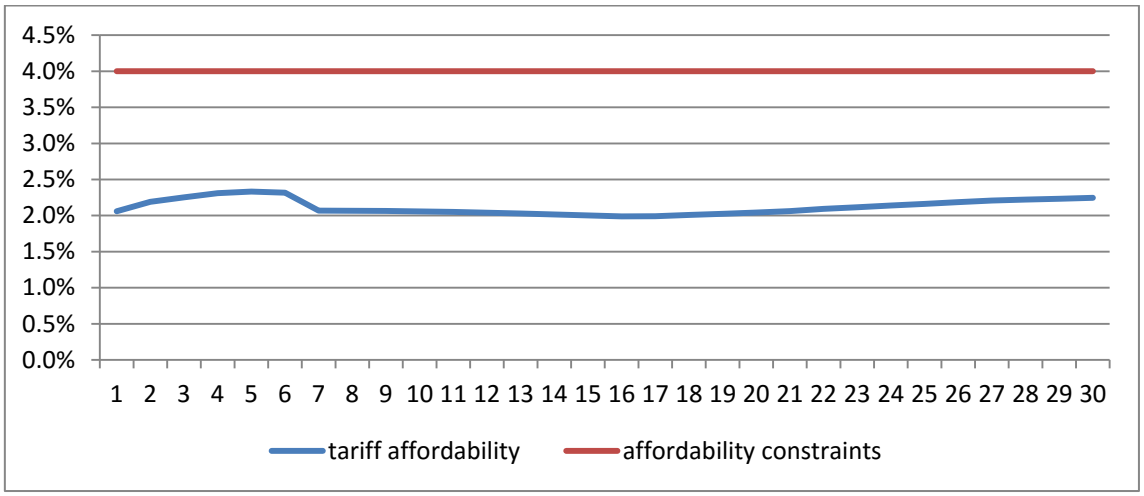
The affordability of tariffs, expressed as the ability of households to pay for services, is estimated as the household expenditures on water and wastewater services expressed as a percentage of disposable household income. For Eastern Europe countries, a common benchmark figure for the affordability 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 2.1% 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 project' (MDL mil.)

Water supply service	**Unit**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2024**	**2034**	**2044**
Sale of water	ths m^3	251.4	251.5	278.1	304.7	458.9	492.2	688.1	1,042.1	1,304.4
The weighted average tariff for water	MDL/ m^3	16.70	21.50	22.00	22.00	22.00	21.50	20.50	21.77	25.33
Revenues from water service	MDL M	4.20	5.41	6.12	6.70	10.09	10.58	14.11	22.69	33.04
Waste-water service	**Unit**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2024**	**2034**	**2044**
Sale of waste-water	ths m^3	149.4	149.7	161.7	173.8	185.9	198.1	474.6	769.6	1,003.1
The weighted average tariff for waste-water	MDL/ m^3	13.89	15.50	15.50	15.50	15.50	15.50	9.90	8.65	9.09
Revenues from sanitation service	MDL M	2.08	2.32	2.51	2.69	2.88	3.07	4.70	6.66	9.12
Total Revenues	**MDL M**	**6.27**	**7.73**	**8.62**	**9.40**	**12.98**	**13.65**	**18.81**	**29.35**	**42.16**

Source: GIZ/MLPS

The water demand will increase from 251.4 thousand m^3 per year to 1.3 million m^3 per year at the end of the period of analysis. This increase is determined by the growth of

water consumption per capita from 32.1 l/c/d to 110 l/c/d in 2045 and the increase of consumers by 16,861.

The wastewater inflow is calculating proceeding from wastewater generation per capita and the number of consumers. It is assumed that the number of consumers will grow from the current number of 9,207 to 21,085 persons and the wastewater generation will increase from the current 33.8 l/c/d up to 110 l/c/d in 2045.

The average tariff for water services will increase slowly from 21.50 MDL/m^3 to approximately 25.35 MDL/m^3 at the end of projection period.

The average tariff for wastewater services will be about 15.50 MDL/m^3 in the period 2015-2020, and it will be about 9.00 MDL/m^3 in the period 2021-2045.

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 period 2016-2027 in which the profit is expected to be negative. The average annual profit is expected to be MDL 0.59 million. For the wastewater services the financial results will be positive with the exception of period 2018-2020. The average annual profit for the wastewater service will be about MDL 0.16 million. The cumulated net profit for the projected period will be negative with a value of MDL 0.28 million.

The calculation of net profit for each service provided in the ‚with project' option is presented in the 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 M	4.20	5.41	6.12	6.70	10.09	10.58	14.11	22.69	33.04
Costs of water services	MDL M	4.87	5.10	6.13	7.40	12.10	12.48	14.93	22.14	32.24
Gross profit from water services	MDL M	-0.68	0.31	-0.01	-0.70	-2.01	-1.90	-0.82	0.55	0.81
Wastewater service	**Unit**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2024**	**2034**	**2044**
Sale of wastewater	MDL M	2.08	2.32	2.51	2.69	2.88	3.07	4.70	6.66	9.12
Costs of wastewater services	MDL M	2.42	2.41	2.51	2.58	3.21	3.27	4.59	6.50	8.90
Gross profit from wastewater services	MDL M	-0.34	-0.09	0.00	0.12	-0.33	-0.20	0.11	0.16	0.22
Total gross	MDL	-1.02	0.22	-0.01	-0.58	-2.34	-2.10	-0.71	0.72	1.03

Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
profit	M									
Income tax	MDL M	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.09	0.12
Net profit	MDL M	-1.02	0.19	-0.01	-0.58	-2.34	-2.10	-0.71	0.63	0.90
Cumulated net profit	MDL M		0.19	0.18	-0.40	-2.74	-4.84	-10.77	-8.08	-0.28

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: Assumption for calculation of 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 6, Table 16 and 17 for the ’with project’ and BAU scenarios.

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 M	0.00	12.23	34.83	31.78	13.43	13.70	18.89	29.47	42.29
Donor contribution (capital grant)	MDL M	0.00	3.63	18.14	14.51	0.00	0.00	0.00	0.00	0.00
Own contribution	MDL M	0.00	1.95	9.77	7.81	0.00	0.00	0.00	0.00	0.00
Revenues from sale	MDL M	0.00	7.73	8.62	9.40	12.98	13.65	18.81	29.35	42.16
Increase in current liabilities	MDL M	0.00	-1.08	-1.70	0.05	0.45	0.05	0.08	0.12	0.13
Financial outflows	MDL M	0.00	11.26	35.73	30.66	13.38	13.41	17.20	26.93	39.48
Investment costs	MDL M	0.00	5.58	27.91	22.33	0.00	0.00	0.00	0.00	0.00
Costs of providing services	MDL M	0.00	6.78	7.74	8.25	12.91	13.35	17.11	26.74	39.24
Increase in current assets	MDL M	0.00	-1.13	0.08	0.09	0.47	0.06	0.09	0.11	0.12
Income tax	MDL M	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.09	0.12
Net cash flow (inflow - outflow)	MDL M	0.00	0.97	-0.89	1.12	0.05	0.29	1.69	2.54	2.81
Cumulated cash	MDL M	0.02	0.99	0.10	1.21	1.26	1.55	7.59	31.01	57.88

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 55.81 million. In the first years of the project, the net cash flow is insignificant, and is increasing in value in the latest years. During the 30-year period of analysis, the project is expected to generate MDL 57.88 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)=	-32.45	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 on 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 water and 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, water storage tank, water towers 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 water quality improvement programmes involves determining the positive health effects that will result from the programme and assigning a monetary value to them. This approach, however, requires precise study of the relationships between pollution in the source 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 water quality improvement programmes have many limitations.

The economic valuation of the benefits from implementing a water quality improvement programme 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 water pollution; underestimation of economic costs of water pollution, etc., P. Faircloth[57] 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. The situation in communes where there is no water supply is even more difficult to estimate. However, there are studies that estimate, especially health benefits. ECOTEC report[58] 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 water supply system is not able to provide water for new businesses. This situation is due to high level of leakages in the water distribution network in Straseni, and lack of the network in other localities. The situation reduces the possibilities of business development or the business will have to find other sources of water - 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 delivery of water to new business were used. The shadow price was estimated at 30 MDL/m3, as equal to the production price and distribution costs (including distribution by cisterns). The shadow price was applied to the water demand from business.

Non-financial benefits

Apart from those described elsewhere in this chapter no non-financial benefits in this project were identified.

[57] Peter Faircloth (Cranford Economics) and others “Approximation of Environmental legislation A Study of the Benefits of Compliance with the EU Environmental Acquis”

[58] The benefits of compliance with the environmental Aquis for the candidate countries

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 sewerage 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 23% while the ENPV is MDL 91.96 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 services area extension

With respect to the regionalisation of water supply and wastewater services in administrative-territorial units included in this feasibility study, by operating jointly the services and developing the projects related to these services infrastructure, the parties have expressed a consensus of opinion.

The existing operator in the town of Straseni, Municipal Enterprise ‘Apa - Canal’ Straseni, hereinafter ME ‘Apa - Canal’ Straseni has stated that extension of water supply and wastewater services area to other administrative units is one of the company's strategic development activities. To date, ME ‘Apa-Canal’ Straseni provide water supply and wastewater services within the town of Straseni and within the locality of Micauti, partially.

Representatives of local public administrations of the town of Straseni, communes of Micauti and Radeni and locality of Sireti have agreed to appoint ME ‘Apa - Canal’ Straseni 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 Straseni 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 wastewater 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[59], 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 administrations. In addition, rural 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:

[59] Art. 8 of Law no. 303 on water supply and sanitation public service dated December 12, 2013

- 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;
- 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

A regional operator can be considered the operator organised as a business enterprise with public equity owned by one or more administrative-territorial units. It provides water supply and wastewater public services within the area of several administrative-territorial units, ensuring management and operation of the systems related to these public services.

The main activities of the regional operator will be abstraction/intake, treatment and distribution of drinking water; wastewater collection and treatment; performing other activities as well in accordance with the legislation in force, necessary to achieve the goal of activity established by constituent act.

The regional operator is responsible for provision of water supply and wastewater public services within the area of administrative-territorial units that have delegated the management of the service. The operator also bears responsibility for the management, operation, maintenance, renewal and extension, where appropriate, of all fixed assets (systems) subject to the contract.

All administrative-territorial units take charge of the activities carried out by regional operator activities under the provisions specified in the constitutive act.

The regional operator can be set up on the basis of the existing operator following one of two ways:

- Reorganisation of the ME ‘Apa – Canal’ Straseni.
  Reorganisation through transformation of the legal person, applicable in this case, means the continuity of legal person’s activity, having the same rights of property and corresponding liabilities, ensuring uninterrupted operation of the assets and continuous production of benefits.
  The process of transformation does not imply the transfer of rights and obligations from one legal person to the other because it does not disappear, but continues its existence in a different legal form;
- Setting up of a new business enterprise with wholly public equity, whose founders are administrative-territorial units only in the area where regional operator will provide the service.

Another important point is to identify the organisational-legal form of a new regional operator, in accordance with legislation in force and specificity of the public service.

Given the subject of activity, namely the provision of the water supply and wastewater services and legal provisions in force as well, the following are the organisational-legal

forms that can be taken in the future: the municipal enterprise with more founders, limited liability company, and joint stock company.

Table 7-1: Comparative analysis of the organisational-legal forms

	Municipal enterprise (inter-municipal)	Limited liability company	Joint-stock company
Regulatory framework	• Government Decision no. 387 of 06.06.1994 regarding the approval of regulations' model of Municipal Enterprise; • Civil Code (Law no. 1107-XV of June 6, 2002); • Law on entrepreneurship and enterprises no. 845-XII from 01.03.1992; • Law on State Registration of Legal Entities and Individual Entrepreneurs No. 220-XVI from 10.19.2007.	• Law on Limited Liability Companies no. 135-XVI of 06.14.2007; • Civil Code (Law no. 1107-XV of June 6, 2002); • Law on entrepreneurship and enterprises no. 845-XII from 01.03.1992; • Law on State Registration of Legal Entities and Individual Entrepreneurs No. 220-XVI from 10.19.2007.	• Law on Joint Stock Companies no.1134-XIII of 04.02.1997; • Civil Code (Law no. 1107-XV of June 6, 2002); • Law on entrepreneurship and enterprises no. 845-XII from 01.03.1992; • Law on State Registration of Legal Entities and Individual Entrepreneurs No. 220-XVI from 10.19.2007.
Governing bodies	• The head (director); • Boards of directors (if needed).	• General meeting of shareholders; • The council of enterprise; • Enterprise's manager; • Auditor.	• General meeting of shareholders; • The council of enterprise; • Executive body; • Auditing committee.
Responsibilities of governing bodies	The director manages the daily operations of enterprise; its responsibilities are set out in the employment contract concluded between the founder and head of the company.	• General meeting of shareholders is the supreme body of the enterprise (art. 48-61 of Law no. 135-XVI dated 06.14.2007)); if enterprise has only one shareholder, the rights and liabilities of general meeting are taken over by the latter (art. 62 of Law no. 135-XVI dated 06.14.2007); • Council of the enterprise (at least 3 people) is its executive body (art. 64-68 of Law no. 135-XVI dated 06.14.2007 and constituent act); • The company may have one or more managers (art. 69-76 of Law no. 135-XVI dated 06.14.2007); • Auditor is enterprise's supervisory body; the general meeting may appoint one or more auditors; the enterprise may instead appoint an independent audit censor (art. 77-79 of Law no. 135-XVI dated 05.14.2007).	• Shareholders general meeting is the supreme leading body (art. 50-64 of Law no. 1134-XIII dated 04.02.1997); • Council of the enterprise performs general management and control over enterprise's activities (art. 65-68 of Law no. 1134-XIII dated 04.02.1997); • The executive body carries out the management of enterprise's current activities (art. 69-70 of Law no. 1134-XIII dated 04.02.1997); • Auditing Committee exercises control over financial and economic activity of enterprise (art. 71-72 of Law no. 1134-XIII dated 04.02.1997).
Legal liability	• The enterprise is liable for the obligations assumed by entire property it owns under ownership right; • The administrative-	• The company is liable for its obligations with all its assets; • Shareholders are not liable for enterprise's obliga-	• The enterprise is liable for its obligations by entire property it owns under ownership right; • The enterprise is not liable

	Municipal enterprise (inter-municipal)	Limited liability company	Joint-stock company
	territorial units are not responsible for the obligations of municipal enterprises; • Municipal enterprises are not responsible for the obligations of administrative-territorial units.	tions; they bear the risk of losses resulting from the enterprise's activity within their participation in the share capital.	for obligations of its shareholders; • Shareholders are not liable for enterprise's obligations and bear the risk of losses within the value of shares belonging to them.
Setting up conditions	• Setting up decision and enterprise charter is adopted by founder (local council); • Incorporation from the moment of registration by State Registration Chamber.	• Enterprise can be set up by one or more natural and/or juridical persons; • Number of associates shall not be more than 50; • Founding agreement is signed by all founders and notarised; charter is approved by single founder; • It is registered by State Registration Chamber.	• Enterprise can be set up by one or more persons; • Both natural and juridical persons can be founders of enterprise; • Shareholders can be natural and juridical persons from Republic of Moldova, other countries, stateless citizens, foreign countries and international organisations; • Contract conclusion (decision taken on enterprise setting up); founders subscription to shares and constituent assembly holding; enterprise contract (statement on enterprise setting up) loses its force since enterprise is registered; charter approval by founding members; • Incorporation from the moment of registration by State Registration Chamber.
Constituent acts	Local council decision on enterprise setting up and its charter	Founding agreement or enterprise charter (art.12 of Law no.135-XVI of 06.14.2007)	Founding agreement (or founding statement) and enterprise charter (art.32 of Law no.1134-XIII of 04.02.1997)
Initial equity	Not regulated	Equity capital shall not be less than 5,400 MDL (art. 21 para 2 of Law no. 135-XVI of 06.14.2007)	Equity capital shall not be less than 20,000 MDL (art. 40 of Law no. 1134-XIII of 04.02.1997)
New members acceptance	No members	Allowed in accordance with charter provisions	Allowed in accordance with charter provisions
Strengths	• The best known organisational-legal form for public services provision; • A separate legal entity having own property and budget; • The loans taken are guaranteed by the local public administration; • Subsidies from local public administrations.	• The most applicable; • Organisational-legal form for delegated public services in the rural area; • More mobility and capacity to respond to the economic and financial changes; • Possibility to access loans for investments; • Independence from local public authorities; • More simple procedure on setting up and registration.	• Possibility to attract investments for development; • More mobility and capacity to respond to the economic and financial changes; • More profitable services when provided on larger area (regional or rayon level); • Higher transparency of activity and management of public goods.

	Municipal enterprise (inter-municipal)	Limited liability company	Joint-stock company
Weaknesses	• Outdated legal regulations in this sector; • Limited possibility for investments; • Dependence on founding local public administrations; • High probability on budgeting dependence and political influence on tariffs level.	• It is subject to all risks of market economy; • It is seen through concern for personal benefits to the detriment of the public interest.	• It is subject to all risks of market economy; • More complex registration procedures; • More complex structure and operating mode; • Not practical for rural areas.

Taking into account all mentioned above and considering the regionalisation policy for water supply and wastewater sector by creating stronger operators, it is proposed that the optimal legal form for conversion of the existing operator is joint-stock company.

Setting up of the regional operator will be made in compliance with Civil Code, Law on entrepreneurship and enterprises no. 845-XII of 01.03.1992, Law on Joint Stock Companies no. 1134-XIII of 04.02.1997, Law on State Registration of Legal Entities and Individual Entrepreneurs no. 220-XVI of 10.19.2007.

