Modernization of local public services in the Republic of Moldova

- Intervention area 2: Regional planning and programming -

Technical report

on feasibility study for the project "Improving water supply and sanitation services in the rayon of Cahul (town of Cahul, villages of Cotihana, Crihana Veche, Manta and Pascani)"

Draft report

December 2015

Ministerul Dezvoltării Regionale şi Construcţiilor
cooperare germană DEUTSCHE ZUSAMMENARBEIT
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
SWEDEN

Published by:
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

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Prepared for:
Project “Modernization of local public services in the Republic of Moldova”, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of Federal Ministry for Economic Cooperation and Development (BMZ) and with support of Romanian Government, Swedish International Development Cooperation Agency (Sida) and European Union

Project partners:
Ministry of Regional Development and Construction of the Republic of Moldova
Ministry of Environment of the Republic of Moldova
Agencies for Regional Development

Chisinau, December 2015

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Acronyms and abbreviations

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

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

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

Glossary

The main definitions used in this document are following:

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

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

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

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

Raw water – Intake water before any treatment or use

Water sold – authorized 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 organization that uses water supply and wastewater services or commodities according to a contract with the operator.

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

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

Water quality indicators –pollutants values, based on scientific researches, developed and updated by competent national authority. The concentration criteria and 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, village, commune), so as to perfectly fit the existing systems as well as the funds and constraints related to the local water sources and the provisions of the law in force.

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

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

Water resources - surface waters, ground water and atmospheric precipitations/rainfall;

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.

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 Authorities (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 **Cahul Rayon**. The FS particularly focuses on implementation of the first phase of the PIP, covering period of 2015-2018 and further named **the Project**.

The PIP covers the area of the town of Cahul as well as the localities of Cotihana, Crihana Veche, Manta and Pascani. The Project includes the town of Cahul only.

Main beneficiaries of this study are the inhabitants in the concerned LPAs, which will have access to improved Water Supply and Sanitation (WSS) services.

The German Development Bank (KfW) is developing an assistance programme to the Republic of Moldova in which comprehensive feasibility studies for water supply and sanitation services. The priority areas for this assistance are the rayons of Straseni and Calarasi in Development Region Centre and Cahul in Development Region South. KfW has selected a consultant to prepare the feasibility study for Cahul and work should begin in early 2016. At a joint meeting between GIZ and KfW in Chisinau in October 2015, it was agreed that GIZ would hand-over to KfW and its selected consultant a technical report, essentially equivalent to a pre-feasibility study. This is done to ensure synergy and complementary efforts in the development and finalisation of a comprehensive feasibility study. The study financed by KfW is also seen as complementary to the efforts undertaken as part of the so-called Intervention Area 1 of the MLPS project, the results of which will also be shared with KfW by GIZ.

Problem statement and objective

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

- Insufficient area coverage of the WSS services;
- Water transmission main from water intake at Prut River to Cahul Town is in poor condition;
- Unsatisfactory levels of service, including:
  - Continuity of service;
  - The water quality does not comply with national drinking water standards and the water treatment plant is in poor condition.
- As for the operational efficiency, the main findings in a review of the company are as follows:
  - High non-revenue water (NRW) ratio;

- High staff efficiency ratio;
- Poor asset management and lack of preventive maintenance.

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.

Legal aspects

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

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

"*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.

The management of water supply and wastewater public services in Cahul Town, Cotihana, Crihana Veche is ensured by the municipal enterprise (ME) 'Apa-Canal' Cahul, which is organised and operates based on self-financing and financial autonomy principles. In the localities of Manta and Pascani, no centralised water supply services exist.

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

- Regional Operator;
- Delegated management contract which regulates the relationship between regional operator and local authorities.

Regionalisation of water supply and wastewater services will involve the extension of service areas in all localities included in the feasibility study, initially in the urban areas, and afterwards in the rural areas. Creating a regional operator (through reorganisation of ME 'Apa-Canal' Cahul) will require considerable changes in the organisational structure in order to cover the increasing demands of expanding service area. An existing study prepared under Intervention Area 1 of the MLPS project covers also institutional aspects and organisational structure. Support is also provided under MLPS for institutional changes to ME 'Apa-Canal' Cahul.

Technical aspects

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

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

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

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

Investment framework

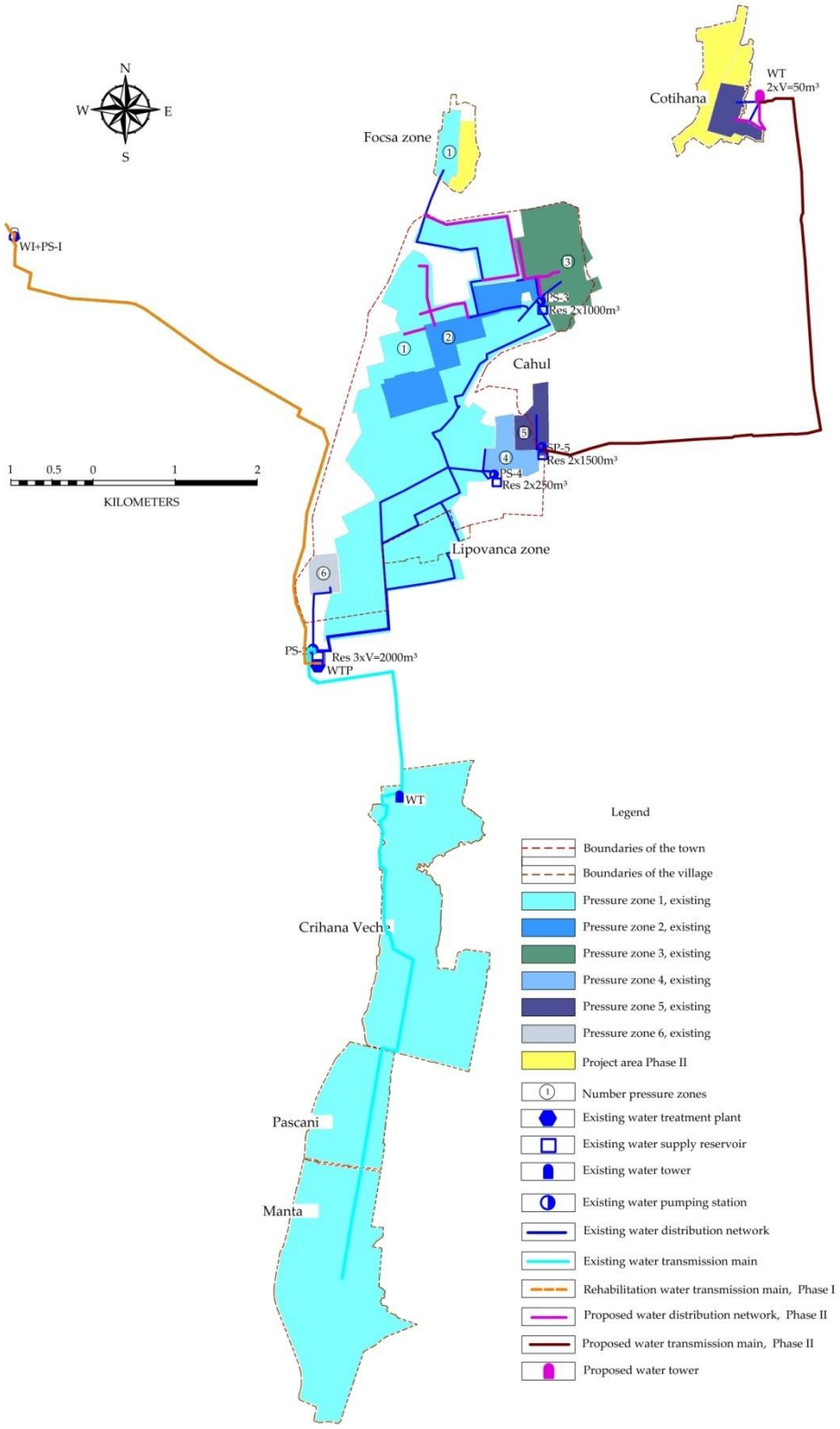
Water Supply:

In order to remediate the deficiencies described in the water supply and distribution system (see Chapter 4), the following improvements have been identified:

- Rehabilitation of water transmission main in the town of Cahul;
- Rehabilitation of water distribution network in the town of Cahul;
- Extension of water distribution network in the town of Cahul;
- Extension of water distribution network in Cotihana village;
- Construction of water tower and pumping stations in Cotihana village;

Only one measure is proposed for Phase I namely: “Rehabilitation of water transmission main pipeline in the town of Cahul”. All other measures are proposed for Phase II.

Figure 1-1: Scheme of proposed measures for water supply system in the town of Cahul and the localities of Cotihana, Crihana Veche, Manta and Pascani



Source: GIZ/MLPS

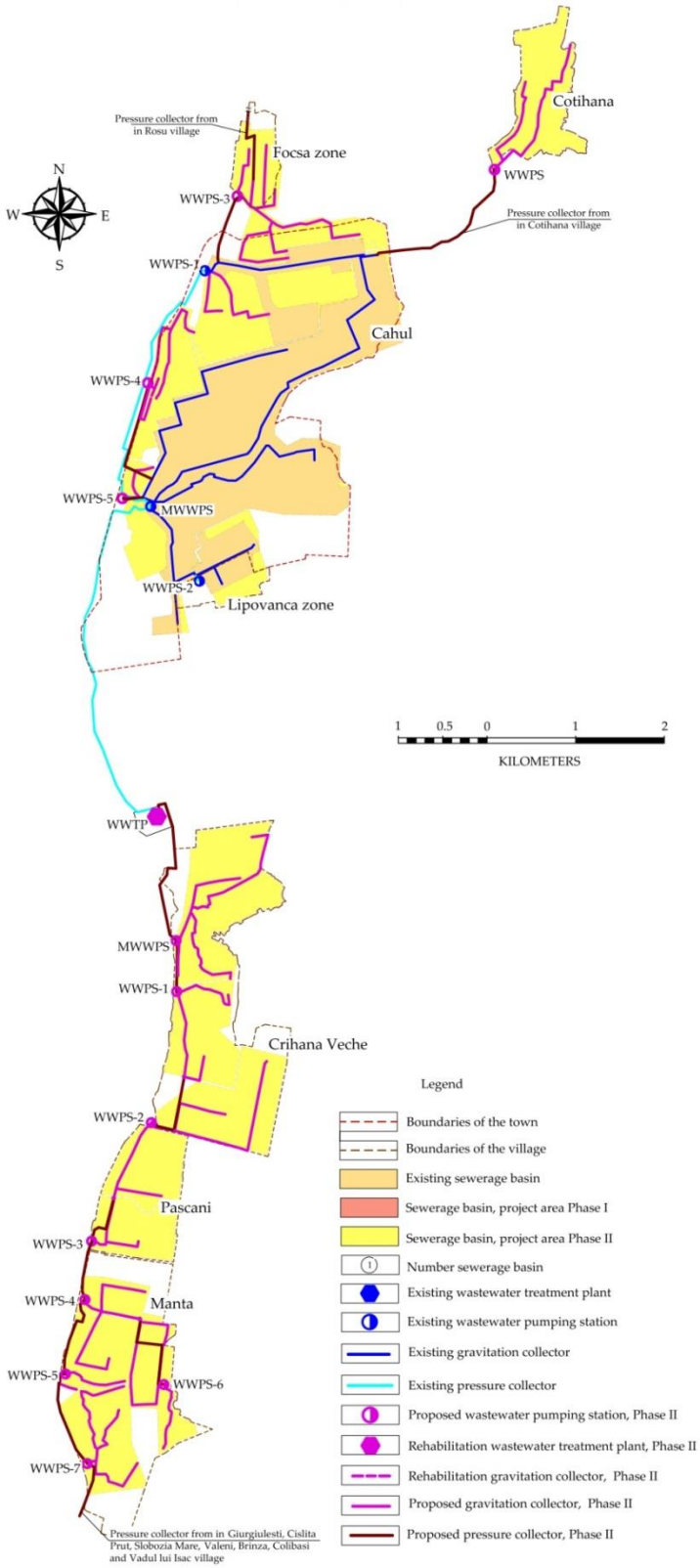
Wastewater:

In order to remediate the deficiencies in the wastewater system (described in Chapter 4), the following improvements have been identified:

- Rehabilitation of Wastewater treatment plant in the town of Cahul;
- Rehabilitation of sewage network in the town of Cahul;
- Extension of sewage network in the town of Cahul;
- Construction of pumping stations in the town of Cahul;
- Extension of sewerage network in Cotihana village;
- Construction of sewerage network and pumping stations in Crihana Veche village;
- Construction of sewerage network and pumping stations in Manta village;
- Construction of sewerage network and pumping stations in Pascani village.

All measures are proposed to be implemented in Phase II.

Figure 1-2: Scheme of proposed extensions of the wastewater system in the town of Cahul and the localities of Cotihana, Crihana Veche, Manta and Pascani



Source: GIZ/MLPS

Priority Investment Plan

The proposed Priority Investment Plan for Phase I and Phase II including capital investments, equipment and technical assistance is presented in the table below. The total cost for the measures in Phase I ("The Project") amount to about 5.5 MEUR. The total costs for measures proposed in Phase II amount to about 47.4 MEUR. The total costs for Phase I and Phase II amount to 52.9 MEUR.

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

No	Measure	Costs [€]
1	Capital Investment	
1.1	Rehabilitation of the water transmission main to Cahul Town	4,001,600
1.2	Equipment and tools	200,000
ST-1	Sub-Total Capital Investment	4,201,600
2	Technical Assistance	804,192
3	Contingencies (10 %)	500,579
GT-1	Total Costs for Phase I	5,506,371

Source: GIZ/MLPS

Table 1-2: Proposed investment measures Phase II

No	Measure	Costs [€]
A	Capital Investments	
1	Capital Investment in Cahul Town	
1.1	Rehabilitation of Wastewater treatment plant	15,885,720
1.2	Rehabilitation of sewage network	599,900
1.3	Extension of sewage network	9,830,090
1.4	Construction of pumping station	102,000
ST-1	Sub-Total Capital Investment Cahul Town	27,619,917
2	Capital Investments Cotihana village	2,068,800
3	Capital Investments Crihana Veche village	4,158,527
4	Capital Investments Manta village	3,138,019
5	Capital Investments Pascani village	1,483,602
ST-A	Total Capital Investments	38,468,865
B	Technical Assistance	4,616,264
C	Contingencies (10%)	4,308,513
GT	Total Costs for Phase II	47,393,641.68

Source: GIZ/MLPS

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 1-3: Procurement plan

N°	Description	Estimated contract value[1], EUR	Contract type	Procurement method
1	Design and Engineering for Phase I investments	554,611	Consulting services	Competitive
2	Construction works: Rehabilitation and extension of water supply network and sewer network in Cahul Town	4,401,760	Works	Open
3	Supply of equipment for operational performance improvement	220,000	Supply of goods	Shopping
4	Technical assistance: Corporate Development Program, Stakeholder Participation Program, Water Supply Network Analysis and Water Loss Reduction Programme, Medium to Long-term Sanitation Study	330,000	Consulting services	Competitive
GT	**Total Amount**	**5,506,371**		

Project implementation plan:

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

Table 1-4: 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

[1] Including contingencies.

