Modernization of local public services in the Republic of Moldova

- Intervention area 2: Regional planning and programming -

Feasibility study

for the project “Improving water supply and wastewater services in the town of Drochia”

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 Program
RtG	‘Ready-to-go’ Project

SCADA	Supervisory Control and Data Acquisition
SDI	State Design Institute
SEE	State Ecological Enterprise
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 authorized 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 provides the link between the water distribution network and internal piping of the buildings.

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

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

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

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

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

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

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

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

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

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

Water quality indicators –pollutants values, based on scientific researches, developed and updated by competent national authority. The concentration criteria and rec-

ommended values, or narrative descriptions that should not be exceeded for a water body to protect aquatic life or human health.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Water quality standard - concentrations/ maximum admissible values recommended or mandatory for chemicals and microorganisms in drinking water. These amounts are

established for the water used by municipalities (provided by public water supply systems), industrial and agricultural enterprises, and entertainment areas.

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

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

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

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

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

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

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

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

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 modernising service provision in water supply and sanitation, solid waste management, regional and local roads, and energy efficiency of public buildings sectors.

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

This Feasibility Study (FS) Report proposes a structured phasing of the **Priority Investment Programme (PIP)** and creating necessary conditions for further implementation of the PIP in **Drochia 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, as well as the Project, includes Drochia town only.

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

Problem statement and objective

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

- Insufficient area coverage of the WSS services. While most of the town of Drochia benefit from water supply, the wastewater services are provided only to a limited urban area;
- Unsatisfactory levels of service, including:
  - Continuity of water and wastewater services. Urban consumers have often interruptions supply due to bursts, leakages and insufficient network pressure. The average supply time is 16 hours per day. Certain parts of the town continuously suffer of sewer blockages.

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 results (around 57% in 2014) results in higher energy consumption for water pumping and consequently increased water tariffs;
- 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 is to extend the coverage and connection rates of the population connected to the regionalised water supply services by 5% from 95% to 100% of coverage rate and by 12% from 64% to 76% of connection rate, as well as increase of coverage and connection rates to wastewater services by 20% from 79% to 99% of coverage rate and by 12% from 47% to 59% of connection rate.

The aim of the first phase (the Project, 2015-2018) is to extend the access of the population to the water supply services by 5% from 95% to 100% of coverage rate and by 4% from 64% to 68% of connection rate.

Legal aspects

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

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

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

In this administrative-territorial unit the water supply and wastewater services are organised and monitored under the responsibility of Drochia Local Council. The operator of water supply and wastewater public services is Municipal Enterprise 'Apa–Canal' Drochia, whose sole founder is Drochia Local Council.

Municipal Enterprise operates under the Charter of Municipal Enterprise and legislation in force, ensuring continuous service and its quality to all consumers within the locality. The existing organisational structure of the enterprise will require changes in the future in order to cover the increasing demands of the service area by connecting new consumers.

This local services operator will have in the future as well the responsibility for providing water supply and wastewater services, making financial investments, renewals, billing procedures and revenue collection. Some modifications could be made only in case of local policy change regarding the management of the water supply and wastewater services in the town Drochia, through a decision taken by local deliberative authority.

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 in this study (Option Analysis, Financial Analysis, Environmental Assessment, etc.).

Investment framework:

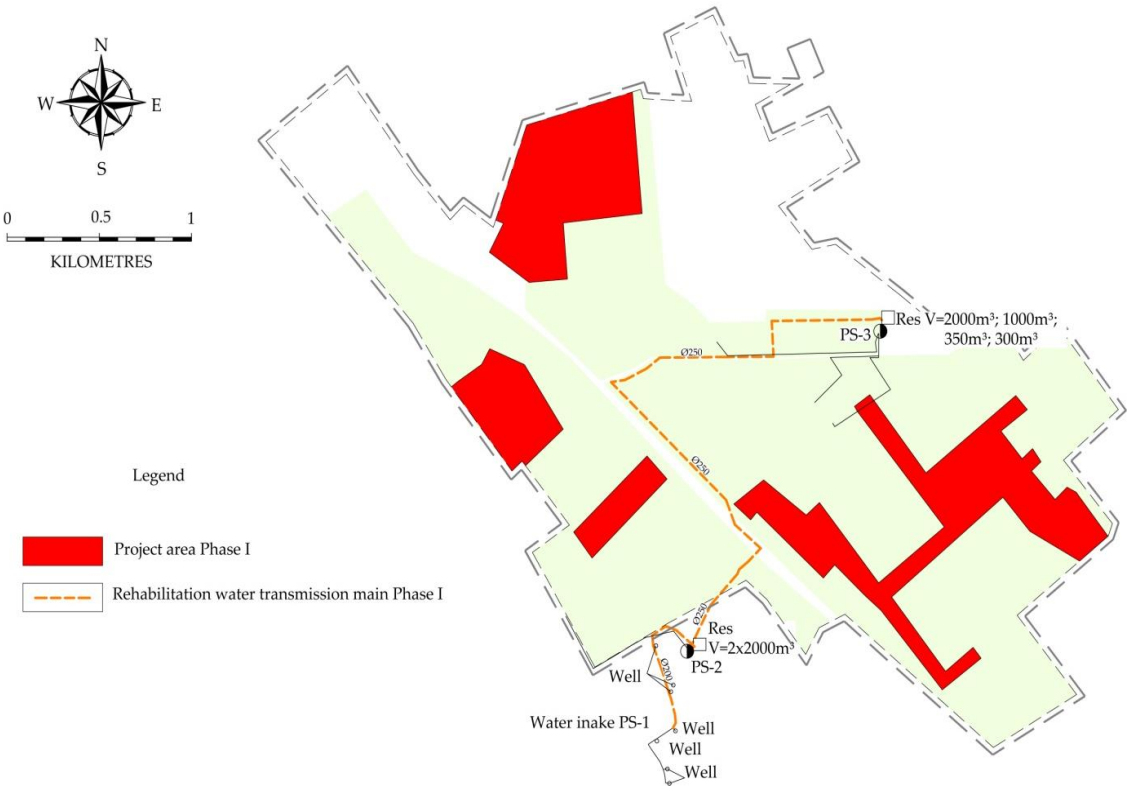
Water Supply:

Currently there are 13,177 people in Drochia Town connected to the existing water supply system (64% connection rate). There are no other localities supplied from the water supply system in Drochia Town and ME 'Apa-Canal' does not plan connecting neighbouring localities to the town water supply system. Currently there is no supply shortage in the service area of ME 'Apa-Canal' and the current production capacity is sufficient to cover the water demand until the year 2045. Further, the water quality for the service area complies with the national standards for drinking water quality. Although water capacities from the well-field are sufficient to supply the town in the long-term, it is recommended to develop strategies aiming at enhancing supply security for the town (second supply source) in the medium to long-term. One of the possible options for a second supply source is to connect Drochia Town to the existing regional transmission main from Soroca-Balti (EBRD financed 'Moldova North Water Project'). In the short-term highest priority within this Project is given to:

- The extension of the distribution system in order to increase the coverage rate to 100%;
- The rehabilitation of the distribution network as well as;
- The rehabilitation of the transmission main from the well-field to the reservoir at pumping station n°3 (PS-3).

It is noteworthy, that the proposed short-term measures are not in contradiction to the above mentioned 'Moldova North Water Project', but can be seen as complementary investment measures, which anyway would have to be implemented ('no-regret measures').

Figure 0-1: Scheme of proposed extensions of the water supply system, the town of Drochia



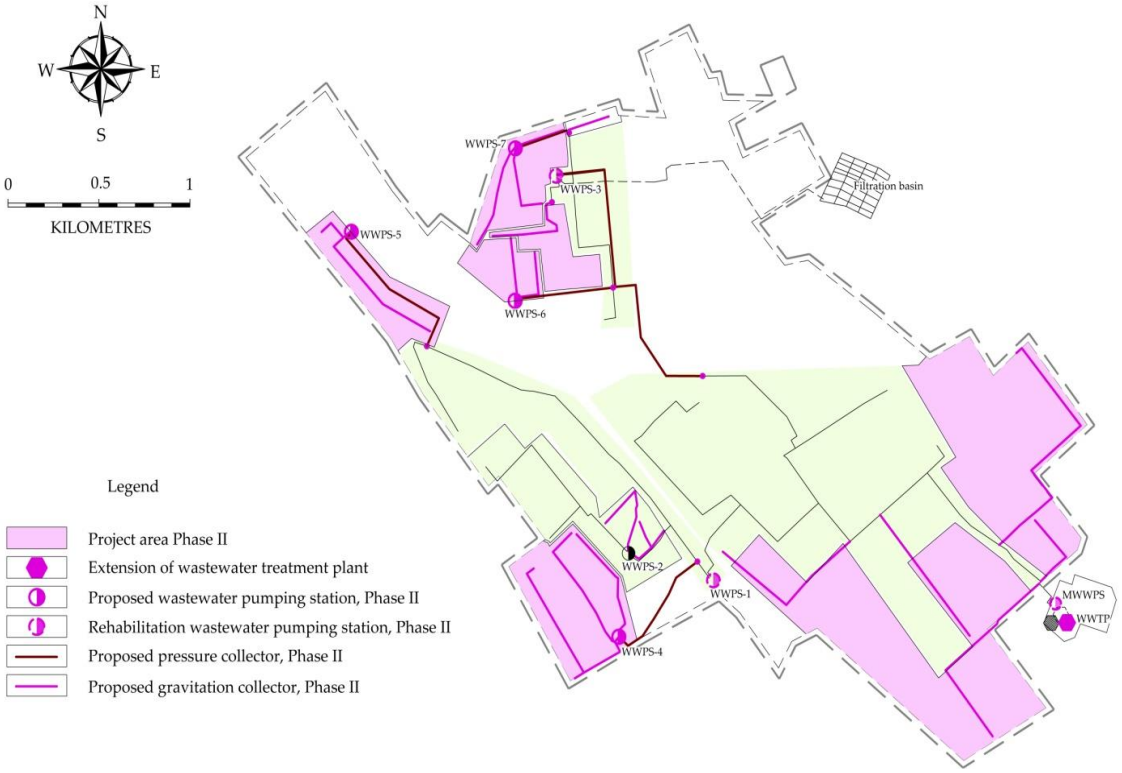
Source: GIZ/MLPS

Wastewater:

Currently Drochia Town is partly endowed with an existing wastewater system. About 47% of the population is currently connected to the sewerage network. The coverage rate in Drochia Town is projected to increase from currently 79% to 99% (the connection rate from 47% to 59% until the year 2021) and the wastewater load generated is projected to increase from currently 10,071 P.E. to 12,621 in 2021 and to 19,223 P.E. in 2030. This will require an extension[1] of the new WWTP (405 m³/day and 8,166 P.E. currently under construction) to a capacity of at least 2,416 m^3/day (19,223 P.E.) to treat the wastewater volume projected until the year 2030. In order to avoid overcapacities, a staged approach for developing the capacities of the WWTP in Drochia is recommended. A thorough agglomeration study (proposed to be included in Phase 1 of this project) has to be carried out for the entire rayon in order to assess which localities should be connected to the WWTP in the rayon town in the future.

[1] Or construction of a new WWTP (to be assessed in the technical assistance study proposed for Phase 1 of this project)

Figure 0-2: Scheme of proposed extensions of the wastewater system, the town of Drochia



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 13,857 people will benefit from the proposed measures. The total costs for measures proposed in Phase 2 amount to about 16.50 MEUR and 15,406 people will benefit from the measures. The total costs for Phase 1 and Phase 2 amount to 19.2 MEUR.

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

N°	Measures	Costs [€]	Benefit from project measures
1	Capital investment		
1.1	Rehabilitation of 4.29 km water transmission main	435,380	Level of service and efficiency improvement for all people covered with water supply system (20,362 people in 2018)
1.2	Extension of 8.16 km water distribution network including chlorination unit	779,830	Water supply coverage rate increased from 95% to 100% (967 additional people served). Improved bacteriological safety (water quality) for all people covered with water supply (20,362 people in 2018)
1.3	Rehabilitation of 7.73 km water distribution network	520,545	Level of service and efficiency improvement for all people covered with water supply (20,362 people in 2018)

N°	Measures	Costs [€]	Benefit from project measures
1.4	Equipment and tools	200,000	Level of service and efficiency improvement for all people connected to the water supply and wastewater system (13,857 people in 2018)
ST-1	Sub-Total capital investment	1,935,755	
2	Technical assistance	532,291	Level of service and efficiency improvement for all people connected to the water supply and wastewater system (13,857 people in 2018)
3	Contingencies (10%)	246,805	
GT-1	Total costs for Phase 1	2,714,850	Additional 967 people will be served with water supply. In total 20,362 people will benefit from the water supply and wastewater measures.

Source: GIZ/MLPS

Table 0-2: Proposed investment measures Phase 2

N°	Measures	Costs [€]	Benefit
1	Capital investment		
1.1	Extension of the sewer network by 35.7 km and construction of 4 new wastewater pumping stations (WWPS)	7,671,152	Wastewater coverage rate increased from 79% to 99% in Drochia Town (4,019 additional people served)
1.2	Rehabilitation of 13.65 km sewer network and 3 wastewater pumping stations (WWPS)	2,407,201	Level of service and efficiency improvement for all people covered with sanitation (20,042 people in 2021)
1.3	Extension of Wastewater Treatment Plant (WWTP) by additional 2,011 m^3/day (11,057 P.E.)	3,317,100	Improved environmental performance; compliance with effluent standards.
ST-1	Sub-Total capital investment	13,395,453	
2	Technical assistance	1,607,454	Level of service and efficiency improvement for all people connected to the water supply and wastewater system (15,406 people in 2021)
3	Contingencies (10% of 1+2)	1,500,291	
GT-2	Total costs for Phase 2	16,503,197	Additional 4,019 people will be served with sanitation. In total 20,042 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	Water supply & Wastewater, capital investments	1,935,755	13,395,453	15,131,208
2	Technical assistance	532,291	1,607,454	2,139,745
3	Contingencies	246,805	1,500,291	1,747,095
TOT	**Total costs Phase 1 & 2**	**2,714,850**	**16,503,197**	**19,218,048**

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' Drochia generated losses from operating activities between MDL 0.53 million to MDL 2.4 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 operator has no creditworthiness capacity at the moment.

The investment costs of the project are estimated to amount of MDL 56.41 million or EUR 2.71 million. It is planned that the project will be implemented during a period of 3 years. In the first year it is planned that the project will be implemented in proportion of 10%, in the second year it is foreseen 50% to be covered and in third year - 40%. The Summary of the investment costs are presented in the table below.

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

Project investment outlays	2015 (MDL mil.)	2016 (MDL mil.)	2017 (MDL mil.)	Total (MDL mil.)
	10%	50%	40%	
Rehabilitation of water transmission main pipeline	0.90	4.52	3.62	9.05
Extension of the water network	1.48	7.38	5.90	14.75
Rehabilitation of the water network	1.08	5.41	4.33	10.82
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	2.41	1.93	4.83
Technical assistance, supervision and capacity development	0.62	3.12	2.49	6.23
Contingency	0.51	2.56	2.05	5.13
Total	**5.64**	**28.20**	**22.56**	**56.41**

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 77.8% of the total investment costs that constitutes about EUR 2.13 million, while the local sources' contribution is 22.2%, which is about EUR 0.58 million.

In the development of the financial forecast of the project was used the weighted average tariff for providing services. The proposed tariffs take into account the cost coverage principle and the tariff affordability level. The cost coverage principle means that the tariff should cover the operational costs and capital costs.

The weighted average tariff for delivering water services is proposed to get increased slowly in time, beginning from 15.50 MDL/m^3 to approximately 23.65 MDL/m^3 in 2045.

During the implementation period of the investment project, when capital costs increase significantly and water sale is limited, it is proposed that the depreciation cost do not be included in the tariff. The total costs (the operational costs and depreciation cost) will be covered by the mentioned tariff beginning with the year 2022.

The weighted tariff for sanitation services is estimated to be around 11.32 MDL/m^3 in the period 2015-2022, and after that it will be approximately 9.70 MDL/m^3. As well, the tariff for wastewater services will not include the full depreciation cost in the period 2015-2020, because of high depreciation cost of new assets realized due to the implementation of investment project. 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 2.3%, 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 ME 'Apa-Canal' Drochia will be able to generate cumulative cash flow amounted to MDL 53.15 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 – 38.02 million), which emphasize that the project does not generate a return and is financially unprofitable. The economic net present value (ENPV) of the investment project calculated at a 5% discount rate is MDL 46.28 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[2], EUR	Contract type	Procurement method
1	Design, engineering and supervision for Phase 1 investments	255,520	Consulting services	Competitive
2	Construction works: Rehabilitation and extension of water supply network in Drochia town	1,909,331	Works	Open
3	Supply of equipment for operational performance improvement	220,000	Supply of goods	Shopping
4	Technical assistance: Corporate Development Programme, Stakeholder Participation Programme, Water Supply Network Analysis and Water Loss Reduction Programme, Medium to Long-term Sanitation Study	330,000	Consulting services	Competitive
GT	Total Amount	2,714,850		

Source: GIZ/MLPS

[2] Including Contingencies

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

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

1 Introduction

1.1 Preliminary and background

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

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

Currently, the Water Supply and Sanitation (WSS) sector is characterised by an inadequate mid-term financial planning and a lack of a coordinated systemic approach to the development of a pipeline of priority projects. In typical practice in Moldova, investment projects are often developed based on insufficient grounds, which leads to an increased risk to project sustainability. In order to address this situation, a Water Supply and Sanitation Regional Sector Programme (WSS RSP) was developed considering all relevant international, national and sector policy documents, with the intention of contributing to the implementation of the national Water Supply and Sanitation Strategy (2014-2028). The WSS RSP includes an analysis of the current situation in the sector in the development region, a set of sectorial 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 sectorial targets.

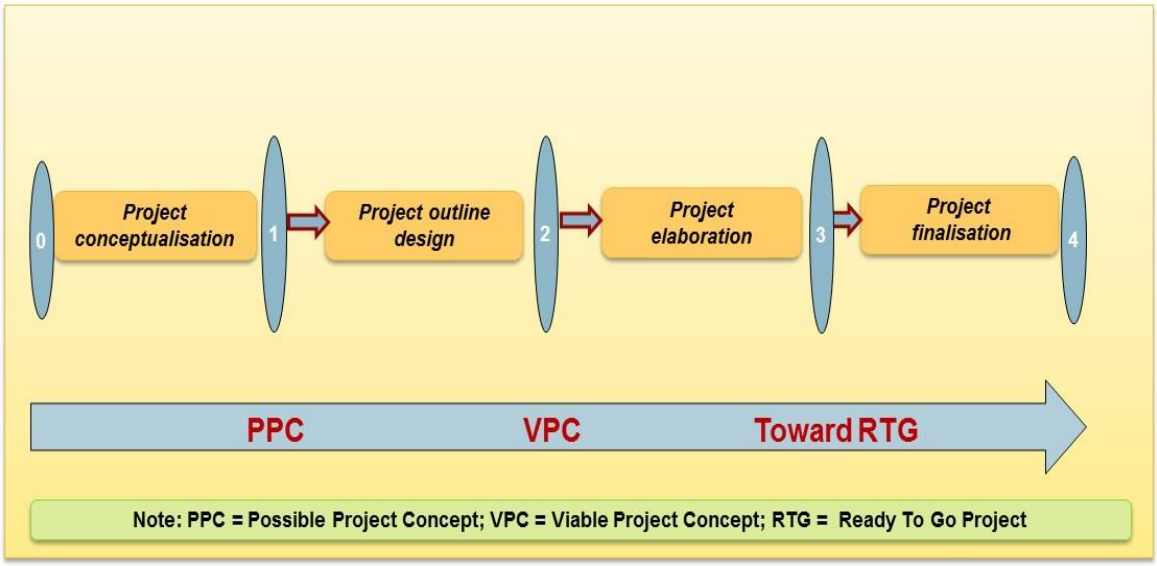
Based on the WSS sector development directions and criteria defined in the WSS RSP, a list of possible project concepts was defined for further project development.

1.2 Project Development Pathway

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

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

Figure 1-1: Project pipeline process in overview



Source: GIZ/MLPS

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**';
- **Stage 2 – Project Outline Design (PPC to Viable Project Concept – VPC)**
  Project ideas that respond to a specific problem or set of problems are developed into possible project concepts and presented in brief reports outlining the objectives to be achieved by each project. Initial estimates for investment and operating costs are provided. Any potential barriers and risks to the development of the project are identified and assessed.
  Projects at the end of this stage are considered 'Viable Project Concepts' and can be submitted to national and/or international agencies for further development and possible financing;
- **Stage 3 – Project Elaboration**
  Subject to availability of financial resources for further development, projects that contribute to the achievement of sectoral targets are further developed with a feasibility study, conceptual design, and EIA, as appropriate.
  Projects at the end of this stage are termed 'Viable Project Concepts at Pre-final Stage' and can be submitted to national and/or international agencies for 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

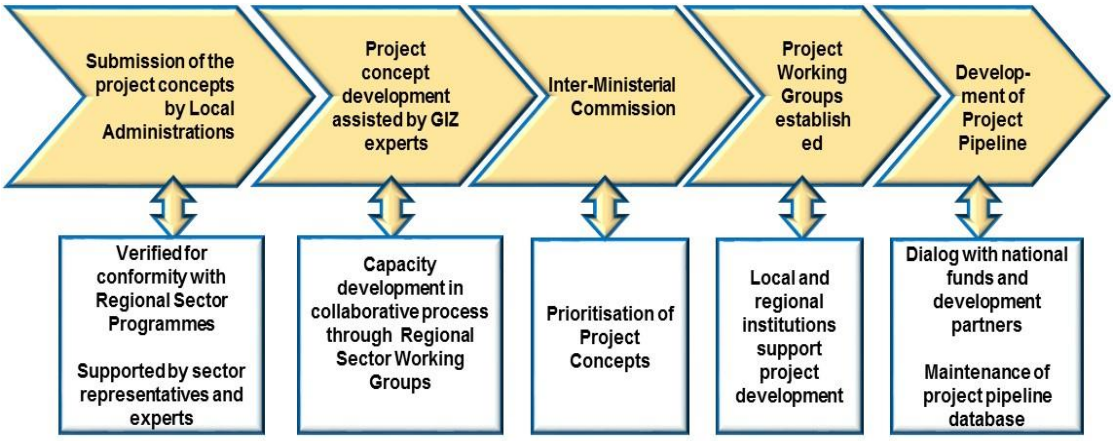
concluded during this stage. The future organisational and institutional set-ups must be clear and agreed so that they are ready for implementation during the investment period.

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 identified 12 projects as most compliant to commonly agreed WSS sector development criteria, as project economic efficiency, contribution to achievement of sector goals, scale of regionalisation etc. A preliminary **Priority Investment Programme** (*further PIP, Programme*), covering period of 2015-2021, for each PPC was approved by the Inter-Ministerial Committee and was further developed in the feasibility study phase (Stage 3).

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

Figure 1-2: Project development and implementation



Source: GIZ/MLPS

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 **Drochia 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 North (RDA North), the Drochia 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 Drochia 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 localities over 15,000 people (10,000 in sensitive areas). Applying the logic of the integrated service, this condition for wastewater systems is extended over the water supply service as well;
- Presence of source of treatable drinking water, including abstraction and treatment facilities. Water quality is essential to consumers;
- **Presence of functioning wastewater collection systems with wastewater treatment facilities**. As stated, the requirement of the UWWT Directive shall be considered and the proposed PIP shall tend to contribution to (at least) partial achievement of the requirements;
- **Agreement between beneficiaries and a sustainable WSS operator**. The inter-municipal cooperation between the potential project beneficiaries is a key to successful regionalisation of services. The current legal framework enforces the local public administrations to adopt the most appropriate way of provision of WSS service in their respective localities, and therefore a strong willingness of the LPAs is required to 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's capacities within the existing service area shall be supported in the first place, and in the in short- term followed by extension of services, not exceeding double the size of the ME Apa-Canal'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 Drochia Rayon, an agglomeration satisfying the WSS development criteria was identified in the area of the Rayon centre, **the town of Drochia**.

The Town of Drochia forms the PIP service area for development of the regionalised WSS services in the Rayon of Drochia, 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 Drochia**.

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

1.4 Identified problems

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

- Insufficient area coverage of the WSS services. While most of the town of Drochia benefit from water supply, the wastewater services are provided only to a limited urban area;
- Unsatisfactory levels of service, including:
  - Continuity of water and wastewater services. Urban consumers have often interruptions supply due to bursts, leakages and insufficient network pressure. The average supply time is 16 hours per day. Certain parts of the town continuously suffer of sewer blockages.

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 results (around 57% in 2014) results in higher energy consumption for water pumping and consequently increased water tariffs;
- 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 stages and provide appropriate measures split into implementation phases.

1.5 Study objective

The objective of the present Feasibility Study is the development of an affordable, 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 sanitation services for the Town of Drochia, 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 is to extend the coverage and connection rates of the population connected to the regionalised water supply services by 5% from 95% to 100% of coverage rate and by 12% from 64% to 76% of connection rate, as well as increase of coverage and connection rates to wastewater services by 20% from 79% to 99% of coverage rate and by 12% from 47% to 59% of connection rate. Also, other major effect of the PIP is the rehabilitation and improvement of existing water supply services for 5% of population connected and for 14% of population connected to wastewater services.

The aim of the first phase (the Project, 2015-2018) is to extend the access of the population to the water supply services by 5% from 95% to 100% of coverage rate and by 4% from 64% to 68% of connection rate. Also, other major effect of phase 1 rehabilitation and improvement of existing water supply services for 5% of population connected.

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	Extention-sion	Rehabilitation	Extension	Improve-provement	After PIP
Share of population directly benefitted from the rehabilitated and extended water supply services							
Urban	64%	5%	4%	0%	0%	9%	76%
Share of population directly benefitted from the rehabilitated and extended wastewater services							
Urban	47%	0%	0%	14%	12%	26%	59%
Non-Revenue Water Ratio, %	56%					16%	40%
Continuity of water service (hours/day)	24					24	24
Number of beneficiary localities covered by regional WSS services (urban/rural)	0/0	1/0	1/0	1/0	1/0		
Number of sustainable regional WSS operators instituted	0	1	1	1	1		

Source: GIZ/MLPS

2 Socio-economic aspects

2.1 Service Area

This Feasibility Study covers the area that includes the territory of the town of Drochia, as shown in Figure 2-1.

Figure 2-1: Map of feasibility study localities

Sursa: www.google.com/maps/place

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

Name of FS localities	Population	Area [km^2]
Drochia	20,500	18.3

Source: GIZ/MLPS

Drochia Rayon is situated in the north of the Republic of Moldova, bordering rayons of Donduseni to the north, Riscani to the west, Soroca to the east, Singerei to the south and Floresti to the south-east. The rayon centre is the town of Drochia.

Covering area of Drochia Rayon is about 999.91 km^2.

Drochia Rayon comprises 40 localities, including one town (Drochia), 27 communes and 12 localities.

The town of Drochia is situated in the north of the Republic of Moldova at a distance of approx. 167 km from Chisinau, bordering with the localities Tarigrad, Surii Noi, Baroncea Noua and Chetrosu.

The area of land fund covers 1,830 ha, of which:

- Agricultural land – 439.4 ha;
- Urban area - 864 ha;
- Forest land - 83 ha.

There is one lake with the area of 30 ha on the territory of town of Drochia.

2.2 Relief and climate conditions

The relief of the Drochia Rayon is specific for Moldovan Plateau and is characterised by plain area – North Plateau. The relief is mostly a hilly plain, strongly dismembered by valleys, with a general inclination in the North-West to the South-East. The landscape is heavily influenced by exogenous processes (landslides and erosion).

The prevailing soils in the Drochia Rayon are Chernozem and gray forest soils having an increased bonitation and high alkalinity level. The plain areas with Chernozom are usually planted with grains, sunflower, corn and sugar beet.

The hydrological network of the Drochia Rayon comprises Raut, Cubolta and Cainarca Rivers. With regard to Drochia town, it is one of the localities that have water resources characterized by increased levels of non-compliance with quality parameters (microbiological, chemical and quantitative).

The climate of Drochia rayon is temperate - continental. The summers are long and warm, with an average temperature of July of 20°C. Winters are cold, with average temperature in January of -5°C. Precipitations vary between 520 and 620 mm. The average annual temperature is 8°C.

2.3 Socio-economic aspects

The total official number of inhabitants of Drochia rayon is about 84,701; of which urban population about 20.500 thousand and rural population 64.201 thousand. Accordingly, the population density is 113.24 inhabitants per 1 km^2.

The ethnical structure of the population from Drochia rayon is the following: Moldovans – 74,044 people or 86.17%; Ukrainians – 9,842 persons or 11.31%; Russians – 1.644 persons or 1.88%; Gagauzians - 44 persons or 0.15% and others – 242 persons.

Vital statistics are provided in the following table:

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

	Born	Deceased	Natural Growth
Drochia Rayon	908	1,220	-312
Drochia Town	281	199	82
Rural Localities	687	1,021	-334

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

Town of Drochia is an administrative centre of Drochia rayon, with a total population number of cca.20.086, of which men – 9.641 people and women – about 10,031[3].

Currently, about 383 business entities are active in Drochia town.

The educational system of town of Drochia includes five pre-schools, two secondary schools (including one boarding school), four lyceums and one vocational school. There is a sport school in Drochia Town as well.

Town of Drochia includes the following cultural institutions: two public libraries, two houses of culture, one musical school and one arts school. There is one local TV station in the town and two newspapers are issued.

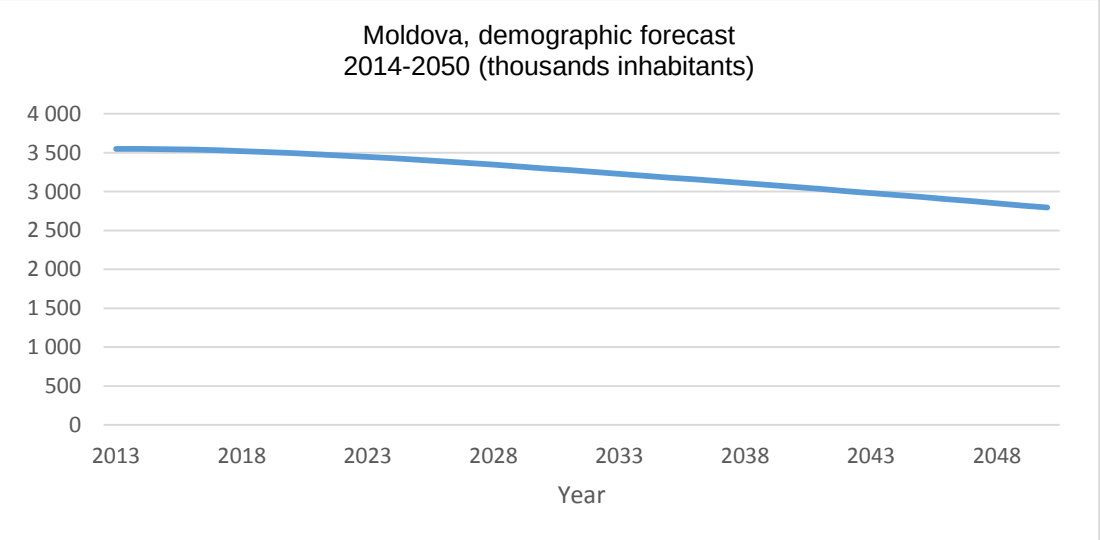
Health care system includes the rayon hospital, a Centre of Family Physicians and 16 pharmacies.

2.4 Population

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

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

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



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

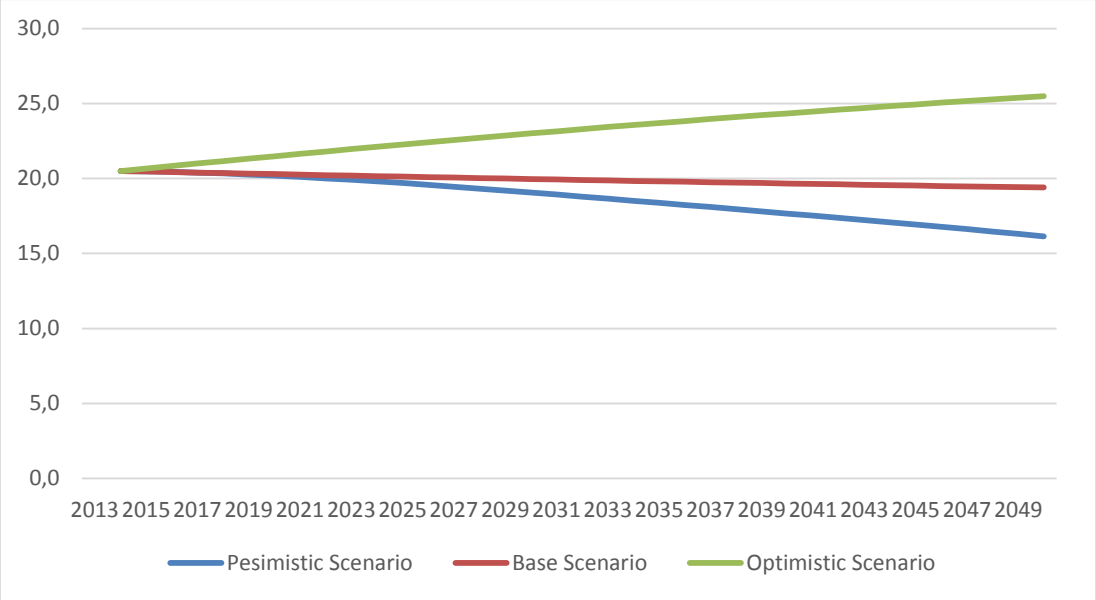
[3] Source: Drochia Municipal Services Utility, Drochia City Hall

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

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

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

Figure 2-3: Population forecast for town of Drochia, 2014-2050 (thousand persons)



Source: GIZ/MLPS

Further in this feasibility study (year 2015, with the expectancy that the detailed design year will be executed in 2016), the population forecast uses the base scenario. In conclusion, it is expected that the population of the town of Drochia will slightly decrease (from 20,500 in 2014 to 19,400 in 2050). Compared to the national prognosis and the population of the rayon, the population of Drochia will not decline as steep, the explanation being the rural-urban migration.

2.5 Employment

About 383 businesses operate in the town of Drochia, of which 60.8% are natural persons with the right of individuals (homesteads, individual businesses and patents), and 39.2% are legal persons (companies, state enterprises, municipal enterprises, associations of farms, households). Most businesses in the first mentioned group are small ones, aiming to develop a family business. Out of the total number of enterprises that

carry out their activities as legal persons, 92% are limited liability companies, 4% are joint stock companies, 3% are municipal enterprises (six) and 1% - cooperatives.

The majority of the population is engaged in trade (commercial enterprises - 65%), followed by the service sector - 13%, industry - 8%, business support - 7%, construction - 5% and only 2% in transport services.

In general, the industrial sector of the economy of Drochia town is based on agri-food industry enterprises processing sugar beet, tobacco, corn seeds, cereals, sunflower, fruit and vegetables, milk and meat etc. In Drochia town there is a production of modern furniture, industrial refrigerating equipment, wood and plastic packaging, garments, bakery and confectionery, bricks, precast concrete panels for the construction of houses. Many businesses and organisations provide various services to the population and perform various works.

The basis of the town's economy comprises 11 large industrial enterprises. Those are modern enterprises, which processes almost all types of agricultural products and deliver its goods throughout Republic of Moldova and to Romania, Ukraine, Russia, Belarus, etc.

The main enterprises and the main investors in the industrial sector of Drochia are Moldovan -German sugar-mill 'Sudzuker-Moldova' JSC, Moldovan -Greece tobacco factory 'Michailides Tobacco Moldova' JSC and 'Sorcatal-Nord' Ltd (milk processor and cheese producer). The first one is the biggest employer in the town where about 500 employees are working now.

Actually, the town's economy relies entirely on a few big enterprises that have advanced production technology achieving a high efficiency in raw materials' processing and providing high quality products. This presents a relatively high potential for economic development in the future. In the present the town of Drochia is in the process of implementing a socio-economic strategy for 2014-2020, that is aimed at facilitating the creation of modern enterprises with application of the state of art technologies.

For geographical reasons, the town has a high potential for development. However, this is possible only if the town can explore all opportunities by creating a favourable business environment and increasing investment attractiveness.

In general, the unemployment rate in the town of Drochia was of 5% in 2014 being higher than the average rate in Moldova (3.9% for 2014) and during 2011 – 2014 the unemployment rate slightly decreased with a small growth in 2014.

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

Year	2011	2012	2013	2014
Town of Drochia	5,85	4,29	4,37	5,0

Source: Drochia rayon statistical department

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

Year	2011	2012	2013	2014
Town of Drochia	12.065	11,963	11,856	11,804

Source: Drochia rayon statistical department

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

Year	2011	2012	2013	2014
Town of Drochia	706	514	519	591

Source: Drochia rayon statistical department

The largest employers are presented in the table below.

Table 2-6: The main employers in the town of Drochia

Compnay name	Company specialisation
'Sudzuker-Moldova' JSC	Food industry
'Bomi-Servis' Ltd	Trade
'Moldovatransgaz' Ltd	Services
'Sorcatal-Nord' Ltd	Food industry
'Michailides Tobacco Moldova' JSC	Food industry
'Holda Argintie'JSC	Trade
'Vehicul' JSC	Services
'Magcom-Gaz' Ltd	Services
'Antratit' Ltd	Trade
'Lukoil-Moldova' Ltd	Trade
'Magols' Ltd	Construction industry
'ColdProdCoop' Ltd	Trade
SP 'Universcoop'	Trade

Source: Drochia rayon statistical department

One of the objectives stated by local authorities and included in the Strategy mentioned above is creation of the modern enterprises with application of the state of art technologies, especially with the foreign investments. This is a good incentive for others to invest in the town economy in the future and speed up the economic development of the town of Drochia.

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 sanitation 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 North 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 household disposable average income is shown in the table below.

Table 2-7: Evolution of the household average income per capita/month by 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 Statistics

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 North region it was 1,738.69 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 17 MDL / m^3 = 30.60 MDL.

Comparing it to the average person income of 1,738.69, the affordability ratio reaches 1.8% 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[4].

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

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

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

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

[4] www.parlament.md

3.1.3 National legislation for water supply and wastewater public services

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

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

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

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

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

3.2 Administrative framework

3.2.1 At national level

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

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

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

The Ministry of Health oversees the population’s health and sets up priorities related to public health; promote provisions regarding health aspects into all public policies and

supports their effective implementation in other sectors to maximise health gains. The Ministry of Health establishes and monitors all aspects of water quality in the field of water supply and wastewater services sector.

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

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

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

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

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

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

3.2.2 At local level

In Republic of Moldova, the local government is organised on two levels: level 2 is the rayon public authorities, while the level1I is the public authorities in towns and localities. The water supply and wastewater public services are set up, organised and managed under the direction, coordination, supervision and responsibility of local public administrations of level 1, represented by local councils, as deliberative authorities, and mayors as executive authorities.

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

3.3 National policies in water supply and wastewater services sector

Up to 2013, there was essentially no planning in the WSS sector at national, regional and local level. Since then, a new sectoral strategy and regional sector programmes have been completed. Thus, the development of water supply and wastewater services sector is based on its principal document which is Water Supply and Sanitation Strategy (2014-2028) and other development policies of the Republic of Moldova, including the National Regional Development Strategy (2013-2015). This framework aims to improve national policies and harmonise the legal framework with the community acquis

and European standards. The National Regional Development Strategy sets out a number of directions of water supply and wastewater services sector development, including national targets for achieving the Millennium Development Goals.

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

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

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

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

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

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

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

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

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

3.4.1 Organisation and management of water supply and wastewater services

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

The operator of water supply and wastewater public services within the town of Drochia is Municipal Enterprise 'Apa-Canal' Drochia, hereinafter ME 'Apa-Canal' Drochia.

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 Drochia administrative-territorial unit.

Under the right to provide the water supply and wastewater services within the town of Drochia, Drochia Local Council has delegated the management and operation rights of the water supply and wastewater systems to the ME 'Apa – Canal' Drochia.

No water supply systems owned by individuals or private legal entities.

3.5 Organisation and management of the ME 'Apa-Canal' Drochia

ME 'Apa-Canal' Drochia 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 manager, who is responsible for coordination of all company activities and conducting regular coordination with Drochia mayor's office, being personally responsible to the company's board for meeting the performance indicators.