7.3.2 Delegated management contract

Under a delegated management contract, an LPA as delegator assigns to a licensed operator as a delegatee, 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[60].

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 (delegate), 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 Straseni; commune of Micauti; localityof Sireti; commune of Radeni), signed by each administrative-territorial 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;

[60] Art. 13, par. 8 of Law no. 303

- 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[61].

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 (town of Straseni; commune of Micauti; localityof Sireti; commune of Radeni) should decide on the management model for water supply and wastewater services, specifically direct management or delegated management.

Under Law no. 303[62], 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.

After that, the Local Councils from each administrative-territorial unit have to approve this study as part of the regionalisation process.

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 Regional operator

The starting point is the local council decisions approving studies, which substantiate this regionalisation and identification of the optimal institutional model regarding regionalisation in Straseni Rayon.

Establishment of a working group to identify the fastest and most viable solution for the setting up regional operator. This activity has the character of a recommendation, but creates prerequisites for a detailed analysis of the future operator.

[61] Art.13, par. 12 of Law no. 303

[62] Art. 13, par. 14 of Law no. 303

Adoption of the decision on reorganisation through transformation of the ME ‘Apa - Canal’ Straseni or decision on new business enterprise setting up.

Establishing new operator will be subject to the provisions of the Civil Code, Law on entrepreneurship and enterprises no. 845-XII from 01.03.1992, the Law on joint stock companies no. 1134-XIII of 04.02.1997, the Law on state registration of legal entities and individual entrepreneurs no. 220-XVI from 10.19.2007, and it is recommended to be organised as a joint stock company.

This stage ends with acquiring legal personality of the new operator by registering at the State Registration Chamber.

7.4.3 Delegation of water supply and wastewater services

The activities necessary for water supply and wastewater public services delegation to regional operator are under competence of deliberative authorities from administrative-territorial units in the project area. Thus, local councils in the town of Straseni; commune of Micauti, commune of Radeni, localityof Sireti 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.

In this process it is recommended that negotiations should be carried out at the same time with all interested parts involved and a single delegated management contract have to be signed by all administrative-territorial units, including clauses and annexes specific to each administrative-territorial unit.

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:

Table 7-2: Timeframe for regionalisation process of water supply/ wastewater services

No.	Method chosen for setting up the regional operator	Steps	Time
a)	Reorganisation of ME 'Apa - Canal' Straseni	• Reorganisation of the ME 'Apa - Canal' Straseni into Joint Stock Company with Straseni Local Council as a sole shareholder; • Increase of the authorised capital stock through acceptance of the new shareholders, in person of administrative-territorial units Micauti, Sireti, Radeni; • Delegation of the management of the water supply and wastewater services to the new set up operator.	5-7 months 5-7 months 3 months
b)	Setting up of a new business enterprise	• Setting up of the Joint Stock Company, whose founders (shareholders) are Straseni Local Council; Micauti Local Council; Sireti Local Council; Radeni local Council; • Delegation of the management of the water supply and wastewater services to the new set up operator.	6-9 months 3 months

Source: GIZ/MLPS

Given the fact that at the present time there is water supply and wastewater services operator in the town of Straseni, it is recommended the reorganisation of the ME 'Apa - Canal' Straseni into Joint Stock Company (regional operator) as an optimal solution.

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 implementation (the Project). Once Phase 2 starts, the full regionalisation of water supply and wastewater services within the localities of the Straseni Rayon will be completed.

7.6 Corporate and human resources development of the operator

The existing institutional setup of the ME 'Apa-Canal' Straseni will require considerable changes, in order to meet the increasing demands of the expanding service area.

In general, ME 'Apa-Canal' Straseni is currently overstaffed, as the staff efficiency indicator is 6.64 W&WW staff per 1,000 W&WW connections, while an 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 company (e.g. joint-stock company, municipal company etc.) and ways of service management (e.g. delegated to the Company, certain activities outsourced to third-parties etc.). This may have an impact over 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).

For the first phase of investments (until 2018), a considerable extension of water services over the rural localities is planned (increase of 41% in total number of water consumers), while development of wastewater service will have a slower pace (only 1% increase, as compared to the current situation).

Although the company is currently overstaffed, the planned extension of services will still require considerable additional efforts and the current staff will not be able to efficiently manage the entire extended area. For 2018, it is projected that the utility will reach an average staff efficiency indicator for Moldovan utilities of 6.0 W&WW staff per 1000 W&WW connections. Basing on the projected number of future water and wastewater consumers, this would result in total need of 74 staff persons. In absolute values this means an increase by 10 persons, as compared to the current situation. It is expected that that number of water staff will be increased for the new rural members, having representatives in each rural locality.

As for the second phase (2018-2021), the major extension (53%) of wastewater service area is projected, while water supply services will have a modest increase (5%). This will require increase in 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. In the meantime, a slow reduction of admin and support staff is foreseen.

The staff projections are provided in the Table below:

Table 7-3: Staff projections of the operator

Indicator	Unit	Current Situation, as of 2015	Projected Situation for 2018	Projected Situation for 2021
Number of water staff	people	33	44	42
Number of wastewater staff	people	17	18	27
Number of administrative and other W&WW staff	people	14	12	10
Total Number of staff	people	64	74	79
Number of water connections	conn.	6,435	9,089	9,536
Number of wastewater connections	conn.	3,197	3,218	4,916
Water & related admin staff per 1.000 W connections	pers./1.000 con	6.53	5.83	5.03
WW & related admin staff per 1.000 WW connections	pers./1.000 conn.	6.88	6.52	6.31
Total staff per 1.000 W&WW connections	pers./1.000 conn.	6.64	6.00	5.50

Source: GIZ/MLPS

In order to facilitate further institutional development of the Operator, the Phase 1 investments foresee a Technical Assistance for Corporate Development.

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 ME ‘Apa – Canal’ Straseni, 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 for VPC Straseni

8.1 Executive summary and conclusions

It is proposed to rehabilitate and extend the water supply and wastewater system in Straseni town.

The Feasibility Study for the town of Straseni has been developed in the WSS sector by the Project “Modernisation of Local Public Services” (MLPS Project, intervention area 2) and it refers the following components:

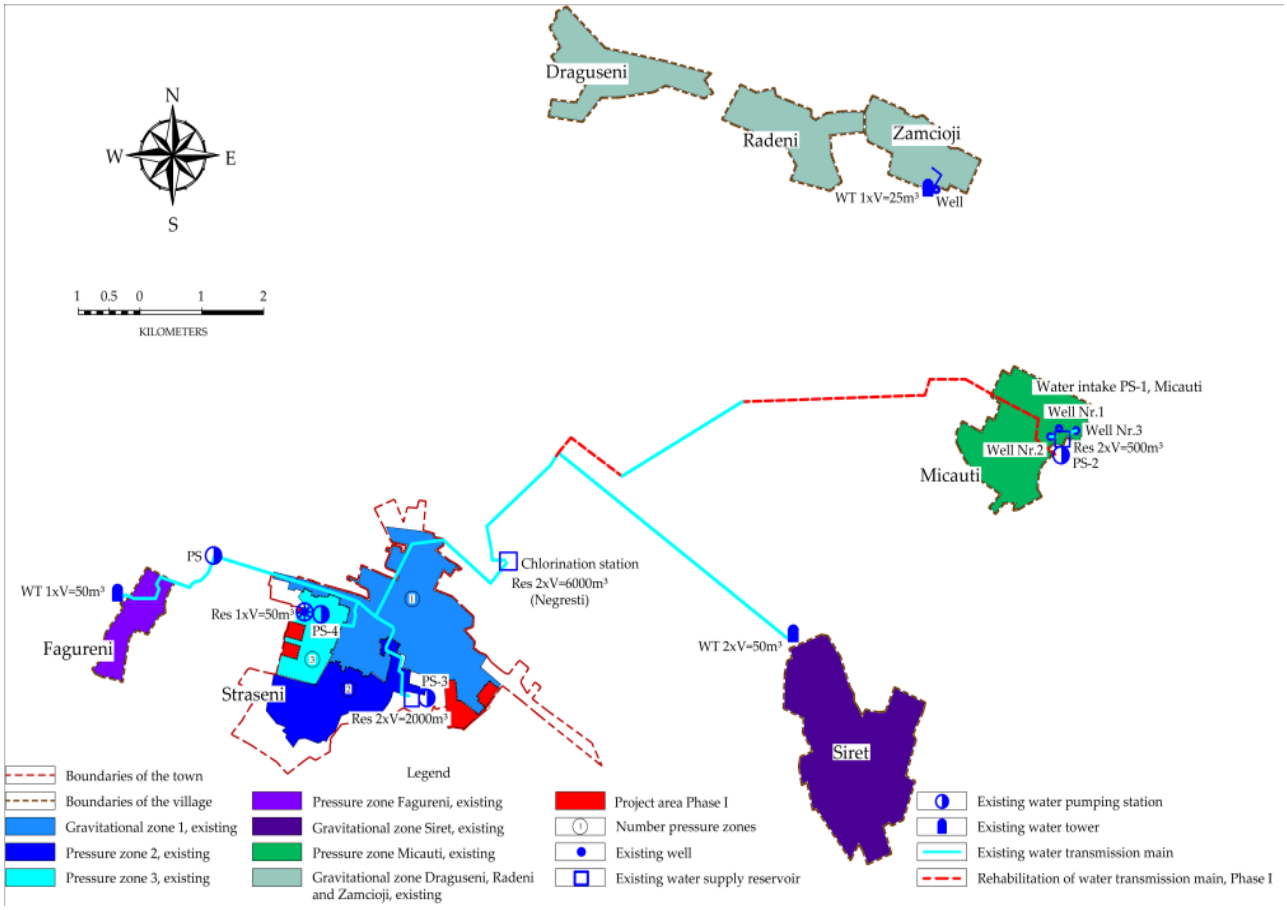
- Water supply sector:
  - Rehabilitation of the transmission main from the water intake Micauti to the town of Straseni– 8,535 m;
  - Construction water disinfection unit – 1 unit;
  - Replacement of deep submersible pumps - 3 units;
  - Extension of water distribution network in the town of Straseni – 6,751 m.
- Wastewater sector:
  - Extension of sewerage network in the town of Straseni – 57,535 m;
  - Construction of wastewater pumping station in the town of Straseni – 1 pcs;
  - Construction of a new WWTP in the town of Straseni – 1 pcs;
  - Rehabilitation of sewerage network in the town of Straseni i – 4,000 m.

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 (this period might be extended depending on the availability of funds and the capacity of the operator or implementing agency).

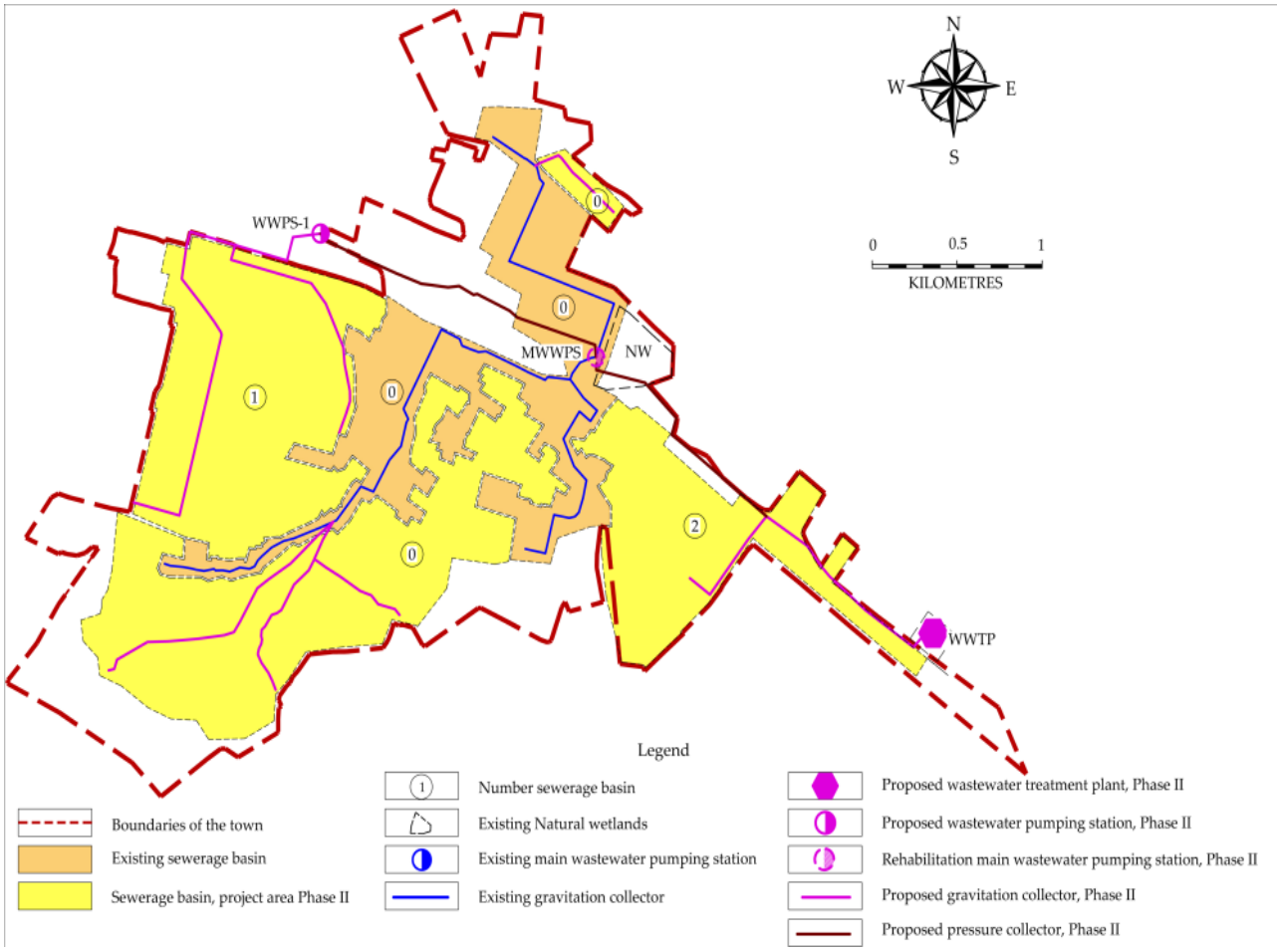
Priority Investment Plan (PIP) including investment cost estimates for Phase 1 and Phase 2 measures. Schemes of existing and proposed water supply system and wastewater systems in the town of Straseni proposed are presented in the figures 8-1 and 8-2.

Figure 8-1: Scheme of existing and proposed water supply system in the town of Straseni and Micauti, Sireti, Fgureni, Zamcioj, Rdeni and Draguseni localities



Source: GIZ/MLPS

Figure 8-2: Scheme of existing and proposed wastewater system in the town of Straseni



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 the 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 WSS objectives of the Project is subject to full EIA at 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 in "Environmental Impacts and Mitigation measures". Potential environmental impacts arising from the designed 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.

8.2 Introduction

This document presents the Environmental and Social Assessment (ESA) for the phase 1 of the feasibility study (the Project). The Environmental and Social Assessment is part of this e Feasibility feasibility sStudy (FS).

8.2.1 Objective of the environmental and social assessment

The objective of the ESA is to facilitate the implementation and to ensure that the envisaged the 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 components of the Project.

8.2.2 Methodology

The methodology used for the preparation of this Environmental and Social Assessment 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 Centre (DRC) 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.

8.2.3 Study area

The Project Area of Influence (PAI) comprises the territory of the town of Straseni. The area that is foreseen for water supply rehabilitation and extension is shown in the figure in Chapter 8.4 Project Description and Location.

8.3 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 WSS components of the FS is subject to EIA on large scale at 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 describes in detail the legal framework conditions and the SEE approval process.

8.4 Project description and location

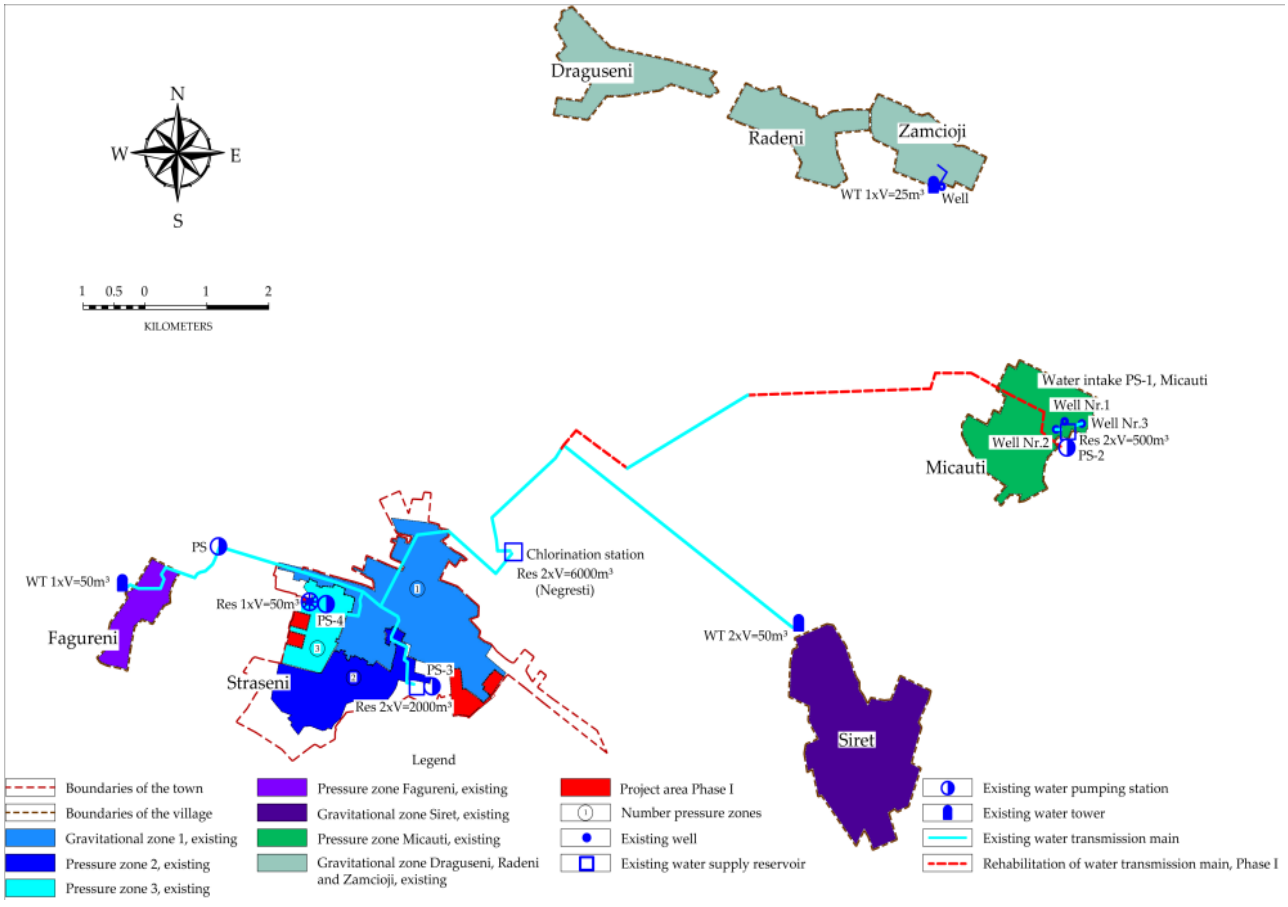
The FS involves the new construction and rehabilitation of various components in the water supply system. It is designed to improve the service standards of the WSS system in Straseni town as follows.