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 Authorities (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 public services infrastructure, and capacity development of local public administration and local 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.

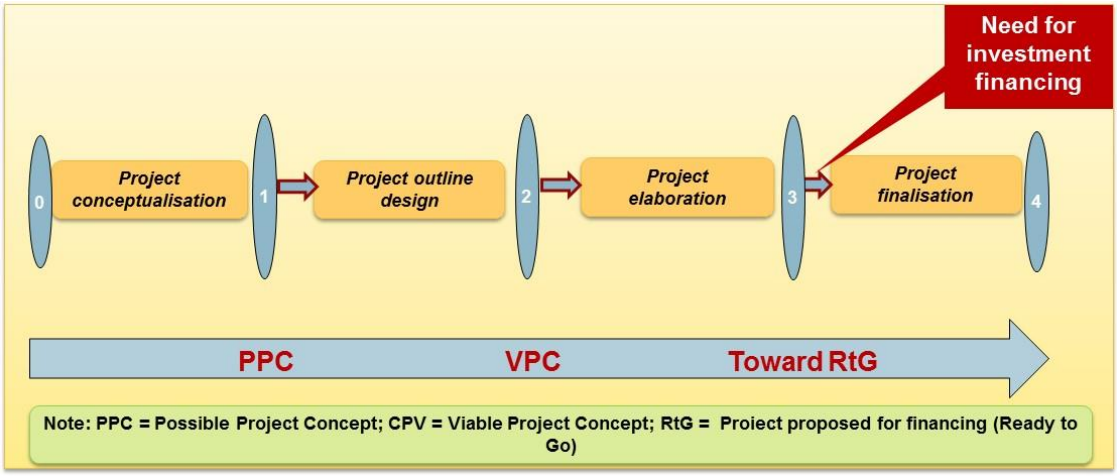
Based on the WSS sector development directions and criteria defined in the WSS RSP, a list of possible project concepts was defined for further project development.

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



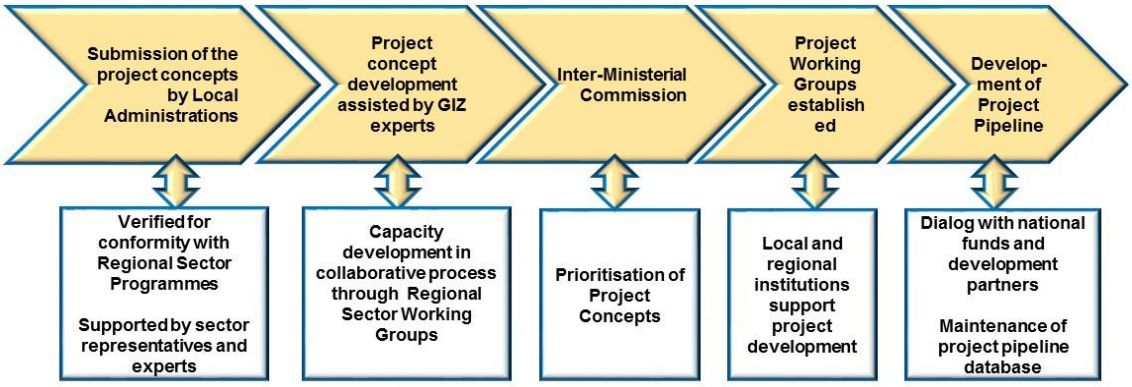
More specifically, the five stages of project development in MLPS are as follows:

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

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

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

Figure 1-2: Project development and implementation



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

A Project Working Group (PWG), established by decision of the Rayonal Council and comprising members from the Regional Development Agency Centre (RDA Centre), the Cahul 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 Cahul Rayon council.

1.3 Background

1.3.1 General information on the WSS

The Rayon of Cahul is located in the south-west of the Republic of Moldova (RM) and includes 55 communities, the Rayon capital is Cahul Town. The total population is about 130,000, whereof about 40,000 live in Cahul Town.

The coverage with water supply and sanitation services in the Rayon of Cahul is very limited. Only 30 from the 55 communities have centralized water supply systems.

The water supply in the Cahul Town and the neighbouring communities is operated by the municipal owned utility Apa-Canal Cahul (“ACC”). The connection rate is about

60% of the population. The central water supply system of Cahul Town and neighbouring communities is based on treated Prut River surface water.

In the remaining, rural part of the Rayon the connection rate to centralized water supply is about 40%. It needs to be stated that centralized water supply in rural area is often based on artesian wells which in most cases do not correspond with the drinking water standards in Moldova.

Only six of the 30 communities with water supply systems have sewage networks, which collects wastewater from public institutions such as kindergartens and schools. In four of these communities, some households are connected to the sewage system as well. Except in Cahul Town, where the connection rate is 63%, and in the village of Rosu (connected to the sewer system in Cahul), the connection rate of households to the sewage system in these areas is below 1%.

The main sanitation facilities can therefore be found in Cahul Town with a network of about 50 km and a WWTP. It needs to be stated that all the facilities are rather outdated.

In order to improve the service quality in Moldova in general, the Government of the RM developed the “Program for Water Supply and Sanitation of Localities of the Republic of Moldova up to 2015”, stating that all 53 localities in the Cahul Rayon shall be provided with water supply and sanitation service.

The implementation of the program is ambitious and challenging and due to limited funds and capacities on all levels the service quality is improving only slowly.

1.3.2 German technical cooperation (TC)

The poor service level in the Rayon of Cahul and the efforts of the RM to improve the situation have been one of the aspects for the German Government to provide support to the Rayon of Cahul (among other areas).

The German Technical Cooperation (TC) through GIZ supports Moldova with the “Modernization of local public services in the Republic of Moldova” (MLPS) programme in the sectors WSS, solid waste, energy efficiency since 2010 and local roads since 2014.

For the WSS sector the MLPS supports the improvement in the water governance at all levels, the central, regional, and local level as well as the development and implementation of capital investments in the WSS sector.

Among others, the following activities have been supported in the Rayon of Cahul:

- Support the Rayon of Cahul in the development of the WSS component for the “Social and Economic Development Strategy for Cahul District 2012-2017”;
- Preparation of the “Feasibility study for aggregating water supply services for Rayon of Cahul with options for wastewater services (2013/14)”;
- Provision of equipment and tools for the operational performance improvement of the ME ‘Apa-Canal’ Cahul;
- Support of the villages Cotiahana, Crihana Veche, Pascani and Manta in the implementation of water supply and sanitation facilities (project preparation and capital investments);
- Rehabilitation of the existing water treatment plant (WTP) in Cahul to ensure a reliable operation for Cahul Town and the neighbouring localities on a mid-term, until a new construction of the water treatment plant is ensured (rehabilitation of WTP is planned, but not yet implemented).

1.3.3 German financial cooperation (FC)

The German Government decided together with the Government of the RM to extend the assistance in the WSS by additional investment measures through the German Financial Cooperation (FC) with the “Open Programme Water Supply and Sanitation in the Republic of Moldova”.

So far the Government of Germany has committed 11.5 million EUR for FC through KfW Development Bank to finance investment in the water sector infrastructure. Provision of additional funds for the following years is likely.

One of the planned interventions within this program the “Water Supply and Sanitation in Rayon Cahul” which is subject to these ToR and the technical proposal at hand.

The following measures are planned to be implemented with this intervention:

- Construction of a new central water treatment plant (WTP) in Cahul and connection of selected neighbouring localities where technically feasible and cost-effective;
- Construction of a new wastewater treatment plant (WWTP) in Cahul, and connection of selected neighbouring localities where technically feasible and cost-effective;
- Improvement measures in the water distribution network and sewer system in Cahul and in other pipe-bound supply and sanitation schemes.

To this end, the KfW-financed consultant’s task is to prepare a detailed Feasibility Study (FS) for a planning horizon of 10 years addressing present uncertainties and imponderables as well as to re-assess, complement and to update the information available.

1.3.4 Programme status

With the support of German technical assistance through GIZ under the MLPS programme, the following major documents have been prepared:

- “Social and Economic Development Strategy (SEDS) for Cahul District 2012-2017”;
- “Feasibility study for aggregating water supply services for Rayon of Cahul with options for wastewater services (2013/14)”.

The later document is based on the SEDS and both together describe the planned development of the WSS in the Rayon of Cahul.

The KfW-financed consultant’s task is to prepare a document based on these documents but shall verify conclusions, update data and complement the documents.

1.3.5 Coordination between MLPS/GiZ and KfW activities

Recently, the Ministry of Regional Development and Construction (financed by KfW) has launched the procurement process for the Consultancy assignment *“Water Supply and Sanitation in Southern Moldova - Consulting Services for Preparation of a Feasibility Study”*. In order to ensure that the scope of said study complements and builds upon the technical study in this present document, a coordination meeting with participants of MLPS experts and KfW representatives took place on 21 October 2015.

The results of the meeting related to the rayon of Cahul are summarized as follows:

- The main scope of the proposed KfW feasibility study for Cahul potentially overlaps with the main scope of the feasibility study prepared under MLPS (water intake on Prut River to water treatment plant as well as wastewater networks). It was agreed that a "technical report" including all information prepared under MLPS will be shared with KfW once the expert is selected and this will be used as input into the feasibility study to be prepared by the KfW consultant;
- The pilot project measure to rehabilitate the existing water treatment plant will proceed as planned. This pilot measure will continue since at this time it is not known when the new plant would be operational and the existing plant is not operationally sound and may experience failure in the near future, which would leave a significant population without a source of water. The KfW consultant will use the existing feasibility study for Cahul rayon developed under the pilot project.

1.3.6 Revised approach for preparation of a Feasibility Study

As mentioned above, it was important to ensure that the scope of a feasibility study (FS) for Cahul rayon based on the possible project concept developed in accordance with the approved Regional Sector Programme for Development Region South and the scope of the feasibility study to be developed by KfW-financed experts currently under preparation by MLPS Consultants and the scope of the study contracted by MRDC Consultants would be complementary and not overlap. Therefore, the approach in the present study is to provide a technical report that sets out the current situation (as of the end of 2015) that can be handed over to the KfW-financed project or developed into a full feasibility study. To that end, the current technical report presents a pre-feasibility study that may still contain some inconsistencies between chapters. In particular it is noted that the chapters related to institutional development (Chapter 3 and 7) and environmental and social assessment (Chapter 8) are not or only partially available.

1.4 Institutions and stakeholders involved

The roles and responsibilities in the WSS sector are distributed among different institutions and authorities on the central, regional and local level. The roles range from policy making on ministry level to the operation of WSS facilities on local government level.

- The Ministry of Regional Development and Construction (MRDC) keeps all responsibilities related to regional development. Regarding the WSS sector the MRDC approves the general and regional urban development plans, including with WSS infrastructure. For the KfW Programme the MRDC is the Project Executing Agency (PEA);
- The Regional Development Agencies' (RDAs) are the regional satellites of the MRDC. Their activities are mainly the development and implementation of the national regional development strategies and the regional operational plans and their implementation;
- Ministry of Environment (MEnv) – is the main authority responsible for management of all environmental issues and develops and promotes the national policy in the areas, among others, of water resource management, water supply and sanitation. Main departments and subordinated agencies which may become stakeholders are:
  - *The Water Management Division (WMD*) – responsible for water management, water supply and sanitation, which include activities for drafting and

promoting policy documents, and legislation for water resources and water supply and sanitation area, including the monitoring of investment projects;

- *The Agency Apele Moldovei (AAM)* – is responsible for the implementation of Government policy in water resource management and WSS as well as the implementation of all capital investment programmes;
- *The State Hydro meteorological Service (SHS)* – is responsible for monitoring the status of surface waters and hydrological regime;
- *The Agency for Geology and Mineral Resources (AGMR)* – monitors the quality of underground waters and provides services related to artesian wells;
- *The State Ecological Inspectorate (SEI)* – identifies and assesses the water pollution and water management frauds and issue permits for water use, waste water discharge.

- Ministry of Health (MoH) – is responsible for the development and promotion of state policy for health care. With the National Centre for Public Health (NCPH) it is monitoring drinking water quality through the regional entities;
- Local Public Authorities (LPAs) – The Local Administration in Moldova is divided in two levels:
  - *Level 2 – Rayon level:* 32 rayons have been established in Moldova, Cahul is one of them. In terms of WSS, rayons are responsible for developing the General Water Supply and Sanitation Plan and also for planning and financing the regional WSS systems;
  - *Level 1 – Municipal level:* the responsibility for organisation and functioning of the water and sanitation infrastructure is decentralized to the local governments (Municipalities). The LPA is the owner of the WSS infrastructure and decides on the water tariffs (based on the regulations). The LPA provides water supply and sanitation services through its own units or through municipality owned utilities or Joint Stock Companies. For the Programme, the LPA 1 will be the direct beneficiary institution and responsible for all facilities.
- KfW Development Bank – is the funding institution and immediate counterpart for the PEA. Further, KfW will be involved in all project related coordination of the Consultant. Project steering issues and project monitoring regarding progress, achievement of objectives and goals, financial issues etc. are most probably further functions of KfW.

1.5 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 villages, 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;

- **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 authorities to adopt the most appropriate way of provision of WSS service in their respective localities, and therefore a strong willingness of the LPAs is required to organize a regionalized WSS service.

The Study area of this Feasibility Study includes the town of Cahul (including the neighbourhood units Lipovanca and Focsa) and the localities of Cotihana and Pascani.

In terms of administrative and territorial division, the study area includes the town of Cahul, the village of Crihana Veche and the commune of Manta with its localities Manta and Pascani.

The town of Cahul is located in the south-west part of the Republic of Moldova, on the bank of the Prut River and it is crossed by two (2) rivers Frumoasa and Cotihana, which are Prut River's affluents. The town of Cahul is located 160 km far from Chisinau City.

The town of Cahul is the administrative and commercial centre of the Cahul Rayon and has a total population of approx. 39,800 inhabitants.