Three subordinated specialists from administration unit (head of the Legal and Sales Unit, Human resources officer, secretary) and three departments report directly to the manager:

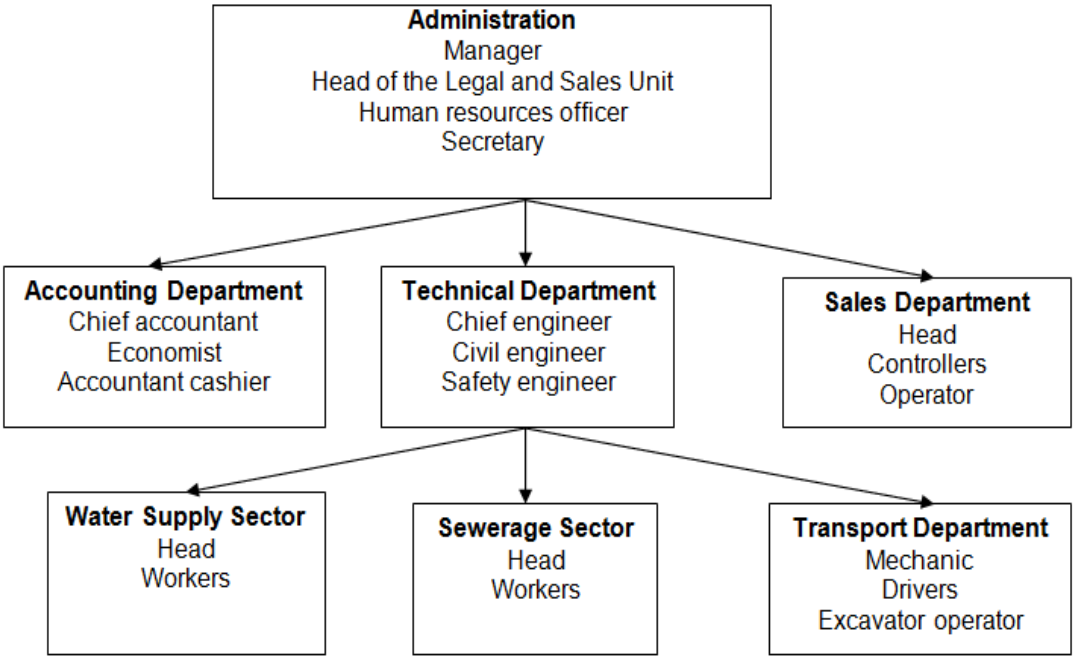
- Technical Department headed by chief engineer, responsible for the management of production sectors, elaboration of proposals for development, development of technical conditions for connection to water supply and wastewater networks;
- Accounting Department, responsible for accounting records management and working out of the accounting reports and analysis of financial and economic situation, calculation of tariffs and development of production program as well;
- Sales Department, responsible for issuing bills and keeping evidence of the payments made by consumers.

Two units and one department are subordinated to chief engineer, who is the manager for technical teams:

- Water Supply Sector that manages the water supply system of the town of Drochia;
- Sewerage Sector that manages the wastewater system of the town of Drochia;
- Transport Department that provides transport services to the production and administrative units.

The organisational structure of the ME 'Apa - Canal' Drochia is showed below:

Figure 3-1: ME 'Apa-Canal' Drochia (organisation chart)



Source: ME 'Apa-Canal' Drochia

3.6 Company staff and training needs

The organisational structure of the company includes 72 positions (according to the staff list) and actual 72 employees. The actual number of employees within the company enables compliance with the actual schedule and workload.

The occupancy rate within the company is high at 100%, while the staff turnover rate ranging from 4.5% to 12.7%.over the past two years.

The years of service at the company of the technical a financial staff shows a stable situation. The overwhelming majority of staff members (66 or 92% of the total) have more than 10 years of employment in the position, with an average of cca 13 years. Three key persons in the company (the head of Water Supply Sector, head of Sewerage Sector and head of the Legal and Sales Unit) have higher educations in water supply and sanitation, with work experience in the company of more than 20 years, and the relevant qualification for their duties. In general, 24% of the staff has a higher education, 41% - 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' Drochia does not have any strategic or planning document that includes a set of measures designed to increase staff capacities.

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

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

Training topic	Beneficiary
Strategic planning	Manager; chief engineer; economist
Investment planning and analysis of investment projects	Manager; chief engineer; heads of departments; economist; chief accountant
Human resources planning and development	Manager; human resources officer; economist
Performance indicators and staff motivation	Manager; chief engineer; heads of departments; human resources officer
Customer service management, public relations	Economist/Sales Department employees
Tariffs and costs calculation	Economist; chief accountant
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	Sales Department; controllers
Job retraining on 'Operation of water supply and wastewater systems', specialty 'Intervention and reconstruction works'	Plumbers/operators
Project management	Manager; chief engineer
Legislative aspects and standards in water supply and sanitation	Manager; chief engineer
Economic analysis in the field of water supply and sanitation	Economist; accounting department employees
Integrated accounting software use	Accounting department employees
Drawing up reports (statements) and annual financial statements regarding income tax	Economist
International Financial Reporting Standards	Economist
Cost management control and management reporting	Economist

Source: ME 'Apa-Canal' Drochia

4 Technical aspects - existing situation

4.1 General information

The assessment of the existing water supply and wastewater situation in the town of Drochia has been conducted by the GIZ/MLPS experts in collaboration with members of Project Working Group (PWG).

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

- Water supply and wastewater questionnaire prepared and distributed by GIZ/MLPS experts, and completed by Local Public Administrations (LPAs) and the ME 'Apa-Canal' Drochia;
- Project Working Group (PWG);
- Site visits conducted by GIZ/MLPS experts to verify the collected information and to inspect the existing water supply and sewerage facilities;
- Available pre-feasibility and feasibility studies, existing and implemented technical design project, 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 Drochia are provided by a single operator - ME 'Apa-Canal' Drochia.

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

Table 4-1: General information about feasibility study localities

No.	Locality	Population	Current situation and on-going 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.	Drochia	20,500	The coverage area of water supply system is about 94%. The connection rate is 64%.	19,395	13,177	The coverage area of wastewater system is about 79%. The connection rate is about 46%.	16,131	9,534

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

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 Drochia is provided in Annex 4.

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

No.	Locality/Public institution name	No. of institutions	Pupils/children/ places/beds	Connected to water supply system	Connected to centralised wastewater system
1.	Drochia				
	Kindergarten	5	1,232	yes	yes
	Schools	5	2,659	yes	yes
	Healthcare institutions	2	814	yes	yes

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

The business entities in the feasibility study localities are listed in table below (Table 4-3). More detailed information about business entities 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.	Drochia				
	Commerce	5	285	yes	yes
	Production	4	291	yes	yes
	Service area	1	670	own source	yes

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

4.3 Water supply system

Water is supplied 16 hours/day in the town of Drochia. Water supply services are provided to about 13,177 consumers (64%) out of 20,500 inhabitants.

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

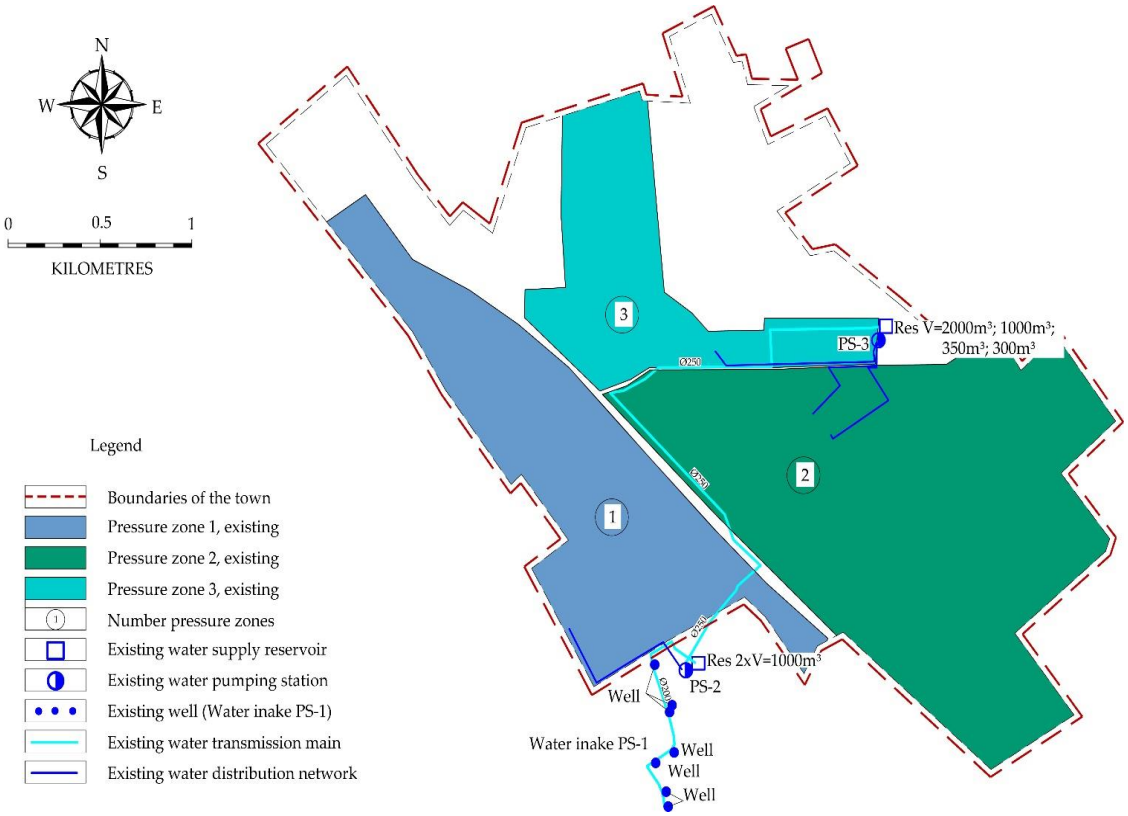
- Water source (water intake and deep wells) and first level pumping station (PS-I);
- Transportation of water, from water intake to the underground water reservoirs and further from underground water reservoirs to the distribution network (raw and drinking water transmission main);
- Underground water reservoirs with a volume of 1,000 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 firefighting purposes;
- Second level pumping station (PS-2), booster pumping station (PS-3), to ensure the required pressure in the water distribution network;
- Looped water distribution network, combined with branched one; and
- Underground water reservoirs with a volume of 300 m^3, 350 m^3, 1,000 m^3 and 2,000 m^3.

The water distribution network in the town of Drochia is divided in three pressure zones (pressure zone no.1, no. 2 and no. 3), as provided in Figure 4-1. The raw water from

deep wells is pumped and stored into the underground water reservoirs. Further, a part of the water volume, by the second level pumping station (PS-2) is pumped into the distribution network in pressure zone no.1 (Hospital district), and a part of water volume is pumped in four (4) underground water reservoirs, which further supplies the pressure zone no.2 and no.3 in the town of Drochia.

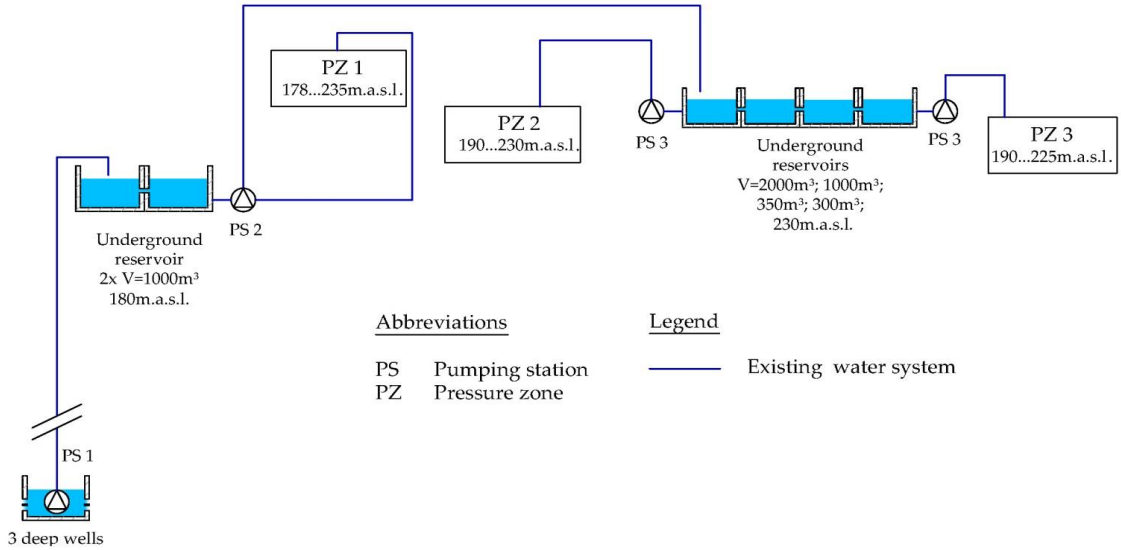
Scheme of water supply system in the town of Drochia is presented in Figure 4-1. More detailed information about the water supply system in the town of Drochia is provided in Annex 11.

Figure 4-1: Scheme of water supply system of the town of Drochia



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

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



Source: GIZ/MLPS

4.3.1 Water source

In the town of Drochia, the water intake includes seven (7) deep wells in operation drilled at an average depth of 230 m, of which three (3) are in operation, two (2) are as reserve and two (2) are suspended.

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	Year of instal-lation	Well no. in technical passport	Well depth (m)	Hydrostat-ic water level (m)	Hydrody-namic water level (m)	Yield ca-pacity (l/s)	Status
1.	1978	3861	230	95	101	6.95	in operation
2.	1967	4p	235	76	80	6.38	in operation
3.	1978	3881	230	105	111	11.94	in operation
4.	1951	435	140	-	-	10.00	suspended
5.	1971	939	235	-	-	23.00	reserve
6.	1967	16p	235	-	-	22.00	reserve
7.	1971	948	235	-	-	16.00	suspended

Source: ME 'Apa-Canal' Drochia

According to the obtained data, the quality of the raw water at well and drinking water in the distribution network do not comply with the 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') for following indicators: colour, ammonia and total hardness. The analysis of the raw water quality and drinking water quality in the distribution network provided by the ME 'Apa-Canal' Drochia, is present++ed in Table 4-5 and in Table 4-6.

Table 4-5: Raw water quality indicators (27 May, 2015)

No	Indicator	Unit	Max. concentration acc. to G.D. No 934	Raw water concentration (well no.3861)	Raw water concentration (well no.4P)	Raw water concentration (well no.3881)
1.	Smell	degree	acceptable for customers	-	-	-
2.	Taste	degree	acceptable for customers	-	-	-
3.	Colour	degree	acceptable for customers	6.8	5.6	6.2
4.	Hydrogen Index pH		≥ 6.5 ≤9.5	6.0	6.51	6.48
5.	Turbidity	degree	5	0.73	0.58	0.65
6.	Ammonia NH_4	mg/l	0.5	0.70	0.97	<0.05
7.	Nitrites (NO_2)	mg/l	0.5	<0.003	<0.003	<0.003
8.	Nitrates (NO_3)	mg/l	50	<0.1	<0.1	<0.1
9.	Total hardness	degree	5 German degree	24.5	17.9	1.8
10.	Total soluble dry sediment	mg/l	1,500	892	1021	792
11.	Chlorides	mg/l	250	25	54	98
12.	Sulphates	mg/l	250	201	214.5	213
13.	Fluorides	mg/l	1.5	0.49	0.51	0.5
14.	Iron	mg/l	0.3	<0.1	<0.1	<0.1
15.	Manganese	µg/l	50	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l

Source: ME 'Apa-Canal' Drochia

Table 4-6: Quality indicators for drinking water in distribution network[5]

No	Indicator	Unit	Max. concentration acc. to G.D. No 934	Drinking water quality (to PS-2)	Drinking water quality (to PS-3)	Drinking water quality (kindergarten no.3)	Drinking water quality (123, Biruința str.)
1.	Smell	degree	acceptable for customers	-	-	-	-
2.	Taste	degree	acceptable for customers	-	-	-	-
3.	Colours	degree	acceptable for customers	5.6	6.2	5.6	5.6
5.	Turbidity	degree	5	0.58	0.80	0.73	0.73
6.	Ammonia NH_4	mg/l	0.5	1.4	<0.05	<0.05	<0.05
7.	Nitrites (NO_2)	mg/l	0.5	<0.003	<0.003	<0.003	<0.003
8.	Nitrates (NO_3)	mg/l	50	<0.1	<0.1	<0.1	<0.1
14.	Iron	mg/l	0.3	<0.05	0.092	<0.05	<0.05

Source: ME 'Apa-Canal' Drochia

[5] 17 September, 2015

4.3.2 Water abstraction

Water abstraction facilities consist of:

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

The raw water from wellfield, composed of three (3) deep wells in operation is stored in two (2) underground water reservoirs with a volume of 1,000 m^3 each. The nominal parameters of submersible pumps are presented in Table 4-7.

Table 4-7: The nominal parameters of the submersible pumps in operation

No	No. in technical passport	Type	Flow rate (m^3/h)	Head (m)	Pump's power (kW)	Energy specific consumption [kwh/m^3]	Condition
1.	3861	ЭЦВ 8-25-150	25	150	16		in operation
2.	4p	ЭЦВ 8-25-150	25	150	16		in operation
3.	3881	ЭЦВ 10-63-150	63	150	45		in operation
4.	435	ЭЦВ 8-25-150					suspended
5.	939	ЭЦВ 8-25-150					reserve
6.	16p	ЭЦВ 8-25-150					reserve
7.	948	ЭЦВ 10-63-150					suspended

Source: ME 'Apa-Canal' Drochia

The main technical data on the existing underground water reservoirs with a volume of 1,000 m^3 are provided in Table 4-8.

Table 4-8: Main technical parameters of the existing underground reservoirs

No	Location	Year of construction	Type of reservoir	Capacity (m^3)	Quantity, no. of chambers	Condition
1.	On the PS-2 area	1986	rectangular	1,000	2	satisfactory

Source: ME 'Apa-Canal' Drochia

Figure 4-3: Underground water reservoir with a volume of 1,000 m^3 (PS-2 area) and with a volume of 300 m^3 (PS-3 area)

Source: GIZ/MLPS

4.3.3 Water pumping stations

By the second level pumping station PS-2, the water is pumped partly into water distribution network in the pressure zone no. 1 (Hospital district) and partly in the underground water reservoirs with a volume of 300 m^3, 350 m^3, 1,000 m_3 and 2,000 m^3 located on the third level pumping station PS-3 area, by which water is supplied in the pressure zone no. 2 and no. 3 situated in the town of Drochia.

The water supply system in the town of Drochia is equipped with water meter nodes, which records the volume of water at the inflow and outflow on the second level pumping station SP-2, as well as at the inflow and outflow on the third level pumping station PS-3.

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	Type	Flow rate (m^3/h)	Head (m)	Power (kW)	Energy specific consumption [kwh/m³]
1.	PS-2	1986	2011	DAB NT25-250	110	80	45	
2.				D200-90	165	90	90	
3.	PS-3	1986	2005	DAB K50-800T	24-78	25	12,75x3	

Source: ME 'Apa-Canal' Drochia

Figure 4-4: PS-2: Pump unit NT25-250. Branching node for water supply in Hospital district and underground water reservoirs in the PS-3 area

Source: GIZ/MLPS

Figure 4-5: PS-2: water meter node which records the raw water volume at the inflow and at the outflow of pumping station

Source: GIZ/MLPS

Figure 4-6: Third level pumping station PS-3: pump unit DAB K50-800T

Source: GIZ/MLPS

Figure 4-7: PS-3: water meter node which records the volume of water at the inflow and at the outflow of pumping station

Source: GIZ/MLPS

4.3.4 The water disinfection

The raw water is disinfected by chloride of lime into underground water reservoirs with a volume of 1,000 m^3 each located at the second level pumping station PS-2.

The chloride of lime is stored in closed barrels in a well ventilated dry room. Initially, the required amount of chloride of lime for disinfecting is determined experimentally, further introduced into mentioned above reservoirs.

4.3.5 Water storage facilities

The water storage capacity of the existing water supply system in the town of Drochia can be considered as enough and in a satisfactory technical condition.

The main technical data on the existing underground water reservoirs are provided in Table 4-10.

Table 4-10: Main technical parameters of the existing underground water reservoirs

No.	Location	Year of con-struction	Type of reservoir	Capacity (m^3)	Quantity/No. of chambers	Condition
1.	On the PS-3 area	1986	rectangular	300	1	satisfactory
2.		1986	rectangular	350	1	satisfactory
3.		1986	rectangular	1,000	1	satisfactory
4.		1986	rectangular	2,000	1	satisfactory

Source: ME 'Apa-Canal' Drochia

4.3.6 Water distribution network

The water distribution network in the town of Drochia consists of steel, cast iron, asbes-tos-cement and high density polyethylene (HDPE) pipes with diameters of between 100 mm and 250 mm. The total length of water distribution network is about 65,870 m, as provided in Table 4-11. The length of water distribution network for different diameters expressed as a percentage, is provided in Table 4-12.

Table 4-11: Main technical parameters of water distribution network

No	Material	Length (m) / diameter (mm)						Length (m)	Pipe's age (years)	Total length (m)
		250	200	160	150	110	100			
1.	Cast iron	33,012	10,700		1,440			45,150	31	65,870
2.	Steel		2,702		1,280		5,780	9,770	30	
3.	Asbes-tos-cement		260		1,920		1,350	3,530	30	
4.	HDPE			1,800		5,620		7,420	10	

Source: ME 'Apa-Canal' Drochia

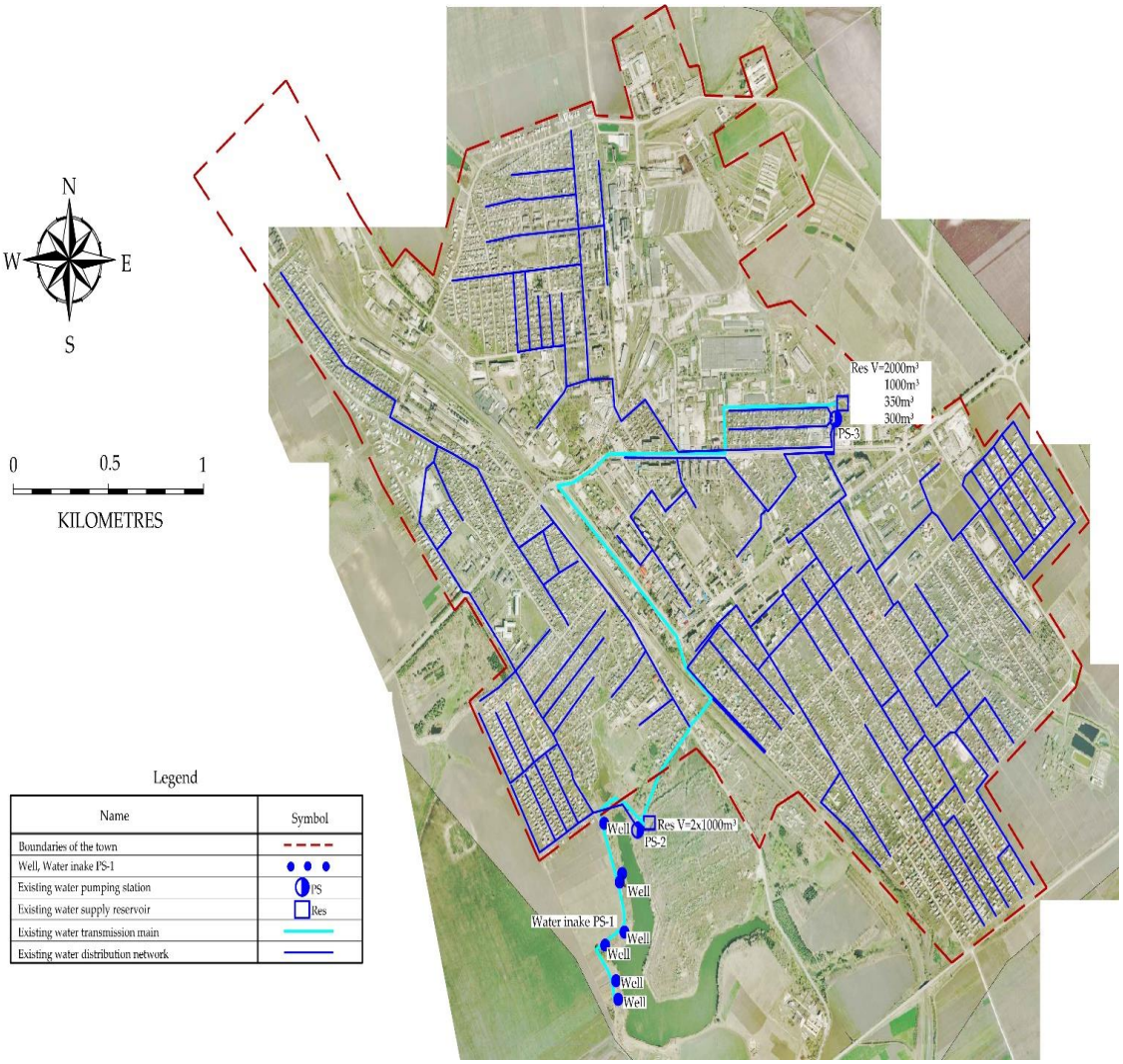
Table 4-12: Percentage of water distribution network by diameter size

No.	Material	Network length (m) by diameter size (mm)		Length (m)	Age (years)	Total (%)
		250 – 200 mm	160 – 100 mm			
1	Cast iron	43,712	1,440	45,150	31	69
2	Steel	2,702	7,060	9,770	30	15
3	Asbestos-cement	260	3,270	3,530	30	5
4	HDPE		7,420	7,420	10	11
	Total	**46,674**	**11,770**	**65,870**		**100**

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

The water distribution network in the town of Drochia is provided in Figure 4-8. More detailed information about water distribution network in the town of Drochia is provided in Annex 11.

Figure 4-8: Water distribution network in the town of Drochia



Source: www.geoportal.md, ME 'Apa-Canal' Drochia, GIZ/MLPS

4.4 Water balance

The data necessary for water balance calculation were provided by the ME 'Apa-Canal' Drochia and included the following details: monthly volumes of the abstracted raw water, monthly volumes of water sold to domestic consumers, monthly volumes of water sold to public institutions and business entities.

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

4.4.1 The monthly volume of the abstracted raw water

According to the information provided by the ME 'Apa-Canal' Drochia, the monthly volume of the abstracted raw water is determined according to the water meters data from the raising pipe located at the first level pumping station (PS-1), as provided in Table 4-13.

4.4.2 Water consumption

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

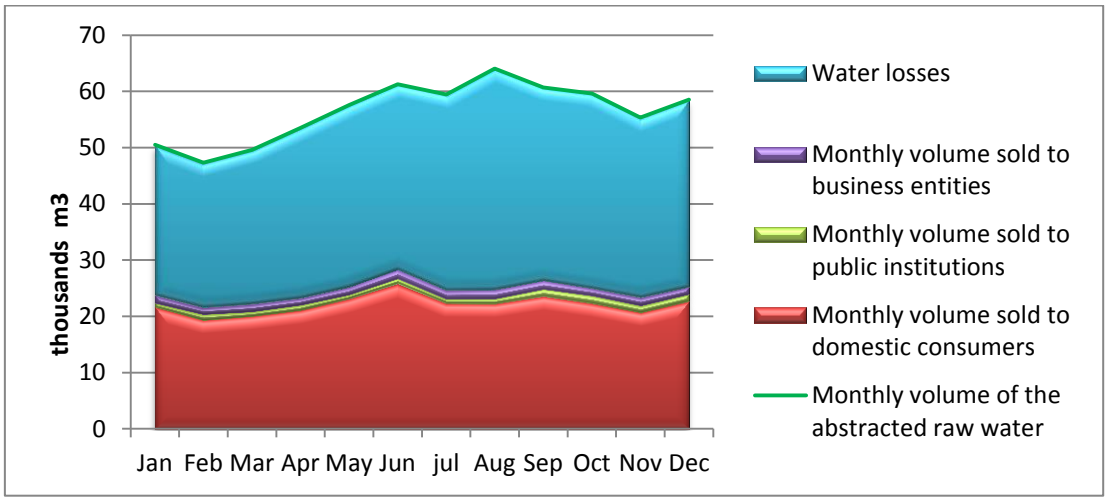
Operational indicators for 2014, presented by the ME 'Apa-Canal' Drochia, are provided in Table 4-13.

Table 4-13: Operational indicators for 2014

No	Month	Schedule of water supply (hours/24 hours)	Monthly volume of the abstracted raw water (water production) (m^3)	Volume of water sold, m^3		
				Domestic customers	Public institutions	Business entities
1.	January	24	50,489	21,671	804	1,406
2.	February		47,327	19,381	1,120	1,229
3.	March		49,589	20,080	886	1,386
4.	April		53,536	21,086	1,035	1,231
5.	May		57,578	23,052	822	1,449
6.	June		61,239	25,702	987	1,664
7.	July		59,428	22,259	887	1,563
8.	August		64,056	22,222	953	1,638
9.	September		60,676	23,546	1,315	1,553
10.	October		59,595	22,286	1,392	1,381
11.	November		55,336	20,698	1,283	1,479
12.	December		58,559	22,704	1,287	1,388
13.	**Total**		**677,408**	**264,687**	**12,771**	**17,367**

Source: M.E. 'Apa-Canal' Drochia

Figure 4-9: Operational indicators



Source: ME 'Apa-Canal' Drochia, 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 consumers 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 4-14.

Table 4-14: The real water consumption

No.	Indicator	Unit of measurement	Year		
			2012	2013	2014
1.	Number of domestic customers	pers.	7,520	7,631	13,177
2.	The annual volume of abstracted raw water	m³	669,404	669,414	677,408
3.	Total water sold by the utility, of which: • Domestic consumers • Public institutions and business entities	m³ m³ m³	290,399 258,964 31,435	321,171 290,469 30,702	294,825 264,687 30,138
4.	Real water consumption (based on daily sold water)	l/c/d	106	115	61
5.	Real water consumption (based on daily water sold to domestic consumers)	l/c/d	94	104	55

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

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 to domestic consumers, public institutions and business entities.

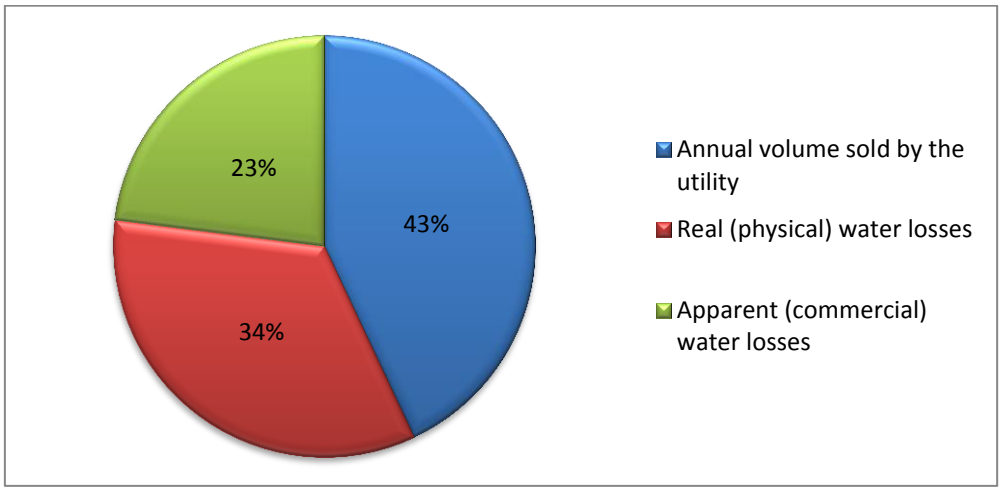
The water balance for water supply system in the town of Drochia is provided in Table 4-15.

Table 4-15: The water balance for water supply system in the town of Drochia

No.	Indicator	Unit of measurement		2014	
1.	Number of domestic consumers	pers.			13,177
2.	Annual volume of abstracted raw water	m³			677,408
3.	Annual volume of water sold	m³			294,825
4.	The annual volume of NRW, including:	m³	%	382.583	57
	• Real (physical) water losses (60% of NRW)	m³	%	286.937	42
	• Apparent (commercial) water losses (40% of NRW)	m³	%	95.646	14

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

Figure 4-10: Water balance



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

With the purpose 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);
- Identifying the network sections with an advanced degree of wear or damage;
- Rapidly detect hidden water losses; and
- Maintain the records related to damages/ leaks and their quick remedy.

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

- Install high precision water meters;
- Identify and replace defective water meters; and
- Water meters installed for consumers of public institutions and business entities must be subjected to metrological control after two (2) years of wear and as appropriate to be replaced.

4.4.5 Water metering

During the period 2007-2009 was carried out the water metering of about 75% of customers in single-family dwellings, 99% of multi-story apartment buildings consumers, 100% of public institutions and business entities in the town of Drochia. The installed water meters are in average 15% of class 'A', 55% of class 'B' and 40% of class 'C'. Besides, 10% of water meter nodes are installed on the water distribution network for water losses metering or water consumption per districts metering.

4.4.6 Equipment and facilities

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

- Pressure logger and manometers for network pressure recording (twenty (20) units);
- Water transportation truck with a tank volume of 6 m^3 ZIL-130 (one (1) unit); and
- Drainage truck (e.g. with mixed functions of vacuum suction and pipelines cleaning) and other facilities for sewerage network maintenance (two (2) units).

4.5 Technical and operational analysis of the water supply system

4.5.1 Non-revenue water (NRW)

Non-revenue water 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 raw and drinking water transmission mains is high, causing large leaks in the water supply system (about 9-10% on the raw water transmission main from PS-1 to PS-2 and about 25-40% on drinking water transmission main from PS-2 to PS-3) in the town of Drochia. The statistics on damages and repairs in the period 1 January 2014 – 31 December 2014 are provided in Tables 4-16 and 4-17.

Table 4-16: Statistics of damages in the period January 01, 2014 - December 31, 2014

No.	Location	Pipeline breakdowns
1.	On raw water transmission main	7
2.	On water transmission main	9
3.	On water distribution network	383

Source: ME 'Apa-Canal' Drochia

Table 4-17: Statistics on repairs made, 1 Jan-31 Dec 2014

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

Source: ME 'Apa-Canal' Drochia

4.6 Wastewater system

About 9,534 consumers out of 20,500 inhabitants are connected to the centralised wastewater system, connection rate for wastewater services is about 46%.

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

- Gravity sewerage network, as well pressure sewerage networks;
- Wastewater pumping stations (one (1) main wastewater pumping station (MWWPS) installed on the WWTP area and three (3) local wastewater pumping stations located in the Ghica Voda street (WWPS-1), in the Toporceanu street (WWPS-2) and in the Barbu Lautaru street (WWPS-3)); and
- Wastewater treatment plant (WWTP).

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

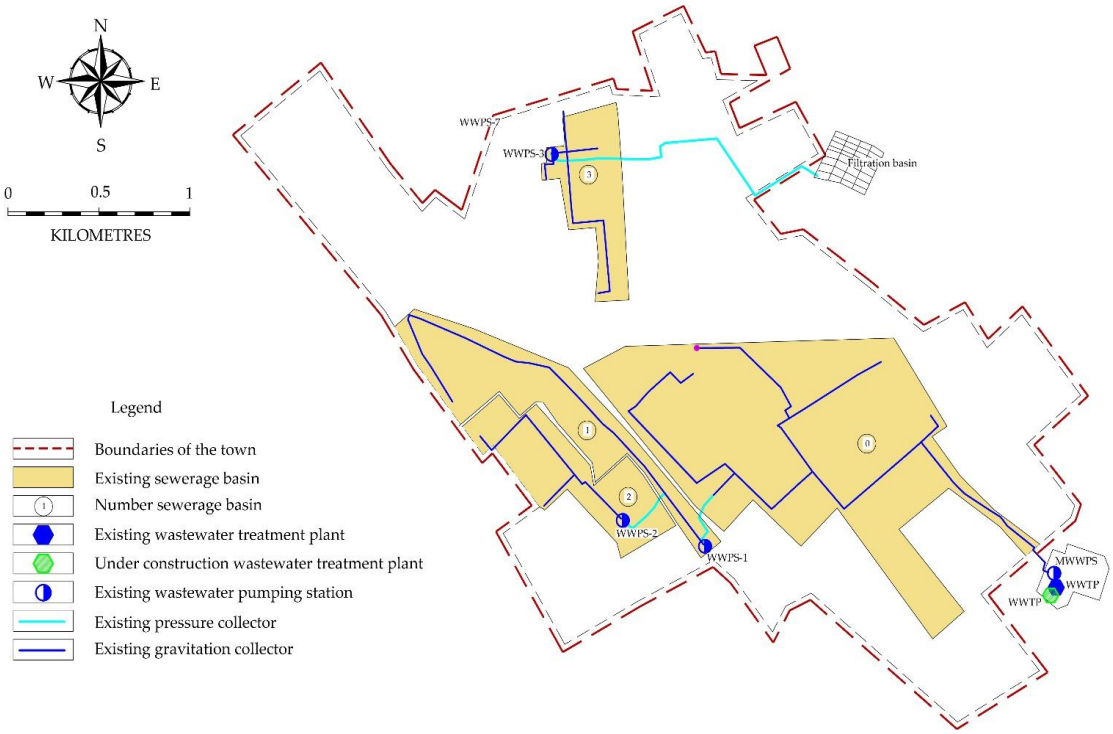
The wastewater basin represents a defined territory, from which the wastewater is collected to a sewerage network.

The wastewater from the existing wastewater basin no. 1 is collected by gravity to the wastewater pumping station (WWPS-1) located in the Ghica Voda street, and further pumped by pressure pipes to the main wastewater pumping station (MWWPS) located in the town of Drochia.

The wastewater from the existing wastewater basin no. 2 is collected by gravity to the wastewater pumping station (WWPS-2) located in the Toporceanu street, and further pumped by pressure pipes to the main wastewater pumping station (MWWPS) located in the town of Drochia.

The wastewater from the existing wastewater basin no. 3 is collected by gravity to the wastewater pumping station (WWPS-3) located in the Barbu Lautaru Street, and further pumped by pressure pipes to the biologic ponds.

Figure 4-11: The scheme of wastewater system in the town of Drochia



Source: ME 'Apa-Canal' Drochia

4.6.1 Sewerage network

The total length of gravity sewerage is about 36,490 m. The main technical parameters of the gravity sewerage network are provided in Table 4-18. The total length of pressure sewerage is about 9,009 m. The main technical parameters of the pressure sewerage network are provided in Table 4-19. The length of sewerage network for different diameters expressed as a percentage is provided in Table 4-20.