Water Supply Sector:

- Rehabilitation of the transmission main from the water intake Micauti to the town of Straseni – 8,535 m;
- Construction water disinfection unit – 1 unit;
- Extension of water distribution network in the town of Straseni – 6,751.

Scheme of existing and proposed water supply system in the town of Straseni (Phase 1) is presented in the Figure 8-3.

Figure 8-3: Scheme of existing and proposed water supply system in the town of Straseni (Phase 1)



Source: GIZ/MLPS

8.5 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 WSS system. In the follow-

ing the required activities for these stages are described under Environmental considerations.

8.5.1 Construction stage

In the Water Supply System the following main elements are planned:

- Rehabilitation of the transmission main from the water intake Micauti to the town of Straseni – 8,535 m;
- Construction water disinfection unit – 1 unit;
- Extension water distribution network in the town of Straseni – 6,751.

The new pipes for installing water supply system will be polyethylene. Pipes of smaller diameter will be laid for rehabilitation and extension of the distribution network in Straseni town. The pipes will be will be laid along existing streets, lanes or other linear structures, thus keeping the involved environmental impacts and land acquisition requirements to a minimum.

The typically depth of trench will be 1.5 – 2.5 m depending on topographical conditions. The width of the trench in average will vary from 0.6 m to 2.0 m depending on the pipe's outside diameter, type of soil and groundwater level. After construction part of trench will be occupied by pipe and sand layer, and trench is refilled with the excavated material, supplemented by manual and mechanical compaction.

Earthwork for construction of water disinfection unit will consist of site clearing, trench excavation, grading, embankment filling and backfilling of excavation trench after built in of structures. Excavated soil will be placed alongside. Surplus soil will be used for other construction activities. Base of foundation will be gravel and sand.

Sand and aggregates will be sourced from licensed borrow areas. There is no designated disposal site for construction waste. It is generally disposed 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 Ghidighici Reservoir, Bic River or other surface waters in the vicinity of construction site.

Transportation routes: construction site is accessible via the Republican Road R1 and other local roads.At some locations, particularly along the transmission main from Micauti to the distribution network in Straseni construction of temporary access roads might be required.

For mitigation measures please refer to subsequent chapters.

8.5.2 Operation stage

Water supply infrastructure will require repair and maintenance activities like detection and repair of leaks. Since good quality pipes are being used breaks are 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.

No significant environmental impacts are associated with the operation of the new water supply system and wastewater system.

8.6 Environmental and social baseline conditions

8.6.1 Physical environment

The area project is located approximately 3 km to the North-West of Ghidighici reservoir in the Bic river valley. Quaternary, alluvial deposits are exposed in the floodplain of the river. The surface layer is represented by water saturated silty sands with limestone fragments and broken seashell. Most of the study area is built up area. The adjoining area is mainly under agricultural use.

The prevailing chernozem soils in the wider vicinity of the study area support substantial and diverse agricultural production. Soils and ground water are reported to have suffered significantly from intensive use of chemical fertilizers, pesticides and herbicides during the Soviet Union.

The whole study area is located within the watershed area of river Bic. River Bic is one of the 8 rivers of the country exceeding 100 km in length and is a right hand tributary of the river Nistru. Being mostly located within the floodplain of Bic River and in the wider vicinity of the Ghidighici reservoir high ground water levels are expected to occur.

The regional climate is temperately continental and characterised by a lengthy frost-free period, a comparatively mild winter, significant fluctuations in temperature, erratic rainfall and extended droughts. Mean annual rainfall is in the order of 550 to 625 mm. Most of that precipitation occurs during the warmer summer months. Heavy rainfall coupled with irregular surface often cause erosion problems and siltation of rivers. Winds tend to mainly come from northwest or southeast.

8.6.2 Biological environment

Geographically, the Project covers the area within the floodplains of the Bic River and surroundings of the Codri Forest. Most of the area is built up but there are also sections with river meadows and agricultural use alongside the Project area. The natural vegetation of the study area are the beech (*Fagus sylvatica*), sessile oak (*Quercus petraea*) and pedunculate oak (*Quercus robur*), hornbeam (*Carpinus betulus*), silver lime (*Tilia tomentosa*), ash (*Fraxinus excelsior*) and others. In the floodplain of the River Bic some relicts of natural habitats exist.

Mammal species that potentially occur in the wider vicinity of the study area include the red deer (*Cervus cervus*), the fox (*Vulpes vulpes*), the wild boar (*Sus scrofa*), the beech marten (*Martes foina*), and the roe deer (*Capreolus capreolus*).

Within the shoreline of the river Bic and Amphibians and Reptiles are expected to occur including the common spadefoot (*Pelobates fuscus*), the green toad (*Bufo viridis*), the crested newt (*Triturus cristatus*), the tree frog (*Hyla arborea*) and the grass snake (*Natrix natrix*)

8.7 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 and/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 finalisation of construction activities. Vegetation planting and stabilisation of site, including replacement of any native plant species that were removed during construction activities.	Construction Contractor	Construction and labour camp, storage area. Trenches for pipes	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 at Straseni town	Part of construction cost
	The Contractor shall coordinate with local Traffic Management Department to minimise 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	Contractor	Transportation routes of construction material	Part of construction cost

Activity/Impacts	Mitigation measures	Responsibility	Location	Cost
	distance to the construction site is less than 50 m.			
Noise Pollution	• Maintain machinery and vehicle silencer units to minimise noise; • Keep noise generating activities associated with construction activities to a minimum and within working hours; • 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 in 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.	Construction Contractor	Excavation areas for trenches at Straseni town	Part of construction cost
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 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	Construction site	Part of construction cost
Impact on Traffic	• Inform all residents and businesses about the nature and duration	Construction	Construction	Part of construc-

Activity/Impacts	Mitigation measures	Responsibility	Location	Cost
	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.	Contractor	site, Access Roads	tion 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; • 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.	Construction Contractor	Construction site Storage Area	Part of construction 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	Construction site	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 site	Part of construction cost
Impact on air quality due to emissions from construction equip-	• 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	Construction Contractor	Construction site in Straseni town and Micauti lo-	Part of construction cost

Activity/Impacts	Mitigation measures	Responsibility	Location	Cost
ment/vehicles	noise norms		cality and access roads	
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, 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.	Construction Contractor	All construction sites	Part of construction cost
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 recognised 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 to ensure 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 km/hand avoid use of horn in the town;	Contractor, Police Department	Construction site, access road	Part of operation costs

Activity/Impacts	Mitigation measures	Responsibility	Location	Cost
	• Provide prior information to local people about work.			
Influx of insects, rodents	Regular waste and sludge disposal on landfill	State Environmental Inspection of the Ministry of Environment and Centre of Public Health of the Ministry of Health	WTP	Part of operation costs
Risk of delivery of unsafe water to consumers	• Conduct regular water quality monitoring; • Develop & implement water quality monitoring program for distribution system; • Establish a water quality laboratory as part of the project, with adequate building, equipment and trained personnel.	State Environmental Inspection of the Minis-try of Environment and Centre of Public Health of the Ministry of Health	Water intake, transmission main, distribution network	Part of operation cost

8.8 Social and gender assessment of WSS project in Straseni

8.8.1 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:

- Although the population of the Republic of Moldova has decreased in recent years, Straseni rayon registered an increase in population. As of 1 January, 2015, the official population of the Republic of Moldova was 3,555,159 persons, with 5,271 persons less than 2011. The population decrease is determined by the negative natural growth rate and the on-going out-migration processes. However, Straseni rayon registered a slight increase (by 557) in population number from 91,541 persons in 2012 to 92,098 persons in 2014.[63] The population of Straseni town was 22,047 in 2014, or 24% of the total population of Straseni rayon and 0.6% of the total population of the Republic of Moldova[64]
- **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 break-down of the population by gender was: 51.9% women and 48.1% men. In Straseni rayon, the gender distribution was the following: women – 51.1% and men – 48.9%.[65] In Straseni town, women constituted 51.6% and men 48.4% in 2014[66];
- **On average, at the national level women have higher life expectancy at birth than men by 7.9 years in 2014.**[67] In 2014 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 Straseni rayon, life expectancy at birth was higher for men and lower for women than the rates at the national level (men – 68 years, women – 73.8 years)[68];
- **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 Straseni rayon the average age increased from 35.3 years in 2012 to 35.8 years in 2014. The average age by gender for the town is lower than the one at national level: women – 37.5 years, men – 34.8 years[69];
- **The employment rate among women was lower (37.4%) compared to that for men (42.1%) in 2014**. For the Centre Statistical Region the employment rate for men was 38.8% while for women – 34.9%. Women with higher levels of edu-

[63] Statistica teritoriala, 2014.

[64] Ibid.

[65] Ibid.

[66] Strategia de dezvoltare socio-economica a orasului Straseni, 2014-2020.

[67] http://www.statistica.md/newsview.php?l=ro&id=3814&idc=168.

[68] Statistica teritoriala, 2014.

[69] Ibid.

cation are more likely to participate in the labour market. Therefore, the employment rate is greater among women with higher education (53%), followed by those with specialised secondary education (48%), secondary professional education (43%) secondary school (33%) and gymnasium (27%).[70] 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[71];

- **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%)[72];
- **Women are mostly employed in low-paying jobs and occupy lower positions in the job hierarchy where they are employed**.[73] 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[74];
- **Unemployment affects men more than women**. The unemployment rate at the country level was 3.9% in 2014, compared to 5.6% in 2012[75], the rate among unemployed men being higher (4.6%) compared to women (3.1%). In 2013, in Straseni rayon the unemployment rate was 7.2% 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 services - or occupy lower-paid positions. For Straseni rayon the gender pay gap

[70] Statistical databank, NBS website.

[71] Statistica Moldovei, 2014. Portretul statistic al barbatilor si femeilor in Republica Moldova.

[72] Ibid.

[73] http://www.undp.md/mdg/MDG3/gender.shtml

[74] Statistica Moldovei, 2014. Portretul statistic al barbatilor si femeilor in Republica Moldova.

[75] Statistical databank, NBS website.

was even more significant, of 80.6% or 632 MDL difference between the salary of men and women[76];

- **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)[77];
- **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%[78];
- **The average nominal monthly earnings per employee** in Straseni in 2013 was 2902.7 MDL (compared to 3765.1 MDL in the country overall), with 398 MDL more than in 2011; this constitutes 79% 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, Straseni rayon is ranked sixth for the index of multiple deprivation of small areas and it second in income deprivation specifically[79];
- **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[80];
- **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)[81];

[76] Promote gender equality and empower women, UNDP Moldova; Statistica teritoriala 2014.

[77] Biroul National de Statistica, Chisinau 2013. Utilizarea timpului in Republica Moldova. Sinteza.

[78] Statistica Moldovei, 2014. Portretul statistic al barbatilor si femeilor in Republica Moldova, 2014.

[79] 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).

[80] 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

[81] CEDAW. Replies of Moldova to the list of issues.

- **Women in Moldova are less represented in politics than men**, they constituting 19.8% of the members of Parliament, 18.6% of councillors in rayonal councils, 29.9% in local councils, and 20.5% of mayors, which is far below international standards and the country's commitments under nationally and internationally agreed goals. After the local elections in June 2015, the Straseni Rayon Council comprised 33 councillors, of whom four (12%) are women.[82] Regarding the local council of Straseni town, of 27 councillors six (22%) are women[83];
- 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.[84] In Straseni town, the vulnerable families constituted 16% of the total families in 2012 and included 1,130 families with persons with disabilities, 520 families – with one parent, 80 families – with three and more children, 70 families –that have children under the tutorship (IDAM, 2012)[85];
- **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.[86]

Based on the analysis of social and gender dimensions in the Republic of Moldova and in the Project area, we can conclude 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)[87] – there are still many problems faced within its practical implementation in the country, including in the Project area, including among others:

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[82] Webpage of the Rayonal Council Straseni: http://crstraseni.md/index.php?pag=page&id=777&l=ro

[83] Webpage of the town hall Straseni http://www.straseni.md/ro/page/consiliul-local

[84] Raport privind saracia in Republica Moldova, 2014.

[85] Ministry of Economy, Deprivation Index for Small Areas, 2012 http://www.mec.gov.md/ro/content/indicatori-social-economici-pe-localitati

[86] Raport privind saracia in Republica Moldova, 2014.

[87] World Economic Forum. The Global Gender GAP Report, 2015 http://reports.weforum.org/global-gender-gap-report-2015/economies/#economy=MDA

- Employment inequalities;
- Under-representation of women in decision-making positions;
- Salary and pensions 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, and the 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 Straseni 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 other projects) 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 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, engineering and supervision 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:

- One new chlorination unit - (building, technical equipment, electric installations);
- Rehabilitation of 35 m of existing connection pipes HDPE with diameter of 160 mm at Micauti locality wellfield (wells to PS-2);
- Rehabilitation of 8,500 m water transmission main HDPE with diameter of 280 mm from Micauti village to the town of Straseni;
- Extension of the water distribution network in the town of Straseni by 6,751 m;
- Equipment and tools for operational performance improvement (e.g. leak detection).

9.2 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 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

It is proposed to group the project measures into packages of similar type of works. The contract values should be kept as large as possible to attract national as well as international contractors. The required works are divided into three lots:

- Lot 1 - Rehabilitation of water transmission main and rehabilitation of existing connection pipes (wells to PS-2), supply and installation of a chlorination unit, equipment and tools;
- Lot 2 - Extension of the water distribution network in the town of Straseni.

The proposed strategy should allow local companies to bid for single lot without teaming up with international contractors (i.e. local construction companies bidding only for Lot 2 – Extension of the water distribution network) or might bid in association with international companies for one or both Lots. This strategy promises most competition for the different types of works and finally lowest cost.

The Conditions of Contracts for the works contracts for Lot 1 and Lot 2 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	Works - Lot 1	Works - Lot 2	Supply of Equipment	Technical assistance
1	Water supply						
1.1	New chlorination unit	70,000		70,000			
1.2	Rehabilitation of existing connection pipes HDPE with diameter of 160 mm at Micauti locality wellfield (wells to PS-2)	2,625		2,625			
1.3	Rehabilitation of water transmis-	1,054,000		1,054,000			

N°	Component	Total project costs	Design & Engineering	Works - Lot 1	Works - Lot 2	Supply of Equipment	Technical assistance
	sion main HDPE with diameter of 280 mm from Micauti village to the town of Străseni						
1.4	Extension of the water distribution network in the town of Straseni	585,695			585,695		
2	Equipment and tools for operational performance improvement (water supply and sanitation)	200,000				200,000	
3	Technical Assistance						
3.1	Design and Engineering for Phase I investments (12% of investment costs)	229,478	229,478				
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)	244,180	22,948	112,663	58,570	20,000	30,000
GT	**Total costs per contract**	**2,685,978**	**252,426**	**1,239,288**	**644,265**	**220,000**	**330,000**

Source: GIZ/MLPS

Table 9-2: Procurement plan

N°	Description	Estimated contract value[88], EUR	Contract type	Procurement method
1	Design, engineering and supervision for Phase 1 investments	252,426	Consulting services	Competitive
2a	Construction Works - Lot 1 – Rehabilitation of water transmission main HDPE with diameter of 280 mm from Micauti locality to the town of Straseni; Rehabilitation of existing connection pipes HDPE with diameter of 160 mm at Micăuti locality wellfield (wells to PS-2); supply and installation of a new chlorination unit, and procurement of equipment and tools	1,239,287.50	Works	Open
2b	Construction Works - Lot 2 - Extension of the water distribution network in the town of Straseni	644,265	Works	Open
3	Supply of Equipment and tools 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
	Total Amount	**2,685,978**		

Source: GIZ/MLPS

[88] Including Contingencies.

9.3 Project implementation plan

9.3.1 Key steps of project implementation

Key steps in project implementation will be the following:

9.3.1.1 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.