The neighbourhood unit Focsa (the lodgings are located within Rosu village's area, being actually a component part of the Cahul Township) is located at a distance of approx.5 km far from the town of Cahul and comprises of 1,300 inhabitants. The village of Cotihana is located at a distance of approx.6 km far from the town of Cahul and comprises of 1,800 inhabitants. The commune of Manta (Manta and Pascani villages) is located at a distance of approx.8 km far from the town of Cahul and comprises of 3,960 inhabitants.

Figure 1-3: Geographical location of the town of Cahul

1.6 Study objective

The objective of this technical report, pre-feasibility study (FS) consists in exploring the improvement of water supply service for 39,800 consumers (town of Cahul), 475 consumers (Focsa neighbourhood unit), 375 consumers (Cotihana village) and wastewater collection service for 16,400 consumers (town of Cahul, including neighbourhood unit Lipovanca), 740 consumers (neighbourhood unit Focsa), 1,800 consumers (Cotihana village) and 3,960 consumers (Pascani villniage) which will lead to improvement of wellbeing and health of the population.

The specific objectives of this study are to provide:

- Water supply of drinking water to consumers;
- Rational operation of water sources;
- Protection of water sources against pollution;
- Environmental protection;
- Reduction of water losses;
- Reduction of operating costs;
- Reasonable estimation of investments.

2 Socio-economic aspects

2.1 Natural features

The whole territory that is located southward of the Colina Moldovei (Moldovan Valley) is called South Moldova. It represents 20% of the Moldovan territory. The South of Moldova is less populated. Only 465 thousand people live here, which constitutes about 14% of the country's population and the population density is 68 people per km^2. The majority population consists of Moldovans, but there are several regions where the Gagauz and Bulgarians are predominant. There are also Ukrainian villages. This can be seen in the names of communities - Slobozia Mare, Leova, Slave origin − Ferapontevka, Mikhailovka and Turkish origin − Beş-Alma, Beş-Gioz and others. Southward of the Codri in the direction of Danube and the Black Sea the heights decrease, the surface is flatter, there are no forests and the influence of the Mediterranean climate can be felt – it is warmer, more arid, the winter is milder. The average annual temperature is 9-10°; in July the temperature is about 22° and the sum of active temperatures is over 3100°. The precipitations amount to 400-480 mm, the largest part of them in the warm season in the form of torrential rains. In the summer of almost every year there is a deficit of humidity and the droughts are not rare. On the once large areas in the South of Moldova the Gramineae and straw steppe was predominant with a mixture of plants typical of the regions coterminous with the Mediterranean Sea and the Middle Danube (Pannonia). The fauna suffered a transition as well. The specific combination of the elements from Eastern Europe and the Balkans has maintained in the soil coating: ordinary Chernozem soils, Chernozem soils similar to those from the steppes of Ukraine and Northern Caucasus, as well as compact black soils in the neighboring areas – such as the black clay soils of Bulgaria and Yugoslavia and brown soils with dry forests, such as those located close to the Mediterranean Sea. This interaction between western and eastern influences has not been identical in different parts of Southern Moldova. Representatives of the woody plants came from the upper northern and southern parts of the Codrii and of Colina Tigheci and from Dobrogea. As a result, a pile steppe was formed. It is dominated by steppe areas that are cut across by groves of downy oak, hornbeam and sumac. Southward, on lower areas the true steppe lies. It has had the same name since the nomad Tatars − Bugeac. It is referred to as straw steppe on the modern botanical-geographic maps. The lack of ores and fuels, the limited hydro-energy resources, on the one hand and the exuberance of heat and increased soil fertility – on the other hand have led to the fact that agriculture is more developed than industry in the South of Moldova. The number of farmed land plots is very large — over 80%: 58% are the pastures (403 thousand ha) and 10% − orchards and vineyards (69 thousand ha)[2].

2.2 Population

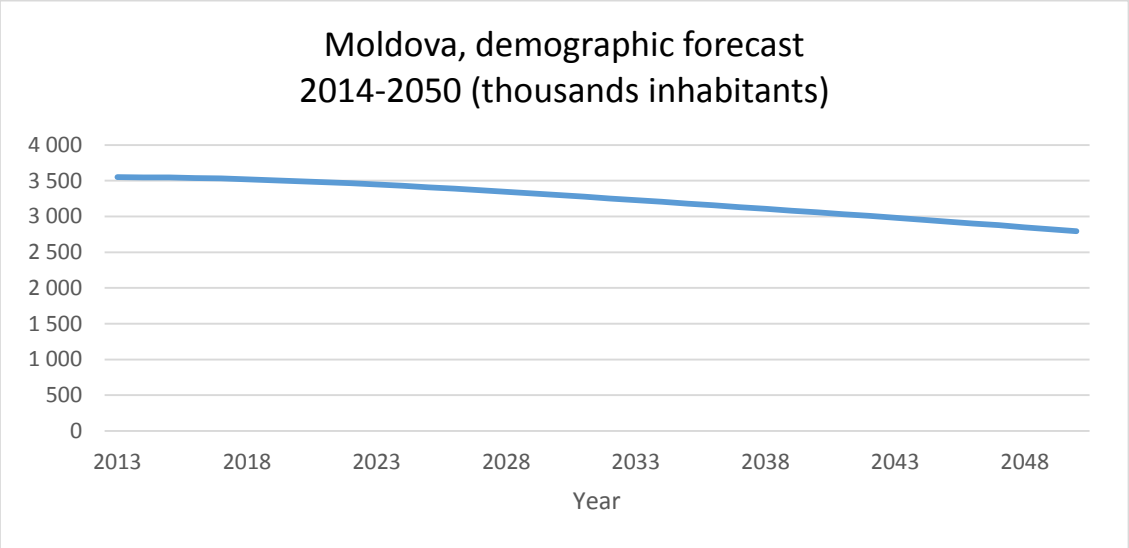
Immediately upon gaining its independence in 1991, the Republic of Moldova faced economic hardships that severely affected demographic indicators. The main factors affecting demography are outmigration for economic reasons and a decline in the birth rate. These trends began with the military conflict in Transnistria in 1992, which prompted a wave of emigration from Moldova toward Russia and Ukraine, followed by

[2] Feasibility study for aggregating water supply services for Rayon of Cahul with options for wastewater services (2013/14).

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 2-1: United Nations Development Programme population forecast for Moldova



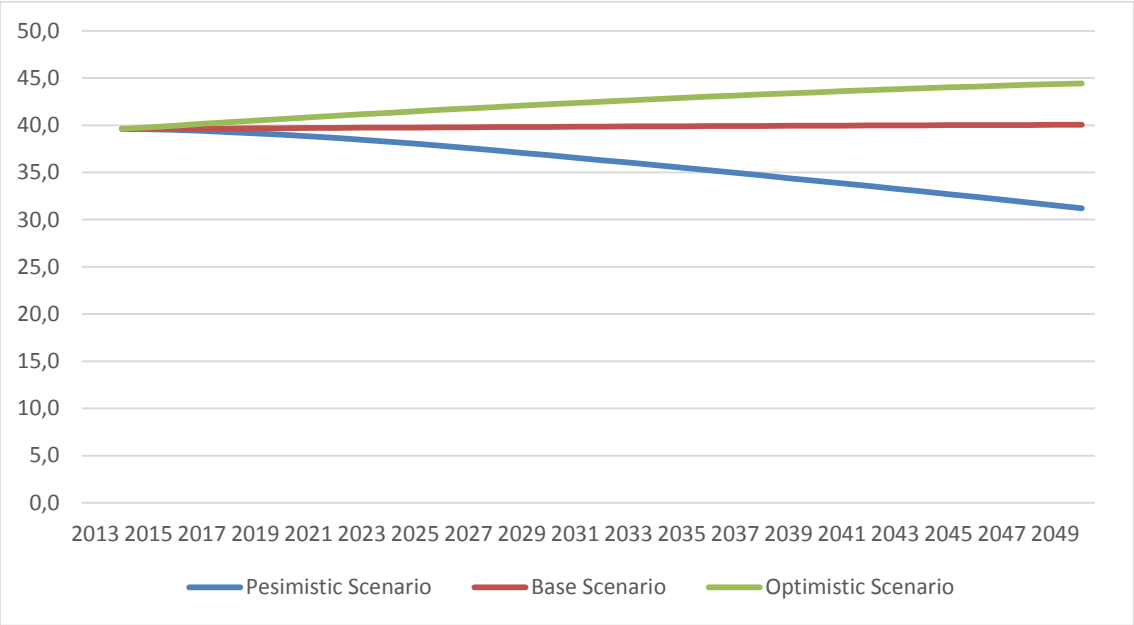
Source: UNDP, World Population prospects, 2013, internet: esa.un.org/wpp/

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

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

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

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



Source: GIZ/GOPA forecast

Further in this feasibility study (year 2015, with the expectancy that the detailed design year will be executed in 2016) the population forecast uses the base scenario. In conclusion, it is expected that the population of the town of Cahul will remain essentially constant despite the decrease of national population. In regard to rural population, the population forecast to year 2050 reflects the national declining trend, as well as the rural-urban migration.

2.3 Household Income

According to the National Bureau of Statistics, the average household income in Moldova is 1,756.1 MDL/person/month (Quarterly bulletin, II 2014) while in the South region it was 1,419.1.9 MDL/person/month.

The average size of households is 2.4 (2.3 in urban and 2.5 in rural areas). 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 2,4 x 9,50 MDL / m^3 = 41,04 MDL.

Comparing it to the average household income of 1,419.1 x 2.4 = 3,405.84 MDL, the affordability ratio reaches 1.20 % 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 minimize adverse impacts of water production and consumption on water quality.

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

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

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

Directive 91/271/EEC concerning urban wastewater treatment aims to protect surface waters, including those from the coastal territories, by regulating collection and treatment of urban wastewater and discharge of the biodegradable industrial wastewater (coming mainly from the agro-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[3].

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 harmonized 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.

[3] 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 harmonized only to a small extent with European legislation, represents the legal basis for the establishment, organization, management, financing and monitoring of the functioning of these services.

The legal regulation of decentralized 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, organization, 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 authorities) 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 organized 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 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 wastewater 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 maximize 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 organized on two levels: level 2 is the rayon public authorities, while the level 1 is the public authorities in towns and villages. The water supply and wastewater public services are set up, organized and managed under the direction, coordination, supervision and responsibility of local public authorities 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 sector 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 harmonize 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 reorganized 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 sector 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 this study

3.4.1 Competence and management of water supply and wastewater services

The water supply (and sanitation for the town of Cahul only) public service has been established, organized and managed under the leadership, coordination, control and responsibility of the local public authorities, represented by the Local Councils as deliberative authorities, and Mayor Offices, as executive authorities.

3.4.2 Management of water supply and sanitation public service

Water supply and sewerage public service in the town of Cahul is provided by the Municipal Enterprise 'Apa-Canal' Cahul. The same operator ensures water supply in the

localities of Cotihana, Crihana Veche and Roșu, according to Cahul Local Council decision dated 2012.

3.4.3 Ownership

The public water and waste water systems, including all technological and functional structures covering the entire technologic cycle from the capture of raw water at the source to the discharge of treated wastewater into receiving body, are the property of the administrative-territorial units.

The water supply and sewerage systems, the property of the administrative-territorial unit Cahul, are operated and managed by the Municipal Enterprise 'Apa-Canal' Cahul.

As regarding the other localities of Cahul rayon which are part of the PPC, the water supply systems are managed and operated by the local public authorities. The process of management transfer of the service to the Municipal Enterprise 'Apa-Canal' Cahul is not finished yet.

3.4.4 Assessment of the potential capacity for association/extension of service area

In October 2012, the Cahul Local Council took a decision regarding the expanding of the water supply services to the villages of Rosu, Crihana Veche and commune of Manta through the Municipal Enterprise 'Apa-Canal' Cahul. In accordance with this decision, the local authorities have signed a partnership agreement and took the responsibility to organize and manage water supply and sewerage service in those administrative-territorial units through a regional operator.

At the moment, these services are provided under the same conditions as those when the decision was adopted and partnership agreement signed.

4 Technical aspects - existing situation

4.1 General information

The assessment of the existing water supply and sewerage situation in the town of Cahul and localities in its vicinity has been conducted by the GIZ/MLPS experts in collaboration with members of a Project Working Group (PWG) established for the purposes of developing the project.

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

- Water supply and sewerage questionnaire prepared and distributed by GIZ/MLPS experts, and completed by Local Public Authorities (LPAs) and the ME 'Apa-Canal' Cahul;
- 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

General information about service area in the town of Cahul is provided in Table 4-1. General information about service area in the project localities (Cotihana, Manta and Pascani villages) is provided in Table 4-2. General information about service area in Crihana Veche village is provided in Table 4-3.

General information about public institutions in the town of Cahul is provided in Table 4-4. General information about public institutions in the feasibility study localities is provided in Table 4-5.

General information about business entities in the town of Cahul is provided in Table 4-6. General information about business entities in the feasibility study localities is provided in Table 4-7.