Table 4-18: Main technical parameters of gravity sewerage network

No	Material	Length (m) / diameter (mm)							Length (m)	Pipe's age (years)	Total length (m)
		100	150	200	250	300	350	400			
1.	Cast iron	1,066	2,567	4,887	5,353				13,873	31	36,490
2.	Ceramic	1,000	2,135	5,040					8,175	30	
3.	Asbestos-cement		3,000			5,413	3,300		11,713	30	
4.	Reinforced concrete							2,729	2,729	30	

Source: ME 'Apa-Canal' Drochia

Table 4-19: Main technical parameters of pressure sewerage network

No.	Material	Length (m) / diameter (mm)		Length (m)	Pipe's age (years)	Total length (m)
		150	200			
1.	Cast iron	3,576	5,413	9,009	30	9,009

Source: ME 'Apa-Canal' Drochia

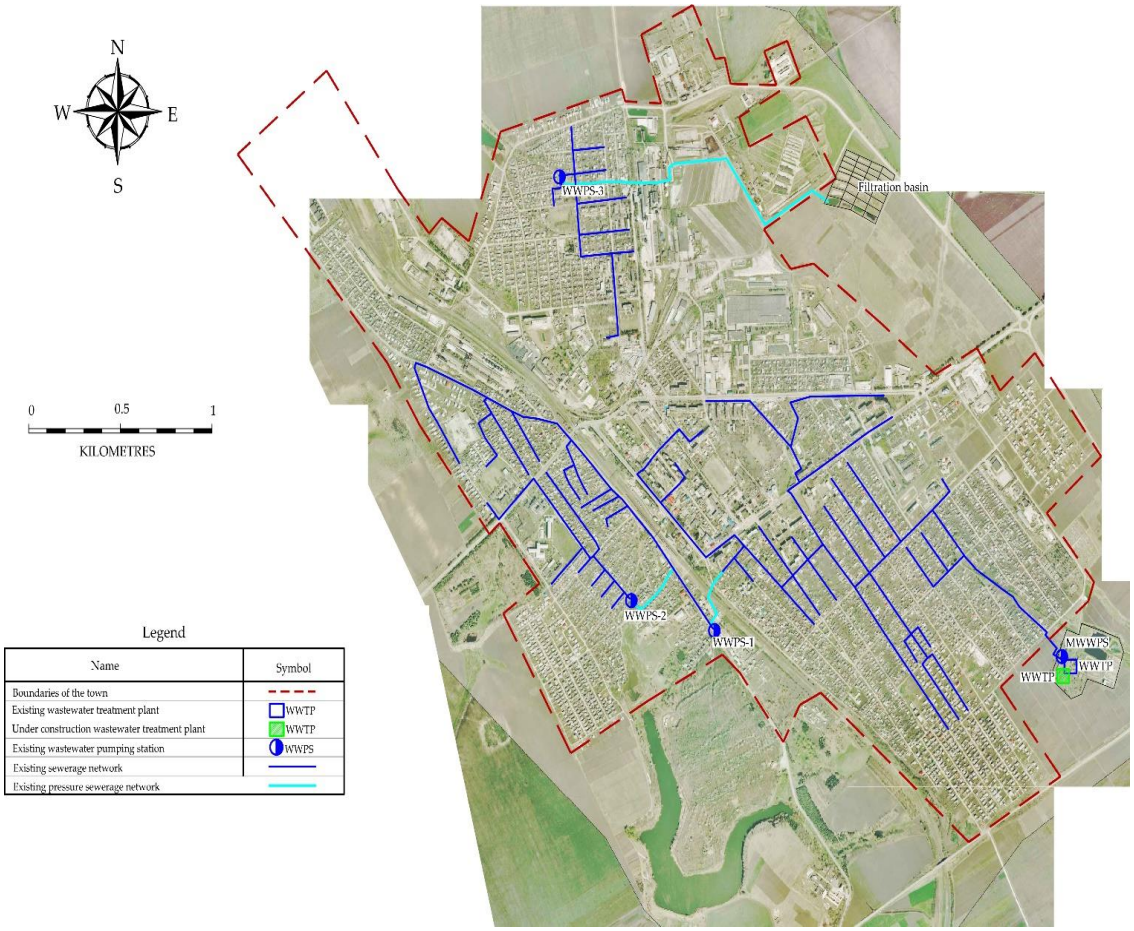
Table 4-20: Percentage of water distribution network by diameter size

No.	Material	Network length (m) by diameter size (mm)		Length (m)	Age (years)	Total (%)
		800 – 250 mm	200 – 65 mm			
1.	Cast iron	13,816	9,046	22,862	31	50
2.	Ceramic	3,135	5,040	8,175	30	18
3.	Asbestos-cement	3,000	8,713	11,713	30	26
4.	Reinforced concrete		2,729	2,729	30	6
	Total	**19,951**	**25,528**	**45,479**		**100**

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

The sewerage network in the town of Drochia is provided in figure 4-12. More detailed information is provided in Annex 11.

Figure 4-12: Sewerage network in the town Drochia



Source: www.geoportal.md, ME 'Apa-Canal' Drochia, GIZ/MLPS

4.6.2 Wastewater pumping stations

The wastewater pumping stations are located in the lower part of wastewater basin, where the gravity collection is impossible because of the topography in the area.

The technical parameters of the wastewater pumping stations and pumps are presented in Table 4-21.

Table 4-21: Technical parameters of pumping equipment

No.	PS name	Year of installation	Year of rehabilitation	Pump type	Pump flow rate (m^3/h)	Head (m)	Pump power (kW)	Condition
1.	MWWPS	1968		CD 160-45	160	45	40	unsatisfactory
2.	WWPS-1	1987		CM 160-45	160	45	30	unsatisfactory
3.	WWPS-2	1984	2005	WILO FA 08.64E	11,2	27	5,5	satisfactory
4.	WWPS-3	1968		SM 160-45	160	45	30	unsatisfactory

Source: ME 'Apa-Canal' Drochia

Figure 4-13: Main wastewater pumping station MWWPS: Receiving tank. Engine room

Source: GIZ/MLPS

Figure 4-14: Wastewater pumping station WWPS-1: station building, engine room

Source: GIZ/MLPS

Figure 4-15: Wastewater pumping station WWPS-2: Receiving tank. Engine room

Source: GIZ/MLPS

Figure 4-16: Wastewater pumping station WWPS-3: Receiving tank. Engine room

Source: GIZ/MLPS

Figure 4-17: Biological ponds

Source: GIZ/MLPS

4.6.3 Wastewater treatment plant

The wastewater treatment plant is located at about 2 km in the southeast part from town centre and was putted into operation in 1968, with a design capacity of 3,500 m³/day. At present, the capacity of wastewater treatment plant 620 m³/day.

Wastewater treatment includes the following processes: mechanical treatment, biological treatment, tertiary treatment, and disinfection level.

The technological scheme of wastewater treatment includes the following facilities:

- Energy dissipater;
- Horizontal grit chambers (two (2) units);
- Sand drying beds (two (2) units);
- Primary settlers (four (4) units);
- Biological filters (two (2) units with four (4) sections);
- Secondary settlers (two (2) units);
- Sludge drying beds (four (4) units);
- Biological ponds (two (2) units);
- Chlorination plant; and

- Warehouse and workshop.

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

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

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

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

The sand trapped sludge (dredged sludge) is non-decayed and it is subjected to dewatering on the sand platforms. The technological scheme includes two (2) sand drying beds, of which only one is in operation.

Figure 4-18: Wastewater treatment plant. Energy dissipater. Horizontal grit chamber

Source: GIZ/MLPS

Figure 4-19: Wastewater treatment plant. Sand drying beds

Source: GIZ/MLPS

The primary settlers are designed to gravity sedimentation of particles smaller than 0.2 mm, especially of organic suspended solids. The technological scheme includes four (4) primary settlers.

Figure 4-20: Wastewater treatment plant. Primary settlers

Source: GIZ/MLPS

Biological treatment or secondary treatment uses the biological activity of microorganisms in order to oxidise and mineralise the organic matter from wastewater, which previously had been subjected to the primary treatment. The removal of organic matter dissolved in the wastewater is carried out by its absorption on the cell area, microorganisms, especially bacteria. As a result, the new bacteria cells and so-called metabolites (carbon dioxide, mineral salts) are formed. The technological scheme includes two (2) biological filters with four (4) sections.

Figure 4-21: Wastewater treatment plant. Biological filters

Source: GIZ/MLPS

The secondary settlers are designed to remove the grown microorganisms from wastewater, (usually as a biological membrane) in the biological filters. Sedimented sludge is stored on the sludge drying beds for dewatering, which aims to reduce humidity from 93 – 98% up to 70 – 80%. The technological scheme includes two (2) secondary settlers and four (4) sludge drying beds.

Figure 4-22: Wastewater treatment plant. Secondary settlers. Sludge drying beds

Source: GIZ/MLPS

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

- Chlorination plant, where the chlorine solution is dosed and prepared.

According to obtained data, the quality of effluent wastewater at the wastewater treatment plant do not comply to the actual standards of the Republic of Moldova (Law no.950 of 25.11.2013 on Approval of the Regulations on the conditions of collection, treatment and wastewater evacuation into sewage and/or water bodies for rural and urban localities), and corresponding treatment, for following indicators: ammonia nitrogen (NH_4+) and total phosphorus (P). Quality indicators of influent and effluent wastewater were presented by the ME 'Apa-Canal' Drochia, as provided in Table 4-22.

Table 4-22: Wastewater quality indicators

No.	Indicator	Unit	Influent concentration	Effluent concentration	Maximum allowed concentration acc. to GD nr.950
1.	Hydrogen ion concentration (pH)			6.5	6.5 – 8.5
2.	Suspended solids	mg/l	285.0	10.8	35.0
3.	Five days biochemical oxygen demand (BOD_5)	mgO_2/l	138.8	11.00	25.0
4.	Chemical oxygen demand (COD)	mgO_2/l	296.0		125.0
5.	Ammonia Nitrogen (NH_4+)	mg/l	54.4	10.4	2.0
6.	Total phosphorus (P)	mg/l	-	195.4	2.0
7.	Synthetical detergents biodegradable active anions	mg/l		-	0.5

Source: ME 'Apa-Canal' Drochia

The treated wastewater is discharged into biological ponds, and further into the Graidului River. The monthly volume of treated wastewater is provided in Table 4-23.

Table 4-23: Monthly volume of treated wastewater for 2014

Month	Monthly volume of treated wastewater (m^3/month)
January	19.269
February	18.053
March	17.483
April	17.732
May	18.599
June	19.880
July	18.775
August	19.017
September	19.580
October	19.381
November	18.778
December	20.036
Total	**226.583**

Source: ME 'Apa-Canal' Drochia

At time of the site visits, according to the technical design 'Construction of Wastewater Treatment Plant in the town of Drochia (Phase 1)', elaborated by 'PROTELCO GEO-CAD' Ltd in 2014, the GIZ/MLPS experts have been informed about the financing of construction of the wastewater treatment plant with a capacity of 400 m^3 /day, which will be implemented on the existent wastewater treatment plant area. The above mentioned technical design foresees the design capacity of the wastewater treatment plant of about 1,200 m³.

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 4-24.

Table 4-24: Available studies and technical documentation

No.	Project Name	Type of document	Financing Agency
1.	Water supply and sewerage feasibility studies, second design intended for small towns of the Republic of Moldova, Water and Sewerage Project Implementation Unit, SWECO INTERNATIONAL, 2007	Prefeasibility study	N.A
2.	Construction of Wastewater Treatment Plant in the town of Drochia (phase 1), 'PROTELCO GEOCAD' Ltd, 2014	Technical design	N.A.

Source: LPA Drochia

4.8 Conclusions

The identified issues of water supply and wastewater services in the feasibility study area are the following:

- In the town of Drochia, the water supply service area is about 94% and water supply connection rate is about 64%;
- High real (physical) and apparent (commercial) water losses (annual volume of NRW is about 57%);

- 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 Drochia;
- According to the obtained data, provided by ME 'Apa-Canal' Drochia, the quality of the raw water at the well /intake does not comply with the 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') for following indicators: colour, ammonia (NH4) and total hardness;
- Considering that the raw water is disinfected only in underground water reservoirs with a volume of 1,000 m^3 installed on the water pumping station PS-2 area, the installation of water disinfection unit is required;
- In the town of Drochia, the wastewater coverage area is about 79% and wastewater connection rate is about 46%;
- High degree of wear of existing pipelines (the pipe age exceeds years of useful life) causes frequent sewerage blockages and emergency driven maintenance;
- According to information provided by the ME 'Apa-Canal' Drochia, the quality of effluent wastewater at the wastewater treatment plant do not comply to the actual standards of the Republic of Moldova (Law no. 950 of 25.11.2013 on Approval of the Regulations on the conditions of collection, treatment and wastewater evacuation into sewage and/or water bodies for rural and urban localities), and corresponding treatment, for following indicators: ammonia nitrogen (NH_4+) and total phosphorus (P).

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 study area and to identify the investment needs that will lead to increased coverage of population with water supply and wastewater services, improved service quality and efficiency improvements.

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

- Existing pre-feasibility, feasibility studies and detailed designs (see Chapter 4.7);
- WSS Regional Sector Programme (RSP) and Possible Project Concept (PPC) for Drochia 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);
- The comparison of results and assessment of initial conditions with the Regional Sector Programme for Development Region North 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 Drochia and M.E 'Apa-Canal' Drochia (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

[6] A Project Working Group (PWG), established by decision of the local council and comprising members from the Regional Development Agency Centre (RDA North), the Drochia Local Public AdministrationLocal 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 Drochia local council.

immediately after completion of this feasibility study and which neither require further studies or investigations nor might it 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 water supply and wastewater services

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

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

Strategic goal

The general strategic goal of the Mayor Office and 'Apa-Canal' is to achieve a viable and high quality management of the centralized water supply and wastewater systems. As for now, no specific policy and strategy for the Water Supply and Wastewater Sector has been developed for the town of Drochia. The Mayor Office and 'Apa-Canal' are well aware of the actual situation regarding to water supply and wastewater services and are willing to improve its quality.

It is noteworthy that the Republic of Moldova (RM) entered into a loan agreement with EBRD for the '*Moldova North Water Project*' which aims at improving water supply and wastewater services in the municipality of Balti and six rayons: Floresti, Soroca, Singerei, Telenesti, Riscani and Drochia. The agreement was signed in July 2014 and ratified by the RM in 2015. The project design foresees connecting the town of Drochia[7] to the existing regional Soroca-Balti transmission main. A *Regional Operating Company* (ROC) should be established to operate the entire system (water supply and wastewater services). Creation of the ROC is a precondition for the loan disbursement

[7] And other rural localities in the rayon

(loan covenant). Currently the institutional development (foundation of the ROC) is still not ensured and it is unclear if and when the project will be implemented. Reference is made to Chapter 3 – Legal and *Institutional Framework* and Chapter 7 – *Institutional Development* for more detailed description of this investment project.

Urban development

According to the analysis of demographic development in recent years, the population of Drochia Town can be expected to slightly decrease (see Chapter 2.4 - Population) throughout the period of analysis. During Soviet Union the town of Drochia was highly industrialised (agricultural machinery, construction materials, food processing) but during the first decade after the collapse of the Soviet Union the town experienced and overall decline of the economy which affected strongly the demography (heavy migration due to lack of employment). New residential area with individual houses (storey buildings) emerged on the road towards Donduseni, but no multi-storey apartment buildings were built recently.

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 'Apa-Canal' should consider (see assumptions and targets presented in Chapter 5.3) the following specific objectives:

- Provide water compliant with the national drinking water standards to all parts of the service area;
- Maintain the current level of service by providing water 24 hours per day;
- Provide water of sufficient quantity to all customers;
- Extend the water supply and sewerage service area in the town of Drochia;
- Treat effluents from the sewer system in compliance with the current nation legislation and in the future in compliance with the respective EU legislation (Urban Wastewater Treatment Directive);
- Reduce non-revenue water to an acceptable level of a maximum 25% by 2045;
- Improve efficiency of service provision by enhancing operation and maintenance practices for the Mayor Office and 'Apa-Canal';
- 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

Despite of the slightly decreasing demographic trend in the last decade there is a tendency of stabilisation of the population during the last few years. Following, the national trend, the income of the population is expected to increase and the standard of living to improve. The water demand for domestic customers is expected to increase due to higher per capita water demand and improved access to the centralised water supply system. Similarly, an increase of demand for industries and public institutions is expected. From the existing industry, the most notable is the sugar factory 'Suedzucker' with a capacity of 3,000 tons of sugar beet per day. The development of the water de-

mand, including water losses and wastewater flow projection, is presented in the Chapter 5-3 Design Parameters and Assumptions.

Metering policy

Water production metering:

M.E 'Apa-Cana' Drochia reported that water meters at all wells and all pumping stations have been installed and are operational. Further, water meters in the network have been installed. However, in the medium-term replacement of part of these water meters is recommended by M.E 'Apa-Canal' Drochia.

Customer metering:

In general the current status of water metering is at high level (most of the customers are metered). About 75% of the individual households (private houses) and 99% of the apartments are metered. There are no master meters installed at the entrance of the multi-storey buildings. Further, M.E 'Apa-Canal' Drochia reported that the non-domestic (institutional and commercial customers) customer metering rate reached 100%. However, most of the water meters are outdated and need to be replaced due to their low accuracy.

Tariff policy

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

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

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

5.3 Design parameters and assumptions

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

5.3.1 Domestic water consumption and wastewater generation

- Population forecast and its assumptions as presented in Chapter 2.4;
- The development of the **service connection rate (water and wastewater)** for domestic customers considers the following:
  - Existing population connected;
  - Additional population connected due to on-going projects (completed before 2018);
  - Population connected due to network extension foreseen in Phase 1 by 2018;
  - Population connected due to network extension foreseen in Phase 2 by 2021;
  - Maximum target connection rate within the planning horizon is assumed to be reached in 2030 for urban localities and in 2045 for rural localities.
- It is further assumed that the coverage rate (population which can potentially be connected to the network) is different from the connection rate (population which

actually is connected to the network) and the following applies: Data for the existing situation regarding coverage and connection rate are applied if available (see Chapter 4-Technical Aspects-Existing situation); if data are not available it is assumed that the connection rate is 30% less than the coverage rate for water supply and 40% less than the coverage rate for wastewater. The difference between coverage rate and connection rate will then decrease linearly and will be zero in the year when the target connection rate is defined (e.g. water supply coverage rate for urban areas will reach 100% in 2030 and will be equal to the water supply connection rate in 2030). The respective targets are presented in Table 5-1 below;

- **Per capita domestic water consumption** (volume of water sold) is currently very low as presented in Chapter 4.4 - Water balance, mainly due to two reasons (i) absence of part of the registered customers and (ii) apparent water losses (water theft, metering inaccuracy). Due to measures proposed in this feasibility study (Chapter 5.7.6- Technical Assistance) aimed at drastically reducing apparent (commercial) losses it is assumed that per capita water sales are projected to 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[8]', 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[9]: During the last decades, the economy in the study area has slowed down and many industries closed, which resulted in a steep decline in industrial water consumption. For the purpose of this study, it is assumed that industrial water consumption will slightly increase (from a very low level) linearly to 15 l/c/d until 2030, and will then remain constant until the end of the planning horizon. It is assumed that industrial consumption only applies to urban localities;
- Institutional water consumption: It is assumed that institutional water consumption will increase/decrease from current consumption level[10] linearly to 10 l/c/day until 2030 (in line with the National WSS Strategy) and will then remain constant until the end of the planning horizon. It is assumed that institutional consumption applies to urban and rural localities;
- The wastewater generation factor for non-domestic customers (share of wastewater discharged to the wastewater system out of water consumed) is assumed to be 100% for commercial and institutional customers (factor 1);
- Industrial wastewater flow from customers not connected to the water supply system (own wells) but discharging to the sewer system is unknown and cannot be

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

[9] Including all commercial entities

[10] According to data from 'Apa-Canal' sales department

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 Water losses

The following assumptions have been made with regard to reduction of Non-Revenue Water (NRW) for the network.

- *Apparent Losses*[11] *(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 and metering 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[12]) proposed in Phase 1. Further, in the long-term it is assumed that continuous renovation of the network[13] will further reduce real water losses;
- Overall, NRW is therefore assumed to decrease to 25% until the year 2045.

5.3.4 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 sewer network are foreseen. The development of this parameter is based on expert assessment, separate for each sewer network, depending on:

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

There is no information on the current infiltration rate available for Drochia sewer network (see Chapter 4-Technical Aspects –Existing situation) and therefore a typical[14] infiltration rate for the existing sewer networks in the region has been applied in the model (see Table 5-1). It is assumed that the infiltration rate will decrease after implementation of measures for rehabilitation of sewer network or extension of the sewer network in accordance with the ratio of 'new sewer network[15]' and 'old sewer network[16]'

[11] Including unbilled authorized consumption

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

[13] Financed from additional revenues generated by M.E 'Apa-Canal' Drochia as a result of technical assistance measures included in Phase 1.

[14] Outworn and obsolete sewer system

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

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

(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[17].

5.3.5 Wastewater flow and load

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

- Specific domestic wastewater load: 60 gBOD_5/capita/day for design of WWTP;
- Specific non-domestic wastewater load: Wastewater flow at a max. admissible BOD_5 concentration of 225 mg/l to discharge into the sewer network;
- Peak Storm Water Factor: 1.3 for allowance for storm water entering into the sewer network from 'inappropriate[18]' 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).

Table 5-1: Design parameter

N°	Design Parameter	Unit	2014[19]	2018[20]	2021[21]	2030	2045
0	Service coverage rate for domestic customers, disaggregated for urban and rural localities						
0.1	Water - total	%	95	100	100	100	100
0.2	Wastewater - total	%	79	79	99	100	100
0.3	Water supply – urban	%	95	100	100	100	100
0.4	Water supply – rural	%	0	0	0	0	0
0.5	Wastewater - urban	%	79	79	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	%	64	68	76	100	100
1.2	Wastewater - total	%	47	47	59	90	95
1.3	Water supply – urban	%	64	68	76	100	100
1.4	Water supply – rural	%	0	0	0	0	0
1.5	Wastewater - urban	%	47	47	59	90	95
1.6	Wastewater - rural	%	0	0	0	0	0
2	Volume of water sold for domestic customers						
2.1	In urban localities	l/c/d	55	62	67	83	110
2.2	In rural localities	l/c/d	0	0	30	49	80
3	Volume of water sold for non-domestic customers (industry, commercial…), disaggregated for urban and rural localities						
3.1	Industrial and commercial - urban	l/c/d	3.6	6.5	8.6	15.0	15.0
3.2	Industrial and commercial - rural	l/c/d	0.0	0.0	0.0	0.0	0.0

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

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

[19] Existing situation

[20] 1st year of operation Phase 1 investments

[21] 1st year of operation Phase 2 investments

N°	Design Parameter	Unit	2014[19]	2018[20]	2021[21]	2030	2045
3.3	Institutional entities - urban	l/c/d	2.7	4.5	5.9	10.0	10.0
3.4	Institutional entities - rural	l/c/d	0.0	0.0	5.0	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	%	56	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	30	25	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	1.44				
7.3	Hourly variation factor wastewater	factor	1.9				
7.4	Peak storm water factor	factor	1.3				
8	Wastewater flow and load parameters for domestic and non-domestic sources						
8.1	Specific Domestic wastewater Load	$gBOD_5/c/d$	60				
8.2	Specific Non-domestic Wastewater Load - maximum admissible BOD_5 concentration for sewer discharge	mg/l	225				

Source: GIZ/MLPS

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

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

5.4 Water demand and wastewater flow projection

Water demand projection (volume of water sold, non-revenue water and water production) is presented in the Table 5-2 (a detailed table is presented in Annex 5.1). As can be seen, the projected water production needs are highest in the year 2045, which will be the basis for design calculation.

Table 5-2: Water demand projection

N°	Parameter	Unit	2014[22]	2018[23]	2021[24]	2030	2045
1	Population in the study area served with water						
1.1	Total population serviced	N°	13,177	13,857	15,406	19,967	19,529
1.2	In urban localities	N°	13,177	13,857	15,406	19,967	19,529
1.3	In rural localities	N°	0	0	0	0	0
2	Volume of water sold in total and disaggregated for different consumers						
2.1	Total volume sold	m³/y	294,825	369,596	460,574	790,030	962,310
2.2	Domestic customers	m³/y	264,687	314,216	379,251	607,832	784,104
2.3	Industrial customers	m³/y	17,367	32,664	48,323	109,318	106,923
2.4	Institutional customers	m³/y	12,771	22,717	33,000	72,879	71,282
3	Total water sold disaggregated for urban and rural areas						
3.1	Urban localities	m³/y	294,825	369,596	460,574	790,030	962,310
3.2	Rural localities	m³/y	0	0	0	0	0
4	Non-Revenue Water (NRW) volume disaggregated for total NRW, apparent losses, and real losses						
4.1	Total NRW	m³/y	382,583	302,397	307,049	413,825	320,770
4.2	Apparent losses	m³/y	153,033	100,799	115,143	135,434	64,154
4.3	Real losses (physical losses)	m³/y	229,550	201,598	191,906	278,391	256,616
5	Water demand figures considering the demand variation factors						
5.1	Yearly water demand/production	m³/y	677,408	671,993	767,623	1,203,855	1,283,080
5.2	Average daily water demand	m³/d	1,856	1,841	2,103	3,298	3,515
5.3	Maximum daily water demand	m³/d	1,937	1,942	2,229	3,515	3,779
5.4	Average hourly water demand	m³/h	77	77	88	137	146
5.5	Maximum hourly water demand	m³/h	97	101	118	190	211

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 sewer network and wastewater treatment plant (if applicable).

Table 5-3: Wastewater flow and load projection

N°	Parameter	Unit	2014[25]	2018[26]	2021[27]	2030	2045
1	Population in the study area served with sewerage						
1.1	Total population serviced	N°	9,534	9,470	11,882	17,970	18,553
1.2	In urban localities	N°	9,534	9,470	11,882	17,970	18,553
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	m³/y	226,583	254,859	347,823	653,246	870,762
2.2	by domestic customers	m³/y	174,282	199,836	275,890	531,337	744,899

[22] Existing situation

[23] 1st year of operation Phase 1 investments

[24] 1st year of operation Phase 2 investments

[25] Existing situation

[26] 1st year of operation Phase 1 investments

[27] 1st year of operation Phase 2 investments

N°	Parameter	Unit	2014[25]	2018[26]	2021[27]	2030	2045
2.3	by industrial customers	m³/y	39,821	42,627	56,379	98,387	101,577
2.4	by Institutional customers	m³/y	12,480	12,396	15,554	23,523	24,286
3	Total wastewater charged disaggregated for urban and rural areas						
3.1	in urban Localities	m³/y	226,583	254,859	347,823	653,246	870,762
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	113,292	127,430	104,347	163,312	130,614
5	Wastewater generation figures considering variation factors						
5.1	Average wastewater flow (dry weather)	m³/y	339,875	382,289	452,170	816,558	1,001,376
5.2	Maximum daily dry weather flow (Qdmax)	m³/d	993	1,117	1,334	2,416	2,982
5.3	Maximum hourly dry weather flow (QDWF)	m³/h	67	75	95	174	223
5.4	Maximum hourly Storm Water Flow (QSWF)	m³/h	87	98	123	227	289
6	Population equivalents in total and disaggregated for different customers						
6.1	Total population equivalent	PE60	10,071	10,035	12,621	19,223	19,846
6.2	by domestic customers	PE60	9,534	9,470	11,882	17,970	18,553
6.3	by Industrial and institutional customers	PE60	537	565	739	1,252	1,293
7	Pollution load – BOD in total and disaggregated for different customers						
7.1	Total BOD_5 load	kg/d	604	602	757	1,153	1,191
7.2	by domestic customers	kg/d	572	568	713	1,078	1,113
7.3	by industrial and institutional customers	kg/d	32	34	44	75	78

Source: GIZ/MLPS

5.5 Water demand projection versus available water resources and production capacities

As presented in Chapter 4-Technical Aspects-Existing situation, the existing capacities[28] from three operational wells for Drochia Town are 2,183 m^3/day.

The long term water demand projection for Drochia Town shows an increase of the water demand with the peak water demand (Qdmax) in the year 2045 (see Chapter 5.4 Water demand and wastewater flow projection) up to a maximum of 3,779 m³/day.

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	2,183
2	Peak water demand (Qdmax) in year 2045	m³/d	3,779
3	Additionally required water production capacities (2 – 1)	m³/d	1,596

Source: GIZ/MLPS

[28] Yield of wells

The projected water demand (see table below) can be covered with the three currently operated wells until the year 2021. In order to cover the water demand in the following period until 2045 the two wells which are currently used as standby capacities (reserve) will have to be put into operation. The total yield of these two wells is about 3,888 m³/day, of which 1,596 m³/day will be needed Therefore one additional well with a capacity of 1,987 m^3/day (yield of 23 l/s) has to be put into operation in order to cover the demand in the year 2045.

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	1,856	1,841	2,103	3,298	3,515
2	Maximum daily water demand	m³/d	1,937	1,942	2,229	3,515	3,779
3	Available water source/well capacities	m³/d	2,183	2,183	2,183	4,173	4,173
4		l/s	25.3	25.3	25.3	48.3	48.3
5	Number of well in operation	n°	3	3	3	4	4

Source: GIZ/MLPS

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 5-6 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 5-6: 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
1.11	Pipe	OD	280	EUR/m	124
1.12	Pipe	OD	315	EUR/m	139
1.13	Pipe	OD	355	EUR/m	154

[29] Existing situation

[30] 1st year of operation Phase 1 investments

[31] 1st year of operation Phase 2 investments

N°	Item	Dimension		Investment costs	
				Unit	Unit cost
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	1,500	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 5-7 shows the unit costs for the relevant wastewater components applied for the cost estimations for the investment measures proposed for Phase 1 and Phase 2.

Table 5-7: Unit costs for wastewater facilities

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

N°	Item	Dimension		Investment costs	
				Unit	Unit cost
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- Development strategy for water supply and wastewater services) as well as the targets in line with the Regional Sector Programme (RSP), a number of investment measures have been identified and are presented in this chapter. These measures are based on the measures identified in previous assessments ('Possible Project Concept' (PPC)) and the findings from this study (reference is made to Chapter 4 – Existing situation and Chapter 5.4 - Water demand and wastewater flow projection).

This chapter contains:

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

5.7.2 Investment framework

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

Water supply:

- Currently, there are 13,177 inhabitants (64% connection rate) in Drochia Town connected to the existing water supply system (see Table 5-8 below and Chapter 4 Technical aspects – Existing situation)). There are no other localities supplied from the water supply system in Drochia Town;
- The water supply network in Drochia Town is in poor condition and about 89% of the pipes are older than 30 years, which causes frequent pipe bursts and supply interruptions as well as high water losses in part of the system. Therefore rehabilitation of part of the network will be of utmost importance;
- Further, the transmission main from the well-field to the reservoir at pumping station n° 3 (PS-3) is in poor condition (according to ME 'Apa-Canal' Drochia, water losses in the water main between pumping station n° 2 (PS-2) and n° 3 (PS-3) are up to 40% and the customers connected along this transmission main have to be disconnected. Therefore replacement of the transmission main has been given high priority;
- Water quality of abstracted groundwater from the well-field complies with the national standards (see Chapter 4 Technical Aspects - Existing situation);
- Currently there is no supply shortage for the service area of M.E 'Apa-Canal' Drochia. The current production capacity is sufficient to cover the water demand until the year 2021. In the medium and long-term one existing well, which is currently used as reserve, will have to be put into operation to cover the water demand until 2045. Therefore, no investments for increasing the water production capacities are needed;
- Although water capacities from the well-field are sufficient to supply the town in the long-term, it is recommended to develop strategies aiming at enhancing supply security for the town (second supply source). There are three options which could be envisaged for strategic development and enhancement of the supply security in Drochia Town:
  - *Option 1 – Groundwater supply from a new well-field in Drochia*: A thorough hydro-geological investigation (incl. pump-tests) will be necessary to assess if additional capacities with adequate water quality can be provided from aquifers in the vicinity of the existing well-field. Otherwise, alternative locations for groundwater abstraction would have to be identified;
  - *Option 2 – Groundwater from the neighbouring locality of Tsarigrad*: The capacities of the well-field in this locality would have to be increased and the possibilities to interconnect Drochia with the water supply system of Tsarigrad would have to be assessed. This option cannot be assessed within this study as the locality of Tsarigrad is not included in the study area of this feasibility study and no information is available which would allow assessment of this option;
  - *Option 3 – Connection to the existing Regional Transmission Main from* Soroca to Balti: Drochia is located along the planned regional transmission main from Soroca to Balti (*below referred to as Regional Transmission Main*) and is part of the towns which are planned to be included in the 'Moldova North Water Project' (loan agreement between EBRD and the RM signed in 2014). Currently it is unclear if the project will be implemented (see Chapter 7 – Institutional Development and Chapter 5.2 - Development Strategy for the Water Supply and Wastewater). Assessment of this option would require extending the study area beyond the limits of this feasibility study and therefore cannot be carried out. The investment scope of the 'Moldova North Water Project' in-

cludes inter-alia construction of transmission mains to connect Drochia Town water supply system with the *Regional Transmission Main*. Further, the project includes technical assistance to support the operator in improving its performance in operation and maintenance of the water supply and wastewater system (Corporate Development Component).

- Conclusively, medium to long-term enhancement of the supply security for Drochia Town requires a comprehensive assessment at regional level and therefore cannot be carried out within the framework of this study. Hence, it is recommended that a thorough option analysis (considering the development of the above mentioned 'Moldova North Water Project') should be carried out within the technical assistance measure proposed for Phase 1 (see Chapter 5.7.6 – Technical Assistance). Based on the results of this assessment, the retained option should be implemented in the medium term to long-term;
- In the short-term highest priority within this project is given to (i) the extension of the distribution system in order to increase the coverage rate to 100% and (ii) the rehabilitation of the distribution network as well as (iii) the rehabilitation of the transmission main from the well-field to the reservoir at pumping station n°3 (PS-3);
- In the medium-term 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 technical assistance measures in Phase 1 (reference is made to Chapter 5.7.6-Technical Assistance). These measures might inter-alia include:
  - Rehabilitation of 30% of the water supply network older than 30 years;
  - Establishment of adequate system operation and control comprising pressure zoning, district metering and leakage monitoring with installation of permanent and temporary measure and control spots incl. chambers, measuring and control equipment, valves etc.;
  - Installation of a SCADA system.
- It is noteworthy, that the proposed short-term measures are not in contradiction to the above mentioned 'Moldova North Water Project', but can be seen as complementary investment measures, which anyway would have to be implemented ('no-regret measures').

The Table 5-8 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 5-8: Development of connection rates water supply

N°	Locality	Population connected to the water supply system									
		2014		2018		2021		2030		2045	
		n°	%	n°	%	n°	%	n°	%	n°	%
1	Drochia	13,177	64	13,857	68	15,406	76	19,967	100	19,529	100

Source: GIZ/MLPS

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

Source: GIZ/MLPS

Wastewater:

- Currently Drochia Town is partly endowed with an existing wastewater system (sewer network and wastewater treatment plant are described in Chapter 4- Technical Aspects. Existing situation of this report). About 47% of the population is currently connected to the centralised sewerage network (see Table 5-9);
- Wastewater load generated in Drochia Town will increase from currently 10,071 P.E. to 12,621 P.E. in 2021 and is projected then to further increase to 19,846 P.E. in 2045 (see Chapter 5.4 Water demand and wastewater flow projection);
- In Drochia Town the coverage rate is projected to increase from currently 79% to 99% and the connection rate from 47% to 59% until the year 2021[32];
- 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

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

Chapter 5.7.6 – Technical Assistance). The localities in the vicinity of Drochia Town will be served in accordance with the results of the agglomeration analysis defined in this technical assistance component (see above) and possibly in the future with the dates to be negotiated in the EU-accession treaty. Compliance of these localities with EU-environmental regulations (e.g. Urban Wastewater Treatment Directive 91/271/EEC) will require grouping the agglomerations into localities (i) below 2,000 P.E., (ii) between 2,000 P.E. and 10,000 P.E., and (iii) above 10,000 P.E. Among the agglomerations in the rayon (outside of Drochia Town) there are several ones (e.g. Tsarigrad, Surii, Chetrosu) which are located close to Drochia Town (most of them above 2,000 P.E. and thus subject to the requirements defined in the Urban Wastewater Treatment Directive 91/271/EEC) and hence are to be either endowed with a sewer network and connected to a WWTP in the medium and long-term, or alternative wastewater systems (on-site sanitation) have to developed in order to ensure adequate wastewater treatment. However, these localities are not included in the study area of this assignment and are thus not subject to an assessment in this study;

- Collection and treatment for wastewater in Drochia Town (current population of 20,500) should be given highest priority (in line with priorities defined in the Urban Wastewater Treatment Directive 91/271/EEC);
- The design capacity of the existing WWTP (600 m³/day) is just sufficient to treat the current wastewater load of Drochia Town (although the actual wastewater flow rate has not been measured). However, the plant is outworn and should be abandoned. A new WWTP for a total capacity of 1,200 m³/day and 24,500 P.E. has been designed. Currently the first phase of this new WWTP with a capacity of 405 m³/day and 8,166 P.E. (1/3 of the total design capacity) is under construction (see Chapter 4-Technical Aspects. Existing situation). For the second phase with 795 m³/day and about 16,334 P.E. financing has not yet been assured. Considering that the required treatment capacities (Qdmax) are 1,334 m³/day in 2021 and 2,416 m³/day in 2030 it becomes obvious that this new plant will not have sufficient capacity to treat wastewater for the extension areas proposed within the framework of this study. Further, the possible extensions to other localities in the vicinity of Drochia Town would again need additional treatment capacities to be provided. Therefore an extension of the new/existing WWTP to the required capacities will be required. As soon as construction of the new plant is completed and the real treatment capacity can be measured, the required capacity for future extensions[33] and the optimal solution for the extension of the WWTP have to be assessed in detail. A thorough option analysis has to be carried out in the technical assistance measures included in Phase 1 (see Chapter 5.7.6 – Technical Assistance) as the design capacity for the extension of the WWTP will depend on the above mentioned agglomeration analysis. Depending on the number of localities to be connected to the WWTP in Drochia Town the design capacity could be from about 19,200 P.E. (Qdmax of 2,416 m³/day) in 2030 (only for Drochia Town) but could be much higher if the localities in the vicinity of the town will be connected. For example the locality of Tsarigrad is almost merged with Drochia and both have to be considered as one agglomeration. Further, there are several localities in the north-east of Drochia Town (e.g. Surii and Chetrosu) located at a distance of only 5 km from Drochia Town. Therefore the required design capacity

[33] Considering also the results of the agglomeration analysis mentioned above for the localities in the vicinity of Drochia Town

can only be roughly estimated at this stage. A staged approach is recommended in order to avoid over capacities. For the purpose of investment cost estimation in this study a capacity of 11,057 P.E. (difference between the required capacity of 19,223 P.E. in 2030 and the capacity of the new/existing plant of 8,166 P.E.) for the WWTP in Drochia Town has been used;

- Rehabilitation of the sewer network in Drochia Town with a length of about 13.7 km (out of 45.5 km total network length) is proposed due to the frequent emergency cases in the existing sewer network;
- An extension of the sewer network in Drochia Town with a length of about 35.7 km (including pressure main) is required in order to increase the sewer coverage rate from currently 79% to 99% and the connection rate from currently 47% to 59%. The main extension areas are located in the north-west (drainage area n° 3,5,6 and 7) and in the south-east (drainage area n°0) as well as in the south of the town centre (drainage area n°4);
- Conclusively, the proposed measures will increase the connection rate in Drochia Town from 47% to 59%. An extension of the existing/new WWTP by about 11,057 P.E (see calculation above) will be necessary to treat the wastewater volume projected for Drochia Town in the year 2030. Depending on the results of the technical assistance study to be carried out in Phase 1, the capacity has to be confirmed and a staged development approach of the WWTP has to be proposed.

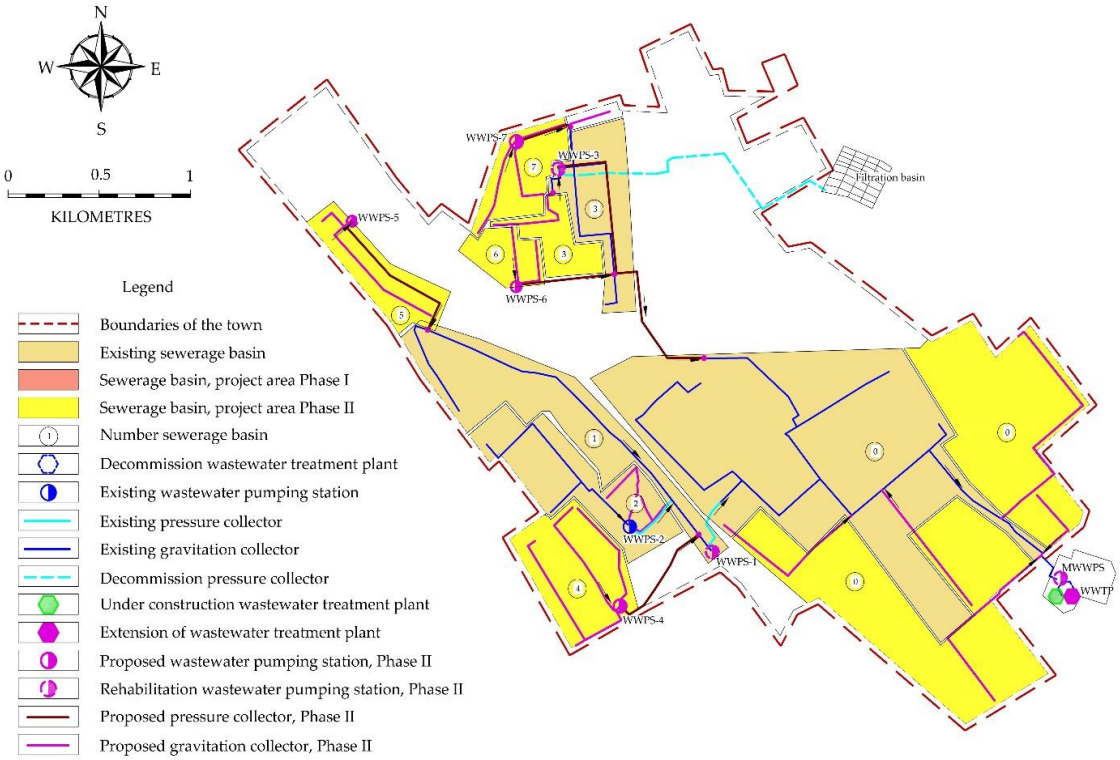
The Table 5-9 shows the development of service connections for the wastewater network (existing situation and additional connections for the year 2018 and 2021 as well as for the years 2030 and 2045). For more detailed projection tables reference is made to Annex 5.5 and Annex 5.6.