9.3.1.2 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[89] be the LPA Straseni, which is the owner of the assets or ME 'Apa-Canal' Straseni, 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;
- Tendering process for services and works contracts;
- Monitor the implementation of the service and works contracts;
- Organise 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.

9.3.1.3 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 in regard to procurement and implementation of the consulting services (the Engineer) will be:

- Issuing the Request for Proposal;

[89] Depending on the funding arrangement (donor and type of contract).

- Technical and financial evaluation of the received proposals;
- Recommendation for consultant selection;
- Contract award for consulting services;
- Implementation of consulting services.

9.3.1.4 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.

9.3.1.5 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 organised.

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 the year 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 the supply 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

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[90].

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[91]."

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 availability[92]". 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;

[90] European Commission, Guide to Cost-Benefit Analysis of Investment Projects, Economic appraisal tool for Cohesion Policy 2014-2020, December 2014.

[91] Ibid, p 69

[92] 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 water utility 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 decentralisation process which leads to uncertainty in WSS sector and artificial fragmentation of the areas managed by the specialised institutions;
  - Institutional capacity – financial weakness of the institutions which increases the perceived risks of making investments in WSS.
- 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 decentralisation process which leads to uncertainty in WSS sector and artificial fragmentation of the areas managed by the specialised institutions	Operating revenues	Delays in establishment of new tariff policy for the regional and local water companies ongoing and delayed decentralisation 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 specialised 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 9.

Annexes

Annex 3	Legal and regulatory framework
Annex 4	General information on consumers
Annex 5	Investment Programme
Annex 6	Financial and economic analysis
Annex 8	Environmental impact assessment and gender aspects
Annex 11	Conceptual drawings

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 Straseni

No.	Public institution name	No. of pupils/children/ /places/beds	No. of employers	Connected to water supply system	Connected to centralised sewerage system
1.	Theoretical Lyceum “Mihai Eminescu"	920	104	yes	yes
2.	Gymnasium “Mihai Viteazu"	950	70	yes	yes
3.	Theoretical Lyceum “Nekrasov"	143	26	yes	yes
4.	Theoretical Lyceum "Ion Vatamanu"	720	58	yes	yes
5.	Kindergarten no. 1	115	31	yes	yes
6.	Kindergarten no. 2	297	50	yes	yes
7.	Kindergarten no. 3	383	71	yes	yes
8.	Kindergarten no. 4	154	37	yes	yes
9.	Kindergarten no. 5	160	32	yes	yes
10.	Centre of Family Physicians	420	137	yes	yes
11.	Public Healthcare Centre	150	77	yes	yes
12.	Raion Hospital	250	361	yes	yes

Source: LPA Straseni, ME 'Apa-Canal' Straseni

Table 4-2: General information about business entities in the town of Straseni

No.	Business entity	No. of employers	Field	Type of property	Connected to water supply system	Connected to centralised sewerage system
1.	Ltd. “Cornelia Prim"	38	commerce	private		
2.	CE „Panifcoop"	121	industry	private	yes	yes
3.	Ltd. “Alianţa Vin"	101	industry	private	yes	yes
4.	Ltd. “Floarea Viei"	8	commerce	private		
5.	Ltd. “LCV Servicii"	8	commerce	private		
6.	Ltd. “Masfricom"	19	industry	private		
7.	Ltd. “Promotab"	8	industry	private		yes
8.	Ltd. “Mob Elita"	47	industry	private		
9.	Ltd. “Dominos"	10	commerce	private		
10.	S.E. “Silvocinegetica"	136	forestry	state enterprise	yes	

Source: LPA Straseni, ME 'Apa-Canal' Straseni

Annex 5

Investment Programme

Annex 5: Investment Programme

Annex 5.1: Water Demand Projection

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°	18,534	18,564	18,595	18,625	26,177	26,213	26,248	27,463	27,879	28,299	28,723	29,152	29,586	30,023	30,465	30,912	31,363	31,616	31,871	32,128	32,387	32,649	32,914	33,180	33,449	33,720	33,993	34,269	34,547	34,827	35,110	35,395
1.2	In urban settlements	N°	17,830	17,860	17,890	17,920	19,235	19,267	19,299	19,834	20,034	20,236	20,437	20,640	20,843	21,046	21,250	21,455	21,660	21,696	21,731	21,767	21,803	21,838	21,874	21,910	21,945	21,981	22,017	22,052	22,088	22,124	22,159	22,195
1.3	In rural settlements	N°	704	704	705	705	6,942	6,946	6,949	7,629	7,844	8,063	8,286	8,512	8,743	8,977	9,215	9,457	9,703	9,920	10,139	10,361	10,585	10,811	11,040	11,270	11,504	11,739	11,977	12,217	12,459	12,704	12,951	13,200
2	**Volume of water sold in total and disaggr. for different consumers**																																	
2.1	Total volume sold	m³/y	251,444	251,528	278,092	304,742	458,850	492,224	525,696	583,123	626,121	670,104	715,083	761,069	808,073	856,105	905,177	955,300	1,006,484	1,038,705	1,071,269	1,104,177	1,137,435	1,171,045	1,205,011	1,239,336	1,274,023	1,309,076	1,344,499	1,380,294	1,416,466	1,453,016	1,489,950	1,527,270
2.2	Domestic customers	m³/y	217,218	217,572	235,293	253,071	390,548	412,750	435,018	477,851	507,930	538,683	570,116	602,238	635,055	668,574	702,803	737,750	773,421	804,524	835,962	867,736	899,851	932,310	965,116	998,273	1,031,784	1,065,653	1,099,882	1,134,476	1,169,438	1,204,770	1,240,477	1,276,562
2.3	Industrial customers	m³/y	8,585	8,273	14,264	20,276	28,190	34,675	41,181	48,948	56,137	63,462	70,924	78,522	86,258	94,132	102,145	110,297	118,589	118,784	118,979	119,174	119,370	119,565	119,760	119,955	120,150	120,346	120,541	120,736	120,931	121,126	121,322	121,517
2.4	Institutional customers	m³/y	25,641	25,683	28,535	31,396	40,112	44,799	49,497	56,324	62,054	67,959	74,043	80,309	86,760	93,399	100,229	107,253	114,474	115,397	116,328	117,267	118,214	119,170	120,134	121,107	122,088	123,078	124,076	125,082	126,097	127,120	128,151	129,191
3	**Total water sold disaggr. for urban and rural areas**																																	
3.1	Urban Settlements	m³/y	241,893	242,301	268,343	294,471	343,638	371,821	400,096	439,592	472,747	506,492	540,828	575,758	611,284	647,410	684,136	721,466	759,402	781,212	803,090	825,035	847,048	869,129	891,277	913,493	935,776	958,127	980,545	1,003,031	1,025,585	1,048,206	1,070,895	1,093,651
3.2	Rural settlements	m³/y	9,223	9,227	9,749	10,271	115,213	120,404	125,600	143,531	153,374	163,612	174,255	185,311	196,788	208,696	221,041	233,834	247,083	257,493	268,179	279,142	290,387	301,916	313,734	325,843	338,247	350,950	363,954	377,263	390,881	404,810	419,055	433,619
4	**Non-Revenue Water (NRW) volume dissagregated for total NRW, apparent losses, and real losses**																																	
4.1	Total NRW	m³/y	339,496	339,609	317,395	294,555	375,423	376,407	375,497	388,749	406,656	423,943	440,607	456,641	472,042	486,805	500,923	514,392	527,206	529,152	530,628	531,641	532,194	532,293	531,942	531,144	529,903	528,224	526,108	523,560	520,581	517,175	513,344	509,090
4.2	Apparent losses	m³/y	135,798	135,843	121,003	105,836	125,141	130,295	135,179	145,781	150,613	154,990	158,907	162,361	165,348	167,864	169,904	171,464	172,540	169,851	166,864	163,582	160,006	156,139	151,983	147,540	142,811	137,798	132,501	126,924	121,065	114,928	108,512	101,818
4.3	Real losses (physical	m³/y	203,698	203,766	196,392	188,719	250,282	246,112	240,318	242,968	256,043	268,953	281,699	294,280	306,694	318,941	331,019	342,928	354,666	359,301	363,764	368,059	372,188	376,154	379,958	383,604	387,093	390,426	393,607	396,636	399,516	402,247	404,832	407,272
5	**The water demand figures considering the demand variation factors**																																	
5.1	Yearly water	m³/y	590,940	591,137	595,487	599,297	834,273	868,631	901,193	971,872	1,032,777	1,094,048	1,155,690	1,217,710	1,280,115	1,342,910	1,406,101	1,469,692	1,533,690	1,567,857	1,601,897	1,635,818	1,669,630	1,703,338	1,736,953	1,770,480	1,803,927	1,837,300	1,870,607	1,903,854	1,937,047	1,970,192	2,003,294	2,036,360
5.2	Average daily water	m³/d	1,619	1,620	1,631	1,642	2,286	2,380	2,469	2,663	2,830	2,997	3,166	3,336	3,507	3,679	3,852	4,027	4,202	4,295	4,389	4,482	4,574	4,667	4,759	4,851	4,942	5,034	5,125	5,216	5,307	5,398	5,488	5,579
5.3	Maximum daily water	m³/d	1,688	1,688	1,708	1,725	2,411	2,515	2,613	2,822	3,001	3,181	3,362	3,545	3,729	3,914	4,100	4,288	4,478	4,580	4,682	4,784	4,886	4,988	5,089	5,190	5,291	5,392	5,493	5,594	5,695	5,796	5,897	5,997
5.4	Average hourly water	m³/h	67	67	68	68	95	99	103	111	118	125	132	139	146	153	161	168	175	179	183	187	191	194	198	202	206	210	214	217	221	225	229	232
5.5	Max. hourly water	m³/h	90	91	93	96	137	144	151	164	175	186	197	209	220	232	243	255	267	274	281	288	295	302	309	316	323	330	337	344	351	358	365	372

*existing situation
**1st year of operation phase 1investments
*** 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°	9,207	9,223	9,238	9,254	9,269	9,285	9,300	14,159	14,739	15,323	15,909	16,499	17,092	17,688	18,287	18,889	19,494	19,598	19,703	19,808	19,913	20,018	20,124	20,230	20,336	20,442	20,549	20,656	20,763	20,870	20,977	21,085
1.2	In urban settlements	N°	9,207	9,223	9,238	9,254	9,269	9,285	9,300	14,159	14,739	15,323	15,909	16,499	17,092	17,688	18,287	18,889	19,494	19,598	19,703	19,808	19,913	20,018	20,124	20,230	20,336	20,442	20,549	20,656	20,763	20,870	20,977	21,085
1.3	In rural settlements	N°	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	0	0
2	**Volume of wastewater charged in total and disaggr. for different customers**																																	
2.1	Total volume of wastewate	m³/y	149,446	149,698	161,736	173,813	185,930	198,087	210,284	338,199	370,863	405,091	440,894	478,284	517,273	557,874	600,097	643,957	689,463	711,326	733,392	755,661	778,133	800,810	823,692	846,780	870,074	893,575	917,284	941,202	965,328	989,664	1,014,211	1,038,968
2.2	by domestic customers	m³/y	113,579	113,770	122,527	131,312	140,127	148,970	157,842	253,425	277,477	302,666	329,001	356,492	385,147	414,974	445,983	478,182	511,580	532,490	553,601	574,913	596,426	618,142	640,060	662,182	684,508	707,040	729,776	752,719	775,869	799,227	822,792	846,567
2.3	by industrial customers	m³/y	9,217	9,233	12,004	14,784	17,573	20,372	23,180	39,513	45,528	51,900	58,632	65,726	73,185	81,013	89,211	97,782	106,730	107,302	107,875	108,449	109,024	109,601	110,179	110,759	111,339	111,921	112,505	113,089	113,675	114,263	114,851	115,441
2.4	by Institutional customers	m³/y	26,650	26,695	27,205	27,717	28,230	28,745	29,262	45,261	47,859	50,525	53,260	56,065	58,941	61,887	64,904	67,993	71,153	71,534	71,916	72,299	72,683	73,067	73,453	73,839	74,226	74,614	75,003	75,393	75,784	76,175	76,567	76,961
3	**Total wastewater charged disaggr, for urban and rural areas**																																	
3.1	in urban Settlements	m³/y	149,446	149,698	161,736	173,813	185,930	198,087	210,284	338,199	370,863	405,091	440,894	478,284	517,273	557,874	600,097	643,957	689,463	711,326	733,392	755,661	778,133	800,810	823,692	846,780	870,074	893,575	917,284	941,202	965,328	989,664	1,014,211	1,038,968
3.2	in rural settlements	m³/y	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	0	0
4	**The sewer infiltration water based on the determined infiltration rate**																																	
4.1	**Sewer Infiltration wate**	m³/y	74,723	74,849	80,868	86,907	92,965	77,254	58,879	57,494	62,738	68,190	73,850	79,714	85,781	92,049	98,516	105,180	112,038	114,998	117,954	120,906	123,853	126,795	129,732	132,662	135,587	138,504	141,415	144,318	147,213	150,099	152,977	155,845
5	**The wastewater generation figures considering the variation factors**																																	
5.1	Avg, wastewater flow (dry	m³/y	224,169	224,547	242,603	260,720	278,896	275,341	269,163	395,693	433,601	473,281	514,743	557,998	603,054	649,923	698,614	749,136	801,501	826,324	851,346	876,566	901,986	927,605	953,424	979,442	1,005,661	1,032,080	1,058,699	1,085,519	1,112,541	1,139,763	1,167,188	1,194,814
5.2	Max, daily dry weather flo	m³/d	655	656	709	762	815	809	795	1,177	1,290	1,408	1,531	1,660	1,794	1,933	2,078	2,229	2,385	2,459	2,533	2,609	2,684	2,761	2,838	2,915	2,994	3,072	3,152	3,232	3,313	3,394	3,476	3,558
5.3	Max, hourly dry weather fl	m³/h	43	43	47	50	54	55	56	85	93	102	111	120	130	140	151	162	173	178	184	189	195	201	206	212	218	223	229	235	241	247	253	259
5.4	Max, hourly Storm Water fl	m³/h	56	56	61	65	70	71	72	111	121	132	144	156	169	182	196	210	225	232	239	246	253	261	268	275	283	290	298	306	313	321	329	337
6	**Population equivalents in total and disaggr, for different customers**																																	
6.1	Total population equivaler	PE_{60}	9,576	9,592	9,641	9,691	9,740	9,790	9,839	15,030	15,699	16,375	17,059	17,750	18,449	19,156	19,870	20,592	21,322	21,436	21,550	21,665	21,780	21,895	22,011	22,126	22,242	22,359	22,475	22,592	22,709	22,826	22,944	23,062
6.2	by domestic customers	PE_{60}	9,207	9,223	9,238	9,254	9,269	9,285	9,300	14,159	14,739	15,323	15,909	16,499	17,092	17,688	18,287	18,889	19,494	19,598	19,703	19,808	19,913	20,018	20,124	20,230	20,336	20,442	20,549	20,656	20,763	20,870	20,977	21,085
6.3	by Industrial and instit, cu	PE_{60}	368	369	403	437	471	505	539	871	959	1,052	1,150	1,251	1,357	1,468	1,583	1,703	1,828	1,837	1,847	1,857	1,867	1,877	1,887	1,897	1,906	1,916	1,926	1,936	1,946	1,957	1,967	1,977
7	**Pollution load – BOD in total and disaggr, for different customers**																																	
7.1	The total BOD_5 load	kg/d	575	576	578	581	584	587	590	902	942	982	1,024	1,065	1,107	1,149	1,192	1,236	1,279	1,286	1,293	1,300	1,307	1,314	1,321	1,328	1,335	1,342	1,349	1,356	1,363	1,370	1,377	1,384
7.2	by domestic customers	kg/d	552	553	554	555	556	557	558	850	884	919	955	990	1,025	1,061	1,097	1,133	1,170	1,176	1,182	1,188	1,195	1,201	1,207	1,214	1,220	1,227	1,233	1,239	1,246	1,252	1,259	1,265
7.3	by industrial and instit, cu	kg/d	22	22	24	26	28	30	32	52	58	63	69	75	81	88	95	102	110	110	111	111	112	113	113	114	114	115	116	116	117	117	118	119