Table 4-1: General information about service area in the town of Cahul

No.	Population served by centralised water supply/wastewater service	No.
1.	Population, including: • women • men	39,800 21,412 18,388
2.	Domestic consumers, connected to: • water supply service • centralised wastewater service	 37,723 24,923
3.	Households, connected to: • water supply service • water supply service equipped with water meters • centralised sanitation service	13,500 13,008 11,748 8,594

Source: LPA Cahul, M.E. "Apa-Canal" Cahul

Table 4-2: General information about service area in the feasibility study localities

No.	Locality name	Population		
		Total	Women	Men
1.	Cotihana	1,415	764	651
2.	Manta	2,797	1,360	1,437
3.	Pascani	1,250	635	615

Source: LPA Cahul, LPA Manta Township

Table 4-3: General information about service area in Crihana Veche village

No.	Population served by centralised water supply/wastewater service	No.
1.	Population, including: • women • men	4,420 2,306 2,114
2.	Domestic consumers, connected to: • water supply service	 1,800
3.	Households, connected to: • water supply service • water supply service equipped with water meters	 598 598

Source: LPA Crihana Veche

Table 4-4: Public institutions in the town of Cahul

No.	Public institution name	Pupils/children/ /places/beds	No. of employees	Connected to water supply system	Connected to centralised sewerage system
1.	Theoretical Lyceum „Mihai Eminescu"	910	93	Yes	Yes
2.	Theoretical Lyceum ”Dimitrie Cantemir”	599	78	Yes	Yes
3.	Theoretical Lyceum „Ioan Voda"	720	85	Yes	Yes
4.	Theoretical Lyceum „Ion Creanga"	582	60	Yes	Yes
5.	Theoretical Lyceum „P. Rmeantev”	520	69	Yes	Yes
6.	Gymnasium ”S. Rahmaninov”	275	52	Yes	Yes
7.	Primary school ”Alexandru Donici”	285	47	Yes	Yes
8.	Primary school ”Alexei Mateevici”	170	24	Yes	Yes
9.	Technical college nr. 1	363	86	Yes	Yes
10.	Technical college nr. 2	360	70	Yes	Yes
11.	Specialised boarding school	62	33	Yes	Yes
12.	Medical college	300	70	Yes	Yes
13.	Industrial training college	834	120	Yes	Yes
14.	State University of Cahul	1,667	193	Yes	Yes
15.	Kindergarten nr. 1	300	52	Yes	Yes
16.	Kindergarten nr. 2	299	54	Yes	Yes
17.	Kindergarten 4	211	38	Yes	Yes
18.	Kindergarten 5	100	27	Yes	Yes
19.	Kindergarten 8	320	53	Yes	Yes
20.	Kindergarten 9	280	51	Yes	Yes
21.	Kindergarten 14	328	58	Yes	Yes
22.	Public Healthcare Centre		300	Yes	Yes
23.	Cahul Rayon Hospital	300	600	Yes	Yes
24.	Penitenciary Nr.5		140	Yes	Yes
25.	Bureau of Statistics		15	Yes	Yes

No.	Public institution name	Pupils/children/ /places/beds	No. of employees	Connected to water supply system	Connected to centralised sewerage system
26.	State Tax Service		56	Yes	Yes
27.	Inspectorate of Cahul Police		130	Yes	Yes
28.	Rayon Council		80	Yes	Yes
29.	Social services and family support division		30	Yes	Yes
30.	Civil protection and emergency situations service		138	Yes	No
31.	Cahul District Court		44	Yes	No
32.	Prosecutor's office		23	Yes	Yes
33.	Mobile Light Infantry Division nr.3	350	150	No	Yes
34.	Court of Appeal		42	Yes	Yes
35.	Region Directorate "Sud"		80	Yes	Yes
36.	Cahul Food Safety Authority		10	Yes	No
37.	State Ecological Inspectorate		12	Yes	Yes
38.	Regional blood transfusion centre		50	Yes	Yes

Source: LPA Cahul, Municipal Enterprise "Apa-Canal" Cahul

Table 4-5: Public institutions in the feasibility study localities

No.	Public institution name	Locality name							
		Cotihana		Crihana Veche		Manta		Pascani	
		Pupils/ children/ beds	Employ ployee's	Pupils/ children/ beds	Employee's	Pupils/ children/ beds	Employ ployee's	Pupils/ children/ beds	Employ ployee's
1.	School	70	25	352	54	250	43	145	28
2.	Kindergarten	65	21	176	40	140	29	140	29
3.	Centre of Family Physicians		5		24		7		4

Source: LPA Cahul, LPA Crihana Veche, LPA Manta Township

Table 4-6: Business entities in the town of Cahul

No.	Business entity	Number of employees	Field	Type of property	Connected to water supply system	Connected to centralized sewer system
1.	I.E. Flamingo Russu	30	Restaurant	private	Yes	Yes
2.	CahulPan JSC	260	bread production	private	Yes	Yes
3.	I.E. Schif-1	20	restaurant, canteen	private	Yes	Yes
4.	Cahul Cheese factory JSC	70	dairy production	mixt	Yes	Yes
5.	Tricon JSC	750	Knitting Factory	private	Yes	Yes
6.	Laboratorio Tessile Mol Ltd.	430	Knitting Factory	private	Yes	Yes

No.	Business entity	Number of employees	Field	Type of property	Connected to water supply system	Connected to centralized sewer system
7.	Bere-Unitanc JSC	130	beer and non-alcoholic beverages	mixt	Yes	Yes
8.	Prut-Comagro Ltd.	20	restaurant	private	Yes	Yes
9.	Sanatorium Nufarul Alb JSC	250	tourism	mixt		

Source: LPA Cahul, M.E. "Apa-Canal" Cahul

Table 4-7: Business entities in the feasibility study localities

No.	Locality name	Total no. of business entities	Employee's number
1.	Cotihana	6	36
2.	Crihana Veche	5	85
3.	Manta	13	24
4.	Pascani	1	2

Source: LPA Cahul, LPA Crihana Veche, LPA Manta Township

4.3 Water supply system

The Prut River is the source of supply for the town of Cahul. The surface water abstraction is carried out from the Prut River through water intake located at about 4 km to west from the Cahul town's central area. The water intake was constructed in 1970, with a design capacity of 23,040 m^3/day and rehabilitated in 2006. At present, the water intake capacity is 5,600 m^3/day. The raw water is pumped to the water treatment plant located in the south part of Cahul central area by the first level pumping station (PS-1), through a water transmission main with a diameter of 700 mm.

The treatment plant was constructed in 1970, with a design capacity of 17,400 m³/day. At the present, the treatment plant capacity is about 5,612 m³/day.

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

The technological treatment scheme includes following facilities:

- Vertical truncated mixers (two (2) units);
- Longitudinal horizontal decanters (four (4) units);
- Fast filters (eight (8) units);
- Chlorination plant;
- Reagent building;
- Three (3) drinking water underground reservoirs with a volume of 2,000 m^3 each;
- Second level pumping station (PS-2);
- Administrative building;
- Laboratory;
- Boiler room;

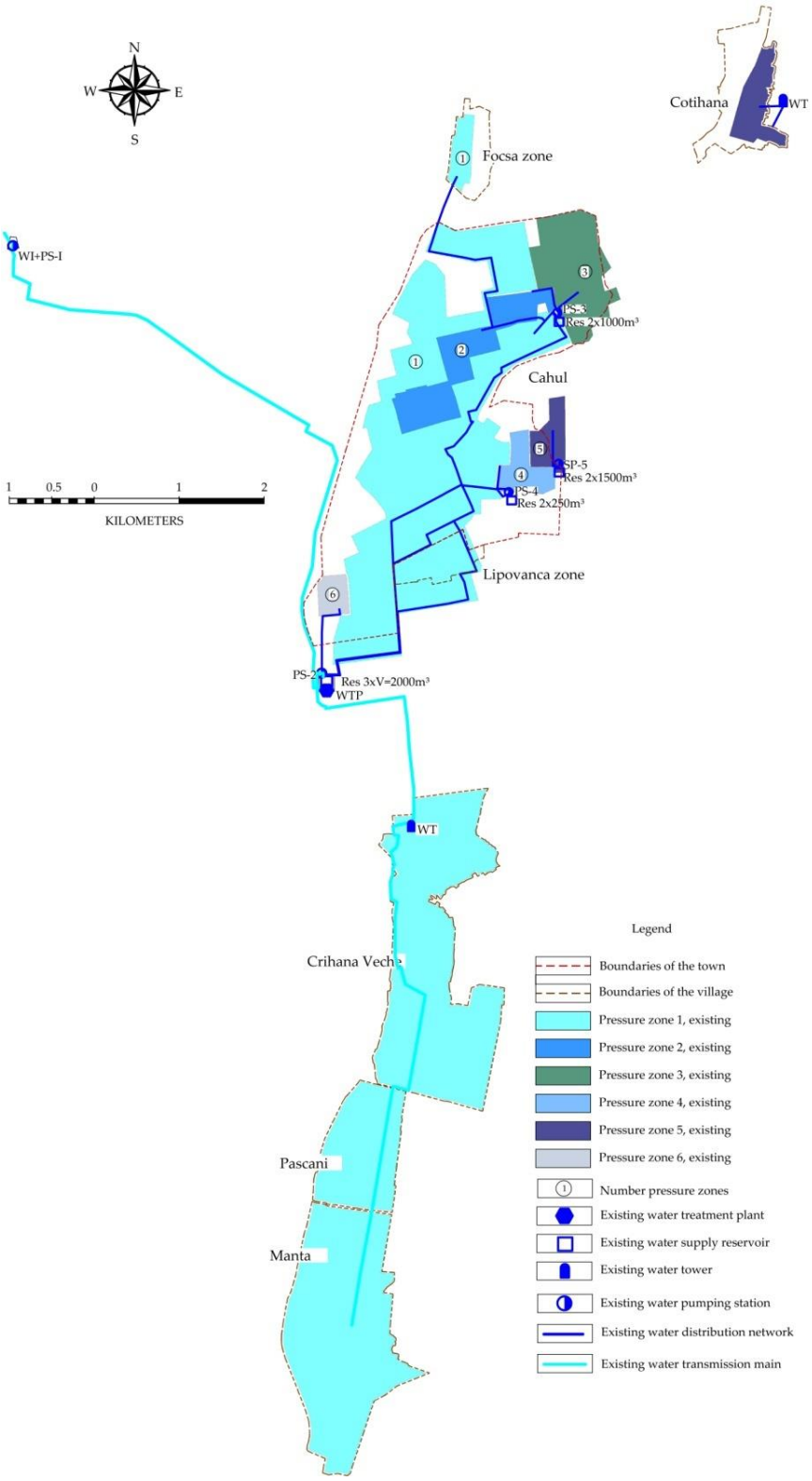
- Warehouse and workshop; and
- Auxiliary buildings and structures.

The drinking water is delivered into water distribution network by the second level pumping station (PS-2), through two (2) steel, reinforced concrete and high-density polyethylene pipelines with a diameter of 500 mm, 400 mm and 315 mm, which is divided in five (5) pressure zones:

- Zone no.1 - supplied with drinking water from the second level pumping station PS-2, delivered partly into water distribution network and a partly being pumped into two (2) underground reservoirs with a volume of 1,000 m^3 each installed at the third level pumping station PS-3 area and into two (2) underground reservoirs with a volume of 250 m^3 each installed at the fourth level pumping station PS-4 area;
- Zone no.2 and zone no.3 – supplied with drinking water from the third level pumping station PS-3;
- Zone no.4 – supplied with drinking water from the fourth level pumping station, delivered partly into water distribution network and partly into two (2) underground reservoirs with a volume of 1,500 m^3 each located at the fifth level pumping station PS-5;
- Zone no.5 - supplied with drinking water from the fifth level pumping station PS-5.

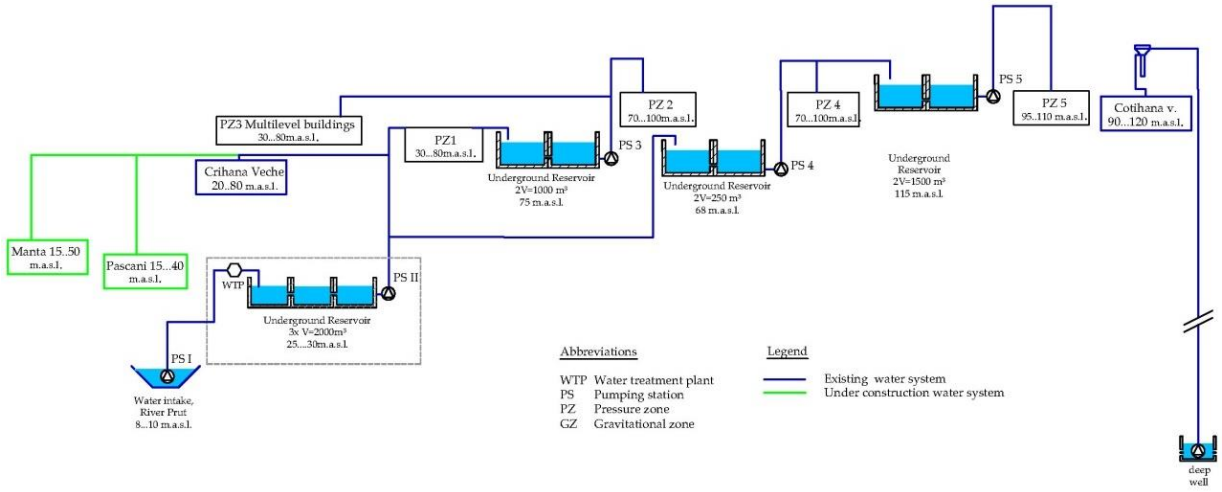
The existing water supply system in the town of Cahul and the villages of Cotihana, Crihana Veche, Manta and Pascani is presented in the figures below.

Figure 4-1: Water supply scheme, town of Cahul and villages of Crihana Veche, Pascani, and Manta



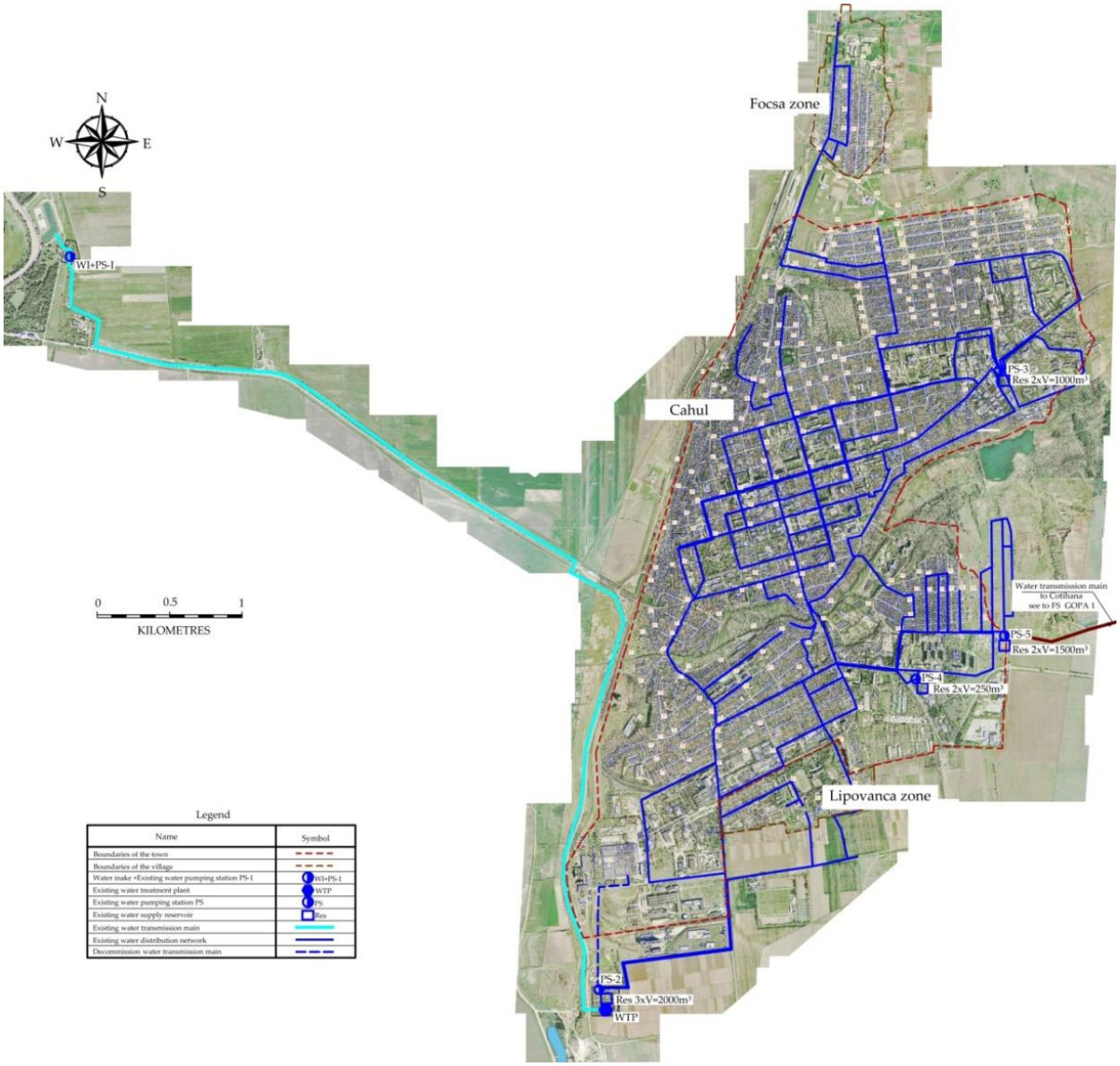
Source: https://www.google.com/earth/; GIZ/MLPS