Table 5-9: Development of connection rates wastewater

N°	Locality	Population connected to the wastewater system									
		2014		2018		2021		2030		2045	
		n°	%	n°	%	n°	%	n°	%	n°	%
1	Drochia	9,534	47	9,470	47	11,882	59	17,970	90	18,553	95

Source: GIZ/MLPS

Figure 5-2: Scheme of existing and proposed extension of the sewer system



Source: GIZ/MLPS

5.7.3 Investment measures - water supply system

5.7.3.1 General description of proposed system

The main deficiencies in the water supply system in Drochia Town are as follows (see Chapter 4-Technical Aspects. Existing situation of this study):

- Low connection rate of about 64%;
- The water supply network is in poor condition and about 89% of the pipes are older[34] than 30 years;
- High real and apparent water losses (NRW of 56%);
- High number of pipe bursts due to old and obsolete water distribution network;
- High number of pipe bursts and water losses (up 40%) in the transmission main from the well-field to pumping station n°3 (PS-3).

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

- Extension of the water distribution network;
- Rehabilitation of the water distribution network;

[34] Or equal to

- Renovation of the existing transmission main;
- Water metering[35] and equipment for operational improvement from the well-field to pumping station n° 3 (PS-3).

5.7.3.2 Proposed investment measures

Extension of the water distribution network in Drochia Town

It is planned to extend the existing water supply system in the south-east part of the water distribution network in order to reach full service coverage. The total network length for this extension area is 8,160 m and 650 households will be connected to the water supply system by implementing this measure. The water supply connection rate will be increased from 64% to 68% by this measure (coverage rate will increase from 95% to 100%).

Rehabilitation of the water distribution network in Drochia Town

Due to frequent pipe bursts in part of the distribution network the operation costs are high and supply security is low (frequent supply interruptions due to pipe repair). Further, total water losses (NRW) in Drochia Town are estimated to be in the range of 56%. It is planned to replace 7.7 km of the pipe network (Diameter between 75 and 160 mm) in order to reduce the number of pipe bursts and water losses.

Replacement of the transmission main

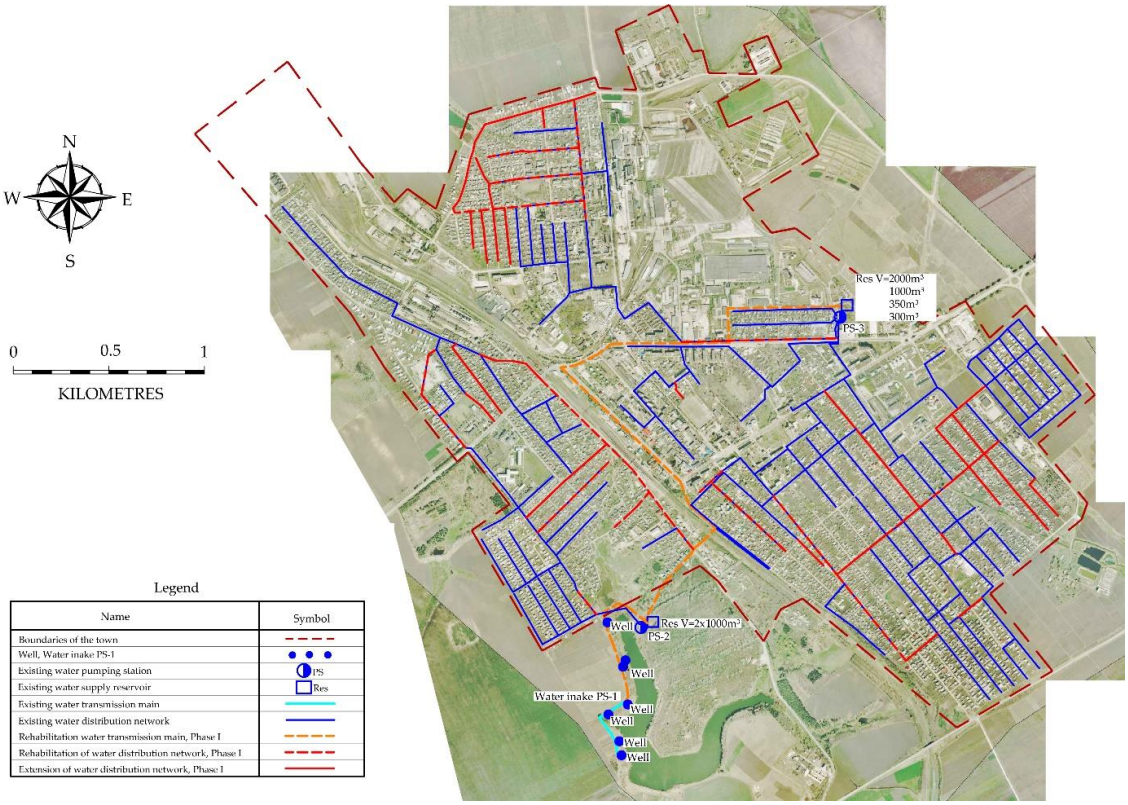
Due to the high number of pipe bursts and water losses (up 40%) in the existing transmission main (steel pipe DN 200 and 250 mm) from the well-field (PS-1) to the pumping station n°3 (PS-3) the water main has to be replaced by a new HDPE pipe main with the following lengths:

- HDPE OD 200 mm with a length of 770 m (from PS-1 to PS-2);
- HDPE OD 250 mm with a length of 3,520 m (from PS-2 to PS-3).

The existing and proposed water supply system in the town of Drochia is presented in the Figure 5-3. More detailed maps are provided in Annex 11.

[35] Replacement of water meters

Figure 5-3: Existing and proposed water supply system in the town of Drochia



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:

- The low connection rate of about 47%;
- The existing sewer network is highly degraded (all the network is older[36] than 30 years) which leads to frequent sewer blockages and emergency driven maintenance;
- The existing WWTP for Drochia Town is obsolete and has to be replaced;
- The capacity of the WWTP currently under construction (405 m³/day) is insufficient to treat future wastewater flow;
- Wastewater Pumping Stations (WWPS) are in poor condition and its capacities are insufficient.

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

[36] Or equal to…

- Extension of the sewer network in Drochia Town;
- Extension of the Wastewater Treatment Plant (WWTP);
- Rehabilitation of existing Wastewater Pumping Stations (WWPS);
- Rehabilitation of the sewer network;
- Procurement of equipment for operational improvement.

5.7.4.2 Proposed investment measures

Extension of the sewer network in Drochia Town:

In order to increase the service coverage for Drochia Town to 99% in 2021 (connection rate of 59%) the sewerage network (separate system) has to be extended by about 35.7 km (33.3 km gravity sewer OD 200 mm and 2.4 km pressure sewer OD 90 - 110 mm) and 2,440 new service connections. Due to the topography of the planning area, the wastewater system will be subdivided into the following wastewater collection areas (see the Figure 5-4):

- Currently wastewater from the north-western part of the town (drainage area n°3 - WWPS-3) is not connected to the WWTP but discharges through a pressure main to an filtration basin north of the town centre. Due to non-compliant discharge conditions, this filtration basin and the pressure main shall be abandoned. An extension is planned (drainage area n° 3, 6 and 7) and two new pumping stations will be required (WWPS-6 and WWPS-7) to pump wastewater from the extension areas to WWPS-3, which has to be renovated. From there a pressure main conveys wastewater to a connection point at the existing main collector in drainage area n°0;
- For the extension areas in the western part of the town (drainage area n°5) and in the southern part of the town (drainage area n°4) two new wastewater pumping stations (WWPS-4 and WWPS-5) and pressure mains will have to be implemented to convey wastewater to the existing wastewater pumping station n°1 (WWPS-1), which has to be renovated, and from there to drainage area n°0;
- Extensions in drainage area n°0 will discharge gravitationally to the main wastewater pumping station (MWWPS) located at the existing WWTP. The MWWP has to be renovated.

Extension of the Wastewater Treatment Plant (WWTP)

The existing WWTP is obsolete and the capacity of the new WWTP under construction (405 m³/day) is insufficient to treat wastewater from the proposed sewerage extension areas. For the purpose of cost estimation we include an extension of the existing WWTP with a capacity of 11,057 P.E/2,011 m³/day (see also Chapter 5.7.2 – Investment framework). Based on the results of the above mentioned assessment (agglomeration study in technical assistance measures included in for Phase 1) the design capacity of the WWTP will be assessed in more detail.

Rehabilitation of existing Wastewater Pumping Stations (WWPS)

- The existing Main Wastewater Pumping Station (MWWPS) is in poor condition and its capacity is insufficient. According to the design of the new WWTP the existing MWWPS is still needed to collect and pump wastewater to the new WWTP. Therefore, renovation of the MWWPS and extension of its capacities is needed. (see above);

- The existing pumping station n° 1 and n°3 (WWPS-1 and WWPS-3) are in poor condition and the capacity is insufficient for the future extension areas. Therefore the equipment has to be replaced and the buildings have to be renovated.

Rehabilitation of the sewer network

As a second priority, it is recommended to conduct a CCTV inspection of the sewer network in Phase 1 (see Chapter 5.7.6 Technical Assistance) and based on its result to identify the need for further rehabilitation of the sewer network. For the purpose of cost estimation in this study, it was assumed that about 30% of the sewer network older than 30 years should be rehabilitated (l=13.7 km, OD 200 – 250 mm).

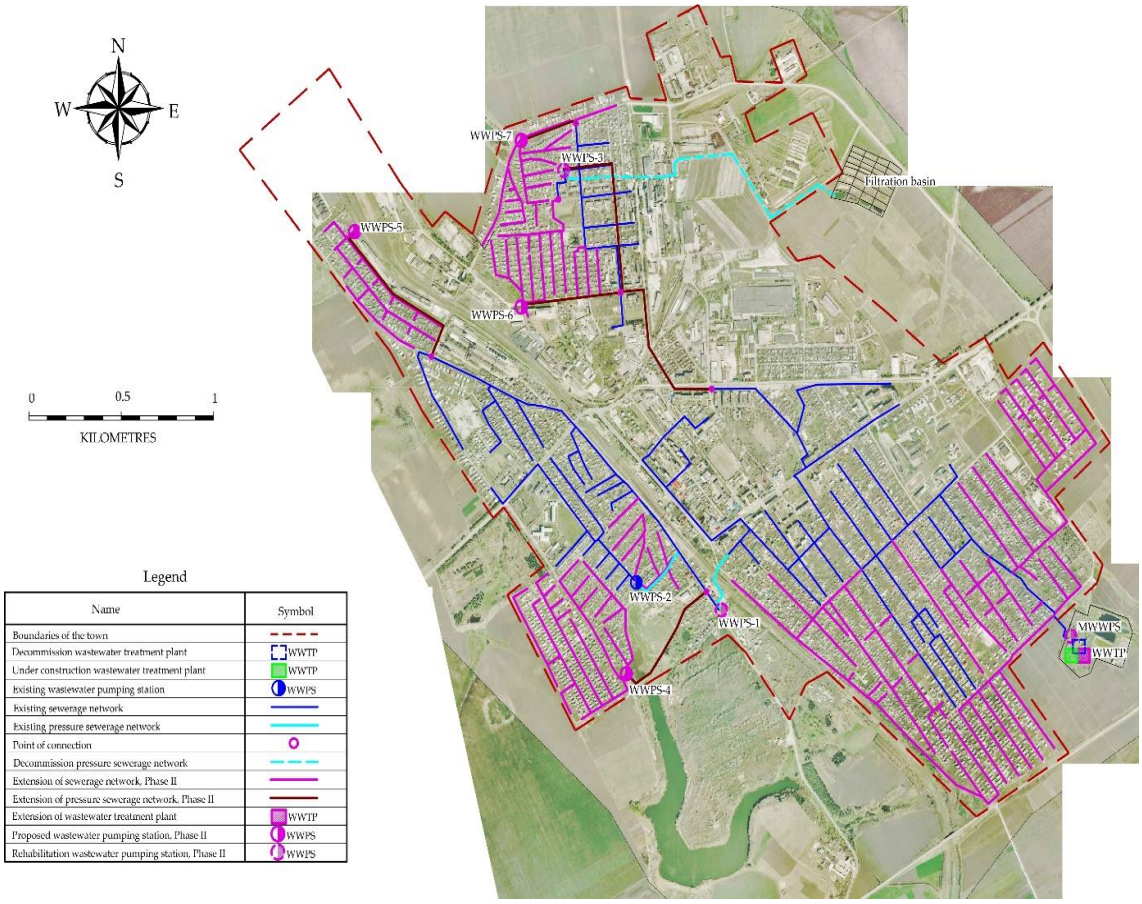
The wastewater investments proposed in this feasibility study are:

- Extension of the existing sewer network by 33,345 m of PP/PVC[37] sewer collectors (2,440 service connections) with diameters OD 200 mm in drainage area 0,4,5,6 and 7;
- Construction of 2,360 m pressure main PE OD 90-110 mm (drainage area 3,4 and 5);
- Rehabilitation of 13,650 m of the existing sewer network (OD 200 – 250 mm);
- Construction of four (4) new Wastewater Pumping Stations (WWPS-4, WWPS-5, WWPS-6 and WWPS-7);
- Rehabilitation of three (3) Wastewater Pumping Stations (WWPS-1, WWPS-3 and MWWPS);
- Extension of Wastewater Treatment Plant (WWTP) by a capacity of 11,057 P.E.

The existing and proposed wastewater system in the town of Drochia is presented in the Figure 5-4. More detailed maps are provided in Annex 11.

[37] Material to be defined in the detailed design phase.

Figure 5-4: Existing and proposed extension of the sewer system in the town of Drochia



Source: GIZ/MLPS

5.7.5 Operational improvement

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

Customer water metering reached high level in Drochia, therefore no investments are foreseen in the short term (Phase 1 and 2 of this study). However, M.E 'Apa-Canal' Drochia reported that most of the water meters are outdated and need to be replaced due to their low accuracy. Therefore M.E 'Apa-Canal' Drochia recommended replacing about 7,800 water meters for domestic customers and 225 for non-domestic customers in the medium and long-term.

Water production is fully metered but water meters are outdated and accuracy is low. Therefore it is recommended to install 21 new flow meters (5 pcs. at water intake; 10 pcs. at pumping stations; 6 pcs at reservoirs) in the short-term. Further, flow meters in the network (District Metering Areas) should be installed in the medium and long-term.

In the medium term, a SCADA system with more advanced features for flow measuring and operation control will have to be installed. A tentative list of equipment is presented below (confirmation by M.E 'Apa-Canal' Drochia during the detailed design stage needed).

The currently available operational equipment of M.E 'Apa-Canal' Drochia is insufficient to perform adequate operation and maintenance activities. According to M.E 'Apa-

Canal' Drochia, 20 pressure manometers with low accuracy are available. The most urgent needs for equipment are:

- One (1) portable ultrasonic flow meter;
- Pressure loggers and manometer for pressure measurement in the network (20 pcs.);
- Leak Detection Equipment including acoustic detection equipment and correlator;
- Equipment for localisation of pipes (e.g. metal pipe detector);
- Laboratory equipment for water quality analysis;
- One (1) truck with water reservoir;
- Other equipment needed may be specified during the detailed design study (e.g. hardware and software, maintenance tools, etc.).

5.7.5.2 Wastewater:

The currently available operational equipment of M.E 'Apa-Canal' Drochia is insufficient to perform adequate operation and maintenance activities (One sewer cleaning truck in operation and one out of operation). The most urgent needs for equipment are:

- CCTV inspection equipment;
- Three flow meters for measurement of wastewater flow;
- One tractor for sewer maintenance;
- One sewer cleaning truck;
- Laboratory equipment for wastewater analysis.

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 sewer network rehabilitation;
- Ensuring high quality standard for implementation of works (detailed designs[38], tender documents and supervision of works).

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

Table 5-10: Technical Assistance

Component	Objectives	Measures
Design and Engineering for Phase 1 investments	To ensure high quality and timely implementation of works and TA-	A) **Preparation of Detailed Design and Tender Documentation** for Phase 1 investment measures including (i) works contracts, (ii) equip-

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

Component	Objectives	Measures
	measures through support of the Project Implementing Agency[39] (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 supervision and monitoring of TA-measures	ment, (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 (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	Raise customer awareness through education campaigns:

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

Component	Objectives	Measures
	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	• Identification of information needs; • Prepare Information campaign Plan and support the implementation. Facilitation of dialogue between clients and the Company: • Creation of and support to information exchange platform for customers; • Creation of an Advisory Committee comprising all major stakeholders; • Encourage transparency in decision-making; • Sustainability of dialogue.
Water Supply Network Analysis and Water Loss Reduction Programme	To improve the knowledge of water supply networks as a basis for preparation of a sound medium and long-term investment plan. To reduce water losses in the system through planning and implementing a comprehensive (i) strategy, (ii) action plan, (iii) capacity building programme.	A) **Network analysis**: Carry out comprehensive network analysis including (i) flow measurements at defined locations in the network (water intake, reservoirs, etc.), (ii) pressure measurements, (iii) analysis of system failures (pipe break data), (iv) analysis of pipe material, (v) preparation of Network Information System (NIS) including field data collection for mapping, (vi) hydraulic modelling and zoning, (vii) detailed investment plan for medium and long term development of the network (replacement, zoning, metering, etc.), (viii) training of operator's staff in applying the NIS and hydraulic modelling software tools. B) **Water loss reduction**: Prepare a water loss reduction strategy (in accordance with IWA best practice) including (i) recommendations for improvement of the organisation structure of the operator (e.g. set-up a water loss reduction department within the operator's organisation, recruitment of staff, etc.); (ii) prepare water balance (analyse components of the water balance in accordance with IWA standard procedures), (iii) recommend strategy and policy for reduction of water losses (e.g. pressure management, DMA/active leakage control, etc.), (iv) prepare detailed action plan for water loss reduction and leakage control including financial requirements, staff capacities required, time steps, methodology, etc.), (v) prepare a capacity building programme to support the operator in implementing the action plan.
Medium to Long-term Sanitation Study	To prepare a medium to long-term rayon investment plan for wastewater (Master Plan for	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

Component	Objectives	Measures
	Wastewater) and define number and capacity of WWTPs.	sewerage treatment and wastewater network analysis[40], (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. 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.

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

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

5.8.2 Justification for phasing

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

Table 5-11: Proposed investment measures and phasing

N°	Investment Measures	Proposed Phase[41]	Justification for Phasing
1	Water Supply	PH 1	• High priority is given to rehabilitation and extension of the water supply system due to the following criteria: (i) Water supply has to be implemented before wastewater system[42] (ii) Capacity of operator sufficient (no complex systems); (iii) Affordability is ensured (comparatively low cost per capita); • The development of a second supply source for enhancing supply security is given lower priority and is proposed to be implemented in the medium to long-term.
1.1	Rehabilitation of the water distribution network	PH 1	About 58 km (89%) out of 66 km of the existing network is older[43] than 30 years and is thus at the end of its service life. Hence there is an urgent need for network renovation in the short and medium term (see Chapter 4-Technical Aspects. Existing situation). M.E 'Apa-Canal' Drochia has identified 7.7 km as highest priority. The measure will reduce the number of pipe bursts and water losses. Further, the service quality for the population will be improved (less supply interruptions).
1.2	Extension of the water distribution network	PH 1	High priority is given to this measure in order to reach 100% coverage rate for the town.
1.3	Renovation of the existing transmission main	PH 1	In order to reduce the high number of pipe bursts and water losses (up 40%) in the transmission main from the well-field to pumping station n° 3 (PS-3) and to disconnect the customers directly connected to the transmission main high priority has been given to the this measure. All customers will benefit from the measure through improved service level (increased pressure and decrease of supply interruptions).
1.4	Installation of disinfection unit	PH 1	High priority to ensure compliance with national drinking water standards for all customers (mandatory investment)
1.5	Second supply source to enhance supply security	MT/LT	Three options have been identified to improve the water quality and to provide additional abstraction capacities, one of being the connection to the regional transmission main from Soroca to Balti and the other two options suggest groundwater development (Reference is made to Chapter 5.7.2 – Investment Framework). A decision cannot be made at this stage as the assessment would go beyond the study area of this feasi-

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

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

[43] Or equal to

N°	Investment Measures	Proposed Phase[41]	Justification for Phasing
			bility study. Therefore it is proposed that the TA-measures proposed in Phase 1 should analyse the options at regional level and should propose respective investment measures for the medium term horizon.
2.	Wastewater system	PH 2	All measures are proposed to be implemented in Phase 2. The wastewater measures cannot be implemented in Phase 1 due to limited capacities of the operator to implement all measures within short time and due to the fact that additional studies (e.g. agglomeration study as mentioned above in Chapter 5.7.2-Investment framework) will be necessary to design the proposed investment components. Therefore it is proposed to implement all wastewater measures in Phase 2.
2.1	Extension of sewer network	PH 2	In order to reach full coverage of wastewater service provision in Drochia Town in 2021 the extension of the network should be carried out in Phase 2. Priority is given to drainage area n° 3 and the extension areas n° 6 and 7, as the sewer currently discharges to a filtration basin (high environmental risk) and should be connected to the WWTP.
2.2	Extension of the Wastewater Treatment Plant (WWTP)	PH 2	The measure should be implemented in Phase 2 for the following reasons, (i) a new WWTP currently under construction will treat wastewater from the existing sewer drainage areas and therefore there is no need to extend the capacity of the WWTP in Phase 1; (ii) The capacity of the WWTP (see Chapter 5.7.2 – Investment framework) can only be determined after completion of the sanitation study in Phase 1, (iii) in order to ensure compliance with national wastewater effluent quality standards (and in the future with EU-standards) for wastewater from Drochia Town and all localities proposed to be connected in Phase 2, the measure should not be carried out at a later stage then in Phase 2.
2.3	Rehabilitation of existing Wastewater Pumping Stations (WWPS)	PH 2	Rehabilitation of the pumping stations has to be implemented together with the network extensions/rehabilitation works and with construction of a new WWTP.
2.4	Rehabilitation of the sewer network	PH 2	In order to ensure functioning of the proposed WWTP (avoid operational problems due to highly diluted sewerage) this measure should be carried out in Phase 2.
3	Equipment for operational performance improvement (water supply and wastewater)	PH 1	Water Supply: High priority is given to the procurement of equipment (see Chapter 5.7.5-Operational Improvement) in order to improve operational efficiency (reduce real and commercial water losses). The equipment shall be procured in parallel to the implementation of TA measures in order to ensure its effectiveness. Wastewater: The procurement of equipment has high priority for operational performance improvement and preparation of long-term investment plan (technical assistance measure) and should be carried out in Phase 1 for the following reasons: • Procurement of equipment has high priority for operational performance improvement and preparation of the sanitation study (wastewater flow and load measurement should be available during the study in order to improve reliability

N°	Investment Measures	Proposed Phase[41]	Justification for Phasing
			of the applied design values for the WWTP); • CCTV inspection and sewer cleaning trucks have been identified as high priority equipment by M.E 'Apa-Canal' Drochia in order to improve operational performance and to prepare sewer rehabilitation programmes.
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 investment measures in order to ensure that part of its results are available for designing Phase 1 investments. In case that insufficient budget is available, 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

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 3.1. and 3.4).

Option analysis for Phase 1:

The proposed capital investment measures for Phase 1 are:

- Extension of the water distribution network;
- Installation of disinfection unit;
- Rehabilitation of the water distribution network;
- Replacement of the transmission main;
- Equipment and tools for operational performance improvement (water supply and wastewater).

The following options have been identified for installation of disinfection unit:

- 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 5-12:

Table 5-12: 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 material – 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.	• 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 development 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 costs are highly depending on the development of electricity and salt prices.

Source: GIZ/MLPS

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 in technical assistance of Phase 1.

Identified options for Phase 2:

The identified options are described below:

Water Supply options:

It is recommended to develop strategies aiming at enhancing supply security for the town (second supply source). There are three options which could be envisaged for strategic development and enhancement of supply security in Drochia Town (see Chapter 5.7.2 – Investment framework for more details):

- Option 1 – Groundwater supply from a new well-field in Drochia;
- Option 2 – Groundwater from neighbouring locality of Tsarigrad;
- Option 3 – Connection to the existing regional transmission main from Soroca to Balti.

Medium to long-term enhancement of supply security for Drochia Town requires a comprehensive assessment at regional level and therefore cannot be carried out within the framework of this study. Hence, it is recommended that a thorough option analysis (considering the development of the above mentioned 'Moldova North Water Project') should be carried out within the technical assistance measure proposed for Phase 1 (see Chapter 5.7.6 – Technical Assistance). Based on the results of this assessment, the retained option should be implemented in the medium term to long-term.

Wastewater options:

Within the framework of technical assistance measures proposed for Phase 1, a thorough assessment and option analysis regarding the localities to be connected in the vicinity of Drochia Town (see also Chapter 5.7.2 – Investment framework) should be carried out in order to identify the most appropriate solution. Among the agglomerations in the rayon (outside of Drochia Town) there are several ones (e.g. Tsarigrad, Surii, Chetrosu) which are located close to Drochia Town (most of them above 2,000 P.E. and thus subject to the requirements defined in the Urban Wastewater Treatment Directive 91/271/EEC). The assessment should take into consideration that in neighbouring EU-countries (Romania) many wastewater collection and treatment systems in small towns are currently not operational due to the high operation costs and the very low connection rates.

5.10 Proposed priority investment plan

The phased investment plan is presented in the tables below. The total investment costs for Phase 1 have been estimated at 2.71 MEUR and for Phase 2 at 16.50 MEUR (see Table 5-13, 5-14, 5-15).

Table 5-13: The investment plan for Phase 1

N°	Component	Units	Quanti-ty	Unit costs	Total cost
				EUR	EUR
1.	Water supply				
1.1	Rehabilitation of water transmission main				
1.1.1	Water transmission main HDPE pipe OD 250 mm	m	3,520	104	366,080
1.1.2	Water transmission main HDPE pipe OD 200 mm	m	770	90	69,300
ST 1.1	Subtotal 1.1 Rehabilitation of water transmission main				435,380
1.2	Extension of the water distribution network				
1.2.1	HDPE pipe OD 160 mm	m	2,195	75.00	164,625
1.2.2	HDPE pipe OD 110 mm	m	1,700	65	110,500
1.2.3	HDPE pipe OD 90 mm	m	750	62	46,500
1.2.4	HDPE pipe OD 75 mm	m	3,515	60	210,900

N°	Component	Units	Quanti-ty	Unit costs	Total cost
				EUR	EUR
1.2.3	Manholes, ϕ 1,500 mm	pcs.	35	423	14,805
1.2.4	Service connections	pcs.	650	250	162,500
ST-1.2	Subtotal 1.2 Extension of the water distribution network				709,830
1.3	Rehabilitation of the water distribution network				
1.1.1	HDPE pipe OD 160 mm	m	2,745	75	205,875
1.1.2	HDPE pipe OD 110 mm	m	2,710	65	176,150
1.1.3	HDPE pipe OD 90 mm	m	1,010	62	62,620
1.1.4	HDPE pipe OD 75 mm	m	1,265	60	75,900
ST-1.3	Subtotal 1.1 Rehabilitation of the water distribution network				520,545
1.4	Installation of disinfection unit – (building, technical equipment, electric installations)	LS	1	70,000	70,000
ST-1	TOTAL water supply (1.1+1.2+1.3+1.4)				1,735,755
2	Equipment and tools for operational performance improvement	LS	1	200,000	200,000
ST-1&2	Sub-Total (1+2)				1,935,755
3.	Technical assistance				
3.1	Design and engineering incl. construction supervision (12% of investment costs)				232,291
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)				532,291
4.	Contingencies (10% of 1+2+3)				246,805
GT	**Total Costs for Drochia Phase 1 (1+2+3+4)**				**2,714,850**

Source: GIZ/MLPS

Table 5-14: The investment plan for Phase 2

N°	Component	Units	Quanti-ty	Unit costs	Total cost
				EUR	EUR
1	Wastewater				
1.1	Extension of the sewer network				
1.1.1	Sewer network PP/PVC pipe OD 200 mm	m	33,345	165	5,501,925
1.1.2	Manholes, ϕ 1,000	pcs	667	1,030	686,907
1.1.3	Pressure main PE OD 90-110 mm	m	2,360	62	146,320
1.1.4	Service connections	pcs	2,440	500	1,220,000
ST-1.1	Subtotal 1.1 Extension of sewer network				7,555,152
1.2	Wastewater pumping station				
1.2.1	Construction of new wastewater pumping station	LS	1	32,000	32,000

N°	Component	Units	Quanti-ty	Unit costs	Total cost
				EUR	EUR
1.2.2	Construction of new wastewater pumping stations	LS	3	28,000	84,000
ST-1.2	Sub-total 1.2 Wastewater Pumping Stations				116,000
1.3	Rehabilitation of wastewater pumping stations				
1.3.1	Rehabilitation of WWPS 2	LS	1	40,000	40,000
1.3.2	Rehabilitation of WWPS 3	LS	1	32,000	32,000
1.3.3	Rehabilitation of MWWPS	LS	1	83,000	83,000
ST-1.3	Sub-total 1.3 Wastewater Pumping Stations				155,000
1.3	Rehabilitation of sewer network[44] (OD 200-250 mm)	m	13,650	165	2,252,201
1.4	Extension of Wastewater Treatment Plant (WWTP)	P.E.	11,057	300	3,317,100
ST-1	Subtotal 1. Wastewater (1.1+1.2+1.3+1.4)				13,395,453
2	Technical Assistance				
2.1	Design and engineering incl. construction supervision (12% of investment costs)				1,607,454
3.	Contingencies (10% of 1+2)				1,500,291
GT-2	**Total Costs for Phase 2 (1+2+3)**				**16,503,197**

Source: GIZ/MLPS

Table 5-15: 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	1,735,755		1,735,755
1.2	Wastewater	0	13,395,453	13,395,453
1.3	Equipment and tools	200,000		
ST-1	Sub-total capital investments water supply and wastewater	1,935,755	13,395,453	15,331,208
2	Technical assistance	532,291	1,607,454	2,139,745
3	Contingencies	246,805	1,500,291	1,747,095
Total	**Total Costs Phase 1 & 2**	**2,714,850**	**16,503,197**	**19,218,048**

Source: GIZ/MLPS

[44] The length of the sewer network to be rehabilitated is estimated as 30% of the sewer network, older than 30 years

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[45] scenario[46], 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 will be extended with 650 households in Drochia in 'with project' scenario and no extension of the service area is forecasted for BAU scenario;
- The wastewater service area will be restricted to the current service area of ME 'Apa-Canal' Drochia, no expanding of the service area is forecasted for both scenarios;
- The connection rate increases in the existing service area to 100% as the targets was set by 2030;
- Apparent losses (Commercial losses) will decrease down to the target set of 15% until 2021 and down to the 5% in 2045;
- Physical losses will decrease down to the target set 25% until 2021 and down to the 20% 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;
- Table 7. Net assets for water supply;

[45] Business as Usual

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

6.1.1 Macroeconomic forecast

Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period. GDP is usually calculated on an annual basis. The major source for the GDP forecast is the Poverty Reduction Strategy[47].

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

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

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

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

The implementation of the Strategy's priorities, considering the direct and quantifiable effects of each priority, supplements this annual growth rate by more than 1.2% annually, thus forming the alternative scenario Moldova 2020, which in this study is called the optimistic scenario. The annual supplement to the additional GDP growth will emerge gradually, but will accelerate rapidly and sustainably, from 1.1% (2015) to 2.1% (by 2020), continuing beyond the analysis horizon used in this study. The difference is small at first glance, but in developed economies an annual GDP growth difference of 2% is sometimes the difference between stagnation and growth, or the difference between normal growth and economic boom. Hence, the alternative scenario assumes that, due to effects only, in 2020 the GDP will be 12% higher compared to the base case scenario and, with each year beyond 2020, this difference will grow significantly. Along with the implementation of these priorities, the annual income per capita by 2020 will be on average 12% higher compared to the base case scenario and 79% higher compared to 2011. Taking into account that the National Development Strategy 2012-2020 also serves as the Poverty Reduction Strategy (PRS) and is the official basis for internal programming and for bilateral relations between the Government of the Republic of Moldova and the IMF and other international financial institutions, it may be concluded that the annual percentage changes in GDP presented in the Strategy can serve as a reference for the feasibility study projections.

Table 6-1: GDP annual percentage of change, information provided by PRS (%)

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, %	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: GDP annual percentage of change in the feasibility study (%)

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

Source: GIZ/MLPS

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

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

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

Source: GIZ/MLPS

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

6.1.2 Wages forecast

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

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

Years/Indicator	Gross aver-age monthly salary, MDL	Salary growth rate, %
2205	1,319	19.5
2006	1,697	28.7
2007	2,065	21.7
2008	2,530	22.5
2009	2,748	8.6
2010	2,972	8.2
2011	3,194	7.5
2012	3,478	8.9
2013	3,765	8.3
2014	4,172	10.8

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

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

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

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

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

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

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

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

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

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

Source: GIZ/MLPS

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

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

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

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

Source: GIZ/MLPS

The base case scenario was used in this feasibility study.

6.1.3 Household income forecast

According to National Bureau of Statistics of the Republic of Moldova the disposable household income was (in 2014), in person per month: MDL 2,292.6 in Chisinau, MDL 1,697.2 in the North, MDL 1,564.3 in the Centre and MDL 1,526.6 in the South Region[48].

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, 2015-2020[49]

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

Source: GIZ/MLPS

Table 6-10: Forecast of disposable household income, 2020-2045[50]

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

Source: GIZ/MLPS

6.1.4 Electricity prices forecast

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

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

- Regulation and government policy keeping prices low;
- Regional price of gas as a major fossil fuel used in the power generation in Moldova;
- Demand for the electricity in the region;
- Situation in Transnistria, from where Moldova imports electricity at a low price due to subsidized gas prices in Transnistria;

[48] 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

[49] Per capita per month (MDL)

[50] Per capita per month (MDL)

- Development of grid connections to Romania and Ukraine;
- General growth of the country's GDP and increase in disposable household income, which may provide the government with the possibility of relaxing control on electricity prices.

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

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

The following table summarizes the assumed future electricity price increases:

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

Scenario/ Years	2015	2016	2017	2018	2019	2020	2030	2040
Base case scenario, %	0.0	37.0	1.0	1.0	1.0	1.0	2.0	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 (see Table 6-12).

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

Balance Sheet	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
ASSETS				
LONG-TERM FIXED ASSETS				
Incomplete fixed assets	040	78,808	78,808	78,808
Fixed Assets	060	14,931,782	26,385,977	26,701,677
Depreciation and depletion of long-term fixed assets	080	-11,181,982	-17,493,266	-17,984,949
Long-term fixed assets' book cost	090	3,828,608	8,971,519	8,795,536
Total Non-Current Assets	180	3,828,608	8,971,519	8,795,536
CURRENT ASSETS				

Balance Sheet	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Stocks of goods and materials				
Raw materials	190	203,725	171,970	179,879
Inventory	210	46,118	56,509	55,277
Stocks of goods and materials	250	249,843	228,479	235,156
Short-term receivables				
Trade accounts receivables	260	969,202	923,035	953,954
Receivables from staff	320	2,888	3,601	4,227
Short-term receivables	350	971,908	926,636	958,181
Cash				
Settlement Account	400	328	7,524	220
Cash	410	8,799	8,641	6,681
Cash and equivalents	440	9,127	16,165	6,901
Total Current Assets	460	1,230,878	1,171,280	1,200,238
TOTAL - ASSETS	470	**5,059,486**	**10,142,799**	**9,995,774**
LIABILITIES AND OWN EQUITY				
EQUITY				
Share capital and capital surplus				
Share capital	480	46,080	46,080	46,080
Share capital and capital surplus	520	46,080	46,080	46,080
Other provisions	550	13,563,833	2,082,446	2,082,446
Correction of previous periods' results	570	0	6,775,554	6,621,588
Retained profit (uncovered loss) of previous years	580	-512,158	0	0
Net income (loss) of the reporting period	590	-11,015,309	-153,966	-131,973
Retained earnings (uncovered loss)	610	-11,527,467	6,621,588	6,489,615
Total Equity	650	2,082,446	8,750,114	8,618,141
SHORT-TERM LIABILITIES				
Short-term accounts payables				
Commercial account payables	830	300,049	346,661	413,813
Short-term accounts payables	860	300,049	346,661	413,813
Wages owed	870	585,018	363,840	233,762
Other employee liabilities	880	88,157	88,157	88,157
Insurance	890	0	80,337	75,758
Insurance	900	1,747,521	485,842	364,115
Non budget payment liabilities	920	11,366	11,366	11,366
Other current liabilities	950	244,929	16,482	190,662
Short-term accrues liabilities	960	2,676,991	1,046,024	963,820
Total Short Term Liabilities	970	2,977,040	1,392,685	1,377,633
TOTAL – EQUITY and LIABILITIES	**980**	**5,059,486**	**10,142,799**	**9,995,774**

Source: ME 'Apa-Canal' Drochia

The following conclusions results from the Balance Sheet analysis:

- The largest assets category is long-term assets, which constituted 88.0% of the total in 2014. It should be mentioned that the operator's assets increased from MDL 5.1 million in 2012 to MDL 10.0 million in 2014;
- Liabilities show that the operator is financed mainly from permanent capital due to the increase of retained earnings up to MDL 6.5 million in 2014;
- The share of short-term debts in 2014 is 13.7% 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 ME 'Apa-Canal' Drochia

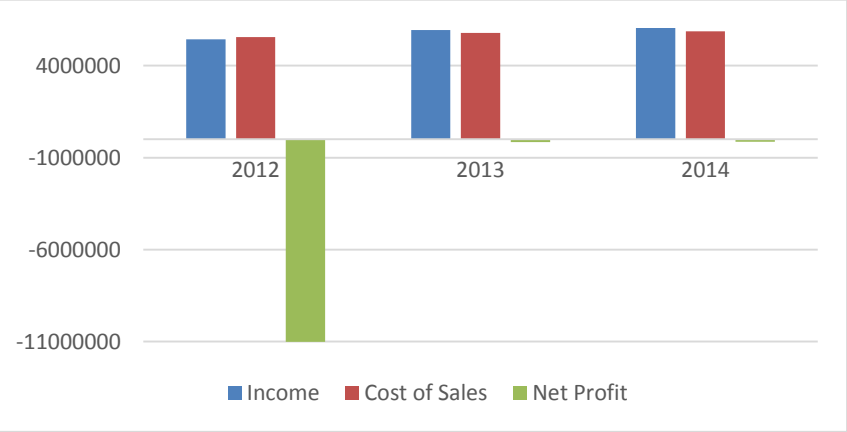
Income Statement	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Income from sales	010	5,438,020	5,944,837	6,154,360
Cost of sales	020	5,555,194	5,793,398	5,865,730
Gross profit (gross loss)	030	-117,174	151,439	288,630
Other operating income	040	454,449	313,555	556,566
Commercial expenses	050			
General and administrative expenses	060	2,742,681	1,211,200	1,369,493
Other operating expenses	070	31,749	73,400	7,502
Result from operating activities: profit (loss)	080	-2,437,155	-819,606	-531,799
Result from investing activities: profit (loss)	090	-8,578,154		355,000
Result from financial activities: profit (loss)	100		665,640	44,826
Result from financial and economic activities: profit (loss)	110	-11,015,309	-153,966	-131,973
Extraordinary result: profit (loss)	120			
Profit (loss) before tax	130	-11,015,309	-153,966	-131,973
Income tax	140			
Net profit (net loss)	150	-11,015,309	-153,966	-131,973

Source: ME 'Apa-Canal' Drochia

The ME 'Apa-Canal' Drochia has losses from operating activities in 2012-2014, which had a negative effect in the accumulation of reserves.