*existing situation
**1st year of operation phase 1investments)
*** 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	Straseni	85%	85%	85%	85%	91%	91%	91%	93%	94%	95%	95%	96%	97%	98%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2	Făgureni	79%	79%	79%	79%	79%	79%	79%	81%	82%	83%	84%	84%	85%	86%	87%	88%	88%	89%	90%	91%	91%	92%	93%	94%	95%	95%	96%	97%	98%	98%	99%	100%
3	Micăuți	0%	0%	0%	0%	81%	81%	81%	83%	84%	84%	85%	86%	86%	87%	88%	89%	89%	90%	91%	91%	92%	93%	94%	94%	95%	96%	96%	97%	98%	99%	99%	100%
4	Sireți	0%	0%	0%	0%	34%	34%	34%	41%	44%	46%	48%	51%	53%	56%	58%	61%	63%	66%	68%	70%	73%	75%	77%	80%	82%	85%	87%	90%	92%	95%	97%	100%
5	Rădeni+Drăgușeni+Zamcioji	0%	0%	0%	0%	56%	56%	56%	61%	62%	64%	65%	67%	69%	70%	72%	74%	75%	77%	79%	80%	82%	83%	85%	86%	88%	90%	91%	93%	95%	97%	98%	100%
TOT	**Total**	**54%**	**54%**	**54%**	**54%**	**76%**	**76%**	**76%**	**80%**	**81%**	**82%**	**83%**	**84%**	**86%**	**87%**	**88%**	**89%**	**90%**	**91%**	**91%**	**92%**	**93%**	**93%**	**94%**	**95%**	**95%**	**96%**	**97%**	**97%**	**98%**	**99%**	**99%**	**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	Straseni	17,830	17,860	17,890	17,920	19,235	19,267	19,299	19,834	20,034	20,236	20,437	20,640	20,843	21,046	21,250	21,455	21,660	21,696	21,731	21,767	21,803	21,838	21,874	21,910	21,945	21,981	22,017	22,052	22,088	22,124	22,159	22,195
2	Făgureni	704	704	705	705	705	706	706	727	734	742	749	757	764	771	779	786	793	801	808	816	823	830	838	845	853	860	868	875	882	890	897	905
3	Micăuți	0	0	0	0	2,471	2,472	2,473	2,540	2,564	2,587	2,610	2,633	2,657	2,680	2,703	2,727	2,750	2,773	2,797	2,820	2,844	2,867	2,891	2,914	2,938	2,962	2,985	3,009	3,033	3,056	3,080	3,104
4	Sireți	0	0	0	0	2,034	2,035	2,036	2,474	2,609	2,747	2,888	3,032	3,180	3,331	3,485	3,642	3,802	3,939	4,078	4,219	4,361	4,505	4,651	4,798	4,948	5,099	5,252	5,406	5,563	5,721	5,881	6,043
5	Rădeni+Drăgușeni+Zamcioji	0	0	0	0	1,732	1,733	1,734	1,888	1,938	1,988	2,039	2,090	2,143	2,195	2,249	2,303	2,357	2,406	2,456	2,506	2,557	2,608	2,660	2,712	2,765	2,818	2,872	2,926	2,981	3,036	3,092	3,148
TOT	**Total**	**18,534**	**18,564**	**18,595**	**18,625**	**26,177**	**26,213**	**26,248**	**27,463**	**27,879**	**28,299**	**28,723**	**29,152**	**29,586**	**30,023**	**30,465**	**30,912**	**31,363**	**31,616**	**31,871**	**32,128**	**32,387**	**32,649**	**32,914**	**33,180**	**33,449**	**33,720**	**33,993**	**34,269**	**34,547**	**34,827**	**35,110**	**35,395**

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	Straseni	44	44	44	44	44	44	44	66	69	72	74	77	79	82	85	87	90	90	91	91	91	92	92	92	93	93	93	94	94	94	95	95
2	Făgureni	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	0	0
3	Micăuți	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	0	0
4	Sireți	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	0	0
5	Rădeni+Drăgușeni+Zamcioji	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	0	0
TOT	Total	27	27	27	27	27	27	27	41	43	44	46	48	49	51	53	54	56	56	57	57	57	57	57	58	58	58	58	59	59	59	59	60

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	Straseni	9,207	9,223	9,238	9,254	9,269	9,285	9,300	14,159	14,739	15,323	15,909	16,499	17,092	17,688	18,287	18,889	19,494	19,598	19,703	19,808	19,913	20,018	20,124	20,230	20,336	20,442	20,549	20,656	20,763	20,870	20,977	21,085
2	Făgureni	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	0	0
3	Micăuți	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	0	0
4	Sireți	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	0	0
5	Rădeni+Drăgușeni+Zamcioji	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	0	0
TOT	Total	9,207	9,223	9,238	9,254	9,269	9,285	9,300	14,159	14,739	15,323	15,909	16,499	17,092	17,688	18,287	18,889	19,494	19,598	19,703	19,808	19,913	20,018	20,124	20,230	20,336	20,442	20,549	20,656	20,763	20,870	20,977	21,085

Annex 5.7: Name of streets planned for sewerage network extension

N°	Street's name	N°	Street's name	N°	Street's name
1.	str. Bucovinei	42.	str. Grigore Madan	83.	str. Jereghi
2.	str. Unirii	43.	str. Tudor Vladimirescu	84.	str. Lomonosov
3.	str. Petru Movilă	44.	str-la 31 August 1	85.	str. Luncilor
4.	str. Mihai Eminescu	45.	str. Barbu Lăutaru	86.	str. 1 Mai
5.	str. Mihai Sadoveanu	46.	str. Burebista	87.	str. Miciurin
6.	str. Cetatea Albă	47.	str. Polihronie Sîrcu	88.	str-la Morii
7.	str. Constantin Stamati	48.	str. Mihai Viteazu	89.	bd. Păcii
8.	str. Grigore Adam	49.	str. Dacia	90.	str. Pirogov
9.	str. Vasile Alecsandri	50.	str. Vasile Lupu	91.	str. Puşchin
10.	str. Trei Ierarhi	51.	str. Elena Alistar	92.	str. Soltîs
11.	str. Ştefan Neaga	52.	str. Ştefan cel Mare	93.	str-la Stepei
12.	str. Gavril Muzicescu	53.	str. Marinescu	94.	str. Şciusev
13.	str. 31 August	54.	str. Decebal	95.	str. Ion Caraciobanu
14.	str. Hotin	55.	str. Toma Alimoş	96.	str. Teilor
15.	str. Alexandru Donici	56.	str. Vlad Ţepeş	97.	str. Codrilor
16.	str. Aron Pumnul	57.	str. Ion Vodă	98.	str. L. Severin
17.	str. Petru Zadnipru	58.	str. Mihail Cogălniceanu	99.	str-la Vasile Alecsandri
18.	str. Şevcenco	59.	str. 8 Martie	100.	str. Ion-Doina Teodorovici
19.	str. Vlad Ioviță	60.	str. Podgorenilor	101.	str. Mircea cel Bătrîn
20.	str. Şoţa Rustaveli	61.	str. Alexandru cel Bun	102.	str. Ion Vatamanu
21.	str. Dosoftei	62.	str. Constantin Negruzzi	103.	str. Vodă cel Cumplit
22.	str. Alexandru Vlăhuţă	63.	str. Igor Vieru	104.	str-la Mihai Eminescu
23.	str. Varlaam	64.	str. Maria Dragan	105.	str-la Decebal
24.	str. Alexandru Plămădeală	65.	str. Eugen Coca	106.	str-la 1 Mai
25.	str. Mihai Curecheru	66.	str. Alexandru Lăpuşneanu	107.	str-la P. Zadnipru
26.	str. Valeriu Cupcea	67.	str. Petru Rareş	108.	str. Tineretului
27.	str. Bogdan Petricescu-Haşdeu	68.	str. Trandafirelor	109.	str. 1 iunie
28.	str. Dragoş-Vodă	69.	str. Chișinăului	110.	str-la Marinescu
29.	str. Gheorghe Asachi	70.	str-la Valeriu Cupcea	111.	str. Calea Basarabiei
30.	str. Gheorghe Cojbuc	71.	str. Liviu Damian	112.	str. Bodoni
31.	str. Traian	72.	str. Doina	113.	str. Mecanizatorilor

N°	Street's name	N°	Street's name	N°	Street's name
32.	str. Maria Cibotaru	73.	str. Dmitrii Cantemir	114.	şos. Chişinăului
33.	str. Aleco Russo	74.	str. Frunze	115.	str. Volocii
34.	str. Constantin Stere	75.	str. Gagarin	116.	str-la 31 August 2
35.	str. Liviu Deleanu	76.	str. Boris Glavan	117.	str-la Vlad Tepes
36.	str. Testimiţeanu	77.	str. Gribov	118.	str. Independenþei
37.	str. Ion Neculce	78.	str. Gorchi	119.	str. Mioriţa
38.	str. Ion Creangă	79.	str-la Havuzului	120.	str. Victoriei
39.	str. Miron Costin	80.	str. Iachir	121.	str. Ţărăncuţa
40.	str. Grigore Ureche	81.	str-la Iachir		
41.	str. Nicolae Milescu-Spătaru	82.	str. Serghei Lazo		

Source: GIZ/MLPS

Annex 6

Financial and economic analysis

Annex 6: Financial and economic analysis

Table 6-1: Macroeconomic forecast

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%

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 water supply

			TOTAL	1	2	3	4	5
Equipment and tools		MDL M	4.16	0.42	2.08	1.66		
Pipelines		MDL M	34.13	3.41	17.06	13.65		
Water towers		MDL M		0.00	0.00	0.00		
Reservoirs		MDL M		0.00	0.00	0.00		
Pumping stations		MDL M		0.00	0.00	0.00		
Water treatment plant		MDL M	1.45	0.15	0.73	0.58		
TOTAL Construction and installation costs		**MDL M**	**39.74**	**3.97**	**19.87**	**15.90**	**0.00**	**0.00**
Design and engineering		MDL M	4.77	0.48	2.38	1.91	0.00	0.00
Technical assistance		MDL M	6.23	0.62	3.12	2.49	0.00	0.00
Contingencies		MDL M	5.07	0.51	2.54	2.03	0.00	0.00
TOTAL Investment Costs		**MDL M**	**55.81**	**5.58**	**27.91**	**22.33**	**0.00**	**0.00**

Table 6-3: Depreciation rates for water supply

		years	%
1	Pipelines	50	2.0%
2	Water towers	16	6.3%
3	Reservoirs	20	5.0%
4	Pumping stations	20	5.0%
5	Equipment and tools	10	10.0%
6	Water treatment plant	35	2.9%
7	Land acquisition	99999999	0.0%
8	Technical assistance	50	2.0%
9	Contingency	50	2.0%

Table 6-4: Summary of investment costs for water supply

			TOTAL	1	2	3	4	5	6
1	Pipelines	MDL M	34.1	3.4	17.1	13.7	0.0	0.0	0.0
2	Water towers	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Reservoirs	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Pumping stations	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Equipment and tools	MDL M	4.2	0.4	2.1	1.7	0.0	0.0	0.0
6	Water treatment plant	MDL M	1.5	0.1	0.7	0.6	0.0	0.0	0.0
7	Land acquisition	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Technical assistance	MDL M	11.0	1.1	5.5	4.4	0.0	0.0	0.0
9	Contingency	MDL M	5.1	0.5	2.5	2.0	0.0	0.0	0.0
	TOTAL	**MDL M**	**55.81**	**5.6**	**27.9**	**22.3**	**0.0**	**0.0**	**0.0**

Table 6-5: Depreciation for water supply

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Pipelines	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
5	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
6	Water treatment plant	MDL M		0.0	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
8	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
9	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**	**1.0**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Pipelines	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
5	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
6	Water treatment plant	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
8	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
9	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	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**

Table 6-6: Gross value of new assets for water supply

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Pipelines	MDL M	3.4	20.5	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1
5	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
6	Water treatment plant	MDL M	0.1	0.9	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
8	Technical assistance	MDL M	1.1	6.6	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
9	Contingency	MDL M	0.5	3.0	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
	TOTAL	MDL M	**5.6**	**33.5**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Pipelines	MDL M	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1
5	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
6	Water treatment plant	MDL M	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
8	Technical assistance	MDL M	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
9	Contingency	MDL M	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
	TOTAL	MDL M	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**

Table 6-7: Net assets for water supply

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Pipelines	MDL M	3.4	20.4	33.6	33.0	32.3	31.6	30.9	30.2	29.6	28.9	28.2	27.5	26.8	26.1	25.5
5	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
6	Water treatment plant	MDL M	0.1	0.9	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.6	0.5	0.4	0.3
8	Technical assistance	MDL M	1.1	6.6	10.8	10.4	10.1	9.8	9.5	9.1	8.8	8.5	8.1	7.8	7.5	7.2	6.8
9	Contingency	MDL M	0.5	3.0	5.0	4.8	4.7	4.5	4.4	4.2	4.1	3.9	3.8	3.6	3.4	3.3	3.1
	TOTAL	MDL M	**5.6**	**33.3**	**54.6**	**53.0**	**51.3**	**49.6**	**48.0**	**46.3**	**44.6**	**43.0**	**41.3**	**39.6**	**38.2**	**37.0**	**35.7**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Pipelines	MDL M	24.8	24.1	23.4	22.7	22.0	21.4	20.7	20.0	19.3	18.6	18.0	17.3	16.6	15.9	15.2
5	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
6	Water treatment plant	MDL M	0.2	0.1	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
8	Technical assistance	MDL M	6.5	6.2	5.8	5.5	5.2	4.8	4.5	4.2	3.9	3.5	3.2	2.9	2.5	2.2	1.9
9	Contingency	MDL M	3.0	2.8	2.7	2.5	2.4	2.2	2.1	1.9	1.8	1.6	1.5	1.3	1.2	1.0	0.9
	TOTAL	MDL M	**34.5**	**33.2**	**32.0**	**30.8**	**29.6**	**28.4**	**27.3**	**26.1**	**25.0**	**23.8**	**22.6**	**21.5**	**20.3**	**19.1**	**18.0**

Table 6-8: Depreciation costs for water supply

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Pipelines	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
5	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
6	Water treatment plant	MDL M		0.0	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
8	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
9	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**	**1.0**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.4**	**1.3**	**1.3**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Pipelines	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
5	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
6	Water treatment plant	MDL M	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	0.0	0.0
8	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
9	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**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**

Table 6-9: Variable costs – summary

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Water supply																
1	Electricity for pumping	MDL M	1.97	2.73	2.77	3.90	4.10	4.29	4.58	4.98	5.40	5.85	6.31	6.80	7.27	7.77	8.28
2	Water treatment costs	MDL M	0.10	0.11	0.11	0.15	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.22	0.23	0.24
	TOTAL variable costs for water	MDL M	2.079	2.831	2.876	4.043	4.250	4.452	4.744	5.157	5.590	6.043	6.517	7.013	7.497	7.999	8.522
	Wastewater																
1	Electricity for pumping	MDL M	0.126	0.186	0.202	0.218	0.217	0.214	0.361	0.400	0.442	0.487	0.536	0.587	0.639	0.695	0.754
2	Wastewater treatment 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
	TOTAL variable costs for water	MDL M	0.126	0.186	0.202	0.218	0.217	0.214	0.361	0.400	0.442	0.487	0.536	0.587	0.639	0.695	0.754

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Water supply																
1	Electricity for pumping	MDL M	8.81	9.19	9.81	10.47	11.17	11.91	12.70	13.40	14.13	14.90	15.71	16.55	17.27	18.01	18.78
2	Water treatment costs	MDL M	0.25	0.26	0.26	0.27	0.27	0.27	0.28	0.28	0.29	0.29	0.29	0.30	0.30	0.31	0.31
	TOTAL variable costs for water	MDL M	9.065	9.447	10.075	10.740	11.443	12.188	12.977	13.682	14.421	15.194	16.004	16.851	17.571	18.315	19.086
	Wastewater																
1	Electricity for pumping	MDL M	0.816	0.863	0.933	1.009	1.090	1.177	1.270	1.357	1.449	1.547	1.650	1.760	1.858	1.960	2.068
2	Wastewater treatment 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
	TOTAL variable costs for water	MDL M	0.816	0.863	0.933	1.009	1.090	1.177	1.270	1.357	1.449	1.547	1.650	1.760	1.858	1.960	2.068

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	0.06	0.33	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
3	Salaries and related costs	MDL M	1.72	1.77	1.85	2.58	2.68	2.79	2.77	2.88	2.99	3.11	3.24	3.37	3.50	3.64	3.79
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	0.68	0.69	0.72	0.64	0.67	0.69	0.60	0.63	0.65	0.68	0.70	0.73	0.76	0.79	0.82
6	Other costs	MDL M	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	TOTAL fixed costs for water	MDL M	2.511	2.629	3.017	5.887	6.056	6.230	6.159	6.336	6.520	6.710	6.907	7.110	7.321	7.539	7.766
	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	0.00	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	0.89	0.91	0.96	1.05	1.10	1.14	1.78	1.85	1.93	2.00	2.08	2.17	2.25	2.34	2.44
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	0.34	0.34	0.36	0.37	0.39	0.40	0.42	0.43	0.45	0.47	0.49	0.51	0.53	0.55	0.57
6	Other costs	MDL M	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
	TOTAL fixed costs for wastewater	MDL M	2.062	2.094	2.150	2.764	2.831	2.900	3.565	3.664	3.766	3.872	3.982	4.096	4.215	4.338	4.466

	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	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
3	Salaries and related costs	MDL M	3.94	4.10	4.26	4.43	4.61	4.79	4.94	5.09	5.24	5.40	5.56	5.72	5.90	6.07	6.26
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	0.86	0.89	0.93	0.96	1.00	1.04	1.07	1.11	1.14	1.17	1.21	1.24	1.28	1.32	1.36
6	Other costs	MDL M	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	TOTAL fixed costs for water	MDL M	8.000	8.242	8.494	8.754	9.024	9.303	9.520	9.743	9.972	10.207	10.449	10.697	10.952	11.214	11.483
	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	0.00	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	2.53	2.63	2.74	2.85	2.96	3.08	3.17	3.27	3.37	3.47	3.57	3.68	3.79	3.90	4.02
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	0.59	0.62	0.64	0.67	0.69	0.72	0.74	0.77	0.79	0.81	0.84	0.86	0.89	0.91	0.94
6	Other costs	MDL M	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
	TOTAL fixed costs for wastewater	MDL M	4.599	4.736	4.879	5.028	5.182	5.342	5.466	5.595	5.727	5.862	6.002	6.145	6.293	6.445	6.601

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	2.20	3.02	3.08	4.26	4.47	4.67	5.11	5.56	6.03	6.53	7.05	7.60	8.14	8.69	9.28
2	Fixed costs	MDL M	4.57	4.72	5.17	8.65	8.89	9.13	9.72	10.00	10.29	10.58	10.89	11.21	11.54	11.88	12.23
3	Depreciation	MDL M	0.73	0.90	1.73	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.11	1.99	1.99
	TOTAL costs	MDL M	7.510	8.638	9.978	15.312	15.755	16.198	17.232	17.959	18.719	19.513	20.342	21.208	21.783	22.558	23.493