Figure 4-2: Technological scheme of water supply system in the town of Cahul and Cotihana village



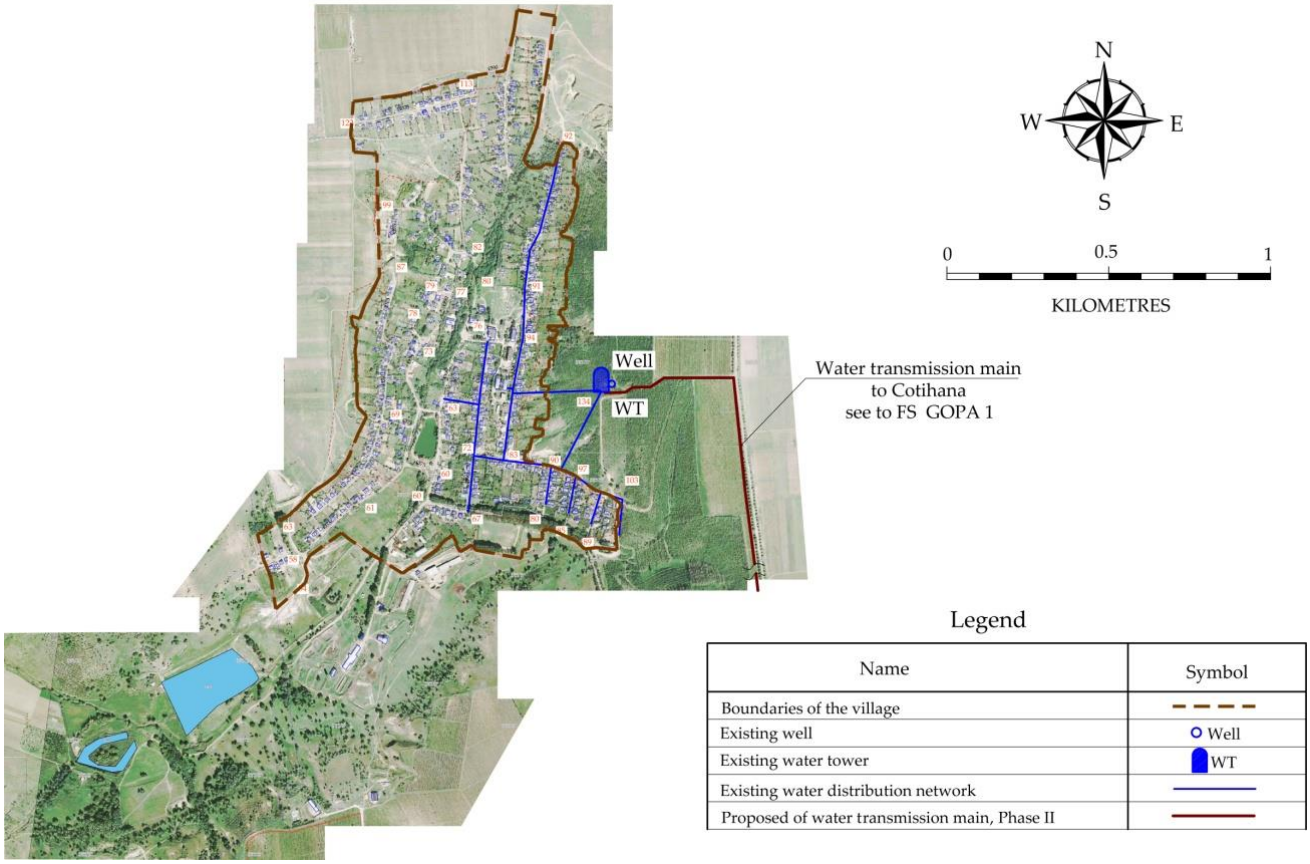
Source: GIZ/MLPS

Figure 4-3: Water supply system of the town of Cahul



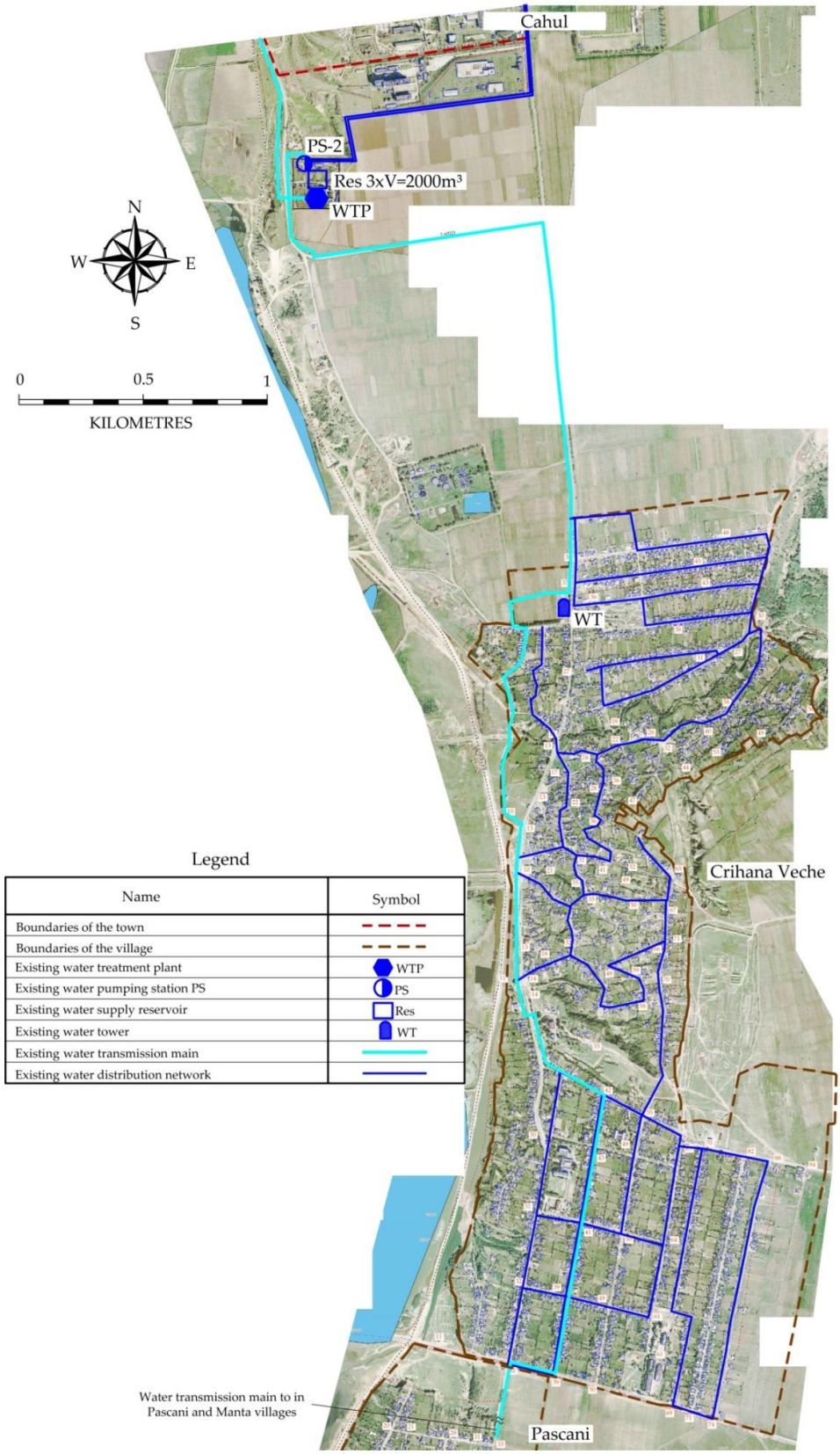
Source: https://www.google.com/earth/; GIZ/MLPS

Figure 4-4: Water supply system of the village of Cotihana



Source: GIZ/MLPS

Figure 4-5: Water supply system of the village of Crihana Veche

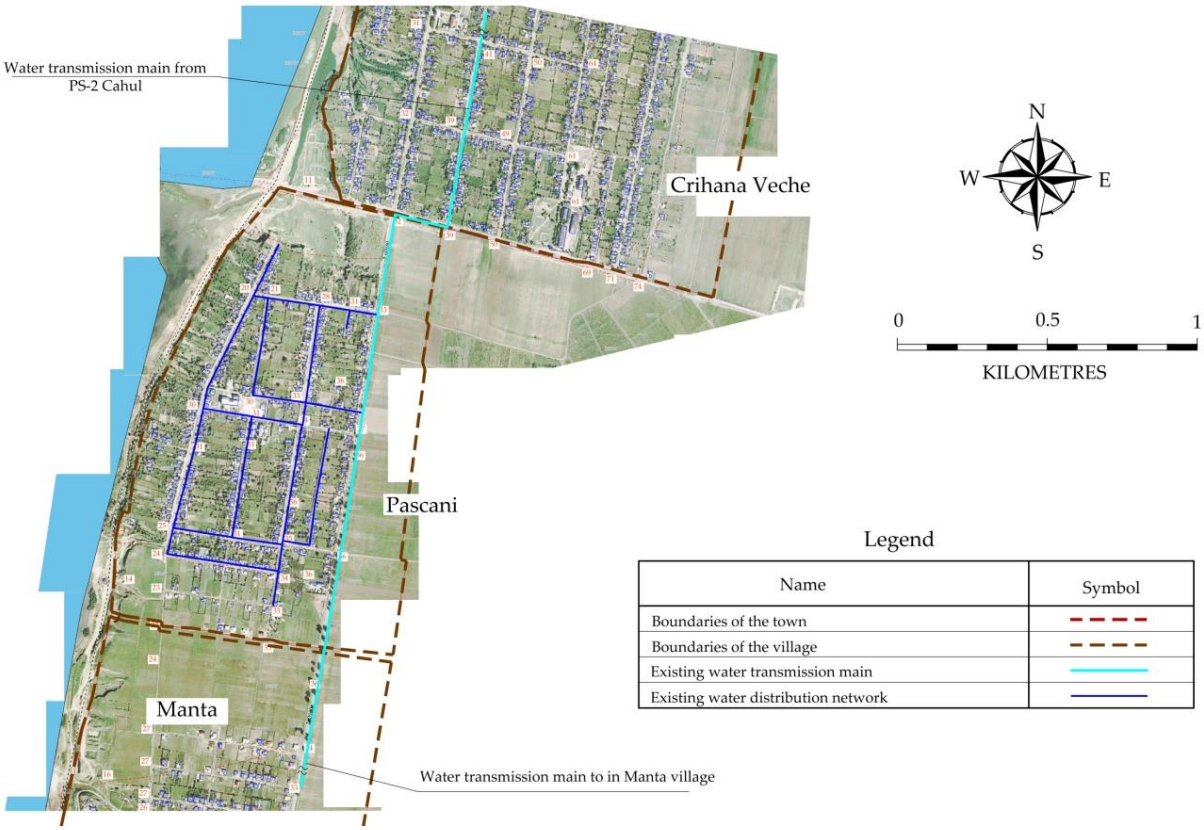


Source: GIZ/MLPS

Figure 4-6: Water supply system of the village of Manta

Source: GIZ/MLPS

Figure 4-7: Water supply system of the village of Pascani



Source: GIZ/MLPS

Water is supplied 24 hours/day in the town of Cahul. Water supply services are provided to about 37,723 consumers out of 39,800 inhabitants, or 94% water supply connection rate.

According to the obtained data, the quality of the raw water at the well /intake complies 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"). The analysis of the raw and drinking water quality provided by the municipal enterprise “Apa-Canal” Cahul is presented in Table 4-8.

According to obtained data, the quality of effluent wastewater don’t 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. Quality indicators of influent and effluent wastewater were presented by the municipal enterprise “Apa-Canal” Cahul, as provided in Table 4-9.

Table 4-8: Raw and drinking water quality indicators, town of Cahul

No.	Indicator	Unit	Max. concentration (G.D. No 934)	Raw water concentration	Drinking water concentration
1	Smell	grade	-	2	2
2	Taste	grade	-	2	2
3	Colour	grade	-	23	4

No.	Indicator	Unit	Max. concentration (G.D. No 934)	Raw water concentration	Drinking water concentration
4	Hydrogen Index pH		≥ 6.5 ≤9.5	8.07	7.3
5	Turbidity	grade	5		0.49
6	Temperature	°C		13	13
7	Oxidisability	ml O_2/l	5	3.98	2.7
8	Total alkalinity	mg/l	no standard	3.9	3.4
9	Total hardness	grade	min 5 German degree	15.5	15.6

Source: M.E. "Apa-Canal" Cahul

Table 4-9: Water quality indicators

No.	Indicator	Unit	Influent concentration	Effluent concentration	Maximum allowed concentration (GD nr.950)
1	Hydrogen ion concentration (pH)		6.95	7.62	6.5 – 8.5
2	Suspended solids	mg/l	308.4	22.5	35.0
3	Five-day biochemical oxygen demand (BOD5)	mgO_2/l	163.0	19.3	25.0
4	Chemical oxygen demand (COD)	mgO_2/l	450	105.8	125.0
5	Ammonia Nitrogen (NH4+)	mg/l	30,3	5	2.0
6	Total phosphorus (P)	mg/l	6,6	1.9	2.0
7	Synthetic detergents biodegradable active anions	mg/l	0,05	0.02	0.5

Source: M.E. "Apa-Canal" Cahul

Water is supplied 24 hours/day in Crihana Veche village. Water supply services are provided to about 1,800 consumers out of 4,420 inhabitants, or 40% water supply connection rate.