The evolution of the utility'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 ME 'Apa-Canal' Drochia

Cash Flow Statement	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Operating activities				
Cash inflows from sales	010	6,541,788	7,759,553	8,298,498
Cash paid to suppliers and contractors	020	2,926,844	3,638,365	2,639,102
Cash payments to employees and social security contributions	030	3,484,264	3,891,777	3,351,033
Interest payments	040			
Income tax payments	050	126,883	222,373	224,712
Other cash receipts	060			
Other cash payments	070			2,092,915
Net cash flow from operating activities	080	3,797	7,038	-9,264
Financing activities				
Net cash flow from financial activity	210	0	0	0
Net cash flow before extraordinary items	220	3,797	7,038	-9,264
Cash proceeds (payments) from extraordinary items	230			
Net cash flow	240	3,797	7,038	-9,264
Positive (negative) foreign exchange differences	250			
Cash balance at the beginning of the year	260	5,330	9,127	16,165
Cash balance at the end of the reporting period	270	9,127	16,165	6,901

Source: ME 'Apa-Canal' Drochia

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	0.41	0.84	0.87	1.0 – 2.0
2	ROE, %	-529.0	-1.8	-1.5	
3	ROA, %	-217.7	-1.5	-1.3	
4	Operating Profitability, %	-44.8	-13.8	-8.6	> 0
5	Debts Service Converge Ratio	0.41	0.86	0.86	<1.2
6	Financial Ratio	0.59	0.14	0.14	
7	Accounts Receivable Turnover, days	65	58	56	< 30
8	Accounts Payable Turnover, days	20	41	24	< 30

Source: GIZ/MLPS

- The profitability indicators (2, 3, 4) have oscillating values, but are generally negative for 2012-2013. This means that the 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 self-financing strategy;
- Liquidity indicator (1) shows a reduced capacity of paying in the short-term period;
- The collection of receivables shows a decrease in the collection period from 65 days in 2012 to 56 days in 2014. The accounts payable period increased from 20 days in 2012 to 24 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[51]

Consumers	Revenues		Volumes	
	(MDL)	(%)	(m^3)	(%)
WATER SUPPLY	3,814,609	100.0	294,825	100.0
Population	2,637,724	69.1	264,687	89.8
Budgetary Consumers	500,240	13.1	12,771	4.3
Private Entities	676,645	17.7	17,367	5.9
WASTEWATER SERVICES	2,339,744	100.0	226,583	100.0
Population	1,218,818	52.1	174,282	76.9
Budgetary Consumers	239,241	10.2	12,480	5.5
Private Entities	881,685	37.07	39,821	17.6

Source: ME 'Apa-Canal' Drochia

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	58,34	58,34	58,34
• Water supply	39,17	39,17	39,17
• Wastewater services	19,17	19,17	19,17
Private Entities	58,34	58,34	58,34
• Water supply	39,17	39,17	39,17
• Wastewater services	19,17	19,17	19,17
Population	17,00	17,00	17,00
• Water supply	10,00	10,00	10,00
• Wastewater services	7,00	7,00	7,00
Weighted average		22,79	
• Water supply		12,98	
• Wastewater services		9,81	

Source: ME 'Apa-Canal' Drochia

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.

[51] ME 'Apa-Canal' Drochia, 2014

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

Cost category	Amount (MDL)	Percentage (%)
WATER SUPPLY	3,610,271	100.0
Electricity (for pumping)	1,663,997	46.1
Chemicals for water treatment	9,600	0.3
Fuel for transport for water supply	69,841	1.9
Salaries of employees working at water supply	1,083,558	30.0
• Number of employees (pers.)	25	-
• Average monthly salary per employee	3,612	-
Social benefits (pension fund/insurance)	294,068	8.2
Depreciation	184,731	5.1
Maintenance costs for water supply	96,260	2.7
Tax for water capturing	113,165	3.1
Other costs	95,051	2.6
WASTEWATER SERVICES	2,251,577	100.0
Electricity (for wastewater treatment)	147,727	6.6
Fuel for transport for wastewater services	63,086	2.8
Salaries of employees working at wastewater	1,266,205	56.2
• Number of employees (pers.)	32	-
• Average monthly salary per employee	3,297	-
Social benefits (pension fund/insurance)	342,422	15.2
Depreciation	306,952	13.6
Maintenance costs for wastewater services	68,974	3.1
Other costs	56,211	2.5
ADMINISTRATION AND OVERHEAD	1,373,376	100.0
Salaries of employees working in administration	809,143	58.9
• Number of employees (pers.)	13	-
• Average monthly salary per employee	5,187	-
Social benefits (pension fund/insurance)	218,677	16.0
Fuel for transport for administration	42,975	3.1
Other overhead costs	302,581	22.0

Source: ME 'Apa-Canal' Drochia

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)
Total			600,000
Pumps purchasing	Danish Fund	2011	600,000

Source: ME 'Apa-Canal' Drochia

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 ME 'Apa-Canal' Drochia

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 54.62 million (EUR 2.63 million). The outlays include:

- Rehabilitation of the water transmission main pipeline – 4.3 km;
- Extension of the water distribution network in the town of Drochia – 8.16 km;
- Rehabilitation of the water distribution network in the town of Drochia – 7.73 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.

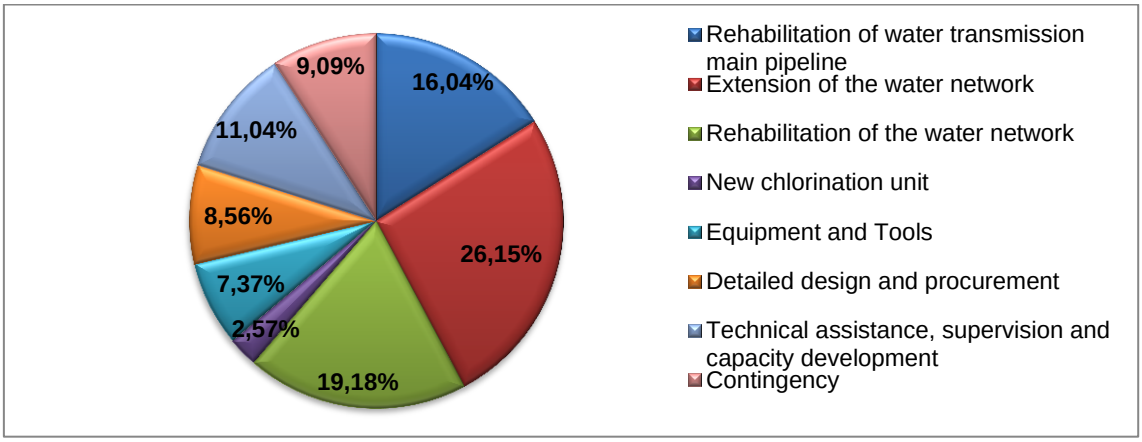
Table 6-20: Summary of the investment costs (MDL mil.)

Project investment outlays	Amount (MDL mil.)	Percentage (%)
Rehabilitation of water transmission main pipeline	9.05	16.04%
Extension of the water network	14.75	26.15%
Rehabilitation of the water network	10.82	19.18%
New chlorination unit	1.45	2.57%
Equipment and Tools	4.16	7.37%
Detailed design and procurement	4.83	8.56%
Technical assistance, supervision and capacity development	6.23	11.04%
Contingency	5.13	9.09%
Total	**56.41**	**100%**

Source: GIZ/MLPS

The main part of investment costs about 45.3% will be for the rehabilitation and extension of water distribution network of the town Drochia. Another 16.0% will be for the rehabilitation of the water transmission main network. Capacity development and technical assistance will be around 19.6% 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[52].

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

It is estimated that 452 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 0.45 million.

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

As indicated when calculating the financial gap (see Chapter 6.3.7 'Financial performance of the project - NPV and IRR calculation'), project is not profitable (FNPV(K)~=0) when own contribution achieve MDL 12.11 million. This means that apart from citizen contributions of MDL 0.45 million, the additional MDL 12.11 million needs to be provided from other sources.

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

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'[53]. 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 ME 'Apa-Canal' Drochia has no creditworthiness capacity.

Source: GIZ/MLPS

The following table presents the financing sources of the investment outlays:

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

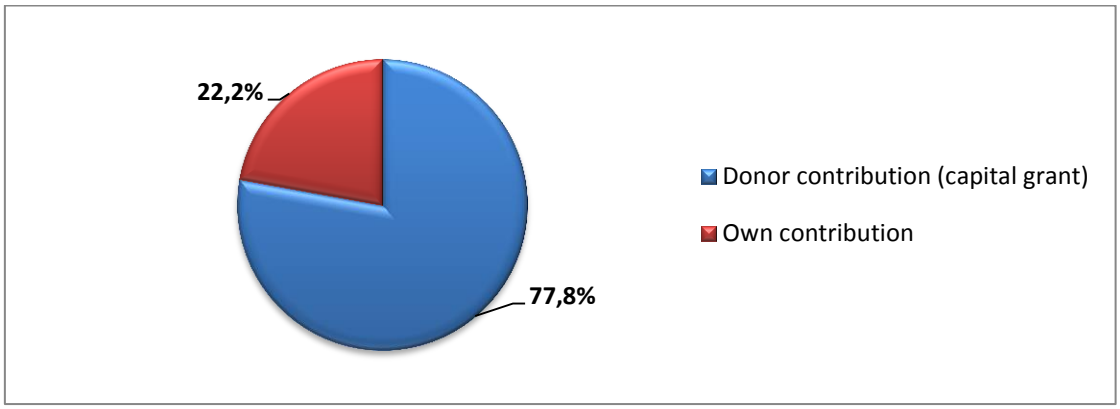
Project financing sources	Amount (MDL mil.)	Percentage (%)
Citizens providing local contribution	0.45	0.80%
Domestic and International donors	44.30	77.80%
Other domestic sources	11.66	21.40%
Water utility	0.00	0.00%
Total	**56.41**	**100.00%**

Source: GIZ/MLPS

The donor contribution was estimated as 77.8% of the total investment costs, while the local sources' contribution is 22.2%.

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

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



Source: GIZ/MLPS

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

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

Project investment outlays	2015 (MDL mil.)	2016 (MDL mil.)	2017 (MDL mil.)	Total (MDL mil.)
	10%	50%	40%	
Rehabilitation of water transmission main pipeline	0.90	4.52	3.62	9.05
Extension of the water network	1.48	7.38	5.90	14.75
Rehabilitation of the water network	1.08	5.41	4.33	10.82
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	2.41	1.93	4.83
Technical assistance, supervision and capacity development	0.62	3.12	2.49	6.23
Contingency	0.51	2.56	2.05	5.13
Total	**5.64**	**28.20**	**22.56**	**56.41**

Source: GIZ/MLPS

6.3.3 Forecast of operating costs

A detailed cost structure of ME 'Apa-Canal' Drochia for the year 2014 was presented in Subchapter 6.**Error! Reference source not found.** (**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 7.4 '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 at 0.18 MDL/m^3 of water treated. No real increase is forecasted;
- **Direct costs (electricity).** The following assumptions were used for unit consumption:
  - **For pumping stations and water treatment plant**. The electricity consumption for water pumping stations and for the water treatment plant is estimated to be 1.56 kWh/ m^3;
  - **For wastewater pumping stations and wastewater treatment plant**. The electricity consumption for wastewater pumping stations and the wastewater treatment plant is estimated to be 0.27 kWh/ m^3.
- Electricity costs are estimated taking into account the electricity prices and the electricity consumption. Price of energy[54] 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 1.37 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 level of MDL 0.49 million annually. However, depreciation costs will increase to about MDL 2.05 million annually, after the investments in new assets have been implemented, beginning with the year 2018.

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

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

The operational costs forecasts are presented in the following table.

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

Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Variable costs water	MDL mil.	1.78	1.87	2.41	2.35	2.43	2.47	3.67	6.82	10.30
Electricity for pumping	MDL mil.	1.66	1.74	2.29	2.23	2.31	2.35	3.50	6.60	10.07
Water treatment costs	MDL mil.	0.11	0.13	0.12	0.12	0.12	0.12	0.16	0.22	0.23

[54] It has to be noted that current electricity price for all pumping station is 1.57 MDL/kWh, while for wastewater treatment plant is 1.60 MDL/kWh.

Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Fixed costs water	MDL mil.	2.67	2.67	2.94	4.09	7.04	7.17	7.95	9.53	11.65
Salaries and related costs	MDL mil.	1.38	1.38	1.42	1.48	1.55	1.61	1.96	2.90	3.93
Maintenance - old assets	MDL mil.	0.00	0.00	0.00	0.00	2.00	2.04	2.25	2.75	3.20
Maintenance - new assets	MDL mil.	0.00	0.00	0.05	0.33	0.55	0.55	0.55	0.55	0.55
Fuel	MDL mil.	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Depreciation of fixed assets	MDL mil.	0.18	0.18	0.34	1.12	1.75	1.75	1.75	1.33	1.33
General and administrative expenditures	MDL mil.	0.85	0.85	0.86	0.90	0.93	0.97	1.18	1.75	2.38
Other costs	MDL mil.	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Total costs for water	MDL mil.	4.45	4.54	5.35	6.44	9.46	9.65	11.62	16.35	21.95
Wastewater service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Variable costs wastewater	MDL mil.	0.15	0.15	0.22	0.22	0.23	0.23	0.41	0.82	1.36
Electricity for pumping	MDL mil.	0.15	0.15	0.22	0.22	0.23	0.23	0.41	0.82	1.36
Wastewater treatment costs	MDL mil.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed costs water	MDL mil.	2.63	2.63	2.68	2.78	3.38	3.48	4.07	5.64	7.35
Salaries and related costs	MDL mil.	1.61	1.61	1.66	1.73	1.81	1.88	2.29	3.39	4.59
Maintenance - old assets	MDL mil.	0.00	0.00	0.00	0.00	0.50	0.51	0.56	0.69	0.80
Fuel	MDL mil.	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Depreciation of fixed assets	MDL mil.	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
General and administrative expenditures	MDL mil.	0.52	0.52	0.53	0.55	0.57	0.60	0.73	1.07	1.46
Other costs	MDL mil.	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Total costs for wastewater	MDL mil.	2.77	2.78	2.90	3.00	3.61	3.71	4.48	6.46	8.71
TOTAL COSTS	**MDL mil.**	**7.23**	**7.32**	**8.25**	**9.44**	**13.07**	**13.36**	**16.10**	**22.81**	**30.66**

Source: GIZ/MLPS2

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.

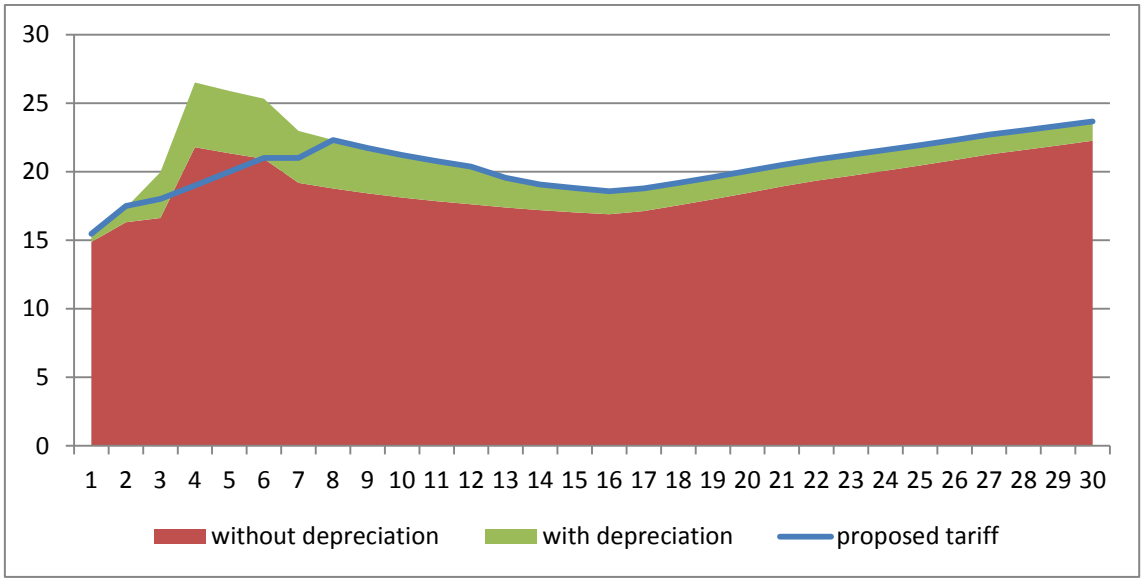
Table 6-25: Tariff calculation for the option 'with project' (MDL mil.)

Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Variable and fixed costs	MDL mil.	4.10	4.36	5.01	5.32	7.72	7.90	9.87	15.02	20.62
Depreciation	MDL mil.	0.18	0.18	0.34	1.12	1.75	1.75	1.75	1.33	1.33
Interest and financial costs	MDL mil.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reserve for irregular receivables	MDL mil.	0.00	0.23	0.24	0.26	0.33	0.29	0.29	0.41	0.55
Sale of water	ths m^3	294.8	308.5	322.1	335.6	369.6	383.8	561.1	836.8	951.1
Tariff without depreciation	MDL/ m^3	13.91	14.87	16.31	16.62	21.78	21.34	18.11	18.44	22.25
Tariff with depreciation	MDL/ m^3	14.54	15.47	17.37	19.96	26.50	25.88	21.22	20.03	23.65
Proposed average tariff	MDL/ m^3	12.98	17.00	17.50	18.00	19.00	20.00	21.22	20.03	23.65
Wastewater service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Variable and fixed costs	MDL mil.	2.33	2.47	2.59	2.70	3.30	3.40	4.18	6.15	8.40
Depreciation	MDL mil.	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Interest and financial costs	MDL mil.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reserve for irregular receivables	MDL mil.	0.00	0.14	0.13	0.12	0.13	0.11	0.11	0.16	0.22
Sale of wastewater	ths m^3	226.6	233.7	240.8	247.8	254.9	261.9	470.4	702.6	846.7
Tariff without depreciation	MDL/ m^3	10.30	11.17	11.30	11.36	13.45	13.43	9.12	8.98	10.18
Tariff with depreciation	MDL/ m^3	11.66	12.48	12.57	12.60	14.65	14.60	9.77	9.42	10.54
Proposed average tariff	MDL/ m^3	9.81	11.17	11.30	11.36	12.00	12.00	9.77	9.42	10.54

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 8 of the forecast for water supply service and in year 7 for sanitation system.

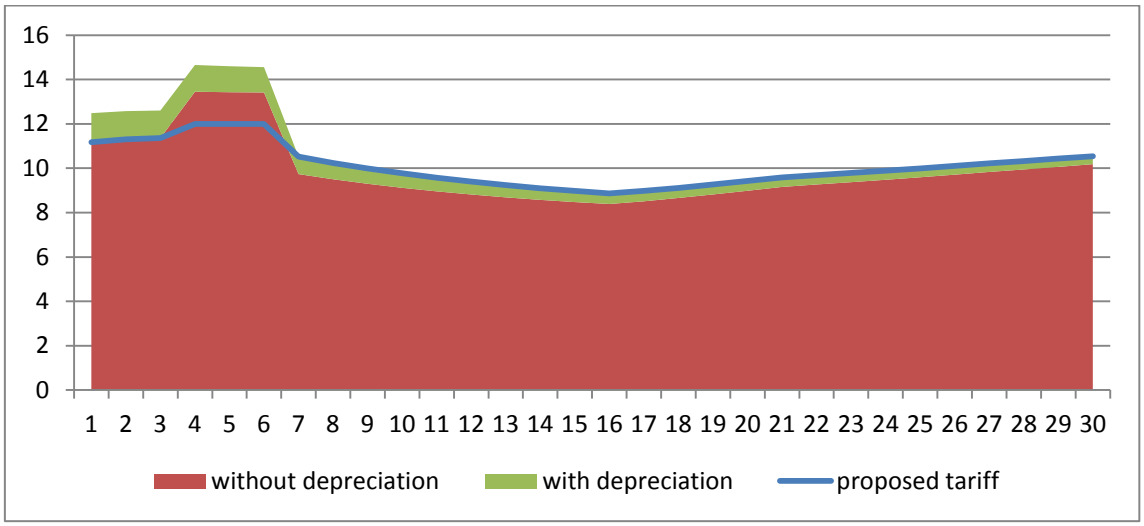
Figure 6-4: Forecast of the tariff for water (MDL/m^3)



Source: GIZ/MLPS

The tariff of water is forecasted to be about MDL 20.50 per m^3 on average for the entire forecast period. The financial projections, however, do not take into account the effect of inflation. As a result, the real decrease or increase of tariffs will depend of the development of costs and their variation.

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



Source: GIZ/MLPS

The tariff for wastewater is forecasted to be about 10.10 MDL per m^3 on average for the whole projected period. Also, the financial projections do not consider the effect of inflation, but the real decrease or increase of tariff will depend on how costs develop and fluctuate.

6.3.4.2 Tariff affordability

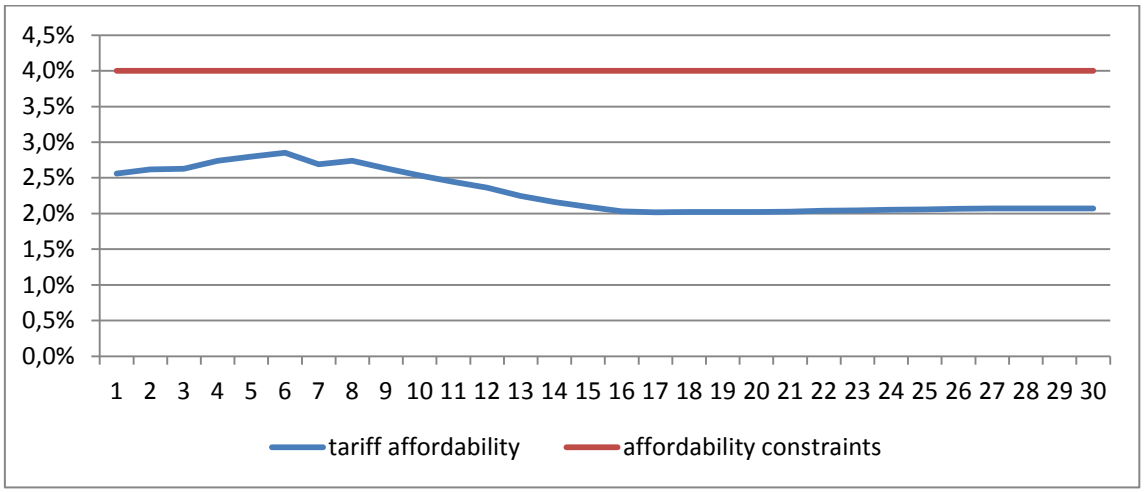
The affordability of tariffs, expressed as the ability of households to pay for services, is estimated as the household expenditures on water and wastewater services expressed as a percentage of disposable household income. For Eastern Europe countries, a common benchmark figure for the affordability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

During the entire period of the financial projections, the average tariff will constitute about 2.3% 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	294.8	308.5	322.1	335.6	369.6	383.8	561.1	836.8	951.1
The weighted average tariff for water	MDL/ m^3	12.98	17.00	17.50	18.00	19.00	20.00	21.22	20.03	23.65
Revenues from water service	MDL mil.	3.83	5.24	5.64	6.04	7.02	7.68	11.91	16.76	22.50
Wastewater service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Sale of wastewater	ths m^3	226.6	233.7	240.8	247.8	254.9	261.9	470.4	702.6	846.7
The weighted average tariff for wastewater	MDL/ m^3	9.81	11.17	11.30	11.36	12.00	12.00	9.77	9.42	10.54
Revenues from sanitation service	MDL mil.	2.22	2.61	2.72	2.82	3.06	3.14	4.60	6.62	8.93
Total Revenues	**MDL mil.**	**6.05**	**7.85**	**8.36**	**8.86**	**10.08**	**10.82**	**16.50**	**23.38**	**31.42**

Source: GIZ/MLPS

The water demand will increase from 294.8 thousand m^3 per year to 951.1 thousand 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 55.0 l/c/d to 110 l/c/d in 2045 and the increase of consumers by 6,352.

The wastewater inflow is calculating based on the wastewater generation per capita and the number of consumers. It is assumed that the number of consumers will grow

from the current number of 9,534 to 18,553 persons and the wastewater demand will increase from the current 50.1 l/c/d up to 110 l/c/d in 2045.

The tariff for water services will increase slowly from 17.00 MDL/m^3 to approximately 23.6 MDL/m^3 at the end of projection period. For the sanitation services the tariff is estimated to be around 11.60 MDL/m^3 in the period 2015-2021, and after that it will be approximately 9.70 MDL/m^3.

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 service will be positive with exception of period 2017-2021 in which the profit is expected to be negative. The average annual profit is expected to be about MDL 0.40 million. For the sanitation services, the financial results will be positive with the exception of period 2015-2020 when the financial results will be negative. Beginning with 2021 the average annual profit for the sanitation service is expected to be about MDL 0.16 million. The cumulated net profit for the projected period will be positive with a value of MDL 3.13 million.

The calculation of net profit for each service in the 'with project' option is presented in Table 6-27.

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

Water supply service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Sale of water	MDL mil.	3.83	5.24	5.64	6.04	7.02	7.68	11.91	16.76	22.50
Costs of water services	MDL mil.	4.29	4.54	5.35	6.44	9.46	9.65	11.62	16.35	21.95
Gross profit from water services	MDL mil.	-0.46	0.70	0.28	-0.40	-2.44	-1.97	0.29	0.41	0.55
Wastewater service	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Sale of wastewater	MDL mil.	2.22	2.61	2.72	2.82	3.06	3.14	4.60	6.62	8.93
Costs of wastewater services	MDL mil.	2.64	2.78	2.90	3.00	3.61	3.71	4.48	6.46	8.71
Gross profit from wastewater services	MDL mil.	-0.42	-0.17	-0.18	-0.19	-0.55	-0.57	0.11	0.16	0.22
Total gross profit	MDL mil.	-0.88	0.53	0.11	-0.59	-2.99	-2.54	0.40	0.57	0.77
Income tax	MDL mil.	0.00	0.06	0.01	0.00	0.00	0.00	0.05	0.07	0.09
Net profit	MDL mil.	-0.88	0.47	0.09	-0.59	-2.99	-2.54	0.35	0.50	0.67
Cumulated net profit	MDL mil.		0.47	0.56	-0.02	-3.02	-5.55	-7.15	-2.84	3.13

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, Tables 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	12.27	35.74	30.75	10.34	10.85	16.57	23.47	31.51
Donor contribution (capital grant)	MDL M	0.00	4.25	21.26	17.01	0.00	0.00	0.00	0.00	0.00
Own contribution	MDL M	0.00	1.21	6.05	4.84	0.00	0.00	0.00	0.00	0.00
Revenues from sale	MDL M	0.00	7.38	8.36	8.86	10.08	10.82	16.50	23.38	31.42
Increase in current liabilities	MDL M	0.00	-0.57	0.07	0.05	0.26	0.03	0.06	0.09	0.09
Financial outflows	MDL M	0.00	11.80	35.01	29.93	11.31	11.37	14.15	21.32	29.19

Indicator	Unit	2014	2015	2016	2017	2018	2019	2024	2034	2044
Investment costs	MDL M	0.00	5.46	27.31	21.85	0.00	0.00	0.00	0.00	0.00
Costs of providing services	MDL M	0.00	6.83	7.60	8.02	11.02	11.31	14.05	21.17	29.02
Increase in current assets	MDL M	0.00	-0.50	0.09	0.07	0.29	0.07	0.06	0.08	0.08
Income tax	MDL M	0.00	0.01	0.01	0.00	0.00	0.00	0.05	0.07	0.09
Net cash flow (inflow - outflow)	MDL M	0.00	0.47	0.73	0.82	-0.97	-0.52	2.41	2.15	2.32
Cumulated cash	MDL M	0.01	0.48	1.21	2.03	1.06	0.54	9.00	30.74	53.15

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 56.41 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 a MDL 53.57 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)=	-38.02	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[55] 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[56] 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 Drochia, 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.

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.

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

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

The following social effects from additional employment were taken into account in the analysis:

- Increase in the number of jobs during investment implementation (temporary effect);
- New jobs resulting from the economic development made possible due to investment implementation.

The first effect was estimated and described in detail below, while the second effect is not quantified.

Increase in jobs during investment implementation

Project implementation results in additional employment. This will be a temporary effect from the infrastructure investments, in which a significant portion of the investment outlays is associated with labour. Full automation is not possible during construction of the water and sewer networks, especially in excavation works, and thus the required labour includes a significant portion of low qualified workers from the ranks of the unemployed. Due to the lack of detailed data on outlays, typical cost estimates of similar project scopes were analysed in order to determine the share of wages for low qualified labour in total outlays. Based on this analysis, a share of 30% of such labour in outlays was assumed and in the CBA this result was adjusted so that the cost of employing these persons was equal to zero.

Reducing developmental disparities among regions

The project's impact on reducing developmental disparities among regions results foremost from the expansion of access to technical infrastructure. Tasks completed under the project have a positive impact on increasing investment also in the entire region.

Two aspects are of key importance for reducing the level of development between regions:

- Expansion of infrastructure is the basic element of development in the region and is viewed by residents as a requirement. A lack of infrastructure leads to a degradation in the region and an outflow of persons toward areas that are better developed;
- The second element in reducing developmental disparities between regions is linked to the strict relationship between the expansion of communal infrastructure – including water– and economic development. The project provides not only for constructing water pipes but also gives the possibility for business development in commercial and service (agriculture) areas. The lack of a water capacity is a large barrier to development of these areas because transporting water by cisterns is much more expensive. This discourages potential investors from developing activities in the area that is lacking basic infrastructure.

6.3.9.3 Economic rate of return (ERR) and economic net present value (ENPV)

Table 24 in Annex 6 contains a calculation of the economic rate of return (ERR) and the economic net present value (ENPV).

This table includes the results of the financial analysis that were corrected for transfers, external effects and price distortions on factors of production.

The net cash flow balance was corrected for the social costs and benefits described earlier:

- Fiscal corrections:
  - VAT.
- Price distortions:
  - Engaging unemployed persons during construction;
  - Price distortions for electricity prices.
- External effects:
  - Shadow prices related to business development;
  - Benefits of avoided water-related diseases.

The calculation does not take into account the grant because it is a transfer.

After making the above corrections, the surplus after corrections was calculated; this in turn was the basis for calculating the economic rate of return (ERR) and the economic net present value (ENPV).

The calculated ERR is 14% while the ENPV is MDL 46.28 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 Competence of the local public administrations 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, decentralization 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 decentralization and transfer of major responsibilities to local authorities.

The deliberative authorities of administrative-territorial units have the exclusive competence on the set-up, organization, coordination, monitoring and control of water supply and wastewater services. They have also the competence of management and operation of the public goods which make up the administrative-territorial units' public infrastructure associated with those services.

According to the Law no. 303 on water supply and sanitation public service dated December 13, 2013, the local councils have the competence to:

- Draw up and implement own business operations and development plan on water supply and wastewater public services for short/mid/long term;
- Approve tariffs of water supply and wastewater public services;
- Manage water supply and sewerage public systems as the integrated components of the administrative-territorial units' infrastructure;
- Approve the regulations and specifications of the service;
- Select the method of management and approve the documentation on organization and conducting of procedures regarding management delegation;
- Approve the performance indicators of the services.

The management of services concerns the organization, 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. 30357, local public administration level 1 (LPA 1):

- Decide on administrative-territorial units association for the purpose of setting up, organizing and encouraging investments in the relevant systems of water supply and wastewater services;
- Use own financial resources/or goods to increase the operator's assets to provide water supply and wastewater services.

The development of water supply and wastewater services requires a level of investment in infrastructure that far exceeds the financial capacities of most local authorities. In addition, localities lack staff specialized 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 organize and operate the services at the regional level, in order to ensure sustainable development and efficiency of activities through achieving economies of scale.

7.2 Institutional development

The Municipal Enterprise 'Apa - Canal' Drochia, hereinafter ME 'Apa - Canal' Drochia, was established by Drochia Local Council, having the right to carry out activities which are part of the water supply and wastewater public services: water abstraction and treatment, distribution of drinking water and wastewater collection and treatment.

The Municipal Enterprise operates under the Law on Local Government no. 436 of 12.28.2006, the Law on entrepreneurship and enterprises no. 845-XII of 01.03.1992, the Civil Code, the Government Decision no. 387 of 06.06.1994 on approval of Municipal Enterprise regulations Model, the Municipal Enterprise charter and the legislation in force.

The assets which are public property, transmitted by founder to the enterprise, are managed and operated under the right of economic management.

The enterprise keeps the daily records and reports to the founder, in accordance with the established procedure, the statistical live data regarding operational and accounting information of its work. Control over financial and economic activity of the company is exercised by the founder as well.

The enterprise is headed by manager who organizes and manages its entire business, as required by law, enterprise charter and functional duties stipulated in the contract concluded with the founder.

The public authority (founder), under the law, has both the right and the obligation to keep permanent control over the activity of municipal enterprise which provides public services, set up by them, thereby ensuring continuity and quality of any service.

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

ME ‘Apa - Canal’ Drochia will bear the responsibility in the future for providing water supply and wastewater services, making financial investments, renewals, billing procedures and revenue collection. Some modifications could be made only in case of local policy change regarding the management of the water supply and wastewater services in the town Drochia, through a decision taken by local deliberative authority.

In order to fulfill the provisions of the Law on water supply and wastewater services no. 303 of 12.13.2013, it is recommended to accomplish the following:

- Contract signing on delegated management of water supply and wastewater services between the ME ‘Apa-Canal’ Drochia, on the one hand, and Drochia Local Council, on the other hand, which will set up the obligations relating water supply and wastewater services provision, development of investment programs and achievement of predetermined levels of performance for these services;
- Development of the addendums regarding delegation of water supply and wastewater services’ management: specifications; regulations regarding provision of services; inventory of movable and immovable property, public or private property of the administrative-territorial unit Drochia related to the services; minutes on assets hand over and taking over;
- Obtaining business license issued by the National Agency for Energy Regulation.

7.3 Regional operator in northern region of Republic of Moldova[58]

Government Decision no.400 of 06.08.2011 is a legal basis for initiating public-private partnership project, which aims maintaining, upgrading and extension through new branches of the aqueduct ‘Soroca-Balti’ and operating the systems which capture, treat, transport and distribute drinking water and those which collect and treat wastewater in municipality of Balti and other localities from Soroca, Drochia, Floresti, Riscani, Singerei and Telenesti rayons.

This public-private partnership on contractual basis involves, first, the setting up of the Joint Stock Company ’Aqua Nord’. The main founder (40% of shares) shall be the municipality of Balti, the state will hold 30 percent of the shares, and the remaining shares shall be equally divided between the towns of Soroca, Floresti, Singerei, Telenesti, Drochia and Riscani.

The future operator will be responsible for financial investments, renewals, operations, maintenance, billing and revenue collection for water supply and wastewater services provided in those seven participating towns.

In the process of regional operator setting up two options were considered and discussed:

- Merging of 8 existing operators (in current form) which are investment project’s beneficiaries;
- Conversion of existing enterprises into joint stock companies as a first step and then their merging at the second stage.

[58] See Consulting Services on PPP development for water supply improving in the northern part of Republic of Moldova.

After a legal analysis of these options, it was concluded that the merging of 8 existing operators (in their current form) is most feasible option.

The operators of water supply and wastewater services in Balti, Soroca, Floresti, Singerei, Telenesti, Drochia and Riscani, including state enterprise 'Aqua Nord' shall merge, setting up a regional operator - Joint-Stock Company 'Aqua Nord'.

The next stage will consist in an international tender that will select international private operator, which will establish a regional operator.

At the moment, Drochia Rayon Council and Drochia Local Council have not made a decision on participation in public-private partnership project 'Aqua Nord'.

7.4 Corporate and human resources development of the operator

The existing institutional setup of the ME 'Apa - Canal' Drochia will not require considerable changes in the near future.

At the present, the staff efficiency indicator of ME 'Apa - Canal' Drochia is lower than the average in Republic of Moldova, as it is 5.39 (both water and wastewater) per total (water and wastewater) connections, while an average value for Moldova is 5.51 persons.

However, the improvement of this indicator is one of the objectives set up by operator and 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 optimization of administration;
- Implementation of a dispatch center. 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 specialized services (e.g. heavy equipment works).

Most of the mentioned activities shall be further developed under the corporate development program proposed as part of the technical assistance in the first phase of implementation of the priority investment program (i.e. the Project). This corporate development program should also provide a general direction for institutional development, in close relation to the phasing of infrastructure investments.

For the Project (first phase of investments until 2018), no extension of water services over the town of Drochia is planned, while most of investments will be spent on rehabilitation of the water supply network within the town of Drochia. Thus, the proposed investments for Phase 1 will not require a high increase of the Company operations and staffing, but in the first place the improvement of the staff efficiency and its reallocation to be able to operate WSS in a sustainable manner.

It is projected that the utility will tend to reach a staff efficiency indicator of 4.5 W&WW staff per 1,000 W&WW connections, which is lower than the average of 5.5 set up for

Moldovan utilities, with the first benchmark of 5.0 staff persons per 1,000 water and wastewater connections in 2018. Given that the planned number of prospective consumers of water supply and wastewater services actually does not increase, this would result in total need of 69 staff persons in 2018. In absolute values this means a decrease by three persons only, as compared to the current situation. The changes will affect the number of the administrative and support staff only in terms of its decreasing with 5 persons.

As for the second phase (2018-2021), an extension of water supply (11%) and wastewater services (25%) areas is foreseen in the town of Drochia. This will require insignificant increase in water and wastewater (W&WW) staff. It is estimated that the Company shall tend to keep the same staff optimization trend, as in the first phase (2015-2018), and will achieve the staff efficiency indicator of 4.5 W&WW staff per 1,000 W&WW connections by 2021. It is expected that that number of wastewater staff will be increased for the new connected areas keeping the same pace.

In the meantime, continuous slow reduction of admin and support staff is foreseen. The staff projections are provided in the Table below:

Table 7-1: Staff projections of the operator

Indicator	Unit	Current Situation, as of 2015	Projected Situation for 2018	Projected Situation for 2021
Number of water staff	people	27	27	28
Number of wastewater staff	people	32	34	37
Number of administrative and other W&WW staff	people	13	8	7
Total Number of staff	people	72	69	72
Number of water connections	conn.	7,751	8,151	9,062
Number of wastewater connections	conn.	5,608	5,571	6,989
Water & related admin staff per 1,000 W connections	pers./1,000con	4.26	3.80	3.42
WW & related admin staff per 1,000 WW connections	pers./1,000con	6.95	6.82	5.87
Total staff per 1,000 W&WW connections	pers./1,000con	5.39	5.00	4.50

Source: GIZ/MLPS

In order to facilitate further institutional development of the Company, the Phase 1 investments foresee a Technical Assistance for Corporate Development (see Chapter 5).

7.5 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 existing services operator ME ‘Apa - Canal’ Drochia, 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

8.1 Executive summary and conclusions

It is proposed to rehabilitate and extend the water supply and wastewater system (WSS) in Drochia town.

The Feasibility Study (FS) for Drochia town 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:

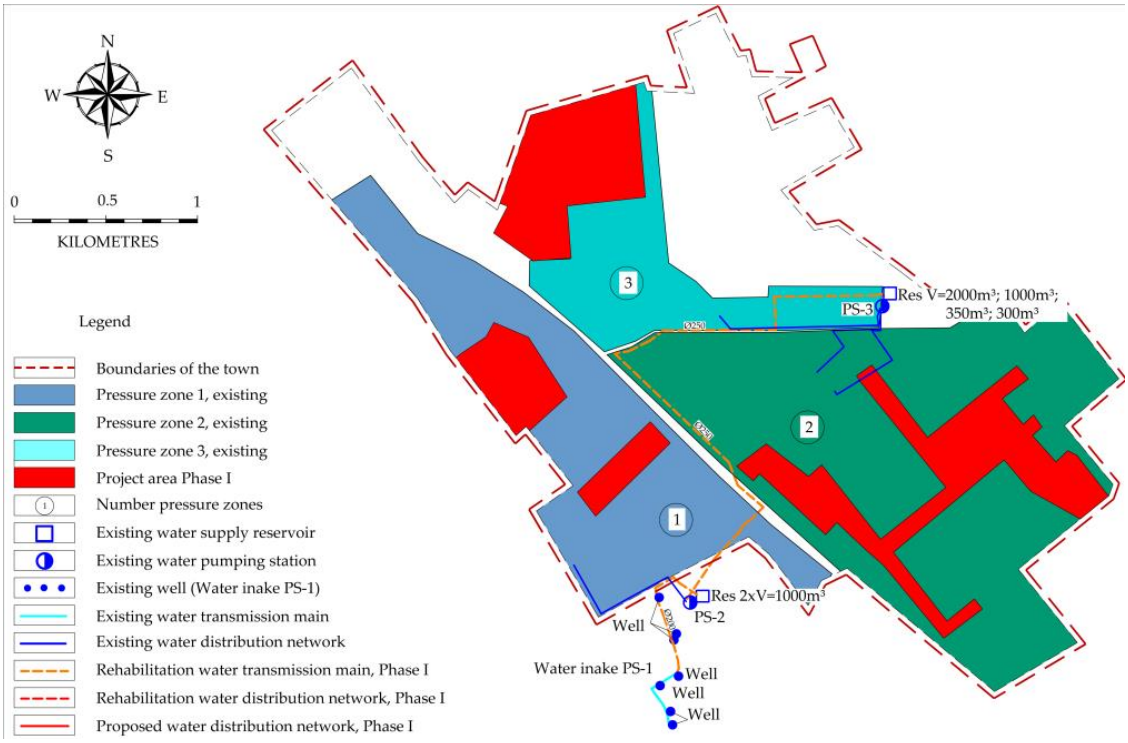
- Water supply system:
  - Rehabilitation of water transmission main – 4,290 m;
  - Extension of the water distribution network in the town of Drochia – 8,160 m;
  - Rehabilitation of the water distribution network in the town of Drochia – 7,730 m.
- Wastewater System:
  - Rehabilitation of sewer network in the town of Drochia – 13,650 m;
  - Extension of the sewer network in the town of Drochia – 35,705 m;
  - Construction of wastewater pumping stations – 4 units;
  - Rehabilitation of wastewater pumping stations – 3 units;
  - Extension of Wastewater Treatment Plant (WWTP) – 1 unit.