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Variable costs	MDL M	9.88	10.31	11.01	11.75	12.53	13.37	14.25	15.04	15.87	16.74	17.65	18.61	19.43	20.28	21.15
2	Fixed costs	MDL M	12.60	12.98	13.37	13.78	14.21	14.64	14.99	15.34	15.70	16.07	16.45	16.84	17.25	17.66	18.08
3	Depreciation	MDL M	1.99	1.99	1.99	1.19	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
	TOTAL costs	MDL M	24.465	25.275	26.367	26.721	27.903	29.174	30.397	31.541	32.733	33.974	35.269	36.617	37.837	39.098	40.402

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	4.37	4.59	5.46	5.89	9.93	10.31	10.68	10.90	11.49	12.11	12.75	13.42	14.12	14.82	15.54	16.29
2	Depreciation	MDL M	0.50	0.50	0.67	1.51	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	1.88	1.76	1.76
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	0.00
4	Reserve for irregular receivables	MDL M	0.00	0.25	0.28	0.30	0.42	0.37	0.32	0.33	0.34	0.36	0.37	0.39	0.41	0.42	0.43	0.45
5	Sale of water	m3	251,444	251,528	278,092	304,742	458,850	492,224	525,696	570,785	609,299	648,418	688,144	728,479	769,426	810,988	853,166	895,964
6	Tariff without depreciation	MDL M/m3	17.38	19.26	20.63	20.31	22.56	21.70	20.93	19.68	19.42	19.23	19.07	18.96	18.88	18.79	18.72	18.68
7	Tariff with depreciation	MDL M/m3	19.38	21.27	23.04	25.26	27.30	26.12	25.07	23.49	22.99	22.58	22.23	21.95	21.71	21.11	20.78	20.65
8	**Proposed avarage tariff**	**MDL/m3**	**16.70**	**21.50**	**22.00**	**22.00**	**22.00**	**21.50**	**21.00**	**20.50**	**20.50**	**20.50**	**20.50**	**20.50**	**20.50**	**20.50**	**20.50**	**20.50**
	Wastewater Services																	
1	Variable and fixed costs	MDL M	2.19	2.19	2.28	2.35	2.98	3.05	3.11	3.93	4.06	4.21	4.36	4.52	4.68	4.85	5.03	5.22
2	Depreciation	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	0.23
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	0.00
4	Reserve for irregular receivables	MDL M	0.00	0.12	0.11	0.10	0.11	0.10	0.08	0.10	0.11	0.11	0.11	0.12	0.12	0.13	0.13	0.14
5	Sale of wastewater	m3	149,446	149,698	161,736	173,813	185,930	198,087	210,284	383,668	413,049	443,360	474,605	506,789	539,916	573,989	609,013	644,993
6	Tariff without depreciation	MDL M/m3	14.64	15.42	14.79	14.12	16.64	15.88	15.21	10.51	10.10	9.74	9.43	9.15	8.90	8.68	8.48	8.30
7	Tariff with depreciation	MDL M/m3	16.16	16.94	16.19	15.42	17.86	17.03	16.29	11.10	10.65	10.25	9.90	9.60	9.32	9.07	8.85	8.66
8	**Proposed avarage tariff**	**MDL/m3**	**13.89**	**15.50**	**15.50**	**15.50**	**15.50**	**15.50**	**15.00**	**11.10**	**10.65**	**10.25**	**9.90**	**9.60**	**9.32**	**9.07**	**8.85**	**8.66**
	Dynamic prime costs for water	**MDL/m3**		**24.31**														
	Dynamic prime costs for wastewater	**MDL/m3**		**9.29**														

	Water Supply		**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
1	Variable and fixed costs	MDL M	17.06	17.69	18.57	19.49	20.47	21.49	22.50	23.43	24.39	25.40	26.45	27.55	28.52	29.53	30.57
2	Depreciation	MDL M	1.76	1.76	1.76	1.70	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67
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	0.47	0.49	0.51	0.53	0.55	0.58	0.60	0.63	0.65	0.68	0.70	0.73	0.75	0.78	0.81
5	Sale of water	m3	939,383	964,947	990,588	1,016,308	1,042,106	1,067,982	1,093,936	1,119,969	1,146,079	1,172,268	1,198,535	1,224,881	1,251,304	1,277,806	1,304,386
6	Tariff without depreciation	MDL M/m3	18.67	18.84	19.26	19.70	20.17	20.67	21.12	21.48	21.85	22.25	22.66	23.09	23.40	23.72	24.05
7	Tariff with depreciation	MDL M/m3	20.54	20.66	21.03	21.37	21.77	22.23	22.64	22.97	23.31	23.67	24.05	24.45	24.73	25.03	25.33
8	**Proposed avarage tariff**	**MDL/m3**	**20.54**	**20.66**	**21.03**	**21.37**	**21.77**	**22.23**	**22.64**	**22.97**	**23.31**	**23.67**	**24.05**	**24.45**	**24.73**	**25.03**	**25.33**
	Wastewater Services																
1	Variable and fixed costs	MDL M	5.41	5.60	5.81	6.04	6.27	6.52	6.74	6.95	7.18	7.41	7.65	7.91	8.15	8.41	8.67
2	Depreciation	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
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	0.14	0.15	0.15	0.16	0.16	0.17	0.17	0.18	0.19	0.19	0.20	0.20	0.21	0.22	0.22
5	Sale of wastewater	m3	681,931	703,556	725,380	747,406	769,633	792,062	814,694	837,530	860,569	883,814	907,264	930,920	954,783	978,853	1,003,132
6	Tariff without depreciation	MDL M/m3	8.15	8.17	8.22	8.29	8.36	8.44	8.48	8.51	8.55	8.60	8.65	8.71	8.76	8.81	8.86
7	Tariff with depreciation	MDL M/m3	8.48	8.49	8.53	8.59	8.65	8.73	8.76	8.79	8.82	8.86	8.90	8.95	8.99	9.04	9.09
8	**Proposed avarage tariff**	**MDL/m3**	**8.48**	**8.49**	**8.53**	**8.59**	**8.65**	**8.73**	**8.76**	**8.79**	**8.82**	**8.86**	**8.90**	**8.95**	**8.99**	**9.04**	**9.09**

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	20.71	22.91	24.62	26.33	27.41	28.41	29.33	30.92	32.52	34.12	35.71	37.31	38.91	40.51	42.10
2	Avarage bill for wastewater (per person)	MDL/month	14.93	16.14	17.35	18.55	19.76	20.29	15.87	16.06	16.27	16.48	16.72	16.97	17.22	17.49	17.78
3	Avarage bill for water and wastewater (per person)	MDL/month	35.64	39.04	41.96	44.89	47.17	48.70	45.20	46.99	48.79	50.60	52.43	54.28	56.13	58.00	59.88
4	Disposable households income	MDL/month	1729.57	1781.46	1863.41	1943.53	2021.27	2102.12	2186.21	2273.66	2364.60	2459.19	2557.56	2659.86	2766.25	2876.90	2991.98
5	Tariff affordability	%	2.1%	2.2%	2.3%	2.3%	2.3%	2.3%	2.1%	2.1%	2.1%	2.1%	2.1%	2.0%	2.0%	2.0%	2.0%
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	43.78	45.65	48.11	50.55	53.19	56.04	58.85	61.48	64.21	67.05	70.00	73.06	75.83	78.69	81.62
2	Avarage bill for wastewater (per person)	MDL/month	18.08	18.75	19.52	20.32	21.15	22.01	22.77	23.52	24.29	25.08	25.91	26.76	27.58	28.42	29.29
3	Avarage bill for water and wastewater (per person)	MDL/month	61.86	64.40	67.63	70.87	74.34	78.05	81.62	84.99	88.50	92.13	95.90	99.82	103.41	107.11	110.91
4	Disposable households income	MDL/month	3111.66	3236.12	3365.57	3500.19	3640.20	3785.81	3899.38	4016.36	4136.85	4260.96	4388.79	4520.45	4656.07	4795.75	4939.62
5	Tariff affordability	%	2.0%	2.0%	2.0%	2.0%	2.0%	2.1%	2.1%	2.1%	2.1%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%
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	5.41	6.12	6.70	10.09	10.58	11.04	11.70	12.49	13.29	14.11	14.93	15.77	16.63	17.49	18.37
2	Sale of wastewater	MDL M	2.32	2.51	2.69	2.88	3.07	3.15	4.26	4.40	4.55	4.70	4.86	5.03	5.21	5.39	5.58
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**	**7.73**	**8.62**	**9.40**	**12.98**	**13.65**	**14.19**	**15.96**	**16.89**	**17.84**	**18.81**	**19.80**	**20.81**	**21.83**	**22.88**	**23.95**
5	Costs of water services	MDL M	5.10	6.13	7.40	12.10	12.48	12.86	13.08	13.67	14.28	14.93	15.60	16.30	16.70	17.30	18.05
	variable costs	MDL M	2.08	2.83	2.88	4.04	4.25	4.45	4.74	5.16	5.59	6.04	6.52	7.01	7.50	8.00	8.52
	fixed costs	MDL M	2.51	2.63	3.02	5.89	6.06	6.23	6.16	6.34	6.52	6.71	6.91	7.11	7.32	7.54	7.77
	depreciation	MDL M	0.50	0.67	1.51	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	1.88	1.76	1.76
6	Costs of wastewater services	MDL M	2.41	2.51	2.58	3.21	3.27	3.34	4.15	4.29	4.43	4.59	4.74	4.91	5.08	5.26	5.45
	variable costs	MDL M	0.13	0.19	0.20	0.22	0.22	0.21	0.36	0.40	0.44	0.49	0.54	0.59	0.64	0.69	0.75
	fixed costs	MDL M	2.06	2.09	2.15	2.76	2.83	2.90	3.57	3.66	3.77	3.87	3.98	4.10	4.22	4.34	4.47
	depreciation	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
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**	**7.51**	**8.64**	**9.98**	**15.31**	**15.75**	**16.20**	**17.23**	**17.96**	**18.72**	**19.51**	**20.34**	**21.21**	**21.78**	**22.56**	**23.49**
10	**Gross profit**	**MDL M**	0.22	-0.01	-0.58	-2.34	-2.10	-2.00	-1.27	-1.07	-0.88	-0.71	-0.55	-0.40	0.05	0.32	0.46
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	0.0	0.1
12	**Net profit**	**MDL M**	0.19	-0.01	-0.58	-2.34	-2.10	-2.00	-1.27	-1.07	-0.88	-0.71	-0.55	-0.40	0.04	0.28	0.40

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sale of water	MDL M	19.29	19.94	20.84	21.72	22.69	23.74	24.77	25.72	26.71	27.75	28.82	29.95	30.95	31.98	33.04
2	Sale of wastewater	MDL M	5.78	5.97	6.19	6.42	6.66	6.91	7.14	7.36	7.59	7.83	8.08	8.34	8.59	8.85	9.12
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**	**25.08**	**25.91**	**27.03**	**28.14**	**29.35**	**30.65**	**31.91**	**33.08**	**34.30**	**35.57**	**36.90**	**38.28**	**39.53**	**40.83**	**42.16**
5	Costs of water services	MDL M	18.82	19.45	20.33	21.19	22.14	23.16	24.17	25.09	26.06	27.07	28.12	29.22	30.19	31.20	32.24
	variable costs	MDL M	9.06	9.45	10.08	10.74	11.44	12.19	12.98	13.68	14.42	15.19	16.00	16.85	17.57	18.32	19.09
	fixed costs	MDL M	8.00	8.24	8.49	8.75	9.02	9.30	9.52	9.74	9.97	10.21	10.45	10.70	10.95	11.21	11.48
	depreciation	MDL M	1.76	1.76	1.76	1.70	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67
6	Costs of wastewater services	MDL M	5.64	5.83	6.04	6.26	6.50	6.75	6.96	7.18	7.40	7.64	7.88	8.13	8.38	8.63	8.90
	variable costs	MDL M	0.82	0.86	0.93	1.01	1.09	1.18	1.27	1.36	1.45	1.55	1.65	1.76	1.86	1.96	2.07
	fixed costs	MDL M	4.60	4.74	4.88	5.03	5.18	5.34	5.47	5.59	5.73	5.86	6.00	6.15	6.29	6.45	6.60
	depreciation	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
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**	**24.47**	**25.27**	**26.37**	**27.45**	**28.63**	**29.91**	**31.13**	**32.27**	**33.46**	**34.71**	**36.00**	**37.35**	**38.57**	**39.83**	**41.13**
10	**Gross profit**	**MDL M**	0.61	0.63	0.66	0.69	0.72	0.75	0.78	0.81	0.84	0.87	0.90	0.93	0.96	1.00	1.03
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**	0.54	0.56	0.58	0.60	0.63	0.66	0.68	0.71	0.74	0.76	0.79	0.82	0.85	0.88	0.90

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	5.41	6.12	6.70	7.31	7.72	8.11	8.64	9.27	9.91	10.56	11.21	11.88	12.55	13.24	13.93
2	Sale of wastewater	MDL M	2.32	2.51	2.69	2.88	3.07	3.15	3.64	3.76	3.89	4.02	4.16	4.31	4.46	4.62	4.79
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**	**7.73**	**8.62**	**9.40**	**10.19**	**10.79**	**11.26**	**12.28**	**13.03**	**13.79**	**14.58**	**15.37**	**16.19**	**17.01**	**17.86**	**18.72**
5	Costs of water services	MDL M	5.10	6.18	6.62	7.62	8.09	8.58	8.92	9.57	10.26	10.98	11.74	12.55	13.36	14.21	15.10
	variable costs	MDL M	2.08	3.11	3.44	3.79	4.13	4.48	4.94	5.45	6.00	6.57	7.19	7.83	8.48	9.16	9.87
	fixed costs	MDL M	2.51	2.57	2.68	3.33	3.46	3.59	3.48	3.61	3.75	3.90	4.05	4.21	4.37	4.54	4.72
	depreciation	MDL M	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
6	Costs of wastewater services	MDL M	2.41	2.51	2.58	2.71	2.78	2.86	3.55	3.67	3.79	3.92	4.06	4.20	4.35	4.51	4.67
	variable costs	MDL M	0.13	0.19	0.20	0.22	0.23	0.25	0.29	0.32	0.35	0.39	0.43	0.47	0.51	0.55	0.60
	fixed costs	MDL M	2.06	2.09	2.15	2.26	2.32	2.38	3.03	3.12	3.21	3.31	3.41	3.51	3.62	3.73	3.84
	depreciation	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
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**	**7.51**	**8.69**	**9.20**	**10.33**	**10.87**	**11.44**	**12.47**	**13.24**	**14.05**	**14.90**	**15.80**	**16.75**	**17.71**	**18.72**	**19.77**
10	**Gross profit**	**MDL M**	0.22	-0.07	0.20	-0.13	-0.08	-0.17	-0.19	-0.21	-0.25	-0.33	-0.43	-0.57	-0.70	-0.86	-1.05
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	0.0	0.0
12	**Net profit**	**MDL M**	0.19	-0.07	0.17	-0.13	-0.08	-0.17	-0.19	-0.21	-0.25	-0.33	-0.43	-0.57	-0.70	-0.86	-1.05

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sale of water	MDL M	16.44	17.22	18.32	19.49	20.73	22.06	23.40	24.67	26.00	27.41	28.88	30.44	31.85	33.31	34.84
2	Sale of wastewater	MDL M	4.96	5.13	5.32	5.52	5.73	5.96	6.15	6.34	6.54	6.75	6.97	7.20	7.42	7.65	7.88
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**	**21.40**	**22.35**	**23.64**	**25.01**	**26.47**	**28.01**	**29.55**	**31.01**	**32.54**	**34.16**	**35.85**	**37.63**	**39.26**	**40.96**	**42.73**
5	Costs of water services	MDL M	16.04	16.80	17.87	19.01	20.23	21.52	22.83	24.07	25.37	26.74	28.18	29.69	31.07	32.50	33.99
	variable costs	MDL M	10.63	11.20	12.07	13.00	14.00	15.07	16.21	17.26	18.38	19.56	20.80	22.11	23.28	24.49	25.76
	fixed costs	MDL M	4.91	5.10	5.30	5.50	5.72	5.94	6.12	6.30	6.49	6.68	6.87	7.08	7.29	7.50	7.72
	depreciation	MDL M	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
6	Costs of wastewater services	MDL M	4.84	5.00	5.19	5.39	5.59	5.81	6.00	6.19	6.38	6.59	6.80	7.02	7.24	7.46	7.69
	variable costs	MDL M	0.65	0.69	0.74	0.81	0.87	0.94	1.02	1.09	1.16	1.24	1.32	1.41	1.49	1.58	1.66
	fixed costs	MDL M	3.96	4.09	4.22	4.35	4.50	4.64	4.76	4.87	4.99	5.12	5.25	5.38	5.52	5.66	5.80
	depreciation	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
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**	**20.88**	**21.80**	**23.06**	**24.40**	**25.82**	**27.33**	**28.83**	**30.26**	**31.75**	**33.32**	**34.98**	**36.71**	**38.30**	**39.96**	**41.68**
10	**Gross profit**	**MDL M**	0.52	0.55	0.58	0.61	0.65	0.68	0.72	0.76	0.79	0.83	0.87	0.92	0.96	1.00	1.04
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**	0.46	0.48	0.51	0.54	0.57	0.60	0.63	0.67	0.70	0.73	0.77	0.81	0.84	0.88	0.92