Water is supplied 24 hours/day in Manta village.Water supply services are provided to about 1,555 consumers out of 2,797 inhabitants, or 55% water supply connection rate.

Water is supplied 24 hours/day in Pascani village. Water supply services are provided to about 436 consumers out of 1,250 inhabitants, or 34% water supply connection rate.

Operational indicators for 2014, town of Cahul are provided in Table 4-10. Operational indicators for 2014, Crihana Veche village are provided in Table 4-11. Operational indicators for 2014, Pascani village are provided in Table 4-12.

Table 4-10: Operational indicators for 2014, town of Cahul

No.	Month	Monthly volume of abstracted raw water (m^3)	Monthly volume of treated water (m^3)	Monthly volume sold to domestic customers (m^3)	Monthly volume sold to public institutions (m^3)	Monthly volume sold to business entities (m^3)	Monthly volume of treated water at WTP (m^3)
1.	January	160,169	160,169	62,542	3,000	8,100	60,586
2.	February	152,292	152,292	57,783	4,000	8,800	60,259

No.	Month	Monthly volume of abstracted raw water (m^3)	Monthly volume of treated water (m^3)	Monthly volume sold to domestic customers (m^3)	Monthly volume sold to public institutions (m^3)	Monthly volume sold to business entities (m^3)	Monthly volume of treated water at WTP (m^3)
3.	March	164,626	164,626	60,826	3,200	9,400	56,049
4.	April	145,350	145,350	63,145	3,400	9,300	58,451
5.	May	152,486	152,486	63,575	2,900	9,600	56,878
6.	June	178,435	178,435	72,340	3,600	10,500	62,712
7.	July	189,237	189,237	68,351	2,900	11,100	62,452
8.	August	202,903	202,903	73,584	2,700	11,500	66,606
9.	September	193,757	193,757	78,046	3,900	10,500	66,609
10.	October	173,398	173,398	70,095	3,800	9,400	64,678
11.	November	165,381	165,381	63,059	3,700	8,000	60,258
12.	December	170,434	170,434	58,003	4,600	8,100	58,593
	Total	**2,048,468**	**2,048,468**	**791,349**	**41,700**	**114,300**	**734,131**

Source: M.E. "Apa-Canal" Cahul

Table 4-11: Operational indicators for 2014, Crihana Veche village

No.	Month	Schedule of water supply (hours/24 hours)	Monthly volume sold to domestic customers (m^3)
1.	January	24	1,392
2.	February		1,892
3.	March		2,390
4.	April		2,590
5.	May		2,986
6.	June		2,984
7.	July		3,184
8.	August		3,186
9.	September		2,988
10.	October		2,588
11.	November		2,190
12.	December		1,992
	Total		**30,362**

Source: LPA Crihana Veche

Table 4-12: Operational indicators for 2014, Pascani village

No.	Month	Schedule of water supply (hours/24 hours)	Monthly volume of water acc. to water meter (m^3)	Monthly volume sold to domestic customers (m^3)	Monthly volume sold to public institutions (m^3)	Monthly volume sold to business entities (m^3)
1.	January	24	1,101	591	13	0
2.	February		825	665	9	0
3.	March		707	677	16	0
4.	April		1,241	800	13	14
5.	May		1,982	1,236	69	1
6.	June		2,917	1,596	26	1
7.	July		3,120	2,134	20	1
8.	August		4,963	3,355	20	1

No.	Month	Schedule of water supply (hours/24 hours)	Monthly volume of water acc. to water meter (m^3)	Monthly volume sold to domestic customers (m^3)	Monthly volume sold to public institutions (m^3)	Monthly volume sold to business entities (m^3)
9.	September		2,500	2,668	39	1
10.	October		4,281	2,788	25	1
11.	November		1,839	1,694	92	1
12.	December		1,580	1,007	48	1
	Total		**27,056**	**19,211**	**390**	**22**

Source: LPA Manta Township

The main technical parameters of raw and drinking water transmission mains are provided in the following table.

Table 4-13: Technical parameters of raw and drinking water transmission mains

No.	Type of water transmission main	Material	Diameter (mm)	Length (m)
1	Raw water transmission main	reinforced concrete steel	700	8,148
2	Drinking water transmission main	Steel reinforced concrete HDPE	500 400 315	10,811
	Total			**18,959**

Source: M.E. "Apa-Canal" Cahul

The main technical data on the existing underground reservoirs are provided in the following table.

Table 4-14: Technical parameters of existing underground water reservoirs

No.	PS name/Location	Year of construction	Type of reservoir	Capacity (m^3)	Quantity, no. of chambers	Condition
	Treatment plant area	1970	Rectangular	2,000	3	satisfactory
	PS-3, Plugarilor str.	1980	Rectangular	1,000	2	satisfactory
	PS-4, M. Viteazul str.	1980	Rectangular	250	2	satisfactory
	PS-5, M. Viteazul str.	1986	Rectangular	1,500	2	satisfactory

Source: M.E. "Apa-Canal" Cahul

Main technical parameters of water pumping stations are presented in Table 4-15.

Table 4-15: Technical parameters of water pumping stations

No.	PS name	Year of installation	Year of rehabilitation	Pump type	Pump flow rate (m^3/h)	Head (m)	Pump power (kW)	Pump energy specific consumption [kwh/m³]
1.	PS-1	1970	2006	ASP200BS-75/4-T4CX-PG-CCV – 2 pcs	480	40	75	0.25
2.	PS-2	1970	2006	ASP1250-75/4-T4-	320	60	75	0.76

				C1-CCV – 3 pcs				
3.	PS-3	1980	2005	LAVARA 121574061 YXXXTD – 2 pcs	30-85	81	15	
				LAVARA 1216L1421YXXXTD – 3 pcs	8-24	40	3	
				WILO HP-50/250B-22/2-12 – 3 pcs	75	70	22	
				WILO HP-80/160-15/2-12 – 3 pcs	112	40	15	
4.	PS-4	1980	2005	MVI3204-3/16/E/3-400-50-2/EC – 3 pcs	50	60	7.5	0.31
5.	PS-5	1986	2004	DPVME 6/3B IE2VIA80 M1 – 2 pcs	6	24	0.75	1.74
6.	Water intake (re-serve)	1983		4K-6 – 3 pcs	60	80	55	

Source: M.E. "Apa-Canal" Cahul

The water distribution network consists of reinforced concrete, cast iron, steel and high-density polyethylene (HDPE) pipes with diameters of between 63 mm and 700 mm. The total length of water distribution network is about 103,588 m. Main technical parameters of water distribution network are provided in Tables 4-16 and 4-17.

Table 4-16: Main technical parameters of water distribution network in the town of Cahul

Material	Length (m) / diameter (mm)							Length (m)	Pipe age (years)
	700	500	400	315	300	250	200		
Reinforced concrete	4,100	2,910						7,010	37
Cast iron					520	6,154	2,454	9,128	62
Steel	4,048	1,800	2,745		334		2,515	11,442	61
HDPE		290	1,900	1,166		400	2,285	6,041	8

Source: M.E. "Apa-Canal" Cahul

Table 4-17: Main technical parameters of water distribution network in the town of Cahul

Material	Length (m) / diameter (mm)					Length (m)	Pipe age (years)	Total length (m)
	160	150	110	100	63			
Reinforced concrete								103,588
Cast iron		9,120		5,160		14,280	62	
Steel		1,730		12,732		14,462	61	
HDPE	6,600		20,272		14,353	41,225	8	

Source: M.E. "Apa-Canal" Cahul

In the Cotihana village, water is abstracted from a deep bedrock aquifer, specifically from two (2) deep wells, of which one (1) is in operation – only. The deep bedrock aquifer does not have the capacity to ensure the required volume of water for the village. The raw water from the deep well is stored in one (1) water tower with a vat volume of 25 m^3 and further distributed by gravity in the water distribution network (about 50% of coverage area).

Table 4-18: Main technical parameters of deep wells and submersible pumps in Cotihana village

Year of installation	Well no. in technical passport	Well depth (m)	Hydrostatic water level (m)	Hydrodynamic water level (m)	Yield capacity (l/s)	Pump type	Pump flow rate (m^3/h)	Head (m)	Pump power (kW)	Pump energy specific consumption [kwh/m³]
1984		172		20		ЭЦВ 6-10-195	10	195	6,80	

Source: M.E. "Apa-Canal" Cahul

Table 4-19: Main technical parameters of water tower in Cotihana village

No.	Location	Year of installation	Volume(m^3)	Head (m)	No.	Condition
1.	In the forest area	1984	25	6	1	satisfactory

Source: M.E. "Apa-Canal" Cahul

In Cotihana village, the water distribution network consists of cast iron and high-density polyethylene (HDPE) pipes with diameters of between 80 mm and 90 mm. The total length of water distribution network is about 4,000 m.

In Crihana Veche village, water is abstracted from a deep bedrock aquifer, specifically from deep wells. The ground water is stored in two (2) water tower with a vat volume of 25 m^3 each and further distributed by gravity in the water distribution network (about 80% of coverage area).

Table 4-20: Main technical parameters of deep wells and submersible pumps in Crihana Veche village

Year of in-installation	Well no. in technical passport	Well depth (m)	Hydrostatic water level (m)	Hydrodynamic water level (m)	Yield capacity (l/s)	Pump type	Pump flow rate (m^3/h)	Head (m)	Pump power (kW)	Pump energy specific consumption [kwh/m³]
1972		130				ЭЦВ 6-4-190	4	190	4 KW	
1974		180				ЭЦВ 6-10-130	10	130	4 KW	

Source: M.E. "Apa-Canal" Cahul

Table 4-21: Main technical parameters of water tower in Crihana Veche village

Location	Year of installation	Volume (m^3)	Head (m)	No.	Condition
Kindergarten area	1972	25	8-10	1	satisfactory
Tineretului str.	1974	25	8-10	1	satisfactory

Source: M.E. "Apa-Canal" Cahul

In Crihana Veche village, the water distribution network consists of asbestos-cement and high-density polyethylene (HDPE) pipes with diameters ranging between 25 mm and 160 mm. The total length of water distribution network is about 13,584 m.

Table 4-22: Technical parameters of water distribution network in Crihana village

Material	Length (m) / diameter (mm)							Length (m)	Pipe age (years)
	160/ 150	140	125	110/ 100	90	75	63		
HDPE	3,820	2,040	3,618	2,052	983	1,720	11,048		
asbestos-cement	320			1,024					

Source: M.E. "Apa-Canal" Cahul

Table 4-23: Technical parameters of water distribution network in Crihana village

Material	Length (m) / diameter (mm)				Length (m)	Pipe age (years)	Total length (m)
	50	40	32	25			
HDPE	6,040						
asbestos-cement							

Source: M.E. "Apa-Canal" Cahul

In Manta village, water is abstracted from a deep bedrock aquifer, specifically from two (2) deep wells, of which one (1) is in operation. The raw water from the deep well is stored in two (2) water towers with a vat volume of 50 m^3 each and further distributed by gravity in the water distribution network.

Table 4-24: Main technical parameters of deep wells and submersible pumps in Manta village

Year of installation	Well no. in technical passport	Well depth (m)	Hydrostatic water level (m)	Hydrodynamic water level (m)	Yield capacity (l/s)	Pump type	Pump flow rate (m^3/h)	Head (m)	Pump power (kW)	Pump energy specific consumption
1987	630	220		70	25	ЭЦВ 6-6.3-85	25	70	8	

Source: M.E. "Apa-Canal" Cahul

Table 4-25: Main technical parameters of water tower in Manta village

Location	Year of installation	Volume (m^3)	Head (m)	No.	Condition
Manta village	1987	50	18	1	satisfactory
		50	16	1	satisfactory

Source: M.E. "Apa-Canal" Cahul

In Manta village, the water distribution network consists of high-density polyethylene (HDPE) pipes with diameters of between 32 mm and 90 mm. The total length of water distribution network is about 3,849 m.

Table 4-26: Main technical parameters of water distribution network in Manta village

Material	Length (m) / diameter (mm)				Length (m)	Pipe age (years)	Total length (m)
	90	75	63	32			
HDPE	763	855	20	2,025	3,849	8	3,849

Source: M.E. "Apa-Canal" Cahul

4.3.1 Technical and operational analysis of the water supply system

Administrative and physical water losses are about 58%; for statistics on breakdowns and repairs during the period 1 January 2014 to 31 December 2014, see the following two tables.