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) includes 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 Drochia proposed are presented in the Figure 8-1 and 8-2.

Figure 8-1: Scheme of existing and proposed water supply system in the town of Drochia



Source: GIZ/MLPS

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

Source: GIZ/MLPS

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

According to the new law on environmental assessment (Law No. 86/29.05.2014 on Environmental Impact Assessment which is in force from beginning January 4, 2015) none of the 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 detailed design stage of the Project.

The environmental impacts of the measures proposed in this FS have been assessed in this Environmental and Social Assessment. The results of analysing the environmental impacts and mitigation measures are presented below 'Environmental Impacts and Mitigation measures'. Potential environmental impacts arising from the 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 feasibility study (the Project). The Environmental and Social Assessment is part of the Feasibility Study (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 Project objectives will comply with Moldova's environmental and social legislation, procedures and policies and international and EU conventions. In addition, the ESA Report addresses the environmental and social impacts, mitigation measures and management issues associated with the proposed objectives of the Project.

8.2.2 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 North Development Region (NDR) and the documents prepared in the PPC (Possible Project Concept) stage of the Project Development

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 Drochia. 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 8 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 water supply system in Drochia town.

Water supply system:

- Rehabilitation of water transmission main – 4,290 m;
- Extension of the water distribution network in the town of Drochia – 8,160 m;
- Rehabilitation of the water distribution network in the town of Drochia – 7,730 m.

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

Figure 8-3: Scheme of existing and proposed water supply system in the town of Drochia (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 following 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 water transmission main – 4,290 m;
- Extension of the water distribution network in the town of Drochia – 8,160 m;
- Rehabilitation of the water distribution network in the town of Drochia – 7,730 m.

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 Drochia 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 1.5–2.5m depending on topographical conditions. The width of the trench in average will vary from 0.6 m to 1.0 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.

Surplus soil will be used for other construction activities or transported and stored at an authorised site. In the wastewater system no elements are planned in the first phase.

Water needed for civil works comprises of potable water and construction (technical) 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 Cubolta River or other surface waters in the vicinity of construction site.

Transportation routes: construction site is accessible via the Republican Roads R7 and R12 and local roads. 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.

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

8.6 Environmental and social baseline conditions

8.6.1 Physical environment

Drochia town is located in the north part between Prut and Dniester rivers along the Cubolta River, a tributary of Raut River.

The Project area is located in an area of Miocene (Tertiary) sediments. Most of the project area is built up area. The dominating soil type in the vicinity of the Project is chernozem.

The region has a temperate continental climate with an average temperature in summer (21-21.5°C) and winter (- 4.5-5°C) characterised by erratic rainfall and extended droughts.

Winds tend to mainly come from northwest or southeast.

8.6.2 Biological environment

Geographically, the Project is located in Moldova's Forest-Steppe Zone. Most of the area is built up but there are also sections with river meadows and agricultural use alongside the Project area.

Due to intensive agricultural land use natural steppe vegetation has almost entirely disappeared in the zone. However, on pasture plots in the wider environs of the Project area and at the edges of agricultural fields typical steppe species like Volga fescue (*Festuca valesiaca*) and different species of feathergrass (*Stipa spec*.) like *Stipa capillata*, *S. lessingiana*, and *S. Pulcherima* may still be found.

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*).

There is no area of natural protection status in the vicinity of the Project.

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. trench 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 in the town of Drochia	Part of construction cost
	The Contractor shall coordinate with local Traffic Management Department to minimize construction traffic impact in the following topics: • Temporary parking restrictions; • Pedestrian and cyclist diversion routes where construction prevents access; • Temporary traffic signals; • One way scheme; • Maintaining local residential access at all times; • General traffic diversion routes where roads are closed; • Sound barriers should be erected at schools and hospitals if the distance to the construction site is less than 50 m.	Contractor	Transportation routes of construction material	Part of construction cost

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
Noise Pollution	• Maintain machinery and vehicle silencer units to minimize noise; • Keep noise generating activities associated with construction activities to a minimum and within working hours; • Notify the residents close to the Project area prior to commencement of the construction phase; • Vehicles and machinery that are used intermittently should not be left idling condition for long period of time; • Equipment used on site will be quietest reasonably available; • Haul routes for construction traffic entering and leaving the site will be selected to ensure noise levels at noise sensitive receptors are kept at a minimum.	Construction Contractor	Excavation areas for trenches in the town of Drochia in Drochia	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 in Drochia town	Part of construction cost
Impact on Traffic	• Inform all residents and businesses about the nature and duration of any work well in advance so that they can make necessary preparations if necessary;	Construction Contractor	Construction site, Access Roads	Part of construction cost

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
	• 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.			
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 equipment/vehicles	• Ensure that all equipment & vehicles used for construction activity are in good condition and are well maintained; • Ensure that all equipment & vehicles confirm to emission and noise norms.	Construction site in the town of Drochia and access roads	Drochia town	Part of construction cost
Socio-economic	To the extent possible labour force should be drawn from the local communi-	Construction	All construction sites	Part of con-

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
benefits from employing local people in construction work	ty	Contractor		struction 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 recognized and measures are taken to ensure they are protected and conserved. This should involve: • Having excavation observed by a person with archaeological field training; • Stopping work immediately to allow further investigation if any finds are suspected; • Calling in the state archaeological authority if a find is suspected, and taking any action they require to ensure its removal or protection in situ.	Construction Contractor	All construction sites	Part of construction cost
Operation Phase				
Potential waste water discharges	Regular monitoring and control of pipe system regarding leakages	State Environmental Inspection of the Minis-try of Environment		
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
Disturbance/ nuisance/ noise due to operation activity including haulage	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;	ME ‘Apa – Canal’	WWTP, access roads	

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
of waste, de-watered sludge	Educate drivers: limit speed between 20-25 km/h and avoid use of horn in the town; Provide prior information to local people about work.			
Influx of insects, rodents	Regular waste and sludge disposal on landfill	State Environmental In-spection of the Ministry of Environment and Center of Public Health of the Minis-try of Health	Sewer network and WWTP	Part of con-struction costs

8.8 Social and gender assessment of WSS project in Drochia

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:

- **The population of the Republic of Moldova has decreased in recent years, with Drochia rayon exhibiting the same trend**. As of 1 January 2015, the official population of the Republic of Moldova was 3,555,159 persons, with 4,382 persons less than 2012. The population decrease is determined by the negative natural growth rate and the on-going out-migration processes. The same situation is observed in Drochia rayon where the population decreased by 1003 persons: from 89,501 in 2012 to 88,498 persons in 2014. The population of Drochia town was 20,508 in 2014, which represented 23% of the total population of Drochia rayon and 0.57% of the total population of the Republic of Moldova;
- **Women are predominant in both the general population and the population of the Project area**. The gender distribution of the population in the country has been practically the same for a long period of time, with small deviations: around 52% of women and 48% of men. In 2014 in the Republic of Moldova the breakdown of the population by gender was: 51.9% women and 48.1% men. In Drochia rayon, the gender distribution was the following: women – 52.5% and men – 47.5%.[59] In Drochia town women constituted 52.7% and men 47.3% in 2013;
- **On average, at the national level women have higher life expectancy at birth than men by 7.9 years in 2014**.[60] In the same year, 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 Drochia rayon, the average duration of life by ages is higher than the average per country (men – 68.8 years, women – 77 years);[61]
- **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 Drochia rayon the average age increased from 40.4 years in 2012 to 40.7 years in 2014 while for the town the figures are 40 in 2012 and 40.7 in 2014. The average age by gender for the Project area is similar to the one at national level: men – 38.8 years, women – 42.4 years;[62]
- **The employment rate among women was lower** (37.4%) **compared to that for men** (42.1%) in 2014. For the North Statistical Region the employment rate for men was 41.6% while for women – 38.3%. Women with higher levels of education are more likely to participate in the labour market. Therefore, the employment rate is greater among women with higher education (54.2%), followed by those with specialised secondary education (48%) and secondary professional

[59] Statistica teritoriala, 2014.

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

[61] Statistica teritoriala, 2014.

[62] Ibid.

education (44.5%), secondary school (39%) and those with gymnasium (31.5%).[63] 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' 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;[64]

- 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%);[65]
- **Women are mostly employed in low-paying jobs and occupy lower positions in the job hierarchy where they are employed**.[66] The statistical data shows 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;[67]
- **Unemployment affects men more than women**. The unemployment rate at the country level was 3.9% in 2014, compared to 5.6% in 2012[68], the rate among unemployed men being higher (4.6%) compared to women (3.1%). In 2013, in Drochia rayon the unemployment rate was 4% 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 Drochia rayon the gender pay gap was 75.2% or a difference of 905 MDL between the salary of men and women;[69]

[63] Statistical databank, NBS website.

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

[65] Ibid.

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

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

[68] Statistical databank, NBS website.

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

- **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);[70]
- **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%;[71]
- **The average nominal monthly earning per employee** in Drochia in 2013 was 3154 MDL (compared to 3,765.1 MDL in the country overall), with 513 MDL more than in 2011; this constitutes 85.9% of the average salary in the country overall. According to the deprivation index of the small areas calculated in 2012, out of 35 LPAs of 2nd level, Drochia rayon is ranked 30th for the index of multiple deprivation and 28th in income deprivation specifically;[72]
- **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;[73]
- **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);[74]
- **Women in Moldova are less represented in politics than men**, constituting 19.8% of the members of Parliament, 18.6% of councillors in rayonal councils, 29.9% in local councils, and 20.5% of the mayors. After the local elections in June 2015, the Drochia Rayon Council comprises 33 councillors, of whom six

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

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

[72] 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).

[73] 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.

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

(18%) are women. Regarding the local council of Drochia town, of 23 councillors six (26%) are women;[75]

- 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.[76] In Drochia town, the vulnerable families constituted 8.6% of the total families in 2012 and included 261 families with persons with disabilities, 187 families – with one parent, 114 families – with three and more children, 24 families –that have children under the tutorship;[77]
- **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.[78]

Based on the analysis of social and gender dimensions in the Republic of Moldova and in the Project area, the conclusion is that, despite the adoption of the legal and regulatory framework on ensuring gender equality, and the relatively high ranking of Moldova in the Global Gender GAP Index 2015 (26)[79] there are still many problems faced within its practical implementation in the country, including in the Project area, including among others:

- Employment inequalities;
- Under-representation of women in decision-making positions;
- Salary and pension disparity between women and men;
- Engagement of women in unremunerated household work etc.

[75] Web page of the town hall Drochia http://www.primariadrochia.md/index.php?pag=page&id=28&l=

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

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

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

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

Poverty in Moldova still affects the most vulnerable groups of population (families who depend on farming, older people, people without education and professional skills, households consisting of three and more children) and limits their access to goods and services, like water supply and sanitation, centralised heating systems, education and health. Given this situation, social and gender mainstreaming is an essential component of the implementation of WSS project in Drochia 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 Drochia) 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 and Engineering for Phase 1 investments;
- Corporate Development Programme;
- Stakeholder Participation Programme;
- Water Supply Network Analysis and Water Loss Reduction Programme;
- Medium to Long-term Sanitation Study.

Capital investments and goods:

- Rehabilitation of 4.3 km water transmission main;
- Extension of 8.2 km water distribution network;
- Rehabilitation of 7.7 km water distribution network;
- Equipment and tools for operational performance improvement (water supply and wastewater).

9.2 Procurement plan

In line with Moldova's policies and rules, the required public sector services and works contracts shall be awarded 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

The strategy is to keep contract values at a size to attract international contractors as well as local contractors. Due to the similarity of the works (network rehabilitation and extension) and the relatively small total investment value it is proposed to combine all capital investment measures in one contract. The Conditions of Contracts for the works contracts should be based on 'FIDIC Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer (FIDIC Red Book)'.

Although the contract value will be relatively small, the equipment for operation and maintenance improvement is proposed to be procured under a supply contract (shopping).

The summary of cost breakdown per contract and the procurement plan below, lists the different contracts to be procured during the entire project including, project component, costs and financing, type of contract and the procurement method.

Table 9-1: Summary cost breakdown per contract

N°	Component	Total project costs	Design & Engineering	Construction works	Supply of equipment	Technical assistance
1	Water supply					
1.1	Rehabilitation of water transmission main	435,380		435,380		
1.2	Extension of the water distribution network	709,830		709,830		
1.3	Rehabilitation of the water distribution network	520,545		520,545		
1.4	Chlorination unit	70,000		70,000		
2	Equipment and tools for operational performance improvement (water supply and wastewater)	200,000			200,000	
3	Technical assistance					
3.1	Design, engineering and supervision for Phase 1 investments (12% of investment costs)	223,891	223,891			
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)	238,965	22,389	166,576	20,000	30,000
GT	Total costs per contract	2,714,850	255,520	1,909,331	220,000	330,000

Source: GIZ/MLPS

Table 9-2: Procurement plan

N°	Description	Estimated contract value, EUR	Contract type	Procurement method
1	Design, engineering and supervision for Phase 1 investments	255,520	Consulting services	Competitive
2	Construction works: Rehabilitation and extension of water supply network	1,909,331	Works	Open
3	Supply of equipment for operational performance improvement	220,000	Supply contract	Shopping
4	Technical assistance: Corporate Development Programme, Stakeholder Participation Programme, Water Supply Network Analysis and Water Loss Reduction Programme, Medium to Long-term Sanitation Study	330,000	Consulting services	Competitive
GT	**Total Amount**	**2,714,850**		

Source: GIZ/MLPS

9.3 Project implementation plan

9.3.1 Key steps of project implementation

Key steps in project implementation will be the following:

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[80] be the LPA Drochia, which is the owner of the assets or ME 'Apa-Canal' Drochia which manages and operates these assets. Further, other 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;

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

- 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;
- 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.

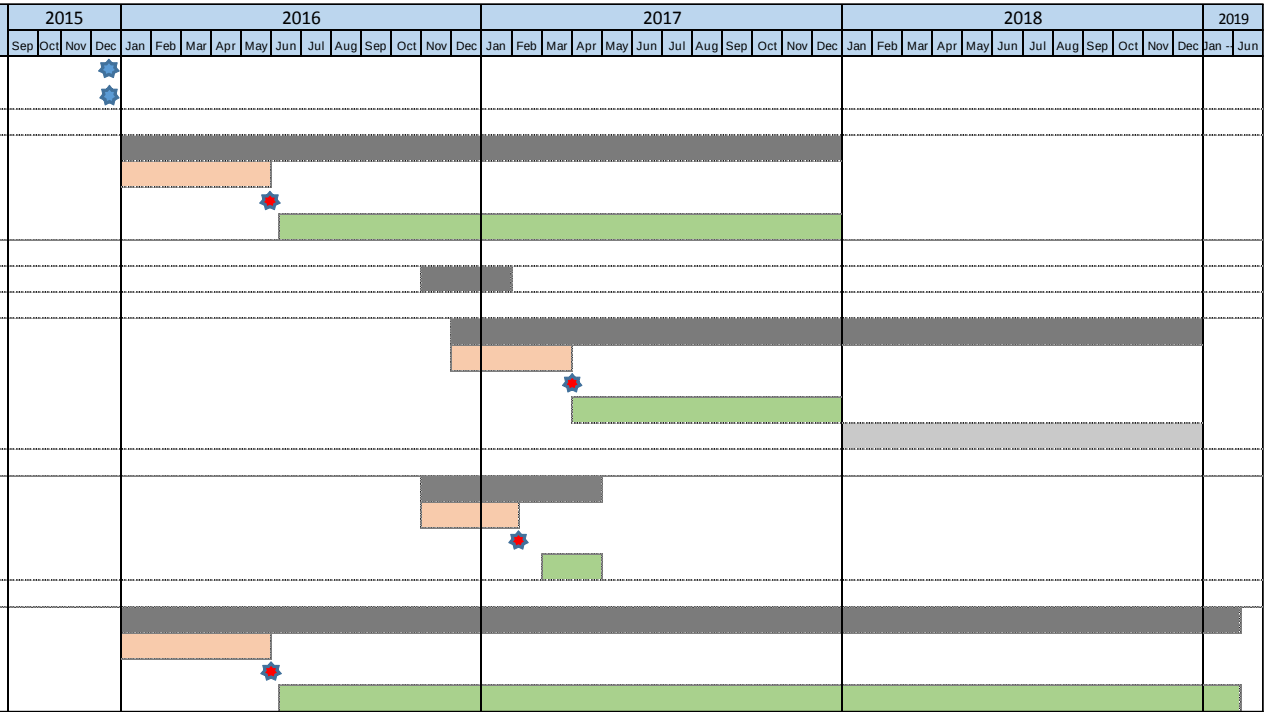
For both instruments the setting of targets and indicators as well as the methodology and administration of data collection need to be organised.

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 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

Source: GIZ/MLPS

10 Risk analysis

10.1 General

The following chapter applies and adapts the methodology for qualitative risk analysis in the new guide to cost-benefit analysis published by the European Commission[81].

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[82].'

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[83]'. 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;

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

[82] Ibid, p 69

[83] 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 assets, as well as provide quality services to the population;
  - Institutional capacity – ongoing and delayed decentralisation process which leads to uncertainty in Water Supply and Sanitation (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 plans)	Reduced project efficiency; project not meeting local needs	Medium to long-term	Negative	C	III	Moderate	Regional sector programmes; intensive cooperation with local partners to identify needs; Corporate development programme as part of technical as-	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
									sistance	
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 establishment of regional operator;	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
									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 specialized 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 fragmentation of the areas managed	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
		by the specialized institutions								
Planning uncertainty financial weakness of the institutions which increases the perceived risks of making investments in WSS	n/a	financial weakness of the institutions which increases the perceived risks of making investments in WSS	Reduced project efficiency; project not meeting needs	Medium and long-term	Negative	C	III	Moderate	Regional sector programmes; intensive cooperation with local partners to identify needs; Corporate development programme as part of technical assistance	Low
Uncertainty in ownership of assets at regional operator	n/a	Lack of legal framework on ownership of land and public infrastructure at the regional level	Delays in implementation; depreciation not calculated in tariff	Short to medium-term	Negative	B	III	Moderate	Corporate development programme as part of technical assistance	Low

Table 10-3: Risk matrix, financial risks

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
Delay in project implementation	n/a	Low financial absorption capacity at national and local level	Delay in project start	Short to medium	Delay in establishing positive cash flow	D	II	Moderate	Capacity development within partner systems	Moderate
Delay in project approval and implementation	n/a	Lack of expressed co-financing commitment from donors for priority projects	Delay in project start	Short to medium	Delay in establishing positive cash flow	C	III	Moderate	Corporate development programme as part of technical assistance	Low to moderate
Project indicators and cash flow forecast not met	Operating revenues	Lower number of actual consumers than estimated after the investment implementation	Reduced project efficiency and financial stability of operator	Medium	Negative	D	III	High	Corporate development programme – revenue enhancement activities, as part of technical assistance; public information campaign	Moderate
Unclear tariff regime	Operating revenues	Political interference in tariff adjustments	Reduced project efficiency and financial stability of operator	Short to medium	Negative	C	III	Moderate	Policy recommendations at national level; Corporate development programme as part of technical assistance	Low to moderate

Table 10-4: Risk matrix, project implementation and management risks

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
Difficulties in supplementing project teams with qualified staff	n/a	Insufficient technical expertise at local level	Reduced project efficiency	Medium	Delay in establishing positive cash flow	C	III	High	Corporate development programme as part of technical assistance; establishment of Project Implementation Unit (PIU)	Moderate
Difficulties in supplementing project teams with qualified staff	n/a	Insufficient project management and implementation experience at local level	Reduced project efficiency	Medium	Delay in establishing positive cash flow	C	III	High	Corporate development programme as part of technical assistance; establishment of PIU	Moderate
Construction delays	n/a	Insufficient project management and implementation experience at local level	Reduced project efficiency	Short to medium	Delay in benefits to public	C	II	Moderate	Corporate development programme and technical supervision as part of technical assistance; assistance to PIU	Moderate
Cost overruns in excess of contingencies	n/a	Insufficient project management and implementation experience at local level	Reduced project efficiency	Short to medium	Negative	C	III	Moderate	Corporate development programme and technical supervision as part of technical assistance; assistance to PIU	Low to moderate
Project targets not met	n/a	Outdated construction standards of materials and technologies applied for design and project implementation	Project not meeting local needs	Medium to long-term	Delay in benefits to public	C	III	Moderate	Lobbying within partner systems; Technical supervision as part of technical assistance; assistance to PIU	Moderate

Table 10-5: Risk level

Severity/Probability	I - none	II – minor	III – moderate	IV - critical	V - catastrophic
A. Very unlikely (0-10% probability)	Low	Low	Low	Low	Moderate
B. Unlikely (10–33% probability)	Low	Low	Moderate	Moderate	High
C. About as likely as not (33–66% probability)	Low	Low	Moderate	High	High
D. Likely (66–90% probability)	Low	Moderate	High	Very high	Very high
E. Very likely (90–100% probability)	Moderate	High	Very high	Very high	Very high

10.3.2 Interpretation of risk matrix

Adverse events for which the residual risk is higher than 'moderate' should be modelled in a probabilistic risk analysis. It is assumed that all risk resulting from the adverse events will be mitigated down to at least 'moderate' level through the measures indicated, with the exception of the political risk from elections and the winding up of various governments. This risk, in turn, cannot be adequately modelled in a probabilistic risk analysis.

The main mitigation measures are related to lobbying within partner systems (work with line ministries), establishment and assistance to a Project Implementation Unit, and technical assistance to the WSS operator through a corporate development programme. The corporate development programme is described in Chapter 5.7.6 – Technical Assistance.

Annexes

Annex 3	Legal and regulatory framework
Annex 4	General information on consumers
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 Drochia

No.	Public institution name	No. of pupils/children/ places/beds	Connected to water supply system	Connected to centralised sewerage system
1.	Lyceum “Mihai Eminescu”	1,000	yes	yes
2.	Lyceum “Bogdan Petriceu-Hajdau”	219	yes	yes
3.	Lyceum “Stefan cel Mare”	551	yes	yes
4.	Lyceum “Boiarnitchii”	670	yes	yes
5.	Gymnasium nr.2	219	yes	yes
6.	Kindergarten no. 1	344	yes	yes
7.	Kindergarten no. 3	99	yes	yes
8.	Kindergarten no. 5	290	yes	yes
9.	Kindergarten no. 8	367	yes	yes
10.	Kindergarten no. 9	132	yes	yes
11.	Raion Hospital “Nicolae Testimiteanu”	710	yes	yes
12	Public Healthcare Centre	104	yes	yes

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

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

No	Business entity	Employee’s number	Field	Type of property	Connected to water supply system	Connected to centralised sewerage system
1.	Univers COOP	40	commerce	state	yes	yes
2.	Ltd. MetSa products IMPEX	45	production	private	yes	yes
3.	Ltd. Combinatul de piine	124	production	private	yes	yes
4.	Drochia Raion Hospital „Nicolae Testemitanu”	670	supply of services	state	own source	yes
5.	JSC Mihailides Tabaco	60	commerce	private		yes
6.	I.M. Holda-Argintie	43	commerce	private	yes	yes
7.	Ltd. Casa piinei	50	production	private	yes	yes
8.	JSC Magestrala	72	production	private	yes	yes
9.	JSC Combifuraj	100	commerce	private	yes	yes
10.	Ltd. SEVA-Nord	42	commerce	private	yes	yes

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

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°	13,177	13,155	13,133	13,111	13,857	13,834	13,811	15,406	15,920	16,432	16,942	17,450	17,957	18,462	18,965	19,467	19,967	19,938	19,908	19,879	19,850	19,821	19,792	19,763	19,734	19,704	19,675	19,646	19,617	19,588	19,559	19,529
1.2	In urban settlements	N°	13,177	13,155	13,133	13,111	13,857	13,834	13,811	15,406	15,920	16,432	16,942	17,450	17,957	18,462	18,965	19,467	19,967	19,938	19,908	19,879	19,850	19,821	19,792	19,763	19,734	19,704	19,675	19,646	19,617	19,588	19,559	19,529
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 water sold in total and disaggr. for different consumers**																																	
2.1	Total volume sold	m³/y	294,825	308,464	322,056	335,603	369,596	383,842	398,042	460,574	493,039	526,552	561,108	596,702	633,327	670,977	709,649	749,335	790,030	801,779	813,491	825,165	836,802	848,400	859,961	871,484	882,969	894,417	905,827	917,199	928,533	939,830	951,089	962,310
2.2	Domestic customers	m³/y	264,687	272,755	280,795	288,808	314,216	322,642	331,042	379,251	402,201	425,770	449,957	474,756	500,165	526,181	552,799	580,018	607,832	619,848	631,826	643,766	655,669	667,533	679,360	691,150	702,901	714,615	726,291	737,929	749,529	761,092	772,617	784,104
2.3	Industrial customers	m³/y	17,367	20,756	24,133	27,498	32,664	36,203	39,731	48,323	54,071	60,079	66,346	72,871	79,653	86,690	93,981	101,524	109,318	109,159	108,999	108,839	108,680	108,520	108,360	108,201	108,041	107,881	107,722	107,562	107,402	107,243	107,083	106,923
2.4	Institutional customers	m³/y	12,771	14,954	17,129	19,297	22,717	24,997	27,269	33,000	36,768	40,703	44,806	49,075	53,508	58,107	62,868	67,793	72,879	72,772	72,666	72,560	72,453	72,347	72,240	72,134	72,027	71,921	71,814	71,708	71,602	71,495	71,389	71,282
3	**Total water sold disaggr. for urban and rural areas**																																	
3.1	Urban Settlements	m³/y	294,825	308,464	322,056	335,603	369,596	383,842	398,042	460,574	493,039	526,552	561,108	596,702	633,327	670,977	709,649	749,335	790,030	801,779	813,491	825,165	836,802	848,400	859,961	871,484	882,969	894,417	905,827	917,199	928,533	939,830	951,089	962,310
3.2	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	**Non-Revenue Water (NRW) volume dissagregated for total NRW, apparent losses, and real losses**																																	
4.1	Total NRW	m³/y	382,583	400,282	358,129	320,202	302,397	293,527	284,315	307,049	320,221	333,125	345,734	358,021	369,963	381,536	392,718	403,488	413,825	408,454	402,944	397,302	391,531	385,636	379,622	373,493	367,253	360,905	354,454	347,903	341,256	334,516	327,686	320,770
4.2	Apparent losses	m³/y	153,033	160,113	136,450	114,965	100,799	101,605	102,354	115,143	118,600	121,788	124,691	127,296	129,592	131,564	133,203	134,496	135,434	131,109	126,712	122,247	117,715	113,120	108,464	103,748	98,976	94,149	89,270	84,340	79,362	74,337	69,267	64,154
4.3	Real losses (physical	m³/y	229,550	240,169	221,679	205,237	201,598	191,921	181,962	191,906	201,621	211,337	221,043	230,725	240,372	249,972	259,516	268,992	278,391	277,345	276,232	275,055	273,816	272,516	271,159	269,745	268,277	266,756	265,184	263,563	261,894	260,179	258,419	256,616
5	**The water demand figures considering the demand variation factors**																																	
5.1	Yearly water	m³/y	677,408	708,746	680,185	655,805	671,993	677,369	682,357	767,623	813,260	859,677	906,842	954,723	1,003,290	1,052,514	1,102,367	1,152,823	1,203,855	1,210,233	1,216,435	1,222,467	1,228,333	1,234,037	1,239,583	1,244,977	1,250,222	1,255,322	1,260,281	1,265,102	1,269,789	1,274,345	1,278,775	1,283,080
5.2	Average daily water demand	m³/d	1,856	1,942	1,864	1,797	1,841	1,856	1,869	2,103	2,228	2,355	2,484	2,616	2,749	2,884	3,020	3,158	3,298	3,316	3,333	3,349	3,365	3,381	3,396	3,411	3,425	3,439	3,453	3,466	3,479	3,491	3,503	3,515
5.3	Maximum daily water	m³/d	1,937	2,026	1,952	1,889	1,942	1,961	1,979	2,229	2,363	2,500	2,638	2,779	2,922	3,067	3,215	3,364	3,515	3,535	3,556	3,575	3,595	3,613	3,632	3,650	3,667	3,684	3,701	3,717	3,733	3,749	3,764	3,779
5.4	Average hourly water	m³/h	77	81	78	75	77	77	78	88	93	98	104	109	115	120	126	132	137	138	139	140	140	141	142	142	143	143	144	144	145	145	146	146
5.5	Max. hourly water demand	m³/h	97	101	99	97	101	103	104	118	126	133	141	149	157	165	173	182	190	192	193	195	196	197	199	200	202	203	204	206	207	208	209	211

*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°	9,534	9,518	9,502	9,486	9,470	9,454	9,438	11,882	12,561	13,239	13,917	14,594	15,270	15,946	16,621	17,296	17,970	18,010	18,050	18,090	18,130	18,169	18,208	18,248	18,286	18,325	18,364	18,402	18,440	18,478	18,515	18,553
1.2	In urban settlements	N°	9,534	9,518	9,502	9,486	9,470	9,454	9,438	11,882	12,561	13,239	13,917	14,594	15,270	15,946	16,621	17,296	17,970	18,010	18,050	18,090	18,130	18,169	18,208	18,248	18,286	18,325	18,364	18,402	18,440	18,478	18,515	18,553
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 wastewater gen,	m³/y	226,583	233,688	240,769	247,826	254,859	261,869	268,857	347,823	377,571	408,369	440,216	473,110	507,051	542,036	578,064	615,135	653,246	667,414	681,631	695,897	710,212	724,575	738,986	753,444	767,948	782,500	797,097	811,740	826,429	841,162	855,940	870,762
2.2	by domestic customers	m³/y	174,282	180,703	187,102	193,480	199,836	206,171	212,485	275,890	300,510	326,074	352,580	380,027	408,414	437,740	468,003	499,202	531,337	545,232	559,178	573,174	587,219	601,315	615,459	629,652	643,894	658,183	672,519	686,903	701,333	715,809	730,331	744,899
2.3	by industrial customers	m³/y	39,821	40,526	41,229	41,929	42,627	43,323	44,017	56,379	60,618	64,965	69,419	73,980	78,648	83,423	88,304	93,292	98,387	98,607	98,826	99,044	99,261	99,477	99,692	99,905	100,118	100,330	100,540	100,750	100,958	101,166	101,372	101,577
2.4	by Institutional customers	m³/y	12,480	12,459	12,438	12,417	12,396	12,375	12,355	15,554	16,442	17,330	18,217	19,103	19,989	20,873	21,757	22,640	23,523	23,576	23,628	23,680	23,732	23,784	23,835	23,886	23,937	23,987	24,038	24,088	24,138	24,187	24,237	24,286
3	**Total wastewater charged disaggr, for urban and rural areas**																																	
3.1	in urban Settlements	m³/y	226,583	233,688	240,769	247,826	254,859	261,869	268,857	347,823	377,571	408,369	440,216	473,110	507,051	542,036	578,064	615,135	653,246	667,414	681,631	695,897	710,212	724,575	738,986	753,444	767,948	782,500	797,097	811,740	826,429	841,162	855,940	870,762
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 water**	m³/y	113,292	116,844	120,385	123,913	127,430	113,477	98,581	104,347	111,174	117,973	124,728	131,419	138,030	144,543	150,939	157,201	163,312	162,404	161,319	160,056	158,614	156,991	155,187	153,200	151,030	148,675	146,134	143,407	140,493	137,390	134,097	130,614
5	**The wastewater generation figures considering the variation factors**																																	
5.1	Avg, wastewater flow (dry weather)	m³/y	339,875	350,533	361,154	371,739	382,289	375,346	367,437	452,170	488,744	526,342	564,944	604,530	645,081	686,579	729,003	772,336	816,558	829,818	842,951	855,954	868,826	881,566	894,173	906,644	918,978	931,175	943,232	955,148	966,922	978,552	990,037	1,001,376
5.2	Max, daily dry weather flow (Qdmax)	m³/d	993	1,024	1,055	1,086	1,117	1,100	1,080	1,334	1,442	1,554	1,668	1,786	1,906	2,030	2,156	2,285	2,416	2,456	2,496	2,536	2,575	2,614	2,652	2,690	2,728	2,766	2,803	2,839	2,876	2,911	2,947	2,982
5.3	Max, hourly dry weather flow (QDWF)	m³/h	67	69	71	73	75	75	75	95	103	111	119	128	137	146	155	165	174	178	181	184	188	191	194	197	200	204	207	210	213	216	220	223
5.4	Max, hourly Storm Water Flow (QSWF)	m³/h	87	90	93	95	98	98	98	123	134	144	155	166	178	190	202	214	227	231	235	240	244	248	252	256	261	265	269	273	277	281	285	289
6	**Population equivalents in total and disaggr, for different customers**																																	
6.1	Total population equivalent	PE_{60}	10,071	10,062	10,053	10,044	10,035	10,026	10,018	12,621	13,353	14,085	14,817	15,550	16,284	17,018	17,752	18,487	19,223	19,266	19,308	19,351	19,393	19,436	19,478	19,519	19,561	19,602	19,643	19,684	19,725	19,766	19,806	19,846
6.2	by domestic customers	PE_{60}	9,534	9,518	9,502	9,486	9,470	9,454	9,438	11,882	12,561	13,239	13,917	14,594	15,270	15,946	16,621	17,296	17,970	18,010	18,050	18,090	18,130	18,169	18,208	18,248	18,286	18,325	18,364	18,402	18,440	18,478	18,515	18,553
6.3	by Industrial and instit, customers	PE_{60}	537	544	551	558	565	572	579	739	792	845	900	956	1,013	1,072	1,131	1,191	1,252	1,255	1,258	1,261	1,264	1,266	1,269	1,272	1,275	1,277	1,280	1,283	1,285	1,288	1,290	1,293
7	**Pollution load – BOD in total and disaggr, for different customers**																																	
7.1	The total BOD_5 load	kg/d	604	604	603	603	602	602	601	757	801	845	889	933	977	1,021	1,065	1,109	1,153	1,156	1,159	1,161	1,164	1,166	1,169	1,171	1,174	1,176	1,179	1,181	1,184	1,186	1,188	1,191
7.2	by domestic customers	kg/d	572	571	570	569	568	567	566	713	754	794	835	876	916	957	997	1,038	1,078	1,081	1,083	1,085	1,088	1,090	1,093	1,095	1,097	1,100	1,102	1,104	1,106	1,109	1,111	1,113
7.3	by industrial and instit, customers	kg/d	32	33	33	34	34	34	35	44	48	51	54	57	61	64	68	71	75	75	75	76	76	76	76	76	76	77	77	77	77	77	77	78

*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	Drochia	64%	64%	64%	64%	68%	68%	68%	76%	79%	81%	84%	87%	89%	92%	95%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Annex 5.4: Development of connected population water supply

N°	Settlement	2014*	2015	2016	2017	2018**	2019	2020	2021***	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Drochia	13,177	13,155	13,133	13,111	13,857	13,834	13,811	15,406	15,920	16,432	16,942	17,450	17,957	18,462	18,965	19,467	19,967	19,938	19,908	19,879	19,850	19,821	19,792	19,763	19,734	19,704	19,675	19,646	19,617	19,588	19,559	19,529

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	Drochia	47	47	47	47	47	47	47	59	62	66	69	73	76	79	83	86	90	90	91	91	91	92	92	92	93	93	93	94	94	94	95	95

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	Drochia	9,534	9,518	9,502	9,486	9,470	9,454	9,438	11,882	12,561	13,239	13,917	14,594	15,270	15,946	16,621	17,296	17,970	18,010	18,050	18,090	18,130	18,169	18,208	18,248	18,286	18,325	18,364	18,402	18,440	18,478	18,515	18,553

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	34.61	3.46	17.31	13.85		
Water towers								
Reservoirs								
Pumping stations								
Water treatment plant								
TOTAL Construction and installation costs		**MDL M**	**38.77**	**3.88**	**19.39**	**15.51**	**0.00**	**0.00**
Design and engineering		MDL M	4.65	0.47	2.33	1.86	0.00	0.00
Technical assistance		MDL M	6.23	0.62	3.12	2.49	0.00	0.00
Contingencies		MDL M	4.97	0.50	2.48	1.99	0.00	0.00
TOTAL Investment Costs		**MDL M**	**54.62**	**5.46**	**27.31**	**21.85**	**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	34.6	3.5	17.3	13.8	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	0.0	0.0	0.0	0.0	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	10.9	1.1	5.4	4.4	0.0	0.0	0.0
9	Contingency	MDL M	5.0	0.5	2.5	2.0	0.0	0.0	0.0
	TOTAL	**MDL M**	**54.6**	**5.5**	**27.3**	**21.8**	**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
2	Water towers	MDL M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Reservoirs	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
4	Pumping stations	MDL M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Land acquisition	MDL M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	TOTAL	MDL M	**0.0**	**0.2**	**0.9**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**

			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
2	Water towers	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Reservoirs	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Pumping stations	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	0.0	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
7	Land acquisition	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	0.1	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
	TOTAL	MDL M	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**

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	3.5	20.8	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6
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
8	Technical assistance	MDL M	1.1	6.5	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
9	Contingency	MDL M	0.5	3.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	TOTAL	MDL M	**5.5**	**32.8**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Pipelines	MDL M	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6
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
8	Technical assistance	MDL M	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
9	Contingency	MDL M	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	TOTAL	MDL M	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**	**54.6**

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	3.5	20.7	34.1	33.4	32.7	32.1	31.4	30.7	30.0	29.3	28.6	27.9	27.2	26.5	25.8
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
8	Technical assistance	MDL M	1.1	6.5	10.7	10.4	10.0	9.7	9.4	9.1	8.8	8.5	8.2	7.9	7.6	7.2	6.9
9	Contingency	MDL M	0.5	3.0	4.9	4.7	4.6	4.4	4.3	4.2	4.0	3.9	3.7	3.6	3.4	3.3	3.2
	TOTAL	MDL M	**5.5**	**32.6**	**53.5**	**52.0**	**50.4**	**48.8**	**47.3**	**45.7**	**44.2**	**42.6**	**41.0**	**39.5**	**38.2**	**37.1**	**35.9**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Pipelines	MDL M	25.1	24.4	23.7	23.1	22.4	21.7	21.0	20.3	19.6	18.9	18.2	17.5	16.8	16.1	15.4
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
8	Technical assistance	MDL M	6.6	6.3	6.0	5.7	5.4	5.1	4.8	4.4	4.1	3.8	3.5	3.2	2.9	2.6	2.3
9	Contingency	MDL M	3.0	2.9	2.7	2.6	2.5	2.3	2.2	2.0	1.9	1.7	1.6	1.5	1.3	1.2	1.0
	TOTAL	MDL M	**34.8**	**33.6**	**32.5**	**31.3**	**30.2**	**29.0**	**27.9**	**26.8**	**25.6**	**24.5**	**23.3**	**22.2**	**21.0**	**19.9**	**18.7**

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
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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	TOTAL	**MDL M**		**0.2**	**0.9**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.3**	**1.1**	**1.1**

			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
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	0.1	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
	TOTAL	**MDL M**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**