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**	**1.83**	**0.70**	**0.78**	**0.87**	**1.34**	**1.40**	**1.45**	**1.59**	**1.67**	**1.76**	**1.84**	**1.93**	**2.02**	**2.11**	**2.20**	**2.30**
1	Inventories	MDL M	0.08	0.06	0.07	0.10	0.27	0.28	0.28	0.28	0.28	0.29	0.30	0.30	0.31	0.31	0.32	0.33
2	Accounts receivable	MDL M	1.75	0.64	0.71	0.77	1.07	1.12	1.17	1.31	1.39	1.47	1.55	1.63	1.71	1.79	1.88	1.97
	Increase in current assets	MDL M		-1.13	0.08	0.09	0.47	0.06	0.05	0.14	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09
B	**Current liabilities**	**MDL M**	**3.64**	**2.56**	**0.86**	**0.91**	**1.36**	**1.41**	**1.46**	**1.59**	**1.67**	**1.75**	**1.83**	**1.91**	**2.00**	**2.09**	**2.18**	**2.28**
1	Liabilities to suppliers	MDL M	1.41	0.56	0.64	0.68	1.06	1.10	1.13	1.22	1.28	1.34	1.41	1.47	1.55	1.62	1.69	1.77
2	Liabilities to employees	MDL M	2.22	2.00	0.22	0.23	0.30	0.31	0.32	0.37	0.39	0.40	0.42	0.44	0.45	0.47	0.49	0.51
3	Increase in current liabilities	MDL M		-1.08	-1.70	0.05	0.45	0.05	0.05	0.14	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.10

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Current assets**	**MDL M**	**2.39**	**2.47**	**2.57**	**2.67**	**2.78**	**2.89**	**3.00**	**3.10**	**3.21**	**3.32**	**3.43**	**3.56**	**3.66**	**3.78**	**3.90**
1	Inventories	MDL M	0.33	0.34	0.35	0.36	0.36	0.37	0.38	0.38	0.39	0.40	0.40	0.41	0.42	0.42	0.43
2	Accounts receivable	MDL M	2.06	2.13	2.22	2.31	2.41	2.52	2.62	2.72	2.82	2.92	3.03	3.15	3.25	3.36	3.47
	Increase in current assets	MDL M	0.10	0.08	0.10	0.10	0.11	0.11	0.11	0.10	0.11	0.11	0.12	0.12	0.11	0.11	0.12
B	**Current liabilities**	**MDL M**	**2.38**	**2.47**	**2.58**	**2.70**	**2.82**	**2.95**	**3.07**	**3.18**	**3.30**	**3.43**	**3.55**	**3.69**	**3.81**	**3.94**	**4.07**
1	Liabilities to suppliers	MDL M	1.85	1.91	2.00	2.10	2.20	2.30	2.40	2.50	2.59	2.70	2.80	2.91	3.01	3.12	3.23
2	Liabilities to employees	MDL M	0.53	0.55	0.58	0.60	0.62	0.65	0.67	0.69	0.71	0.73	0.75	0.77	0.80	0.82	0.84
3	Increase in current liabilities	MDL M	0.10	0.09	0.11	0.12	0.12	0.13	0.12	0.11	0.12	0.12	0.13	0.13	0.12	0.13	0.13

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**	**1.83**	**0.70**	**0.77**	**0.84**	**0.90**	**0.95**	**0.99**	**1.07**	**1.13**	**1.20**	**1.26**	**1.33**	**1.40**	**1.47**	**1.54**	**1.62**
1	Inventories	MDL M	0.08	0.06	0.07	0.07	0.06	0.06	0.07	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08
2	Accounts receivable	MDL M	1.75	0.64	0.71	0.77	0.84	0.89	0.93	1.01	1.07	1.13	1.20	1.26	1.33	1.40	1.47	1.54
	Increase in current assets	MDL M		-1.13	0.07	0.07	0.06	0.05	0.04	0.08	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07
B	**Current liabilities**	**MDL M**	**3.64**	**2.56**	**0.87**	**0.93**	**1.09**	**1.14**	**1.20**	**1.34**	**1.42**	**1.50**	**1.59**	**1.68**	**1.77**	**1.87**	**1.97**	**2.08**
1	Liabilities to suppliers	MDL M	1.41	0.56	0.65	0.70	0.79	0.83	0.88	0.97	1.03	1.09	1.16	1.24	1.32	1.40	1.48	1.56
2	Liabilities to employees	MDL M	2.22	2.00	0.22	0.23	0.30	0.31	0.32	0.37	0.39	0.40	0.42	0.44	0.45	0.47	0.49	0.51
3	Increase in current liabilities	MDL M		-1.08	-1.68	0.05	0.16	0.06	0.06	0.14	0.08	0.08	0.09	0.09	0.10	0.10	0.10	0.11

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Current assets**	**MDL M**	**1.84**	**1.92**	**2.03**	**2.14**	**2.27**	**2.40**	**2.53**	**2.65**	**2.78**	**2.91**	**3.05**	**3.20**	**3.34**	**3.48**	**3.63**
1	Inventories	MDL M	0.08	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.12	0.12
2	Accounts receivable	MDL M	1.76	1.84	1.94	2.06	2.18	2.30	2.43	2.55	2.67	2.81	2.95	3.09	3.23	3.37	3.51
	Increase in current assets	MDL M	0.22	0.08	0.11	0.12	0.12	0.13	0.13	0.12	0.13	0.14	0.14	0.15	0.14	0.14	0.15
B	**Current liabilities**	**MDL M**	**2.19**	**2.29**	**2.41**	**2.54**	**2.68**	**2.83**	**2.98**	**3.11**	**3.26**	**3.41**	**3.57**	**3.73**	**3.88**	**4.04**	**4.21**
1	Liabilities to suppliers	MDL M	1.66	1.73	1.84	1.95	2.06	2.19	2.31	2.43	2.55	2.68	2.81	2.96	3.09	3.22	3.37
2	Liabilities to employees	MDL M	0.53	0.55	0.58	0.60	0.62	0.65	0.67	0.69	0.71	0.73	0.75	0.77	0.80	0.82	0.84
3	Increase in current liabilities	MDL M	0.11	0.10	0.13	0.13	0.14	0.15	0.14	0.14	0.14	0.15	0.16	0.17	0.15	0.16	0.17

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**	**15.42**	**20.11**	**46.31**	**68.11**	**66.22**	**64.17**	**62.21**	**61.08**	**60.08**	**59.28**	**58.65**	**58.19**	**57.88**	**58.01**	**58.39**	**58.89**
1	Fixed assets	MDL M	13.57	18.42	45.43	66.02	63.62	61.22	58.82	56.42	54.02	51.62	49.22	46.81	44.41	42.30	40.32	38.33
2	Current assets	MDL M	1.85	1.69	0.88	2.08	2.60	2.95	3.39	4.66	6.06	7.66	9.44	11.38	13.47	15.71	18.07	20.56
3	Inventories	MDL M	0.08	0.06	0.07	0.10	0.27	0.28	0.28	0.28	0.28	0.29	0.30	0.30	0.31	0.31	0.32	0.33
4	Short-term receivables	MDL M	1.75	0.64	0.71	0.77	1.07	1.12	1.17	1.31	1.39	1.47	1.55	1.63	1.71	1.79	1.88	1.97
5	Cash and other financial assets	MDL M	0.02	0.99	0.10	1.21	1.26	1.55	1.94	3.07	4.39	5.90	7.59	9.45	11.45	13.60	15.87	18.26
6	Other current 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	0.00
B	**Liabilities**	**MDL M**	**15.42**	**20.11**	**46.31**	**68.11**	**66.22**	**64.17**	**62.21**	**61.08**	**60.08**	**59.28**	**58.65**	**58.19**	**57.88**	**58.01**	**58.39**	**58.89**
1	Equity capital	MDL M	6.05	6.24	6.23	5.65	3.31	1.21	-0.79	-2.07	-3.14	-4.02	-4.72	-5.27	-5.67	-5.63	-5.34	-4.94
2	Long-term liabilities	MDL M	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74
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	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	1.41	0.56	0.64	0.68	1.06	1.10	1.13	1.22	1.28	1.34	1.41	1.47	1.55	1.62	1.69	1.77
7	Current liabilities	MDL M	2.22	2.00	0.22	0.23	0.30	0.31	0.32	0.37	0.39	0.40	0.42	0.44	0.45	0.47	0.49	0.51
8	Accruals	MDL M	0.00	5.58	33.49	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Assets**	**MDL M**	**59.53**	**60.17**	**60.86**	**61.58**	**62.34**	**63.13**	**63.93**	**64.75**	**65.61**	**66.50**	**67.42**	**68.37**	**69.34**	**70.35**	**71.38**
1	Fixed assets	MDL M	36.35	34.36	32.37	30.45	28.56	26.66	24.77	22.87	20.98	19.08	17.19	15.29	13.40	11.50	9.61
2	Current assets	MDL M	23.18	25.81	28.49	31.13	33.78	36.46	39.16	41.88	44.63	47.41	50.23	53.08	55.94	58.84	61.77
3	Inventories	MDL M	0.33	0.34	0.35	0.36	0.36	0.37	0.38	0.38	0.39	0.40	0.40	0.41	0.42	0.42	0.43
4	Short-term receivables	MDL M	2.06	2.13	2.22	2.31	2.41	2.52	2.62	2.72	2.82	2.92	3.03	3.15	3.25	3.36	3.47
5	Cash and other financial assets	MDL M	20.79	23.34	25.92	28.46	31.01	33.57	36.16	38.78	41.42	44.09	46.79	49.52	52.28	55.06	57.88
6	Other current 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
B	**Liabilities**	**MDL M**	**59.53**	**60.17**	**60.86**	**61.58**	**62.34**	**63.13**	**63.93**	**64.75**	**65.61**	**66.50**	**67.42**	**68.37**	**69.34**	**70.35**	**71.38**
1	Equity capital	MDL M	-4.40	-3.85	-3.27	-2.66	-2.03	-1.37	-0.69	0.02	0.76	1.52	2.31	3.13	3.98	4.86	5.76
2	Long-term liabilities	MDL M	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74
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	1.85	1.91	2.00	2.10	2.20	2.30	2.40	2.50	2.59	2.70	2.80	2.91	3.01	3.12	3.23
7	Current liabilities	MDL M	0.53	0.55	0.58	0.60	0.62	0.65	0.67	0.69	0.71	0.73	0.75	0.77	0.80	0.82	0.84
8	Accruals	MDL M	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81	55.81

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**	**15.42**	**14.53**	**12.78**	**13.01**	**13.04**	**13.01**	**12.90**	**12.84**	**12.71**	**12.54**	**12.30**	**11.96**	**11.49**	**10.89**	**10.14**	**9.19**
1	Fixed assets	MDL M	13.57	12.84	12.11	11.38	10.65	9.92	9.19	8.45	7.72	6.99	6.26	5.53	4.80	4.07	3.34	2.60
2	Current assets	MDL M	1.85	1.69	0.67	1.63	2.39	3.10	3.71	4.39	4.99	5.55	6.04	6.43	6.69	6.82	6.80	6.59
3	Inventories	MDL M	0.08	0.06	0.07	0.07	0.06	0.06	0.07	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08
4	Short-term receivables	MDL M	1.75	0.64	0.71	0.77	0.84	0.89	0.93	1.01	1.07	1.13	1.20	1.26	1.33	1.40	1.47	1.54
5	Cash and other financial assets	MDL M	0.02	0.99	-0.10	0.79	1.49	2.14	2.72	3.32	3.85	4.35	4.77	5.10	5.29	5.35	5.26	4.97
6	Other current 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	0.00
B	**Liabilities**	**MDL M**	**15.42**	**14.53**	**12.78**	**13.01**	**13.04**	**13.01**	**12.90**	**12.84**	**12.71**	**12.54**	**12.30**	**11.96**	**11.49**	**10.89**	**10.14**	**9.19**
1	Equity capital	MDL M	6.05	6.24	6.17	6.35	6.21	6.13	5.96	5.77	5.56	5.30	4.98	4.55	3.98	3.29	2.43	1.38
2	Long-term liabilities	MDL M	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74
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	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	1.41	0.56	0.65	0.70	0.79	0.83	0.88	0.97	1.03	1.09	1.16	1.24	1.32	1.40	1.48	1.56
7	Current liabilities	MDL M	2.22	2.00	0.22	0.23	0.30	0.31	0.32	0.37	0.39	0.40	0.42	0.44	0.45	0.47	0.49	0.51
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**	**9.76**	**10.34**	**10.97**	**11.64**	**12.35**	**13.10**	**13.88**	**14.68**	**15.52**	**16.41**	**17.33**	**18.31**	**19.30**	**20.34**	**21.43**
1	Fixed assets	MDL M	1.87	1.14	0.41	-0.32	-1.05	-1.78	-2.51	-3.24	-3.98	-4.71	-5.44	-6.17	-6.90	-7.63	-8.36
2	Current assets	MDL M	7.89	9.20	10.56	11.96	13.40	14.88	16.39	17.93	19.50	21.11	22.77	24.48	26.20	27.97	29.79
3	Inventories	MDL M	0.08	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.12	0.12
4	Short-term receivables	MDL M	1.76	1.84	1.94	2.06	2.18	2.30	2.43	2.55	2.67	2.81	2.95	3.09	3.23	3.37	3.51
5	Cash and other financial assets	MDL M	6.05	7.28	8.53	9.82	11.13	12.49	13.87	15.28	16.72	18.20	19.72	21.27	22.86	24.49	26.16
6	Other current 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
B	**Liabilities**	**MDL M**	**9.76**	**10.34**	**10.97**	**11.64**	**12.35**	**13.10**	**13.88**	**14.68**	**15.52**	**16.41**	**17.33**	**18.31**	**19.30**	**20.34**	**21.43**
1	Equity capital	MDL M	1.84	2.32	2.83	3.36	3.93	4.53	5.17	5.83	6.53	7.26	8.03	8.84	9.68	10.56	11.48
2	Long-term liabilities	MDL M	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74
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	1.66	1.73	1.84	1.95	2.06	2.19	2.31	2.43	2.55	2.68	2.81	2.96	3.09	3.22	3.37
7	Current liabilities	MDL M	0.53	0.55	0.58	0.60	0.62	0.65	0.67	0.69	0.71	0.73	0.75	0.77	0.80	0.82	0.84
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**		**12.23**	**34.83**	**31.78**	**13.43**	**13.70**	**14.24**	**16.09**	**16.96**	**17.92**	**18.89**	**19.88**	**20.90**	**21.92**	**22.97**	**24.05**
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		3.63	18.14	14.51	0.00	0.00										
3	Own contribution	MDL M		1.95	9.77	7.81	0.00	0.00										
4	Revenues from sale	MDL M		7.73	8.62	9.40	12.98	13.65	14.19	15.96	16.89	17.84	18.81	19.80	20.81	21.83	22.88	23.95
5	Increase in current liabilities	MDL M		-1.08	-1.70	0.05	0.45	0.05	0.05	0.14	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.10
B	**Financial outflows**	**MDL M**		**11.26**	**35.73**	**30.66**	**13.38**	**13.41**	**13.85**	**14.97**	**15.64**	**16.40**	**17.20**	**18.03**	**18.90**	**19.77**	**20.70**	**21.66**
1	Investment costs	MDL M		5.58	27.91	22.33	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		6.78	7.74	8.25	12.91	13.35	13.80	14.83	15.56	16.32	17.11	17.94	18.81	19.67	20.57	21.51
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		-1.13	0.08	0.09	0.47	0.06	0.05	0.14	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09
5	Income tax	MDL M		0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.05
C	Net cash flow (inflow - outflow)	**MDL M**		0.97	-0.89	1.12	0.05	0.29	0.40	1.12	1.32	1.51	1.69	1.85	2.00	2.15	2.27	2.39
D	Cumulated cash	**MDL M**	0.02	0.99	0.10	1.21	1.26	1.55	1.94	3.07	4.39	5.90	7.59	9.45	11.45	13.60	15.87	18.26

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Financial inflows**	**MDL M**	**25.18**	**25.99**	**27.14**	**28.26**	**29.47**	**30.78**	**32.03**	**33.19**	**34.42**	**35.70**	**37.03**	**38.42**	**39.66**	**40.95**	**42.29**
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	25.08	25.91	27.03	28.14	29.35	30.65	31.91	33.08	34.30	35.57	36.90	38.28	39.53	40.83	42.16
5	Increase in current liabilities	MDL M	0.10	0.09	0.11	0.12	0.12	0.13	0.12	0.11	0.12	0.12	0.13	0.13	0.12	0.13	0.13
B	**Financial outflows**	**MDL M**	**22.65**	**23.44**	**24.56**	**25.71**	**26.93**	**28.22**	**29.44**	**30.58**	**31.78**	**33.03**	**34.33**	**35.69**	**36.90**	**38.17**	**39.48**
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	22.48	23.29	24.38	25.53	26.74	28.01	29.23	30.38	31.57	32.81	34.11	35.45	36.67	37.93	39.24
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	0.10	0.08	0.10	0.10	0.11	0.11	0.11	0.10	0.11	0.11	0.12	0.12	0.11	0.11	0.12
5	Income tax	MDL M	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.12	0.12	0.12
C	Net cash flow (inflow - outflow)	**MDL M**	2.52	2.55	2.58	2.54	2.54	2.57	2.59	2.62	2.64	2.67	2.70	2.73	2.76	2.79	2.81
D	Cumulated cash	**MDL M**	20.79	23.34	25.92	28.46	31.01	33.57	36.16	38.78	41.42	44.09	46.79	49.52	52.28	55.06	57.88