Table 4-27: Statistics on damages in the water supply system, 1 January 2014 – 31 December 2014

No.	Location/Name of damage	No. of cases
1.	On water transmission main	40
2	On water distribution network, including	232
	Breaks	100
	Cracks	120
	Water blows	12
	Valve damage	0

Source: Municipal Enterprise "Apa-Canal" Cahul

Table 4-28: Statistics on repairs accomplished in the town of Cahul, 1 January 2014 – 31 December 2014

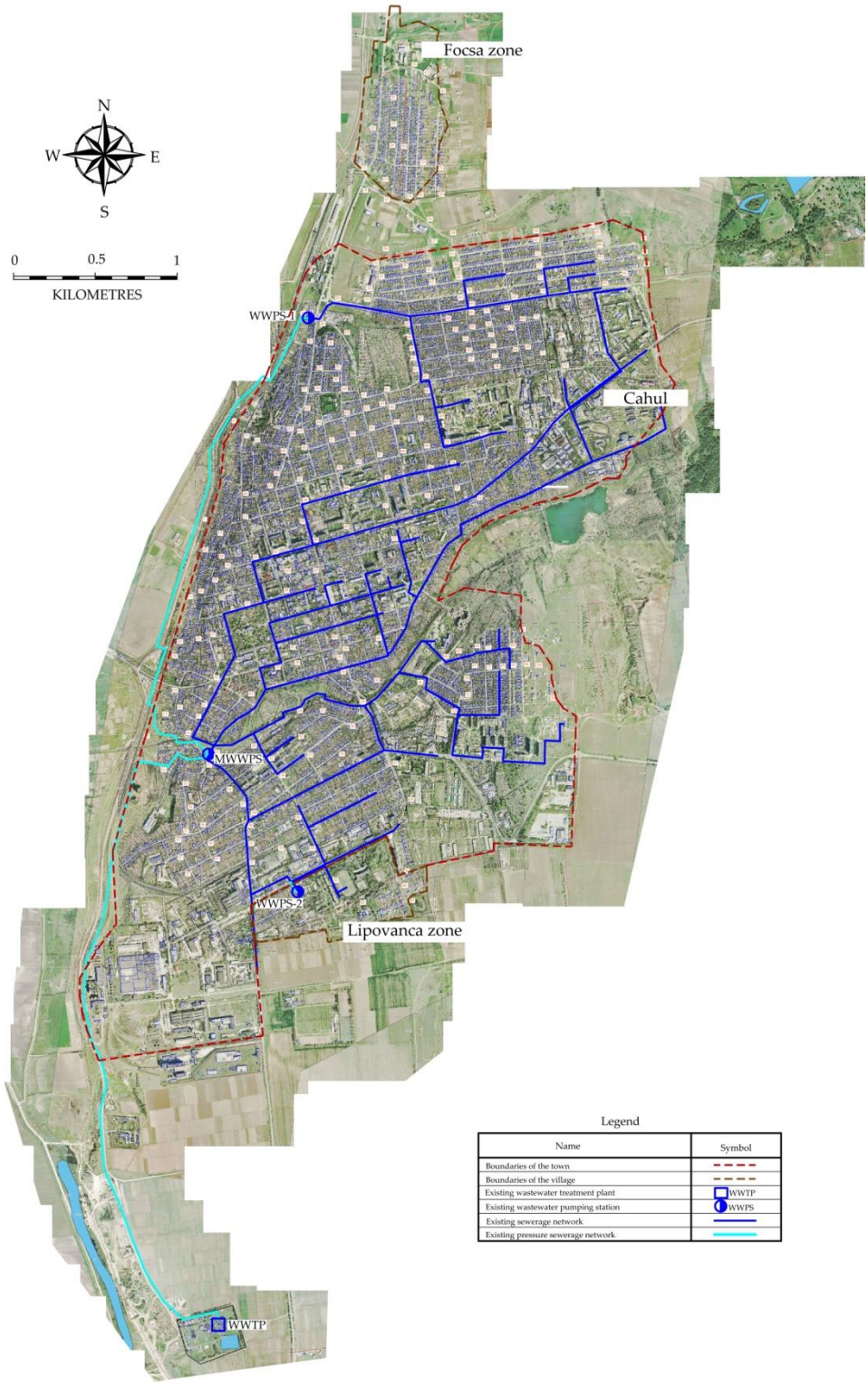
No.	Type of repair	No. of repairs
1.	Current repairs	232
2.	Capital repair	0
3.	Water losses on the water transmission main	40

Source: Municipal Enterprise "Apa-Canal" Cahul

4.4 Wastewater System

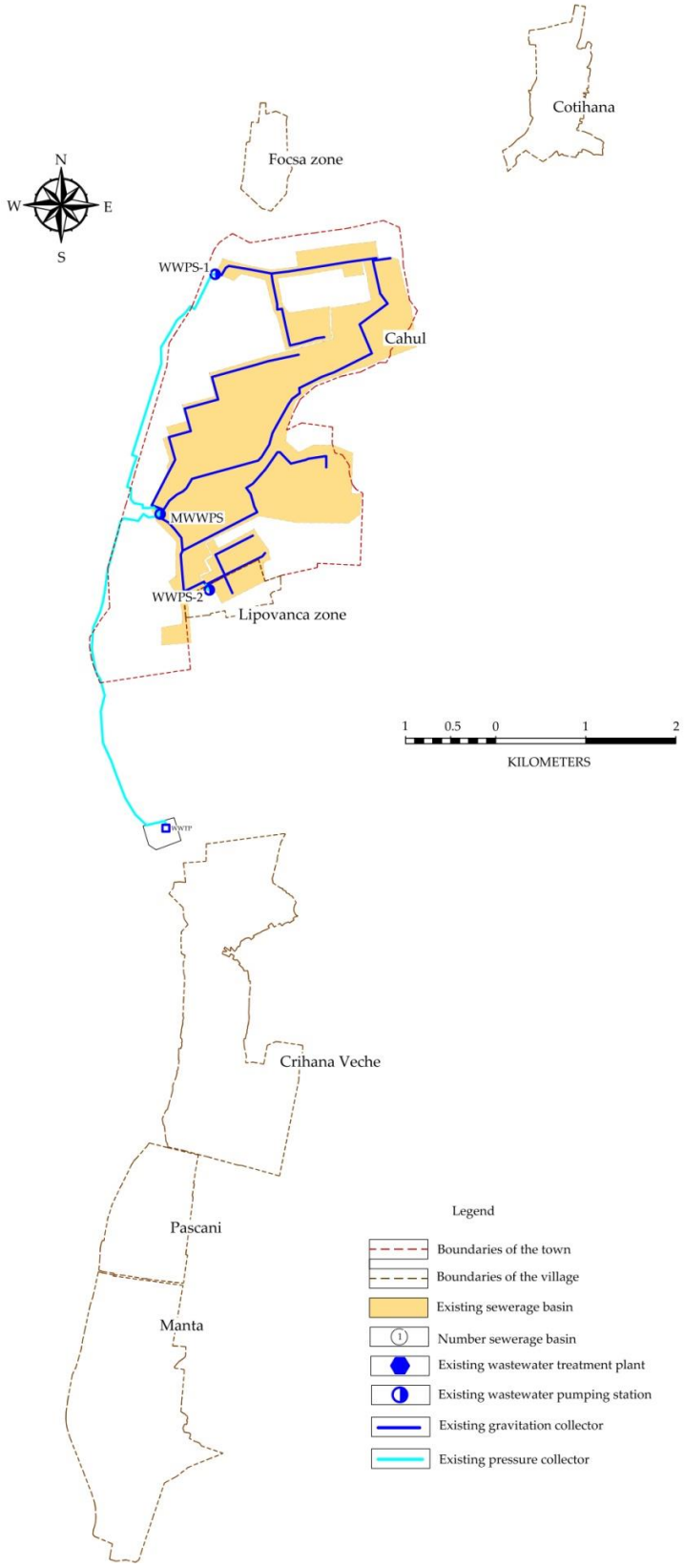
The sewerage system in the town of Cahul includes the following facilities: three (3) wastewater pumping stations, of which one (1) is the main wastewater pumping station (MWWPS) and two (2) are local wastewater pumping stations WWPS "Nord" and WWPS "Sud". The gravity sewerage network consisting of steel, asbestos-cement and ceramic pipelines with diameters between 300 mm and 500 mm; pressure sewerage network consisting of high density polyethylene (HDPE) with diameters of 225 mm and 400 mm; and wastewater treatment plant.

Figure 4-8: Sewerage system in the town of Cahul



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

Figure 4-9: Scheme of sewerage system in the town of Cahul



Source: GIZ/MLPS

The technical parameters of the wastewater pumping stations and pumps are presented in the following table.

Table 4-29: Main technical parameters of pumping equipment in the town of Cahul

No.	PS name	Year of installation	Year of rehabilitation	Pump type	Pump flow rate (m^3/h)	Head (m)	Pump power (kW)	Pump energy specific consumption (kwh/m^3)
1.	MWWPS	1972	2006	CD 160/46 – 2 pcs	160	46	30	0.227
2.				FA 15.77 – 2 pcs	240	55	65	
3.	WWPS „Nord”	1982		FG 144/46	144	36	22	0.224
4.				CM 125-80	100	32	7.5	
5.				CM 100-65	80	32	7.5	
6.	WWPS „Sud”	1970		CM 100/65 – 2 pcs	80	32	7.5	0.17

Source: M.E. “Apa-Canal” Cahul

The total length of gravity sewerage network is about 34,900 m. The main parameters of the gravity sewerage network are provided in Table 4-27.The total length of pressure sewerage is about 16,623 m. The main parameters of the pressure sewerage network, are provided in Table 4-31.

Table 4-30: Main parameters of gravity sewerage network in the town of Cahul

Material	Length (m) / diameter (mm)			Length (m)	Pipe age (years)	Total length (m)
	500	400	300			
Steel	7,000			7,000	45	34,900
Asbestos-cement		1,010	12,580	13,590	51	
Ceramic		7,030	7,280	14,310	51	

Source: M.E. “Apa-Canal” Cahul

Table 4-31: Main technical parameters of pressure sewerage network in the town of Cahul

Material	Length (m) / diameter (mm)			Length (m)	Pipe age (years)	Total length (m)
	400	225				
HDPE	9,223	7,400		16,623	8	16,623

Source: M.E. “Apa-Canal” Cahul

The wastewater treatment plant is located at about 2 km to southeast from the town of Cahul’s central area and was put into operation in 1972, with a design capacity of 13,700 m³/day. In the present, the design capacity of the wastewater treatment plant is about 3,014 m³/day. The treated wastewater is discharged into the Prut River.

The wastewater treatment plant includes the following components:

- Energy dissipater;
- Horizontal grit chamber s(two (2) units);
- Digester-settlers (eight (8) units);

- Biological filters (three (3) units);
- Secondary settlers (three (3) units);
- Sludge drying beds and sand drying beds;
- Sludge pumping station;
- Chlorination plant (out of operation); and
- Laboratory.

There is no centralised sewerage system in the villages of Cotihana, Crihana Veche, Manta and Pascani.

5 Investment Programme

5.1 General

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

The subject of Investment Programme has been developed by MLPS experts in collaboration with local and regional partners[4] based on the following:

- Existing pre-feasibility, feasibility studies and detailed designs;
- WSS Regional Sector Programme (RSP) and Possible Project Concept (PPC) for Cahul 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 on technical aspects of the existing situation);
- The comparison of results and assessment of initial conditions with the Regional Sector Programme for Development Region Centre 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 Office of the town of ME 'Apa-Canal' Cahul (see Chapter 5.2 on the development strategy for water supply and wastewater services);
- Identified problems and objectives based thereon;
- Water demand and wastewater flow projection (see Chapter 5.4 and the water demand and wastewater flow projections).

The Investment Programme includes short-term measures referred to as Priority Investment Measures, which are sub-divided into two sub-phases as follows:

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

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

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

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 sanitation sector are:

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

Strategic goal

A water policy and strategy for the Water Supply and Sanitation Sector has been developed for the town of Cahul for the planning period 2015 - 2020[5] and for the locality Crihana Veche[6]. The Mayor Office and the ME 'Apa-Canal' Cahul are well aware of the actual situation regarding to water supply and sanitation services and are willing to improve its quality. The general strategic goal is to achieve a viable and high quality management of the centralised water supply and wastewater systems[7]. In order further to improve the efficiency of the services and utilise economies of scale, neighbouring localities should be integrated into the services area of the ME 'Apa-Canal' Cahul.

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 the ME 'Apa-Canal' Cahul should consider the following specific objectives:

- Provide water compliant with the national drinking water standards to all parts of the service area;
- Maintain the current level of service by providing water 24 hours per day;
- Provide water with sufficient quantity to all customers;
- Extend the water supply and sewerage service area in the town of Cahul;
- Treat wastewater from the sewer system in compliance with the current national legislation and in the future in compliance with the respective EU legislation (Urban Wastewater Treatment Directive 91/271/CEE);
- Reduce non-revenue water to an acceptable level of maximum 25% by 2045;
- Improve efficiency of service provision by enhancing operation and maintenance practices of the Mayor Office and the ME 'Apa-Canal' Cahul;
- 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.

[5] Strategia de dezvoltare socio-economică a oraşului Cahul pentru perioada 2015-2020.

[6] PLANUL STRATEGIC DE DEZVOLTARE SOCIO-ECONOMICĂ al satului Crihana Veche 2014-2020.

[7] Activity Improvement Plan, (USAID, 2014).

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.

5.3 Design parameters and assumptions

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

Domestic water consumption and wastewater generation

- Population forecast and its assumptions as presented in Chapter 2.2 on population;
- The development of the service connection rate (water and wastewater) for domestic customers considers the following:
  - Existing population connected to water supply and wastewater services;
  - Additional population connected due to on-going projects (completed before 2018);
  - Population connected due to network extension foreseen in Phase I by 2018;
  - Population connected due to network extension foreseen in Phase II by 2021;
  - The maximum target connection rate within the planning horizon is assumed to be reached in 2030 for urban localities and in 2045 for rural localities;
  - It is further assumed that the coverage rate (population which can potentially be connected to the water supply and sewerage network) is different from the connection rate (population which actually is connected to the water supply and sewerage network) and the following applies: Data for the existing situation regarding coverage and connection rate are applied if available (see Chapter 4-on the 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 -** Due to measures proposed in this feasibility study (Chapter 5.6.5. - 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).

Non-domestic water consumption and wastewater flow

- Industrial consumption[9]: 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 determined based on the provided data from the ME ‘Apa-Canal’ Cahul. For future development it is assumed that this volume is insignificant and will not be taken into consideration for wastewater flow projection.

Extension of water supply system to localities in the neighbourhood of the town of Cahul

The ME ‘Apa-Canal’ Cahul wishes to extend the services to the localities of Cotihana, Crihana Veche, Manta and Pașcani in the vicinity of Cahul Town.

Water losses

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

- Apparent Losses[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 included in Phase I of the project measures;

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

[9] Including all commercial entities.

[10] According to data from the ME 'Apa-Canal' Cahul’s sales department.

[11] Including unbilled authorized consumption.

- 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 I of the subject investment plan. 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.

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 Cahul sewer network (see Chapter 4 on technical aspects of the 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 or extension of the sewer network in accordance with the ratio of "new sewer network[15]" and "old sewer network[16]" (see Table 5-1). Thereafter, it is assumed that the sewer infiltration rate will be maintained at constant level until the end of the planning horizon[17].

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;

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

[13] Financed from additional revenues generated by the ME 'Apa-Canal' Cahul as a result of technical assistance measures included in Phase 1 of this project.

[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).

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

- 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 standards. The main design parameters are presented in the Table 5-1 (reference is made to explanations in the Chapter 5-3 Design parameters and assumptions).