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	1.74	2.29	2.23	2.31	2.35	2.39	2.72	2.96	3.23	3.50	3.80	4.11	4.42	4.75	5.09
2	Water treatment costs	MDL M	0.13	0.12	0.12	0.12	0.12	0.12	0.14	0.15	0.16	0.16	0.17	0.18	0.19	0.20	0.21
	TOTAL variable costs for water	MDL M	1.869	2.412	2.348	2.429	2.471	2.513	2.854	3.110	3.382	3.669	3.974	4.296	4.614	4.949	5.299
	Wastewater																
1	Electricity for pumping	MDL M	0.152	0.215	0.224	0.232	0.230	0.228	0.319	0.348	0.380	0.413	0.448	0.486	0.523	0.562	0.603
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		0.152	0.215	0.224	0.232	0.230	0.228	0.319	0.348	0.380	0.413	0.448	0.486	0.523	0.562	0.603

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Water supply																
1	Electricity for pumping	MDL M	5.45	5.61	5.93	6.25	6.60	6.96	7.34	7.67	8.01	8.36	8.73	9.11	9.42	9.74	10.07
2	Water treatment costs	MDL M	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
	TOTAL variable costs for water	MDL M	5.667	5.834	6.146	6.474	6.819	7.182	7.564	7.892	8.233	8.588	8.958	9.343	9.652	9.970	10.298
	Wastewater																
1	Electricity for pumping	MDL M	0.647	0.674	0.719	0.766	0.817	0.870	0.927	0.977	1.030	1.085	1.143	1.204	1.256	1.309	1.364
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		0.647	0.674	0.719	0.766	0.817	0.870	0.927	0.977	1.030	1.085	1.143	1.204	1.256	1.309	1.364

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	0.05	0.33	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
3	Salaries and related costs	MDL M	1.38	1.42	1.48	1.55	1.61	1.67	1.74	1.81	1.88	1.96	2.04	2.12	2.20	2.29	2.38
4	Fuel	MDL M	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
5	General and administrative expenditures	MDL M	0.85	0.86	0.90	0.93	0.97	1.01	1.05	1.09	1.14	1.18	1.23	1.28	1.33	1.38	1.44
6	Other costs	MDL M	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
	TOTAL fixed costs for water	MDL M	2.490	2.599	2.972	5.290	5.429	5.573	5.722	5.876	6.036	6.201	6.372	6.548	6.731	6.920	7.116
	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	1.61	1.66	1.73	1.81	1.88	1.96	2.03	2.11	2.20	2.29	2.38	2.47	2.57	2.68	2.78
4	Fuel	MDL M	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
5	General and administrative expenditures	MDL M	0.52	0.53	0.55	0.57	0.60	0.62	0.64	0.67	0.70	0.73	0.75	0.78	0.82	0.85	0.88
6	Other costs	MDL M	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
	TOTAL fixed costs for wastewater	MDL M	2.319	2.375	2.473	3.069	3.174	3.284	3.397	3.515	3.637	3.764	3.896	4.032	4.174	4.322	4.475

	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	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
3	Salaries and related costs	MDL M	2.48	2.58	2.68	2.79	2.90	3.02	3.11	3.20	3.30	3.39	3.50	3.60	3.71	3.82	3.93
4	Fuel	MDL M	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
5	General and administrative expenditures	MDL M	1.50	1.56	1.62	1.68	1.75	1.82	1.87	1.93	1.99	2.05	2.11	2.17	2.24	2.31	2.38
6	Other costs	MDL M	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
	TOTAL fixed costs for water	MDL M	7.319	7.528	7.745	7.970	8.203	8.444	8.631	8.823	9.020	9.222	9.430	9.644	9.863	10.088	10.319
	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	2.89	3.01	3.13	3.26	3.39	3.52	3.63	3.74	3.85	3.96	4.08	4.20	4.33	4.46	4.59
4	Fuel	MDL M	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
5	General and administrative expenditures	MDL M	0.92	0.95	0.99	1.03	1.07	1.12	1.15	1.18	1.22	1.26	1.29	1.33	1.37	1.41	1.46
6	Other costs	MDL M	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
	TOTAL fixed costs for wastewater	MDL M	4.634	4.799	4.971	5.149	5.334	5.526	5.676	5.830	5.988	6.151	6.319	6.491	6.669	6.852	7.040

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	2.02	2.63	2.57	2.66	2.70	2.74	3.17	3.46	3.76	4.08	4.42	4.78	5.14	5.51	5.90
2	Fixed costs	MDL M	4.81	4.97	5.44	8.36	8.60	8.86	9.12	9.39	9.67	9.96	10.27	10.58	10.91	11.24	11.59
3	Depreciation	MDL M	0.49	0.65	1.43	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	1.76	1.64	1.64
	TOTAL costs	MDL M	7.323	8.249	9.444	13.072	13.358	13.650	14.345	14.902	15.487	16.099	16.742	17.414	17.804	18.390	19.131

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Variable costs	MDL M	6.31	6.51	6.86	7.24	7.64	8.05	8.49	8.87	9.26	9.67	10.10	10.55	10.91	11.28	11.66
2	Fixed costs	MDL M	11.95	12.33	12.72	13.12	13.54	13.97	14.31	14.65	15.01	15.37	15.75	16.14	16.53	16.94	17.36
3	Depreciation	MDL M	1.64	1.64	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
	TOTAL costs	MDL M	19.903	20.472	20.726	21.505	22.318	23.167	23.942	24.667	25.416	26.192	26.996	27.827	28.584	29.364	30.166

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	4.10	4.36	5.01	5.32	7.72	7.90	8.09	8.58	8.99	9.42	9.87	10.35	10.84	11.35	11.87	12.42
2	Depreciation	MDL M	0.18	0.18	0.34	1.12	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.45	1.33	1.33
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	0.23	0.24	0.26	0.33	0.29	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34
5	Sale of water	m3	294,825	308,464	322,056	335,603	369,596	383,842	398,042	460,574	493,039	526,552	561,108	596,702	633,327	670,977	709,649	749,335
6	Tariff without depreciation	MDL M/m3	13.91	14.87	16.31	16.62	21.78	21.34	20.93	19.18	18.77	18.42	18.11	17.84	17.62	17.39	17.19	17.03
7	Tariff with depreciation	MDL M/m3	14.54	15.47	17.37	19.96	26.50	25.88	25.32	22.97	22.31	21.73	21.22	20.77	20.38	19.55	19.06	18.80
8	**Proposed avarage tariff**	**MDL/m3**	**12.98**	**17.00**	**17.50**	**18.00**	**19.00**	**20.00**	**21.00**	**21.00**	**22.31**	**21.73**	**21.22**	**20.77**	**20.38**	**19.55**	**19.06**	**18.80**
	Wastewater Services																	
1	Variable and fixed costs	MDL M	2.33	2.47	2.59	2.70	3.30	3.40	3.51	3.72	3.86	4.02	4.18	4.34	4.52	4.70	4.88	5.08
2	Depreciation	MDL M	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
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	0.14	0.13	0.12	0.13	0.11	0.10	0.10	0.10	0.11	0.11	0.12	0.12	0.13	0.13	0.13
5	Sale of wastewater	m3	226,583	233,688	240,769	247,826	254,859	261,869	268,857	392,063	417,436	443,535	470,355	497,892	526,143	555,104	584,770	615,138
6	Tariff without depreciation	MDL M/m3	10.30	11.17	11.30	11.36	13.45	13.43	13.41	9.73	9.50	9.30	9.12	8.96	8.82	8.69	8.57	8.47
7	Tariff with depreciation	MDL M/m3	11.66	12.48	12.57	12.60	14.65	14.60	14.56	10.52	10.24	9.99	9.77	9.57	9.40	9.24	9.10	8.97
8	**Proposed avarage tariff**	**MDL/m3**	**9.81**	**11.17**	**11.30**	**11.36**	**12.00**	**12.00**	**12.00**	**10.52**	**10.24**	**9.99**	**9.77**	**9.57**	**9.40**	**9.24**	**9.10**	**8.97**
	Dynamic prime costs for water	**MDL/m3**		**23.50**														
	Dynamic prime costs for wastewater	**MDL/m3**		**9.41**														

	Water Supply		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Variable and fixed costs	MDL M	12.99	13.36	13.89	14.44	15.02	15.63	16.19	16.71	17.25	17.81	18.39	18.99	19.51	20.06	20.62
2	Depreciation	MDL M	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
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	0.36	0.37	0.38	0.39	0.41	0.42	0.44	0.45	0.46	0.48	0.49	0.51	0.52	0.53	0.55
5	Sale of water	m3	790,030	801,779	813,491	825,165	836,802	848,400	859,961	871,484	882,969	894,417	905,827	917,199	928,533	939,830	951,089
6	Tariff without depreciation	MDL M/m3	16.89	17.12	17.54	17.98	18.44	18.92	19.34	19.70	20.07	20.45	20.84	21.25	21.58	21.91	22.25
7	Tariff with depreciation	MDL M/m3	18.57	18.78	19.18	19.59	20.03	20.49	20.89	21.22	21.57	21.94	22.31	22.70	23.01	23.33	23.65
8	**Proposed avarage tariff**	**MDL/m3**	**18.57**	**18.78**	**19.18**	**19.59**	**20.03**	**20.49**	**20.89**	**21.22**	**21.57**	**21.94**	**22.31**	**22.70**	**23.01**	**23.33**	**23.65**
	Wastewater Services																
1	Variable and fixed costs	MDL M	5.28	5.47	5.69	5.92	6.15	6.40	6.60	6.81	7.02	7.24	7.46	7.70	7.92	8.16	8.40
2	Depreciation	MDL M	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
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	0.14	0.15	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20	0.21	0.21	0.22
5	Sale of wastewater	m3	646,204	660,219	674,283	688,395	702,556	716,764	731,019	745,321	759,670	774,064	788,504	802,989	817,520	832,094	846,713
6	Tariff without depreciation	MDL M/m3	8.39	8.51	8.66	8.82	8.98	9.16	9.27	9.37	9.48	9.59	9.71	9.83	9.95	10.06	10.18
7	Tariff with depreciation	MDL M/m3	8.86	8.97	9.12	9.26	9.42	9.59	9.69	9.78	9.88	9.99	10.10	10.22	10.32	10.43	10.54
8	**Proposed avarage tariff**	**MDL/m3**	**8.86**	**8.97**	**9.12**	**9.26**	**9.42**	**9.59**	**9.69**	**9.78**	**9.88**	**9.99**	**10.10**	**10.22**	**10.32**	**10.43**	**10.54**

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	28.97	30.75	32.59	35.41	38.34	41.37	42.49	46.33	46.28	46.32	46.44	46.65	45.80	45.67	46.04
2	Avarage bill for wastewater (per person)	MDL/month	19.04	19.86	20.57	22.37	23.00	23.64	21.28	21.26	21.28	21.33	21.41	21.52	21.65	21.80	21.98
3	Avarage bill for water and wastewater (per perso	MDL/month	48.01	50.61	53.16	57.78	61.34	65.02	63.77	67.59	67.56	67.65	67.85	68.16	67.45	67.47	68.02
4	Disposable households income	MDL/month	1876.51	1932.81	2021.72	2108.65	2193.00	2280.72	2371.95	2466.82	2565.50	2668.12	2774.84	2885.84	3001.27	3121.32	3246.17
5	Tariff affordability	%	2.6%	2.6%	2.6%	2.7%	2.8%	2.9%	2.7%	2.7%	2.6%	2.5%	2.4%	2.4%	2.2%	2.2%	2.1%
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	46.47	47.99	50.03	52.15	54.38	56.70	58.93	61.01	63.16	65.38	67.70	70.09	72.26	74.49	76.79
2	Avarage bill for wastewater (per person)	MDL/month	22.18	22.93	23.78	24.66	25.58	26.53	27.33	28.12	28.94	29.78	30.64	31.54	32.41	33.31	34.24
3	Avarage bill for water and wastewater (per perso	MDL/month	68.65	70.92	73.80	76.81	79.95	83.24	86.26	89.13	92.09	95.16	98.34	101.63	104.67	107.81	111.03
4	Disposable households income	MDL/month	3376.02	3511.06	3651.50	3797.56	3949.46	4107.44	4230.67	4357.59	4488.31	4622.96	4761.65	4904.50	5051.64	5203.19	5359.28
5	Tariff affordability	%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%
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	5.24	5.64	6.04	7.02	7.68	8.36	9.67	11.00	11.44	11.91	12.39	12.90	13.12	13.53	14.09
2	Sale of wastewater	MDL M	2.61	2.72	2.82	3.06	3.14	3.23	4.12	4.27	4.43	4.60	4.77	4.95	5.13	5.32	5.52
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**	**7.85**	**8.36**	**8.86**	**10.08**	**10.82**	**11.59**	**13.80**	**15.27**	**15.87**	**16.50**	**17.16**	**17.85**	**18.25**	**18.85**	**19.61**
5	Costs of water services	MDL M	4.54	5.35	6.44	9.46	9.65	9.83	10.32	10.73	11.16	11.62	12.09	12.59	12.80	13.20	13.75
	variable costs	MDL M	1.87	2.41	2.35	2.43	2.47	2.51	2.85	3.11	3.38	3.67	3.97	4.30	4.61	4.95	5.30
	fixed costs	MDL M	2.49	2.60	2.97	5.29	5.43	5.57	5.72	5.88	6.04	6.20	6.37	6.55	6.73	6.92	7.12
	depreciation	MDL M	0.18	0.34	1.12	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.45	1.33	1.33
6	Costs of wastewater services	MDL M	2.78	2.90	3.00	3.61	3.71	3.82	4.02	4.17	4.32	4.48	4.65	4.82	5.00	5.19	5.39
	variable costs	MDL M	0.15	0.22	0.22	0.23	0.23	0.23	0.32	0.35	0.38	0.41	0.45	0.49	0.52	0.56	0.60
	fixed costs	MDL M	2.32	2.38	2.47	3.07	3.17	3.28	3.40	3.51	3.64	3.76	3.90	4.03	4.17	4.32	4.48
	depreciation	MDL M	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
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**	**7.32**	**8.25**	**9.44**	**13.07**	**13.36**	**13.65**	**14.35**	**14.90**	**15.49**	**16.10**	**16.74**	**17.41**	**17.80**	**18.39**	**19.13**
10	**Gross profit**	**MDL M**	0.53	0.11	-0.59	-2.99	-2.54	-2.07	-0.55	0.37	0.39	0.40	0.42	0.44	0.45	0.46	0.48
11	**Income tax**	MDL M	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
12	**Net profit**	**MDL M**	0.47	0.09	-0.59	-2.99	-2.54	-2.07	-0.55	0.33	0.34	0.35	0.37	0.38	0.39	0.40	0.42

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sale of water	MDL M	14.67	15.06	15.60	16.17	16.76	17.38	17.96	18.50	19.05	19.62	20.21	20.82	21.37	21.92	22.50
2	Sale of wastewater	MDL M	5.73	5.92	6.15	6.38	6.62	6.87	7.08	7.29	7.51	7.73	7.96	8.20	8.44	8.68	8.93
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**	**20.40**	**20.98**	**21.75**	**22.55**	**23.38**	**24.25**	**25.04**	**25.79**	**26.56**	**27.35**	**28.17**	**29.03**	**29.80**	**30.60**	**31.42**
5	Costs of water services	MDL M	14.32	14.69	15.22	15.77	16.35	16.96	17.52	18.04	18.58	19.14	19.72	20.32	20.84	21.39	21.95
	variable costs	MDL M	5.67	5.83	6.15	6.47	6.82	7.18	7.56	7.89	8.23	8.59	8.96	9.34	9.65	9.97	10.30
	fixed costs	MDL M	7.32	7.53	7.75	7.97	8.20	8.44	8.63	8.82	9.02	9.22	9.43	9.64	9.86	10.09	10.32
	depreciation	MDL M	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
6	Costs of wastewater services	MDL M	5.59	5.78	6.00	6.22	6.46	6.70	6.91	7.11	7.33	7.54	7.77	8.00	8.23	8.47	8.71
	variable costs	MDL M	0.65	0.67	0.72	0.77	0.82	0.87	0.93	0.98	1.03	1.09	1.14	1.20	1.26	1.31	1.36
	fixed costs	MDL M	4.63	4.80	4.97	5.15	5.33	5.53	5.68	5.83	5.99	6.15	6.32	6.49	6.67	6.85	7.04
	depreciation	MDL M	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
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**	**19.90**	**20.47**	**21.22**	**22.00**	**22.81**	**23.66**	**24.43**	**25.16**	**25.91**	**26.68**	**27.49**	**28.32**	**29.08**	**29.86**	**30.66**
10	**Gross profit**	**MDL M**	0.50	0.51	0.53	0.55	0.57	0.59	0.61	0.63	0.65	0.67	0.69	0.71	0.73	0.75	0.77
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**	0.44	0.45	0.47	0.48	0.50	0.52	0.54	0.55	0.57	0.59	0.60	0.62	0.64	0.66	0.67

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	5.24	5.64	6.04	6.63	7.25	7.90	9.14	7.63	8.16	8.73	9.34	9.98	10.63	11.32	12.05
2	Sale of wastewater	MDL M	2.61	2.72	2.82	3.06	3.14	3.23	3.55	3.69	3.84	3.99	4.15	4.31	4.49	4.67	4.85
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**	**7.85**	**8.36**	**8.86**	**9.69**	**10.39**	**11.12**	**12.69**	**11.32**	**12.00**	**12.72**	**13.48**	**14.29**	**15.12**	**15.99**	**16.90**
5	Costs of water services	MDL M	4.54	5.35	5.59	5.83	6.07	6.31	6.96	7.45	7.97	8.52	9.11	9.74	10.37	11.04	11.75
	variable costs	MDL M	1.87	2.62	2.76	2.90	3.04	3.18	3.72	4.09	4.50	4.93	5.40	5.89	6.39	6.92	7.49
	fixed costs	MDL M	2.49	2.54	2.64	2.74	2.84	2.95	3.05	3.17	3.28	3.40	3.53	3.66	3.79	3.94	4.08
	depreciation	MDL M	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
6	Costs of wastewater services	MDL M	2.78	2.90	3.00	3.11	3.21	3.32	3.47	3.60	3.74	3.89	4.05	4.21	4.38	4.55	4.73
	variable costs	MDL M	0.15	0.22	0.22	0.23	0.24	0.25	0.29	0.32	0.35	0.38	0.42	0.46	0.49	0.53	0.57
	fixed costs	MDL M	2.32	2.38	2.47	2.57	2.66	2.76	2.87	2.97	3.08	3.20	3.32	3.45	3.58	3.71	3.85
	depreciation	MDL M	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
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**	**7.32**	**8.25**	**8.59**	**8.94**	**9.28**	**9.63**	**10.42**	**11.05**	**11.71**	**12.41**	**13.16**	**13.94**	**14.75**	**15.60**	**16.49**
10	**Gross profit**	**MDL M**	0.53	0.11	0.26	0.76	1.11	1.49	2.27	0.28	0.29	0.31	0.33	0.35	0.37	0.39	0.41
11	**Income tax**	MDL M	0.1	0.0	0.0	0.1	0.1	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	**Net profit**	**MDL M**	0.47	0.09	0.23	0.66	0.98	1.31	2.00	0.24	0.26	0.27	0.29	0.31	0.32	0.34	0.36

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sale of water	MDL M	12.82	13.31	14.02	14.78	15.57	16.42	17.25	18.02	18.83	19.67	20.55	21.47	22.28	23.12	23.99
2	Sale of wastewater	MDL M	5.05	5.23	5.44	5.66	5.89	6.14	6.34	6.54	6.75	6.97	7.20	7.44	7.67	7.91	8.15
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**	**17.86**	**18.54**	**19.47**	**20.44**	**21.47**	**22.55**	**23.60**	**24.57**	**25.58**	**26.64**	**27.75**	**28.90**	**29.95**	**31.02**	**32.14**
5	Costs of water services	MDL M	12.50	12.98	13.68	14.42	15.19	16.02	16.83	17.58	18.37	19.19	20.05	20.94	21.74	22.56	23.40
	variable costs	MDL M	8.08	8.40	8.93	9.50	10.10	10.73	11.41	12.01	12.64	13.30	14.00	14.72	15.34	15.98	16.65
	fixed costs	MDL M	4.24	4.39	4.56	4.73	4.91	5.10	5.24	5.39	5.55	5.70	5.87	6.04	6.21	6.39	6.57
	depreciation	MDL M	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
6	Costs of wastewater services	MDL M	4.92	5.11	5.31	5.53	5.75	5.99	6.19	6.38	6.59	6.80	7.02	7.25	7.48	7.71	7.95
	variable costs	MDL M	0.62	0.65	0.69	0.74	0.80	0.85	0.91	0.97	1.03	1.09	1.15	1.22	1.28	1.34	1.41
	fixed costs	MDL M	4.00	4.15	4.31	4.48	4.65	4.83	4.97	5.11	5.26	5.41	5.56	5.73	5.89	6.06	6.24
	depreciation	MDL M	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
7	Interest and financial costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Costs of other services and general costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	**Total costs**	**MDL M**	**17.43**	**18.09**	**18.99**	**19.94**	**20.95**	**22.00**	**23.02**	**23.97**	**24.96**	**25.99**	**27.07**	**28.20**	**29.21**	**30.27**	**31.36**
10	**Gross profit**	**MDL M**	0.44	0.45	0.47	0.50	0.52	0.55	0.58	0.60	0.62	0.65	0.68	0.70	0.73	0.76	0.78
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**	0.38	0.40	0.42	0.44	0.46	0.48	0.51	0.53	0.55	0.57	0.60	0.62	0.64	0.67	0.69

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**	**1.19**	**0.73**	**0.78**	**0.84**	**1.13**	**1.20**	**1.27**	**1.46**	**1.58**	**1.64**	**1.70**	**1.76**	**1.83**	**1.87**	**1.92**	**1.99**
1	Inventories	MDL M	0.24	0.09	0.09	0.12	0.30	0.31	0.31	0.32	0.33	0.34	0.34	0.35	0.36	0.37	0.37	0.38
2	Accounts receivable	MDL M	0.96	0.65	0.69	0.73	0.83	0.89	0.95	1.13	1.26	1.30	1.36	1.41	1.47	1.50	1.55	1.61
	Increase in current assets	MDL M		-0.46	0.05	0.07	0.29	0.07	0.07	0.19	0.13	0.06	0.06	0.06	0.06	0.04	0.06	0.07
B	**Current liabilities**	**MDL M**	**1.38**	**0.81**	**0.88**	**0.92**	**1.18**	**1.22**	**1.25**	**1.32**	**1.38**	**1.44**	**1.50**	**1.57**	**1.64**	**1.71**	**1.79**	**1.86**
1	Liabilities to suppliers	MDL M	0.41	0.56	0.62	0.66	0.91	0.93	0.95	1.01	1.06	1.10	1.15	1.21	1.26	1.32	1.38	1.44
2	Liabilities to employees	MDL M	0.96	0.25	0.25	0.26	0.28	0.29	0.30	0.31	0.32	0.34	0.35	0.36	0.38	0.39	0.41	0.42
3	Increase in current liabilities	MDL M		-0.57	0.07	0.05	0.26	0.03	0.04	0.07	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Current assets**	**MDL M**	**2.07**	**2.13**	**2.20**	**2.27**	**2.35**	**2.43**	**2.51**	**2.58**	**2.65**	**2.72**	**2.80**	**2.88**	**2.95**	**3.02**	**3.10**
1	Inventories	MDL M	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50	0.51	0.52
2	Accounts receivable	MDL M	1.68	1.72	1.79	1.85	1.92	1.99	2.06	2.12	2.18	2.25	2.32	2.39	2.45	2.52	2.58
	Increase in current assets	MDL M	0.07	0.06	0.07	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.07	0.08	0.08
B	**Current liabilities**	**MDL M**	**1.94**	**2.01**	**2.09**	**2.17**	**2.26**	**2.35**	**2.43**	**2.50**	**2.58**	**2.66**	**2.75**	**2.83**	**2.92**	**3.00**	**3.09**
1	Liabilities to suppliers	MDL M	1.50	1.55	1.61	1.67	1.74	1.81	1.87	1.93	1.99	2.06	2.12	2.19	2.26	2.32	2.39
2	Liabilities to employees	MDL M	0.44	0.46	0.48	0.50	0.52	0.54	0.55	0.57	0.59	0.60	0.62	0.64	0.66	0.68	0.70
3	Increase in current liabilities	MDL M	0.08	0.06	0.08	0.08	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.09	0.08	0.08	0.09

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**	**1.19**	**0.73**	**0.77**	**0.82**	**0.89**	**0.95**	**1.01**	**1.15**	**1.04**	**1.10**	**1.16**	**1.23**	**1.30**	**1.37**	**1.44**	**1.52**
1	Inventories	MDL M	0.24	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.13	0.13	0.13
2	Accounts receivable	MDL M	0.96	0.65	0.69	0.73	0.80	0.85	0.91	1.04	0.93	0.99	1.05	1.11	1.17	1.24	1.31	1.39
	Increase in current assets	MDL M		-0.46	0.04	0.04	0.07	0.06	0.06	0.13	-0.11	0.06	0.06	0.07	0.07	0.07	0.08	0.08
B	**Current liabilities**	**MDL M**	**1.38**	**0.81**	**0.89**	**0.93**	**0.97**	**1.01**	**1.05**	**1.13**	**1.19**	**1.26**	**1.33**	**1.40**	**1.48**	**1.56**	**1.65**	**1.74**
1	Liabilities to suppliers	MDL M	0.41	0.56	0.64	0.67	0.69	0.72	0.75	0.82	0.87	0.92	0.98	1.04	1.11	1.17	1.24	1.31
2	Liabilities to employees	MDL M	0.96	0.25	0.25	0.26	0.28	0.29	0.30	0.31	0.32	0.34	0.35	0.36	0.38	0.39	0.41	0.42
3	Increase in current liabilities	MDL M		-0.57	0.08	0.04	0.04	0.04	0.04	0.08	0.06	0.07	0.07	0.08	0.08	0.08	0.09	0.09

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Current assets**	**MDL M**	**1.61**	**1.67**	**1.75**	**1.83**	**1.92**	**2.02**	**2.11**	**2.19**	**2.28**	**2.37**	**2.47**	**2.57**	**2.66**	**2.76**	**2.85**
1	Inventories	MDL M	0.14	0.14	0.15	0.15	0.16	0.17	0.17	0.17	0.18	0.18	0.19	0.19	0.20	0.21	0.21
2	Accounts receivable	MDL M	1.47	1.52	1.60	1.68	1.76	1.85	1.94	2.02	2.10	2.19	2.28	2.38	2.46	2.55	2.64
	Increase in current assets	MDL M	0.08	0.06	0.08	0.09	0.09	0.09	0.09	0.08	0.09	0.09	0.10	0.10	0.09	0.09	0.10
B	**Current liabilities**	**MDL M**	**1.83**	**1.91**	**2.00**	**2.10**	**2.20**	**2.31**	**2.40**	**2.50**	**2.60**	**2.70**	**2.81**	**2.92**	**3.02**	**3.13**	**3.24**
1	Liabilities to suppliers	MDL M	1.39	1.45	1.52	1.60	1.68	1.77	1.85	1.93	2.01	2.10	2.18	2.28	2.36	2.45	2.54
2	Liabilities to employees	MDL M	0.44	0.46	0.48	0.50	0.52	0.54	0.55	0.57	0.59	0.60	0.62	0.64	0.66	0.68	0.70
3	Increase in current liabilities	MDL M	0.09	0.07	0.09	0.10	0.10	0.11	0.10	0.09	0.10	0.10	0.11	0.11	0.10	0.11	0.11

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**	**10.00**	**15.36**	**42.83**	**64.14**	**61.41**	**58.90**	**56.87**	**56.39**	**56.78**	**57.18**	**57.60**	**58.03**	**58.49**	**58.95**	**59.43**	**59.93**
1	Fixed assets	MDL M	8.80	13.77	40.43	60.85	58.80	56.75	54.69	52.64	50.59	48.54	46.48	44.43	42.38	40.62	38.98	37.34
2	Current assets	MDL M	1.20	1.59	2.40	3.29	2.61	2.16	2.18	3.75	6.19	8.64	11.12	13.60	16.11	18.33	20.45	22.58
3	Inventories	MDL M	0.24	0.09	0.09	0.12	0.30	0.31	0.31	0.32	0.33	0.34	0.34	0.35	0.36	0.37	0.37	0.38
4	Short-term receivables	MDL M	0.96	0.65	0.69	0.73	0.83	0.89	0.95	1.13	1.26	1.30	1.36	1.41	1.47	1.50	1.55	1.61
5	Cash and other financial assets	MDL M	0.01	0.86	1.62	2.44	1.48	0.96	0.91	2.30	4.61	7.00	9.42	11.84	14.28	16.47	18.52	20.59
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**	**10.00**	**15.36**	**42.83**	**64.14**	**61.41**	**58.90**	**56.87**	**56.39**	**56.78**	**57.18**	**57.60**	**58.03**	**58.49**	**58.95**	**59.43**	**59.93**
1	Equity capital	MDL M	8.62	9.09	9.18	8.59	5.60	3.06	1.00	0.45	0.78	1.12	1.47	1.84	2.22	2.61	3.02	3.44
2	Long-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
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	0.41	0.56	0.62	0.66	0.91	0.93	0.95	1.01	1.06	1.10	1.15	1.21	1.26	1.32	1.38	1.44
7	Current liabilities	MDL M	0.96	0.25	0.25	0.26	0.28	0.29	0.30	0.31	0.32	0.34	0.35	0.36	0.38	0.39	0.41	0.42
8	Accruals	MDL M	0.00	5.46	32.77	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Assets**	**MDL M**	**60.44**	**60.96**	**61.50**	**62.07**	**62.66**	**63.27**	**63.89**	**64.52**	**65.17**	**65.84**	**66.52**	**67.23**	**67.96**	**68.70**	**69.46**
1	Fixed assets	MDL M	35.70	34.07	32.43	30.79	29.16	27.52	25.88	24.25	22.61	20.97	19.34	17.70	16.06	14.42	12.79
2	Current assets	MDL M	24.74	26.89	29.07	31.28	33.50	35.75	38.01	40.27	42.56	44.86	47.19	49.54	51.89	54.27	56.67
3	Inventories	MDL M	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50	0.51	0.52
4	Short-term receivables	MDL M	1.68	1.72	1.79	1.85	1.92	1.99	2.06	2.12	2.18	2.25	2.32	2.39	2.45	2.52	2.58
5	Cash and other financial assets	MDL M	22.67	24.76	26.88	29.00	31.15	33.32	35.50	37.70	39.91	42.14	44.39	46.66	48.94	51.25	53.57
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**	**60.44**	**60.96**	**61.50**	**62.07**	**62.66**	**63.27**	**63.89**	**64.52**	**65.17**	**65.84**	**66.52**	**67.23**	**67.96**	**68.70**	**69.46**
1	Equity capital	MDL M	3.88	4.33	4.80	5.28	5.78	6.30	6.84	7.39	7.96	8.55	9.15	9.78	10.42	11.07	11.75
2	Long-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
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	1.50	1.55	1.61	1.67	1.74	1.81	1.87	1.93	1.99	2.06	2.12	2.19	2.26	2.32	2.39
7	Current liabilities	MDL M	0.44	0.46	0.48	0.50	0.52	0.54	0.55	0.57	0.59	0.60	0.62	0.64	0.66	0.68	0.70
8	Accruals	MDL M	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62	54.62

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**	**10.00**	**9.89**	**10.07**	**10.34**	**11.05**	**12.07**	**13.42**	**15.49**	**15.80**	**16.12**	**16.47**	**16.83**	**17.22**	**17.62**	**18.05**	**18.51**
1	Fixed assets	MDL M	8.80	8.30	7.81	7.32	6.83	6.34	5.85	5.35	4.86	4.37	3.88	3.39	2.90	2.40	1.91	1.42
2	Current assets	MDL M	1.20	1.59	2.26	3.02	4.22	5.73	7.57	10.14	10.94	11.75	12.59	13.45	14.32	15.22	16.14	17.09
3	Inventories	MDL M	0.24	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.13	0.13	0.13
4	Short-term receivables	MDL M	0.96	0.65	0.69	0.73	0.80	0.85	0.91	1.04	0.93	0.99	1.05	1.11	1.17	1.24	1.31	1.39
5	Cash and other financial assets	MDL M	0.01	0.86	1.48	2.20	3.33	4.78	6.56	8.99	9.90	10.66	11.43	12.22	13.03	13.85	14.70	15.56
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**	**10.00**	**9.89**	**10.07**	**10.34**	**11.05**	**12.07**	**13.42**	**15.49**	**15.80**	**16.12**	**16.47**	**16.83**	**17.22**	**17.62**	**18.05**	**18.51**
1	Equity capital	MDL M	8.62	9.09	9.18	9.41	10.08	11.06	12.37	14.37	14.61	14.87	15.14	15.43	15.74	16.06	16.40	16.77
2	Long-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
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	0.41	0.56	0.64	0.67	0.69	0.72	0.75	0.82	0.87	0.92	0.98	1.04	1.11	1.17	1.24	1.31
7	Current liabilities	MDL M	0.96	0.25	0.25	0.26	0.28	0.29	0.30	0.31	0.32	0.34	0.35	0.36	0.38	0.39	0.41	0.42
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**	**18.98**	**19.45**	**19.96**	**20.50**	**21.06**	**21.65**	**22.26**	**22.88**	**23.53**	**24.20**	**24.91**	**25.64**	**26.38**	**27.16**	**27.96**
1	Fixed assets	MDL M	0.93	0.44	-0.05	-0.55	-1.04	-1.53	-2.02	-2.51	-3.00	-3.50	-3.99	-4.48	-4.97	-5.46	-5.95
2	Current assets	MDL M	18.05	19.02	20.02	21.05	22.10	23.18	24.28	25.40	26.53	27.70	28.89	30.12	31.36	32.62	33.91
3	Inventories	MDL M	0.14	0.14	0.15	0.15	0.16	0.17	0.17	0.17	0.18	0.18	0.19	0.19	0.20	0.21	0.21
4	Short-term receivables	MDL M	1.47	1.52	1.60	1.68	1.76	1.85	1.94	2.02	2.10	2.19	2.28	2.38	2.46	2.55	2.64
5	Cash and other financial assets	MDL M	16.45	17.35	18.27	19.21	20.18	21.16	22.17	23.20	24.25	25.33	26.42	27.55	28.69	29.86	31.06
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**	**18.98**	**19.45**	**19.96**	**20.50**	**21.06**	**21.65**	**22.26**	**22.88**	**23.53**	**24.20**	**24.91**	**25.64**	**26.38**	**27.16**	**27.96**
1	Equity capital	MDL M	17.15	17.55	17.97	18.40	18.86	19.35	19.86	20.38	20.93	21.50	22.10	22.72	23.36	24.03	24.72
2	Long-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
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	1.39	1.45	1.52	1.60	1.68	1.77	1.85	1.93	2.01	2.10	2.18	2.28	2.36	2.45	2.54
7	Current liabilities	MDL M	0.44	0.46	0.48	0.50	0.52	0.54	0.55	0.57	0.59	0.60	0.62	0.64	0.66	0.68	0.70
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**		**12.75**	**35.74**	**30.75**	**10.34**	**10.85**	**11.62**	**13.86**	**15.33**	**15.93**	**16.57**	**17.23**	**17.92**	**18.32**	**18.92**	**19.69**
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		4.25	21.26	17.01	0.00	0.00										
3	Own contribution	MDL M		1.21	6.05	4.84	0.00	0.00										
4	Revenues from sale	MDL M		7.85	8.36	8.86	10.08	10.82	11.59	13.80	15.27	15.87	16.50	17.16	17.85	18.25	18.85	19.61
5	Increase in current liabilities	MDL M		-0.57	0.07	0.05	0.26	0.03	0.04	0.07	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08
B	**Financial outflows**	**MDL M**		**11.89**	**34.97**	**29.93**	**11.31**	**11.37**	**11.67**	**12.48**	**13.02**	**13.54**	**14.15**	**14.80**	**15.48**	**16.14**	**16.87**	**17.62**
1	Investment costs	MDL M		5.46	27.31	21.85	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		6.83	7.60	8.02	11.02	11.31	11.60	12.29	12.85	13.43	14.05	14.69	15.36	16.04	16.75	17.49
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		-0.46	0.05	0.07	0.29	0.07	0.07	0.19	0.13	0.06	0.06	0.06	0.06	0.04	0.06	0.07
5	Income tax	MDL M		0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.04	0.05	0.05	0.05	0.05	0.05	0.06	0.06
C	Net cash flow (inflow - outflow)	**MDL M**		0.85	0.77	0.82	-0.97	-0.52	-0.05	1.38	2.31	2.40	2.41	2.43	2.44	2.18	2.06	2.06
D	Cumulated cash	**MDL M**	0.01	0.86	1.62	2.44	1.48	0.96	0.91	2.30	4.61	7.00	9.42	11.84	14.28	16.47	18.52	20.59

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Financial inflows**	**MDL M**	**20.48**	**21.05**	**21.83**	**22.63**	**23.47**	**24.34**	**25.12**	**25.86**	**26.63**	**27.43**	**28.26**	**29.11**	**29.88**	**30.69**	**31.51**
1	Loan disbursement	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Donor contribution (capital grant)	MDL M															
3	Own contribution	MDL M															
4	Revenues from sale	MDL M	20.40	20.98	21.75	22.55	23.38	24.25	25.04	25.79	26.56	27.35	28.17	29.03	29.80	30.60	31.42
5	Increase in current liabilities	MDL M	0.08	0.06	0.08	0.08	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.09	0.08	0.08	0.09
B	**Financial outflows**	**MDL M**	**18.40**	**18.95**	**19.72**	**20.50**	**21.32**	**22.17**	**22.94**	**23.67**	**24.42**	**25.20**	**26.01**	**26.85**	**27.60**	**28.38**	**29.19**
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	18.27	18.84	19.58	20.36	21.17	22.02	22.80	23.52	24.27	25.05	25.85	26.68	27.44	28.22	29.02
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	0.07	0.06	0.07	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.07	0.08	0.08
5	Income tax	MDL M	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09
C	Net cash flow (inflow - outflow)	**MDL M**	2.08	2.09	2.11	2.13	2.15	2.17	2.18	2.20	2.21	2.23	2.25	2.27	2.29	2.30	2.32
D	Cumulated cash	**MDL M**	22.67	24.76	26.88	29.00	31.15	33.32	35.50	37.70	39.91	42.14	44.39	46.66	48.94	51.25	53.57

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**		**7.28**	**8.44**	**8.90**	**9.73**	**10.43**	**11.16**	**12.77**	**11.39**	**12.07**	**12.79**	**13.56**	**14.37**	**15.20**	**16.07**	**16.99**
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		7.85	8.36	8.86	9.69	10.39	11.12	12.69	11.32	12.00	12.72	13.48	14.29	15.12	15.99	16.90
5	Increase in current liabilities	MDL M		-0.57	0.08	0.04	0.04	0.04	0.04	0.08	0.06	0.07	0.07	0.08	0.08	0.08	0.09	0.09
B	**Financial outflows**	**MDL M**		**6.43**	**7.81**	**8.18**	**8.61**	**8.98**	**9.38**	**10.34**	**10.48**	**11.31**	**12.02**	**12.77**	**13.57**	**14.37**	**15.23**	**16.13**
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		6.83	7.76	8.10	8.44	8.79	9.14	9.93	10.55	11.22	11.92	12.66	13.45	14.26	15.10	16.00
3	Long term loan repayment	MDL M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Increase in current assets	MDL M		-0.46	0.04	0.04	0.07	0.06	0.06	0.13	-0.11	0.06	0.06	0.07	0.07	0.07	0.08	0.08
				0.06	0.01	0.03	0.09	0.13	0.18	0.27	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.05
C	**Net cash flow (inflow - outflow)**	**MDL M**		0.85	0.63	0.72	1.12	1.45	1.78	2.43	0.91	0.76	0.77	0.79	0.81	0.83	0.84	0.86
D	**Cumulated cash**	**MDL M**	0.01	0.86	1.48	2.20	3.33	4.78	6.56	8.99	9.90	10.66	11.43	12.22	13.03	13.85	14.70	15.56