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**		**6.65**	**6.94**	**9.45**	**10.35**	**10.85**	**11.32**	**12.41**	**13.11**	**13.88**	**14.66**	**15.46**	**16.28**	**17.11**	**17.96**	**18.83**
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		7.73	8.62	9.40	10.19	10.79	11.26	12.28	13.03	13.79	14.58	15.37	16.19	17.01	17.86	18.72
5	Increase in current liabilities	MDL M		-1.08	-1.68	0.05	0.16	0.06	0.06	0.14	0.08	0.08	0.09	0.09	0.10	0.10	0.10	0.11
B	**Financial outflows**	**MDL M**		**5.68**	**8.03**	**8.56**	**9.65**	**10.19**	**10.75**	**11.82**	**12.57**	**13.38**	**14.24**	**15.14**	**16.09**	**17.05**	**18.06**	**19.11**
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		6.78	7.96	8.47	9.60	10.14	10.71	11.74	12.51	13.32	14.17	15.07	16.02	16.98	17.99	19.04
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		-1.13	0.07	0.07	0.06	0.05	0.04	0.08	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07
	Income tax			0.03	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C	**Net cash flow (inflow - outflow)**	**MDL M**		0.97	-1.09	0.89	0.70	0.66	0.58	0.60	0.54	0.50	0.43	0.33	0.19	0.06	-0.10	-0.29
D	**Cumulated cash**	**MDL M**	0.02	0.99	-0.10	0.79	1.49	2.14	2.72	3.32	3.85	4.35	4.77	5.10	5.29	5.35	5.26	4.97

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Financial inflows**	**MDL M**	**21.51**	**22.44**	**23.76**	**25.14**	**26.61**	**28.16**	**29.70**	**31.15**	**32.69**	**34.31**	**36.01**	**37.80**	**39.42**	**41.12**	**42.89**
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	21.40	22.35	23.64	25.01	26.47	28.01	29.55	31.01	32.54	34.16	35.85	37.63	39.26	40.96	42.73
5	Increase in current liabilities	MDL M	0.11	0.10	0.13	0.13	0.14	0.15	0.14	0.14	0.14	0.15	0.16	0.17	0.15	0.16	0.17
B	**Financial outflows**	**MDL M**	**20.43**	**21.22**	**22.51**	**23.86**	**25.29**	**26.81**	**28.32**	**29.74**	**31.24**	**32.83**	**34.49**	**36.24**	**37.83**	**39.49**	**41.23**
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	20.15	21.07	22.33	23.67	25.09	26.60	28.10	29.52	31.02	32.59	34.25	35.98	37.57	39.23	40.95
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	0.22	0.08	0.11	0.12	0.12	0.13	0.13	0.12	0.13	0.14	0.14	0.15	0.14	0.14	0.15
	Income tax		0.06	0.07	0.07	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.12	0.13
C	**Net cash flow (inflow - outflow)**	**MDL M**	1.08	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.48	1.52	1.55	1.59	1.63	1.67
D	**Cumulated cash**	**MDL M**	6.05	7.28	8.53	9.82	11.13	12.49	13.87	15.28	16.72	18.20	19.72	21.27	22.86	24.49	26.16

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**	**-0.02**	**0.00**	**3.07**	**2.85**	**2.92**	**3.68**	**3.86**	**4.04**	**4.23**	**4.42**	**4.61**	**4.81**	**5.01**	**5.22**
1	Incremental revenues from sales	MDL M	0.00	0.00	0.00	2.78	2.86	2.93	3.68	3.86	4.04	4.23	4.42	4.62	4.82	5.02	5.23
2	Incremental increase in current liabilities	MDL M	0.00	-0.02	0.00	0.29	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
3	Residual value	MDL M															
B	**Financial outflows**	**MDL M**	**4.45**	**27.77**	**22.19**	**3.79**	**3.27**	**3.14**	**3.23**	**3.13**	**3.09**	**3.03**	**2.96**	**2.88**	**2.78**	**2.68**	**2.56**
1	Investment costs	MDL M	5.58	27.91	22.33	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	0.00	-0.22	-0.23	3.32	3.21	3.09	3.09	3.05	3.00	2.94	2.87	2.79	2.69	2.59	2.47
3	Incremental increase in current assets	MDL M	-1.13	0.08	0.09	0.47	0.06	0.05	0.14	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09
C	Net cash flow (inflow - outflow)	**MDL M**	-4.45	-27.78	-22.19	-0.71	-0.42	-0.22	0.45	0.72	0.95	1.20	1.46	1.74	2.03	2.33	2.66
D	FNPV(C)	**MDL M**	**-32.45**														
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**	**3.67**	**3.55**	**3.37**	**3.11**	**2.87**	**2.62**	**2.33**	**2.04**	**1.73**	**1.39**	**1.02**	**0.62**	**0.24**	**-0.17**	**17.37**
1	Incremental revenues from sales	MDL M	3.68	3.56	3.39	3.13	2.88	2.64	2.35	2.07	1.76	1.42	1.05	0.65	0.27	-0.13	-0.56
2	Incremental increase in current liabilities	MDL M	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
3	Residual value	MDL M															17.97
B	**Financial outflows**	**MDL M**	**2.43**	**2.29**	**2.15**	**1.96**	**1.76**	**1.53**	**1.24**	**0.96**	**0.66**	**0.33**	**-0.03**	**-0.41**	**-0.79**	**-1.18**	**-1.60**
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	2.33	2.22	2.05	1.86	1.65	1.41	1.13	0.85	0.55	0.22	-0.14	-0.53	-0.90	-1.29	-1.71
3	Incremental increase in current assets	MDL M	0.10	0.08	0.10	0.10	0.11	0.11	0.11	0.10	0.11	0.11	0.12	0.12	0.11	0.11	0.12
C	Net cash flow (inflow - outflow)	**MDL M**	1.23	1.26	1.22	1.15	1.11	1.09	1.09	1.09	1.07	1.06	1.04	1.03	1.03	1.01	18.97

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**	**3.63**	**18.12**	**14.51**	**3.07**	**2.85**	**2.92**	**3.68**	**3.86**	**4.04**	**4.23**	**4.42**	**4.61**	**4.81**	**5.01**	**5.22**
1	Incremental revenues from sales	MDL M	0.00	0.00	0.00	2.78	2.86	2.93	3.68	3.86	4.04	4.23	4.42	4.62	4.82	5.02	5.23
2	Incremental increase in current liabilities	MDL M	0.00	-0.02	0.00	0.29	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
3	Donor contribution (capital grant)	MDL M	3.63	18.14	14.51	0.00	0.00										
4	Residual value	MDL M															
B	**Financial outflows**	**MDL M**	**4.45**	**27.77**	**22.19**	**3.79**	**3.27**	**3.14**	**3.23**	**3.13**	**3.09**	**3.03**	**2.96**	**2.88**	**2.78**	**2.68**	**2.56**
1	Investment costs	MDL M	5.58	27.91	22.33	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	0.00	-0.22	-0.23	3.32	3.21	3.09	3.09	3.05	3.00	2.94	2.87	2.79	2.69	2.59	2.47
3	Incremental increase in current assets	MDL M	-1.13	0.08	0.09	0.47	0.06	0.05	0.14	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09
C	**Net cash flow (inflow - outflow)**	**MDL M**	-0.83	-9.64	-7.68	-0.71	-0.42	-0.22	0.45	0.72	0.95	1.20	1.46	1.74	2.03	2.33	2.66
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**	**3.67**	**3.55**	**3.37**	**3.11**	**2.87**	**2.62**	**2.33**	**2.04**	**1.73**	**1.39**	**1.02**	**0.62**	**0.24**	**-0.17**	**17.37**
1	Incremental revenues from sales	MDL M	3.68	3.56	3.39	3.13	2.88	2.64	2.35	2.07	1.76	1.42	1.05	0.65	0.27	-0.13	-0.56
2	Incremental increase in current liabilities	MDL M	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
3	Donor contribution (capital grant)	MDL M															
4	Residual value	MDL M															17.97
B	**Financial outflows**	**MDL M**	**2.43**	**2.29**	**2.15**	**1.96**	**1.76**	**1.53**	**1.24**	**0.96**	**0.66**	**0.33**	**-0.03**	**-0.41**	**-0.79**	**-1.18**	**-1.60**
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	2.33	2.22	2.05	1.86	1.65	1.41	1.13	0.85	0.55	0.22	-0.14	-0.53	-0.90	-1.29	-1.71
3	Incremental increase in current assets	MDL M	0.10	0.08	0.10	0.10	0.11	0.11	0.11	0.10	0.11	0.11	0.12	0.12	0.11	0.11	0.12
C	**Net cash flow (inflow - outflow)**	**MDL M**	1.23	1.26	1.22	1.15	1.11	1.09	1.09	1.09	1.07	1.06	1.04	1.03	1.03	1.01	18.97

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**	**-4.45**	**-27.78**	**-22.19**	**-0.71**	**-0.42**	**-0.22**	**0.45**	**0.72**	**0.95**	**1.20**	**1.46**	**1.74**	**2.03**	**2.33**	**2.66**
1	Social costs	MDL M	0.00	-0.02	-0.04	0.02	0.01	0.00	-0.02	-0.02	-0.03	-0.04	-0.05	-0.07	-0.08	-0.09	-0.11
2	Shadow prices - electricity	MDL M	0.00	-0.02	-0.04	0.02	0.01	0.00	-0.02	-0.02	-0.03	-0.04	-0.05	-0.07	-0.08	-0.09	-0.11
B	**Social benefits**	**MDL M**	**2.51**	**12.56**	**10.05**	**6.95**	**6.96**	**6.97**	**7.51**	**7.60**	**7.69**	**7.78**	**7.88**	**7.98**	**8.08**	**8.19**	**8.30**
1	Tax correction - VAT	MDL M	1.12	5.58	4.47	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	1.40	6.98	5.58	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	0.06	0.07	0.08	0.62	0.71	0.80	0.89	0.98	1.08	1.19	1.29	1.40
4	Benefits of avoiding water related disease	MDL M	0.00	0.00	0.00	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89
C	**Net cash flow (inflow - outflow)**	**MDL M**	-1.94	-15.20	-12.10	6.21	6.53	6.76	7.98	8.34	8.67	9.02	9.39	9.78	10.19	10.61	11.06
D	**ENPV**	**MDL M**	**91.96**														
E	**ERR**	%	**23%**														

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Net cash flow (inflow - outflow)**	**MDL M**	**1.23**	**1.26**	**1.22**	**1.15**	**1.11**	**1.09**	**1.09**	**1.09**	**1.07**	**1.06**	**1.04**	**1.03**	**1.03**	**1.01**	**18.97**
1	Social costs	MDL M	-0.12	-0.14	-0.16	-0.18	-0.20	-0.23	-0.26	-0.29	-0.32	-0.35	-0.38	-0.42	-0.46	-0.49	-0.53
2	Shadow prices - electricity	MDL M	-0.12	-0.14	-0.16	-0.18	-0.20	-0.23	-0.26	-0.29	-0.32	-0.35	-0.38	-0.42	-0.46	-0.49	-0.53
B	**Social benefits**	**MDL M**	**8.41**	**8.42**	**8.42**	**8.43**	**8.44**	**8.44**	**8.45**	**8.46**	**8.47**	**8.47**	**8.48**	**8.49**	**8.49**	**8.50**	**8.51**
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	1.52	1.53	1.53	1.54	1.55	1.55	1.56	1.57	1.57	1.58	1.59	1.60	1.60	1.61	1.62
4	Benefits of avoiding water related disease	MDL M	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89
C	**Net cash flow (inflow - outflow)**	**MDL M**	9.77	9.81	9.81	9.76	9.75	9.77	9.80	9.83	9.86	9.88	9.91	9.94	9.98	10.01	28.01

Table 6-25: Sensitivity analysis

A	**Investment costs**	**%**	100%	105%	110.00%	115.00%	120.00%	125.00%
1	FNPV(C)	MDL M	-32.45	-35.80	-37.66	-39.53	-41.40	-43.27
2	FRR(C)	%	-0.74%	-1.04%	-1.08%	-1.12%	-1.15%	-1.19%
3	FNPV(K)	MDL M	0.00	-0.38	-0.76	-1.14	-1.52	-1.90
4	FRR(K)	%	5.0%	4.9%	4.7%	4.6%	4.5%	4.4%
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	-32.45	-33.93	-32.07	-35.64
2	FRR(C)	%	-0.7%	-1.00%	-0.79%	-1.16%
3	FNPV(K)	MDL M	0.00	0.00	1.86	-1.71
4	FRR(K)	%	5.0%	5.0%	5.7%	4.4%
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	-32.45	-33.93	-33.20	-34.47
2	FRR(C)	%	-0.7%	-1.00%	-0.91%	-1.06%
3	FNPV(K)	MDL M	0.00	0.00	0.73	-0.54
4	FRR(K)	%	5.0%	5.0%	5.3%	4.8%
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	-32.45	-33.93	-37.83	-33.06
2	FRR(C)	%	-0.7%	-1.00%	-1.44%	-0.96%
3	FNPV(K)	MDL M	0.00	0.00	-3.90	0.86
4	FRR(K)	%	5.0%	5.0%	3.6%	5.3%
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 transmission main "Micauti-Straseni"

N
W E
S

0 1 2
KILOMETRES

Legend

Name	Symbol
Boundaries of the town	
Boundaries of the village	
Existing well (Water inake PS-1)	Well
Existing water supply reservoir	Res
Existing water pumping station	PS
Existing water tower	WT
Existing water distribution network	
Existing water transmission main "Micauti-Straseni"	

Draguseni
Radeni
Zamcioji
WT 1xV=25m³
Well
Water intake PS-1, Micauti
105
109
123
140
109
100
Well
Well
Res 2xV=500m³
PS-2
Micauti
217
194
228
147
122
Chlorination station
Res 2xV=6000m³
(Negresti)
Section 5
Res 1xV=50m³
PS-4
Straseni
PS-3
Res 2xV=2000m³
WT 2xV=50m³
Siret

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Feasibility study for the improvement and extension of water supply and sewerage services in the town of Straseni

Existing water transmission main "Micauti-Straseni"

Scale:	Drawing No:	Date:	Annex:
1:20 000	1/6	18.12.2015	No.11

Format A1

Existing water supply system in the town of Straseni

N
W E
S

Water trasmission main
from Micauti

Chlorination station
Res 2xV=6000 m³
(Negresti)

PS-4
Res 1xV=50m³

PS-3
Res 2xV=2000m³

0 0.5 1
KILOMETRES

Legend

Name	Symbol
Boundaries of the town Straseni	
Existing water pumping station	PS
Existing water supply reservoir	Res
Existing water transmission main "Micauti-Straseni"	
Existing water distribution network	
Decommission water supply metalic reservoir	Res

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Existing water supply system in the town of Straseni

Scale:	Drawing No:	Date:	Annex:
1:10 000	2/6	18.12.2015	No.11

Format A2

Existing sewerage system in the town of Straseni

N
W E
S

NW

MWWPS

Legend

Name	Symbol
Boundaries of the town	
Existing main wastewater pumping station	MWWPS
Existing sewerage network	
Existing natural wetlands	NW

0 0.5 1

KILOMETRES

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Existing sewerage system in the town of Straseni

Scale:	Drawing No:	Date:	Annex:
1:10 000	3/6	18.12.2015	No.11

Format A2

Existing and proposed water transmission main "Micauti-Straseni"

N
W E
S

0 1 2
KILOMETRES

Legend

Name	Symbol
Boundaries of the town	
Boundaries of the village	
Existing well (Water inake PS-1)	Well
Existing water supply reservoir	Res
Existing water pumping station	PS
Existing water tower	WT
Existing water distribution network	
Existing water transmission main "Micauti-Straseni"	
Rehabilitation of water transmission main, Phase I	

Draguseni
Radeni
Zamcioji
WT 1xV=25m³
Well
Water intake PS-1, Micauti
Section 1
Section 2
Section 3
Section 4
Section 5
Well
Well
Res 2xV=500m³
PS-2
Micauti
Chlorination station
Res 2xV=6000m³
(Negresti)
Res 1xV=50m³
PS-4
Straseni
PS-3
Res 2xV=2000m³
WT 2xV=50m³
Siret

105 102 140 123 109 100 212 194 228 147 122

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Existing and proposed water transmission main "Micauti-Straseni"

Scale:	Drawing No:	Date:	Annex:
1:20 000	4/6	18.12.2015	No.11

Format A1

Existing and proposed water supply system in the town of Straseni

N
W E
S

Water trasmission main
from Micauti

Chlorination station
Res 2xV=6000 m³
(Negresti)

PS-4
Res 1xV=50m³

PS-3
Res 2xV=2000m³

0 0.5 1
KILOMETRES

Legend

Name	Symbol
Boundaries of the town Straseni	
Existing water pumping station	PS
Existing water supply reservoir	Res
Existing water transmission main "Micauti-Straseni"	
Existing water distribution network	
Decommission water supply metalic reservoir	Res
Extension of water distribution network, Phase I	

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Existing and proposed water supply system in the town of Straseni

Scale:	Drawing No:	Date:	Annex:
1:10 000	5/6	18.12.2015	No.11

Format A2

Existing and proposed sewerage system in the town of Straseni

N
W E
S

WWPS-1

NW

MWWPS

WWTP

Legend

Name	Symbol
Boundaries of the town	
Existing sewerage network	
Existing natural wetlands	NW
Point of connection	
Rehabilitation main wastewater pumping station, Phase II	MWWPS
Proposed wastewater treatment plant, Phase II	WWTP
Proposed wastewater pumping station, Phase II	WWPS
Extension of sewerage network, Phase II	
Extension of pressure sewerage network, Phase II	

0 0.5 1

KILOMETRES

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Existing and proposed sewerage system in the town of Straseni

Scale:	Drawing No:	Date:	Annex:
1:10 000	6/6	18.12.2015	No.11

Format A2