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Financial inflows**	**MDL M**	**17.96**	**18.61**	**19.56**	**20.54**	**21.57**	**22.66**	**23.69**	**24.66**	**25.68**	**26.75**	**27.86**	**29.01**	**30.05**	**31.13**	**32.25**
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	17.86	18.54	19.47	20.44	21.47	22.55	23.60	24.57	25.58	26.64	27.75	28.90	29.95	31.02	32.14
5	Increase in current liabilities	MDL M	0.09	0.07	0.09	0.10	0.10	0.11	0.10	0.09	0.10	0.10	0.11	0.11	0.10	0.11	0.11
B	**Financial outflows**	**MDL M**	**17.07**	**17.71**	**18.64**	**19.60**	**20.61**	**21.67**	**22.69**	**23.63**	**24.63**	**25.67**	**26.76**	**27.89**	**28.90**	**29.96**	**31.06**
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	16.94	17.60	18.50	19.45	20.45	21.51	22.53	23.48	24.47	25.50	26.58	27.71	28.72	29.78	30.87
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	0.08	0.06	0.08	0.09	0.09	0.09	0.09	0.08	0.09	0.09	0.10	0.10	0.09	0.09	0.10
			0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.09	0.09
C	**Net cash flow (inflow - outflow)**	**MDL M**	0.89	0.90	0.92	0.94	0.96	0.99	1.01	1.03	1.05	1.07	1.10	1.12	1.15	1.17	1.19
D	**Cumulated cash**	**MDL M**	16.45	17.35	18.27	19.21	20.18	21.16	22.17	23.20	24.25	25.33	26.42	27.55	28.69	29.86	31.06

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**	**-0.01**	**0.01**	**0.61**	**0.42**	**0.46**	**1.09**	**3.95**	**3.87**	**3.77**	**3.67**	**3.55**	**3.12**	**2.85**	**2.70**
1	Incremental revenues from sales	MDL M	0.00	0.00	0.00	0.39	0.43	0.46	1.10	3.95	3.87	3.78	3.68	3.56	3.13	2.86	2.71
2	Incremental increase in current liabilities	MDL M	0.00	-0.01	0.01	0.22	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
3	Residual value	MDL M															
B	**Financial outflows**	**MDL M**	**5.00**	**27.20**	**21.83**	**2.86**	**2.58**	**2.53**	**2.55**	**2.42**	**2.27**	**2.19**	**2.09**	**1.97**	**1.83**	**1.71**	**1.57**
1	Investment costs	MDL M	5.46	27.31	21.85	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	-0.16	-0.09	2.58	2.52	2.46	2.36	2.29	2.22	2.13	2.03	1.91	1.79	1.65	1.50
3	Incremental increase in current assets	MDL M	-0.46	0.05	0.07	0.29	0.07	0.07	0.19	0.13	0.06	0.06	0.06	0.06	0.04	0.06	0.07
C	Net cash flow (inflow - outflow)	**MDL M**	-5.00	-27.21	-21.82	-2.25	-2.16	-2.07	-1.46	1.52	1.59	1.59	1.58	1.57	1.30	1.15	1.13
D	FNPV(C)	**MDL M**	**-38.02**														
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**	**2.52**	**2.44**	**2.27**	**2.09**	**1.90**	**1.68**	**1.43**	**1.20**	**0.95**	**0.69**	**0.40**	**0.10**	**-0.16**	**-0.45**	**18.00**
1	Incremental revenues from sales	MDL M	2.54	2.44	2.28	2.10	1.91	1.70	1.45	1.22	0.97	0.71	0.43	0.12	-0.14	-0.42	-0.72
2	Incremental increase in current liabilities	MDL M	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
3	Residual value	MDL M															18.74
B	**Financial outflows**	**MDL M**	**1.40**	**1.30**	**1.15**	**0.98**	**0.80**	**0.59**	**0.34**	**0.11**	**-0.13**	**-0.38**	**-0.65**	**-0.95**	**-1.21**	**-1.48**	**-1.77**
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	1.33	1.24	1.08	0.91	0.72	0.51	0.27	0.04	-0.20	-0.45	-0.73	-1.02	-1.28	-1.56	-1.85
3	Incremental increase in current assets	MDL M	0.07	0.06	0.07	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.07	0.08	0.08
C	Net cash flow (inflow - outflow)	**MDL M**	1.12	1.14	1.12	1.11	1.10	1.09	1.09	1.09	1.08	1.07	1.06	1.05	1.05	1.04	19.77

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**	**4.25**	**21.25**	**17.01**	**0.61**	**0.42**	**0.46**	**1.09**	**3.95**	**3.87**	**3.77**	**3.67**	**3.55**	**3.12**	**2.85**	**2.70**
1	Incremental revenues from sales	MDL M	0.00	0.00	0.00	0.39	0.43	0.46	1.10	3.95	3.87	3.78	3.68	3.56	3.13	2.86	2.71
2	Incremental increase in current liabilities	MDL M	0.00	-0.01	0.01	0.22	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
3	Donor contribution (capital grant)	MDL M	4.25	21.26	17.01	0.00	0.00										
4	Residual value	MDL M															
B	**Financial outflows**	**MDL M**	**5.00**	**27.20**	**21.83**	**2.86**	**2.58**	**2.53**	**2.55**	**2.42**	**2.27**	**2.19**	**2.09**	**1.97**	**1.83**	**1.71**	**1.57**
1	Investment costs	MDL M	5.46	27.31	21.85	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	-0.16	-0.09	2.58	2.52	2.46	2.36	2.29	2.22	2.13	2.03	1.91	1.79	1.65	1.50
3	Incremental increase in current assets	MDL M	-0.46	0.05	0.07	0.29	0.07	0.07	0.19	0.13	0.06	0.06	0.06	0.06	0.04	0.06	0.07
C	**Net cash flow (inflow - outflow)**	**MDL M**	-0.75	-5.96	-4.82	-2.25	-2.16	-2.07	-1.46	1.52	1.59	1.59	1.58	1.57	1.30	1.15	1.13
D	**FNPV(K) - Financial Net Present value of the Capital**	**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**	**2.52**	**2.44**	**2.27**	**2.09**	**1.90**	**1.68**	**1.43**	**1.20**	**0.95**	**0.69**	**0.40**	**0.10**	**-0.16**	**-0.45**	**18.00**
1	Incremental revenues from sales	MDL M	2.54	2.44	2.28	2.10	1.91	1.70	1.45	1.22	0.97	0.71	0.43	0.12	-0.14	-0.42	-0.72
2	Incremental increase in current liabilities	MDL M	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
3	Donor contribution (capital grant)	MDL M															
4	Residual value	MDL M															18.74
B	**Financial outflows**	**MDL M**	**1.40**	**1.30**	**1.15**	**0.98**	**0.80**	**0.59**	**0.34**	**0.11**	**-0.13**	**-0.38**	**-0.65**	**-0.95**	**-1.21**	**-1.48**	**-1.77**
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	1.33	1.24	1.08	0.91	0.72	0.51	0.27	0.04	-0.20	-0.45	-0.73	-1.02	-1.28	-1.56	-1.85
3	Incremental increase in current assets	MDL M	0.07	0.06	0.07	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.07	0.08	0.08
C	**Net cash flow (inflow - outflow)**	**MDL M**	1.12	1.14	1.12	1.11	1.10	1.09	1.09	1.09	1.08	1.07	1.06	1.05	1.05	1.04	19.77

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**	**-5.00**	**-27.21**	**-21.82**	**-2.25**	**-2.16**	**-2.07**	**-1.46**	**1.52**	**1.59**	**1.59**	**1.58**	**1.57**	**1.30**	**1.15**	**1.13**
1	Social costs	MDL M	0.00	-0.02	-0.03	-0.04	-0.05	-0.05	-0.07	-0.08	-0.09	-0.10	-0.11	-0.13	-0.14	-0.16	-0.18
2	Shadow prices - electricity	MDL M	0.00	-0.02	-0.03	-0.04	-0.05	-0.05	-0.07	-0.08	-0.09	-0.10	-0.11	-0.13	-0.14	-0.16	-0.18
B	**Social benefits**	**MDL M**	**2.46**	**12.29**	**9.83**	**4.23**	**4.24**	**4.24**	**4.65**	**4.68**	**4.71**	**4.74**	**4.77**	**4.81**	**4.84**	**4.88**	**4.91**
1	Tax correction - VAT	MDL M	1.09	5.46	4.37	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	1.37	6.83	5.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Shadow price - business	MDL M	0.00	0.00	0.00	0.05	0.06	0.07	0.47	0.50	0.53	0.56	0.60	0.63	0.67	0.70	0.74
4	Benefits of avoiding water related disease	MDL M	0.00	0.00	0.00	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18
C	**Net cash flow (inflow - outflow)**	**MDL M**	-2.54	-14.91	-11.96	2.02	2.12	2.23	3.26	6.28	6.39	6.43	6.47	6.51	6.28	6.18	6.22
D	**ENPV**	**MDL M**	**46.28**														
E	**ERR**	%	**14%**														

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Net cash flow (inflow - outflow)**	**MDL M**	**1.12**	**1.14**	**1.12**	**1.11**	**1.10**	**1.09**	**1.09**	**1.09**	**1.08**	**1.07**	**1.06**	**1.05**	**1.05**	**1.04**	**19.77**
1	Social costs	MDL M	-0.19	-0.21	-0.22	-0.24	-0.26	-0.28	-0.31	-0.33	-0.35	-0.38	-0.40	-0.43	-0.46	-0.48	-0.51
2	Shadow prices - electricity	MDL M	-0.19	-0.21	-0.22	-0.24	-0.26	-0.28	-0.31	-0.33	-0.35	-0.38	-0.40	-0.43	-0.46	-0.48	-0.51
B	**Social benefits**	**MDL M**	**4.95**	**4.95**	**4.95**	**4.95**	**4.96**	**4.96**	**4.96**	**4.96**	**4.96**	**4.96**	**4.96**	**4.96**	**4.96**	**4.96**	**4.97**
1	Tax correction - VAT	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Social benefits resulting from additional employment	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Shadow price - business	MDL M	0.77	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.79	0.79	0.79	0.79
4	Benefits of avoiding water related disease	MDL M	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18
C	**Net cash flow (inflow - outflow)**	**MDL M**	6.26	6.30	6.29	6.30	6.32	6.33	6.35	6.38	6.39	6.40	6.42	6.44	6.47	6.48	25.24

Table 6-25: Sensitivity analysis

A	**Investment Costs**	**%**	100%	105%	110.00%	115.00%	120.00%	125.00%
1	FNPV(C)	MDL M	-38.02	-38.90	-40.36	-41.82	-43.27	-44.73
2	FRR(C)	%	-1.4%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%
3	FNPV(K)	MDL M	0.00	0.18	0.36	0.54	0.73	0.91
4	FRR(K)	%	5.0%	5.1%	5.1%	5.2%	5.2%	5.3%
5	Financially sustainable		True	True	True	True	True	True

C	**Real Wage Increase**		Base Case	Base Case	Pessimistic	Optimistic
			1	1	2	3
1	FNPV(C)	MDL M	-38.02	-37.45	-37.45	-37.45
2	FRR(C)	%	-1.4%	-1.06%	-1.06%	-1.06%
3	FNPV(K)	MDL M	0.00	0.00	0.00	0.00
4	FRR(K)	%	5.0%	5.0%	5.0%	5.0%
5	Financially sustainable		True	True	True	True

D	**Real GDP growth**		Base Case	Base Case	Pessimistic	Optimistic
			1	1	2	3
1	FNPV(C)	MDL M	-38.02	-37.45	-37.24	-37.55
2	FRR(C)	%	-1.4%	-1.06%	-1.07%	-1.05%
3	FNPV(K)	MDL M	0.00	0.00	0.20	-0.10
4	FRR(K)	%	5.0%	5.0%	5.1%	5.0%
5	Financially sustainable		True	True	True	True

F	**Costs of electricity**		Base Case	Base Case	Pessimistic	Optimistic
			1	1	2	3
1	FNPV(C)	MDL M	-38.02	-37.45	-37.34	-37.81
2	FRR(C)	%	-1.4%	-1.06%	-0.97%	-1.17%
3	FNPV(K)	MDL M	0.00	0.00	0.11	-0.36
4	FRR(K)	%	5.0%	5.0%	5.0%	4.9%
5	Financially sustainable		True	True	True	True

Annex 8

Environmental impact assessment and gender aspects

Annex 8: Environmental impact assessment and gender aspects

8.1 Summary for legal framework on SEE and EIA in WSS sector

The Moldovan legal basis for environmental assessment is covered by three main laws. During the process of approximation of Moldovan legislation to the EU acquis, these laws are to be amended and/or adjusted in the near future as follow:

- Law on Environmental Protection with subsequent amendments;
- Law on Ecological Expertise with subsequent amendments;
- Law on Environmental Impact Assessment.

The Law on Environment Protection[1] represents the main legal framework for development of special normative acts and instructions in the field of environment protection in order to ensure a healthy living environment, conservation of the natural environment, ecosystem restoration etc.

The Law on Ecological Expertise[2] describes the concept of the State Ecological Expertise (SEE) which precedes decision-making on activities that may have an adverse impact on the environment. It is compulsory for all economic activities that might have negative impact on environment regardless of their destination, ownership, investments, location, source of financing, etc.

The Law on Environmental Impact Assessment[3] describes procedures and requirements for Environmental Impact Assessment (EIA) on the national level.

As result of feasibility studies, technical designs will be developed, which in the regional and local planning process in the WSS (Water Supply and Sanitation) sector will be subject to SEE and the corresponding documents shall be prepared and submitted to the responsible authorities together with the technical project documentation.

The national authority responsible for SEE in Republic of Moldova is the State Ecological Inspectorate (SIE), which is a subdivision of the Ministry of the Environment (MoE). All legal procedures on State Ecological Expertise System are described in the Chapter II of the Law on Ecological Expertise, while the organization of the SEE is detailed in the Chapter V.

In relation to the national environmental permitting procedure of various project-types and activities, there are the SEE and the EIA. The procedures, requirements and entire EIA process are detailed in the new Law on Environmental Impact Assessment.

In addition, the procedures for conducting SEE are included in the Guidelines on Performing SEE (2002). They define in detail the goals, objectives and principles of the SEE and specify the procedures for submitting project documentation, as well as reviewing procedures.

[1] Law No. 1515 of 16.06.1993 on Environment Protection, published in ”Monitorul Parlamentului” No. 10 of 01.10.1993, Art. 283, last amended by the Parliament Law No. 153 of 30.07.2015.

[2] Law No. 851 of 29.05.1996 on Ecologic Expertise and Environment Impact Assessment, published in ”Monitorul Oficial” No. 52-53 of 08.08.1996, Art. 494, last amended by the Parliament Law No. 153 of 30.07.2015.

[3] Law No. 86 of 29.05.2014 on Environment Impact Assessment, published in ”Monitorul Oficial” No. 174-177 of 04.07.2014, Art. 393. Date of entry into force: 04.01.2015.

Therefore, two project categories can be distinguished on the national level:

- Projects requiring SEE only;
- Projects requiring SEE and EIA.

In conclusion, for all selected CPV (Viable Project Concept) set-up projects as a part of the RSP (Regional Sector Program) in WSS sector, the SEE shall be conducted.

In relation to the national environmental permitting procedure of various project-types and activities, there are the SEE and the EIA. The procedures, requirements and entire EIA process for WSS project activities are detailed in the new Law on Environmental Impact Assessment.

Further, the following categories of planned activities are to be subjected of full scale EIA and for which is needed the environmental impact assessment in WSS sector.

According to the new Law No. 86 on EIA the following water supply facilities are subject to full scale EIA:

- Groundwater abstraction activities or artificial groundwater recharge schemes where the annual volume of water to be abstracted or recharged amounts to 10 million cubic metres or more;
- Deep drilling for water supply drilling (5,000 cubic metres per day and more).

And included in Annex 2:

- Installations of long-distance aqueducts (thoroughfares 5 km long and more);
- Groundwater abstraction and artificial groundwater recharge schemes (not included in Appendix no 1, with an abstraction or recharge capacity of 1 million cubic metres per year and more).

In addition waste-water treatment plants with a capacity exceeding the 150,000 population equivalent are subject to full scale EIA (Annex 1 of the New EIA Law No. 86).

Waste-water treatment plants (not included in Annex no. 1, with a capacity ranging from 50,000 to 150,000 population equivalent) are listed in Annex 2 of the new Law No. 86 and require the identification of the need for the conduct of the environmental impact assessment.

All selected VPCs in the WSS sector need only improvements of existing facilities like network repair and rehabilitation. These types of Projects do not fall into the categories that require the conduct of a full scale EIA according to national Moldovan Legislation. Consequently, this project is not subject to the new Law No. 86 and not requires an EIA evaluation.

In conclusion, the financing of programs and projects is allowed only after a positive SEE decision has been issued and following the IFI / international donor’s requirements.

8.2 Social and gender assessment in Straseni

8.2.1 Methodological approach

The main scope of the study was to assess the social and gender dimensions of the WSS project from the Centre Development Region. The objectives of the study were to

analyse the social and gender situation in Moldova and in the project zone and to develop recommendations for the action plan related to these aspects.

The **main tools** used for the assessment were both qualitative and quantitative data. A desk-based review was used to collect secondary data on various aspects on men and women features at the country as well as at the project area level. Most of the collected data[4] was based on the National Bureau of Statistics and Ministry of Economy documents; administrative data from local public administration from the first and second level, as well as studies and reports written by international organisations.

The approach applied for the current project was developed and tested in a pilot study in the town of Straseni in May 2015 where an assessment of the social and gender aspects was undertaken. Its findings were integrated in the feasibility study of the respective project. Given the scope of the proposed project ("no regrets" measures to improve service provision as part of a medium-term programme) and taking into account that social and gender needs and characteristics do not differ much from a town/project to another, the conclusions reached during the field visit in Straseni are also applied to projects of other rayons/towns of Moldova. The tools applied in the field visit to Straseni were interviews with key stakeholders and focus groups disaggregated by gender with potential beneficiaries. Based on its findings a social and gender action plan was developed.

Focus group participants were selected using the following criteria: gender dimension (men/women), education status (high/low), welfare status (low, medium to high), type of dwelling (individual/apartment), and connection to the water supply system. In the end, four focus groups discussions were conducted: 1) a focus group with women with low welfare status (women with disabilities, unemployed, retired); 2) a focus group with men with low welfare status (men with disabilities, unemployed, retired); 3) a focus group with women with medium to high welfare status; 4) a focus group with men with medium to high welfare status. In total, 28 persons (18 women and 10 men) participated in the focus group discussions.

The key stakeholders who were interviewed were selected based on groups interested in the implementation of the project. In total, seven key stakeholders were interviewed, including: the vice-mayor of Straseni, the town architect of Straseni, the person in charge of attracting investments in Straseni, the director of the district hospital, one businesswoman, the director of the district environmental inspection, and the director of the municipal enterprise, Apa-Canal Straseni.

8.2.2 Beneficiaries, needs and priorities by gender

During the focus group meetings and discussions held in Straseni, it was shown that women and men use water in different ways and for different needs. The use of water depends on the distribution of roles of men and women within households. From the table below, it can be seen that the distribution of household activities (where the water is used) between men and women in the Project area is unequal, as extrapolated from the findings from the focus group meetings.

Table 8-1: Water use by men and women

Household activities where the water is used	Men	Women	Children
Cooking		X	
Washing clothes		X	

[4] All presented data at the national level do not include the rayons from the left side of Dniester River and Bender municipality.

Household activities where the water is used	Men	Women	Children
Washing dishes		X	X
Washing children		X	
Watering crops	X	X	
Cleaning the house		X	X
Watering flowers		X	
Bathing (shower or bath)	X	X	X
Cleaning garden	X	X	
Planting garden	X	X	
Washing car	X		
Washing carpets		X	
Cleaning cesspit	X		
Cleaning animal cages	X	X	
Watering domestic animals		X	X

Thus, from the list of activities shared with the participants in focus group discussions, only a few activities are done mostly by men – washing car and, cleaning the cesspit. More than half of activities are done mostly by women, sometimes with small support from children. Those activities are the following: preparation of meals, washing clothes, washing dishes, washing children, watering flowers, cleaning the house, washing carpets, watering domestic animals. Some of the activities, like watering the crops, cleaning the garden, cleaning the animal cages, planting the garden are shared among men and women. In the households connected to the centralised water system, women are mainly those who clean the water and sanitation facilities. In the households with the outdoor sanitation facilities, roles between men and women are shared. Women usually do the daily cleaning and maintenance of the facilities and the men are responsible for the evacuation of the contents of the septic tank/collectors or of the traditional toilet.

The assessment of beneficiaries' needs and priorities by gender shows that the men and women have different needs and patterns in using the water and sanitation facilities. Therefore, these discrepancies and gaps need to be taken into consideration in the development and implementation of the Project.

The perceptions of men and women regarding the impact of the future project. Both men and women consider that as a result of Project implementation the whole population of the town will benefit. At the local level, the view is that the positive impact of the Project will result in the following:

- More business enterprises will be developed and subsequently more jobs will be created;
- The quality of water and afterwards, people's health will improve;
- The ecological situation will be improved;
- There will be more transparency in the use of water;
- The water and sanitation management will improve;
- The women will have more time to spend with their children and for their personal needs;
- Men will have more time to support their wives in household activities;
- Children will have more time for homework, reading, watching TV, playing games etc.;

- More women will use automatic washing machines and will save their time for other activities.

However, men and women consider that the implementation of the project might cause social problems and social conflicts in communities, like the following:

- Vulnerable groups of the population (pensioners, single women, households with many children, households with persons with disabilities) will still have limited access to water and sanitation system because of lack of money for an individual connection and for paying for services;
- The beneficiaries will not be willing to pay an increased tariff for WSS as they do not understand well the content of the tariff, or the factors that influence the tariff calculations;
- Many households will refuse to be connected to the sanitation system because of the need to pay more for the WSS and of lack of information regarding the positive impact of this project on their health;
- Some of the households will use in parallel the wells and will pay less for sanitation;
- The connection of some enterprises to the sanitation system will raise the cost of final products;
- The treatment plants can be located close to households and the population can suffer from bad smells;
- The streets where mostly the vulnerable groups of population live can be excluded from the project;
- Conflict of interests can arise between the city hall and the construction company, which will cause a substantial increase of the cost of the project;
- The companies will have limited interest in employing local persons during the implementation of the project;
- The staff selection for new WSS management unit could be done in a non-competitive way and qualified persons will have limited opportunities to be employed.

That is why in the elaboration and implementation project process is necessary to take into account the issues mentioned by participants and avoid or prevent the emergence of social disputes.

8.2.3 Social and Gender Action Plan

The Social and Gender Action Plan (SGAP) is based on the summary of findings during the social and gender assessment of the WSS project and provides measures that aim to increase equality in the participation of men and women during all project phases. The following activities are required for the plan:

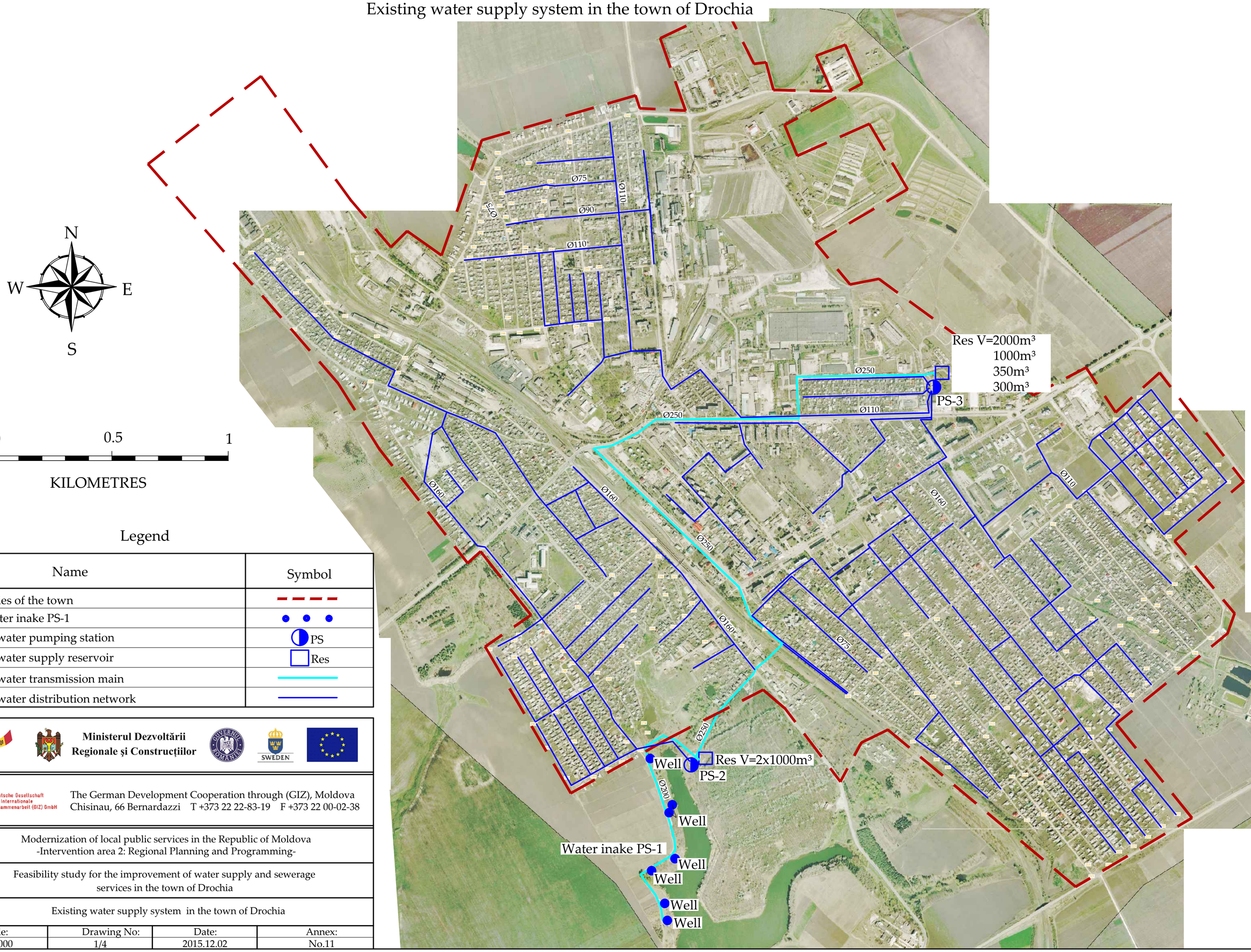
- Information of RDA staff on findings of social and gender assessment and their incorporation in the RDA plan of activities;
- Appointment of a gender focal point at the respective RDA;

- Strengthening the capacities of the RDA staff on integration of social and gender dimensions into the WSS project;
- Incorporation of the findings and recommendations of the social and gender assessment in the ToR of the company performing the detailed designs;
- Consultation of the WSS project technical design separately with women and men, according to their income, disability and age. Women will constitute at least 40% of participants at consultations. Strengthening the capacities of LPAs (rayon councils and local city halls) on the following issues: gender equity, integration of gender dimensions into the project cycle, building an accountable, affordable and qualitative WSS system and communication/information;
- Establishing monitoring committees at the local level and strengthening their capacities in social and gender issues and communication/information. At least 40% of committee members shall be women;
- Provision of information campaigns at the communities' level regarding the WSS project, including the information on SGAP that will be targeted to men/women/persons with disabilities/poor persons. 40% of participants in different communication campaigns will be women;
- Increase the access of vulnerable groups of population to WSS through their involvement at different levels of project preparation and implementation, mobilisation of community support and direct financial support;
- Change the attitudes and behaviours of population regarding the following issues: use of drinkable water for irrigation, using of permeable collectors for wastewater, sustainability of WSS services, etc. At least 40% of participants at those activities must be women.

Annex 11

Conceptual drawings

Existing water supply system in the town of Drochia



Legend

Name	Symbol
Boundaries of the town	
Well, Water inake PS-1	
Existing water pumping station	PS
Existing water supply reservoir	Res
Existing water transmission main	
Existing water distribution network	

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-Intervention area 2: Regional Planning and Programming-

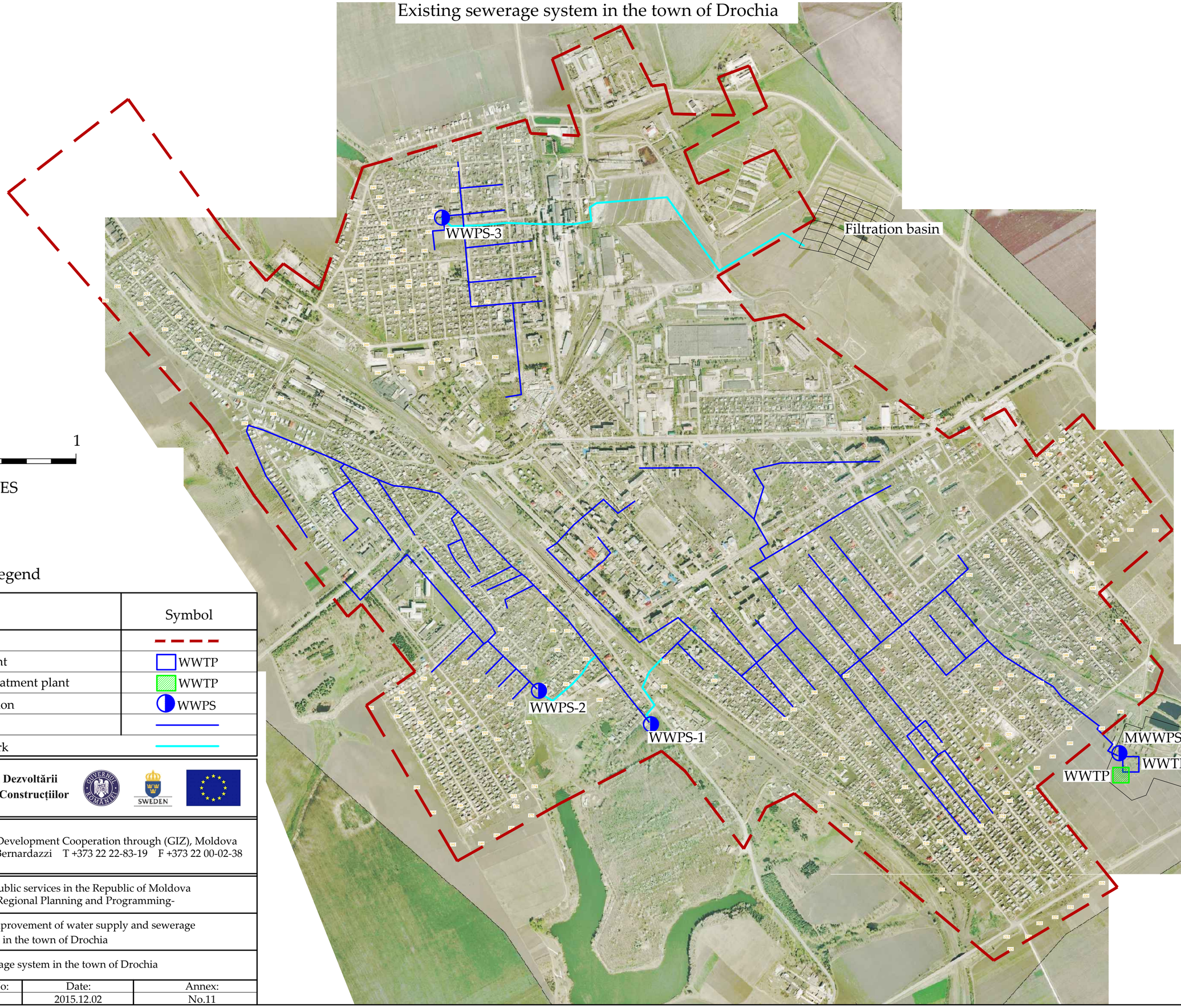
Feasibility study for the improvement of water supply and sewerage services in the town of Drochia

Existing water supply system in the town of Drochia

Scale:	Drawing No:	Date:	Annex:
1:10 000	1/4	2015.12.02	No.11

Format A2

Existing sewerage system in the town of Drochia



Legend

Name	Symbol
Boundaries of the town	
Existing wastewater treatment plant	WWTP
Under construction wastewater treatment plant	WWTP
Existing wastewater pumping station	WWPS
Existing sewerage network	
Existing pressure sewerage network	

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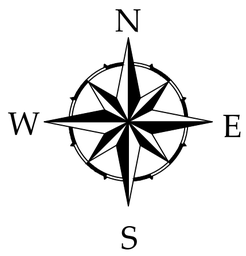
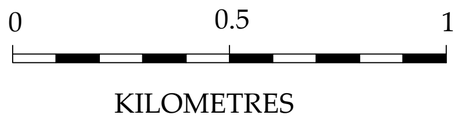
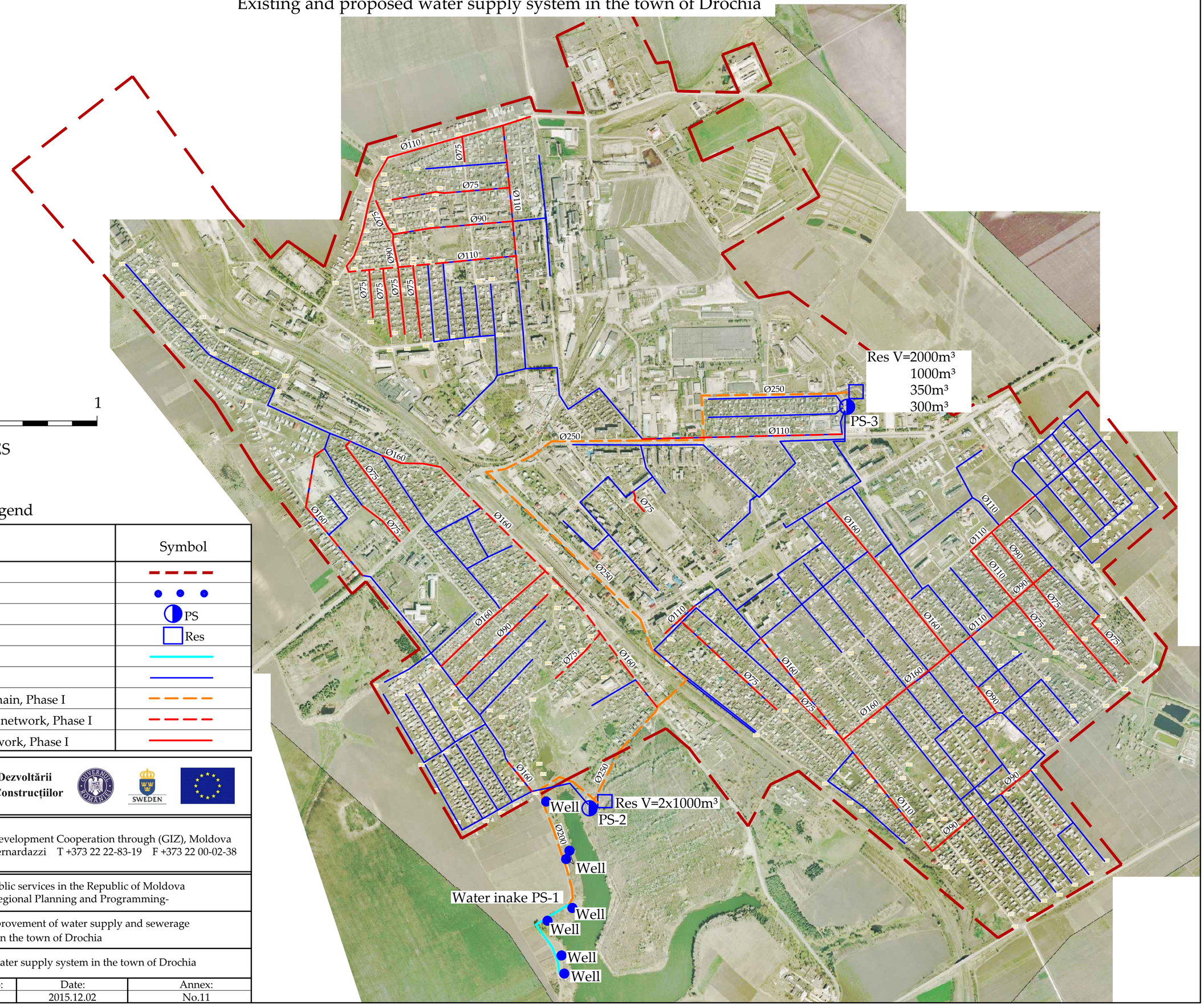
1:10 000	2/4	2015.12.02	No.11

Format A2

Existing and proposed water supply system in the town of Drochia







Legend

Name	Symbol
Boundaries of the town	
Well, Water inake PS-1	
Existing water pumping station	PS
Existing water supply reservoir	Res
Existing water transmission main	
Existing water distribution network	
Rehabilitation water transmission main, Phase I	
Rehabilitation of water distribution network, Phase I	
Extension of water distribution network, Phase I	

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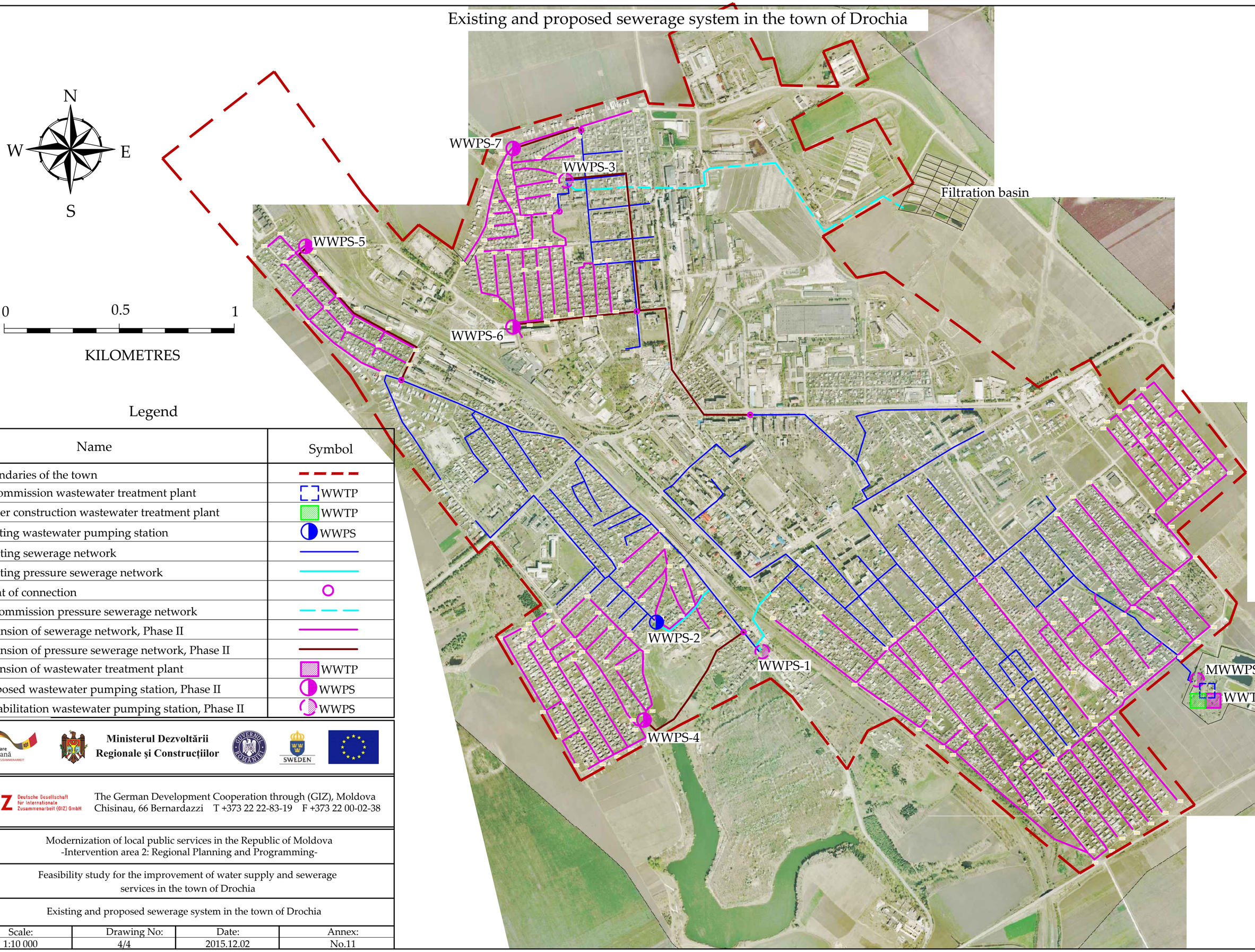
Existing and proposed water supply system in the town of Drochia

Scale:	Drawing No:	Date:	Annex:
1:10 000	3/4	2015.12.02	No.11

Format A2

Existing and proposed sewerage system in the town of Drochia



Legend

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

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1:10 000	4/4	2015.12.02	No.11

Format A2