Table 5-1: Design parameter

No	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	%	88	98	100	100	100
0.2	Wastewater - total	%	56	56	88	91	96
0.3	Water supply – urban	%	100	100	100	100	100
0.4	Water supply – rural	%	45	92	99	100	100
0.5	Wastewater - urban	%	71	71	100	100	100
0.6	Wastewater - rural	%	0	0	44	57	78
1	Service connection rate for domestic customers, disaggregated for urban and rural localities						
1.1	Water – total	%	80	88	92	96	100
1.2	Wastewater - total	%	49	49	69	81	92
1.3	Water supply – urban	%	95	95	99	100	100
1.4	Water supply – rural	%	27	61	69	81	100
1.5	Wastewater - urban	%	63	63	80	90	95
1.6	Wastewater - rural	%	0	0	27	46	78
2	Volume of water sold for domestic consumers						
2.1	In urban localities	l/c/d	57	64	69	85	110
2.2	In rural localities	l/c/d	30	36	41	56	80
3	**Volume of water sold** for non- domestic consumers (industry, commercial, public institutions), disaggregated for urban and rural localities						
3.1	Industrial and commercial – urban	l/c/d	8.3	10.0	11.2	15.0	15.0
3.2	Industrial and commercial – rural	l/c/d	0.0	0.0	0.0	0.0	0.0
3.3	Institutional entities - urban	l/c/d	3.0	4.8	6.1	10.0	10.0
3.4	Institutional entities - rural	l/c/d	3.0	4.8	6.1	10.0	10.0
4	Wastewater generation as factor of the water demand						
4.1	Domestic consumers		1	1	1	1	1
4.2	Non-domestic consumers		1	1	1	1	1
5	Non-Revenue Water (NRW) as share from the water production						
5.1	Total NRW	%	54	48	46	40	30
5.2	Apparent losses	%	17	16	16	15	5
5.3	Real losses (physical losses)	%	37	32	30	25	25
6	Sewer Infiltration rate as share of total water discharged to the wastewater system						
6.1	Sewerage infiltration rate	%	50	45	15	15	15
7	Water demand variation factors (in compliance with SNIP 2.04.02-84 and 2.04.03-85)						
7.1	Daily variation factor		1.1				

[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.

No	Design Parameter	Unit	2014[19]	2018[20]	2021[21]	2030	2045
7.2	Hourly variation factor Water Supply		1.9				
7.3	Hourly variation factor Wastewater		1.8				
7.4	Peak storm water 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 I measures). The results of the financial projections are presented in Chapter 6 on the 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 I (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 TA-measures (Revenue and metering improvement programme).

5.4 Water demand and wastewater flow projection

The water demand projection (water production, volume of water sold and non-revenue water) 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

No	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°	40,686	44,455	46,580	48,033	48,974
1.2	In urban localities	N°	37,738	37,781	39,138	39,831	40,002
1.3	In rural localities	N°	2,948	6,674	7,443	8,203	8,972
2	Volume of water sold in total and disaggregated for different consumers						
2.1	Total volume sold	m^3/y	947,300	1,189,782	1,366,384	1,790,156	2,265,813
2.2	Domestic customers	m^3/y	791,300	974,789	1,102,586	1,396,760	1,868,051

[22] Existing situation.

[23] 1st year of operation Phase 1 investments.

[24] 1st year of operation Phase 2 investments.

No	Parameter	Unit	2014[22]	2018[23]	2021[24]	2030	2045
2.3	Industrial customers	m³/y	114,300	137,570	160,452	218,074	219,009
2.4	Institutional customers	m³/y	41,700	77,422	103,346	175,322	178,754
3	Total water sold disaggregated for urban and rural areas						
3.1	Urban localities	m³/y	947,668	1,089,359	1,237,704	1,593,137	1,971,077
3.2	Rural localities	m³/y	35,544	100,423	128,679	197,019	294,737
4	Non-Revenue Water (NRW) volume disaggregated for total NRW, apparent losses, and real losses						
4.1	Total NRW	m³/y	1,101,119	1,118,003	1,179,688	1,193,437	971,063
4.2	Apparent losses	m³/y	338,984	374,758	405,567	447,539	161,844
4.3	Real losses (physical losses)	m³/y	762,135	743,245	774,121	745,898	809,219
5	Water demand figures considering the demand variation factors						
5.1	Yearly water demand/production	m³/y	2,048,419	2,307,785	2,546,072	2,983,594	3,236,876
5.2	Average daily water demand	m³/d	5,612	6,323	6,976	8,174	8,868
5.3	Maximum daily water demand	m³/d	5,872	6,649	7,350	8,665	9,489
5.4	Average hourly water demand	m³/h	234	263	291	341	370
5.5	Maximum hourly water demand	m³/h	352	411	461	563	651

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

No	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°	24,933	24,961	34,670	40,515	45,035
1.2	In urban localities	N°	24,933	24,961	31,819	35,848	38,001
1.3	In rural localities	N°	0	0	2,851	4,667	7,034
2	**Volume of wastewater charged in total** and disaggregated for different customers						
2.1	Total volume of wastewater	m³/y	734,200	793,283	1,115,909	1,501,043	2,103,586
2.2	by domestic customers	m³/y	458,300	529,096	784,423	1,156,895	1,731,149
2.3	by industrial customers	m³/y	231,600	208,134	242,537	196,267	208,058
2.4	by Institutional customers	m³/y	44,300	56,054	88,949	147,881	164,379
3	Total wastewater charged disaggregated for urban and rural areas						
3.1	in urban localities	m³/y	734,200	793,283	1,066,621	1,388,933	1,872,523
3.2	in rural localities	m³/y	0	0	49,287	112,109	231,063
4	Sewer infiltration water based on the determined infiltration rate						
4.1	Sewer infiltration water	m³/y	367,100	356,978	167,386	225,156	315,538
5	Wastewater generation figures considering variation factors						
5.1	Average wastewater flow (dry weather)	m³/y	1,101,300	1,150,261	1,283,295	1,726,199	2,419,124
5.2	Maximum daily dry weather flow (Qdmax)	m³/d	3,218	3,369	3,822	5,141	7,204

[25] Existing situation.

[26] 1st year of operation Phase 1 investments.

[27] 1st year of operation Phase 2 investments.

No	Parameter	Unit	2014[25]	2018[26]	2021[27]	2030	2045
5.3	Maximum hourly dry weather flow (QDWF)	m³/h	217	230	285	384	538
5.4	Maximum hourly storm water flow (QSWF)	m³/h	282	299	371	499	699
6	Population equivalents in total and disaggregated for different customers						
6.1	Total population equivalent	PE60	27,767	27,676	38,075	44,051	48,862
6.2	by domestic customers	PE60	24,933	24,961	34,670	40,515	45,035
6.3	by Industrial and institutional customers	PE60	2,835	2,714	3,406	3,536	3,826
7	Pollution load – BOD in total and disaggregated for different customers						
7.1	Total BOD_5 load	kg/d	1,666	1,661	2,285	2,643	2,932
7.2	by domestic customers	kg/d	1,496	1,498	2,080	2,431	2,702
7.3	by industrial and institutional customers	kg/d	170	163	204	212	230

Source: GIZ/MLPS

5.5 Unit costs

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

5.5.1 Unit costs water supply

The following table shows the unit costs for the water supply components applied for the cost estimations for the investment measures proposed for the Phase I and Phase II.

Table 5-4: Unit costs for water supply facilities

No	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
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				

No	Item	Dimension		Investment costs	
				Unit	Unit cost
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

5.5.2 Unit costs wastewater

The following table show the unit costs for the wastewater components applied for the cost estimations for the investment measures proposed for Phase I and Phase II.

Table 5-5: Unit costs for wastewater facilities

No	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
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

No	Item	Dimension		Investment costs	
				Unit	Unit cost
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

5.6 Proposed investment measures

5.6.1 General

In order to meet the local development objectives and goals 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 on the technical aspects of the existing situation and Chapter 5.4 on the water demand and wastewater flow projections).

5.6.2 Water Supply

5.6.2.1 Target service connection rates for water supply

The following tables 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 5-6: Development of connection rates water supply

No	Locality	Population connected to the water supply system									
		2014		2018		2021		2030		2045	
		n°	%	n°	%	n°	%	n°	%	n°	%
1	Cahul	37,738	95	37,781	95	39,138	99	39,831	100	40,002	100
2	Cotihana	479	34	475	34	962	70	1,059	81	1,157	100
3	Crihana Veche	2,469	56	2,635	60	2,793	65	3,183	78	3,613	100
4	Manta	0	0	2,829	70	2,926	73	3,144	83	3,335	100
5	Pascani	0	0	735	70	760	73	817	83	867	100
Total		**40,686**	**80**	**44,455**	**88**	**46,580**	**92**	**48,033**	**96**	**48,974**	**100**

Source: GIZ/MLPS

5.6.2.2 Identified measures – water supply system

In order to remediate the deficiencies described in Chapter 4, the following improvements have been identified in the water supply and wastewater sector:

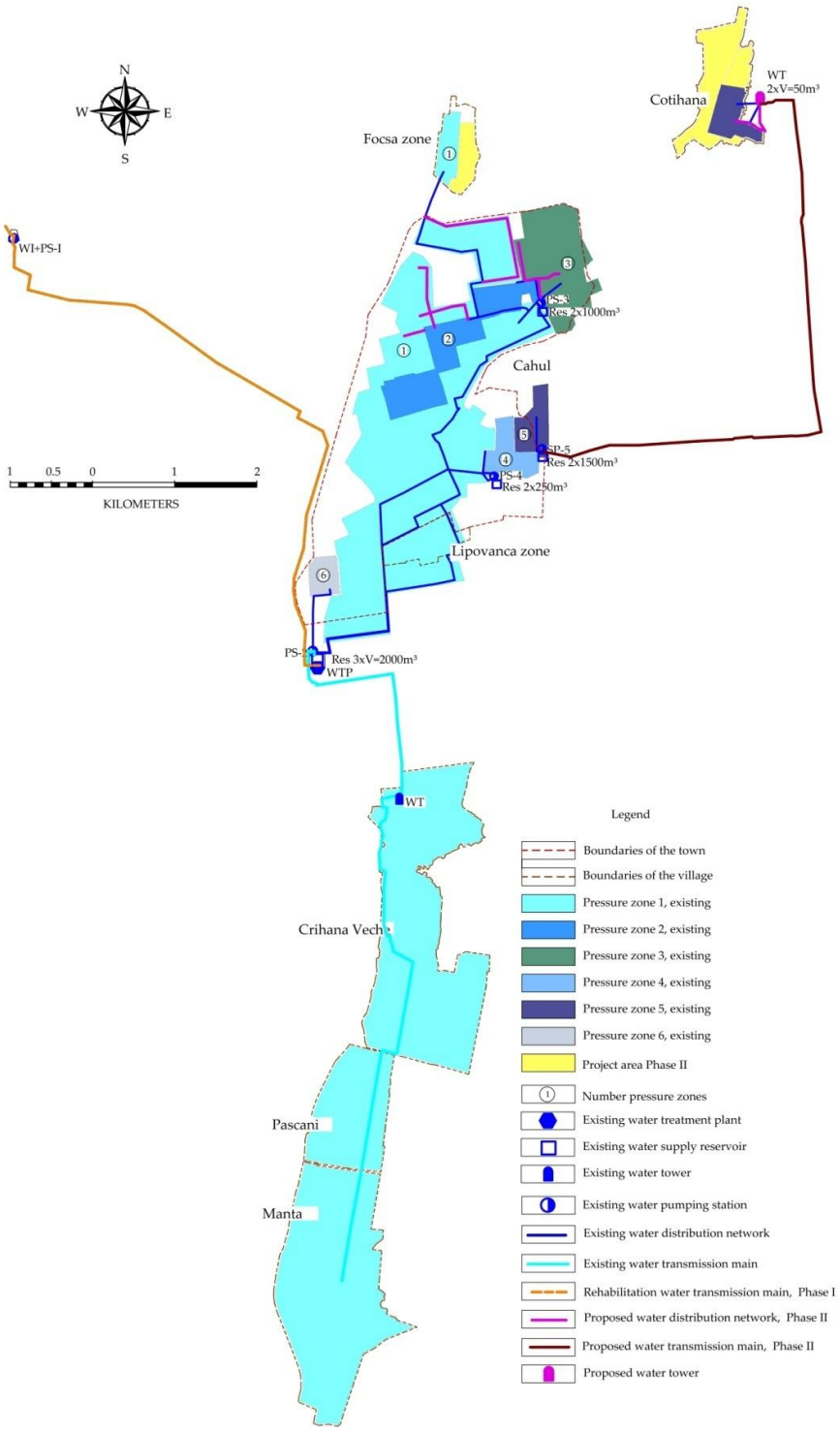
- Rehabilitation of water transmission main pipeline in the town of Cahul;
- Rehabilitation of water distribution network in the town of Cahul;
- Extension of water distribution network in the town of Cahul;
- Extension of water distribution network in Cotihana village;
- Construction of water tower and pumping stations in Cotihana village;

Only one measure is proposed for Phase I namely: “Rehabilitation of water transmission main pipeline in the town of Cahul”. All other measures are proposed for Phase II.

5.6.2.3 Schemes and maps of existing and proposed water supply system

Schemes and maps of existing and proposed extensions of the water supply system in the town of Cahul and the villages in its vicinity are provided in the figures below. More detailed information is provided in Annex 11.

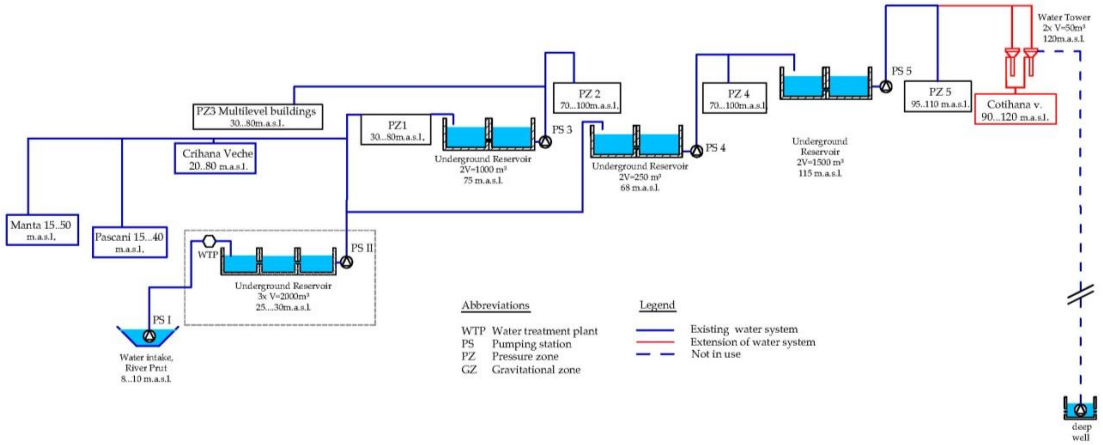
Figure 5-1: Scheme of existing and proposed extensions of the water supply system in the town of Cahul



Source: GIZ/MLPS

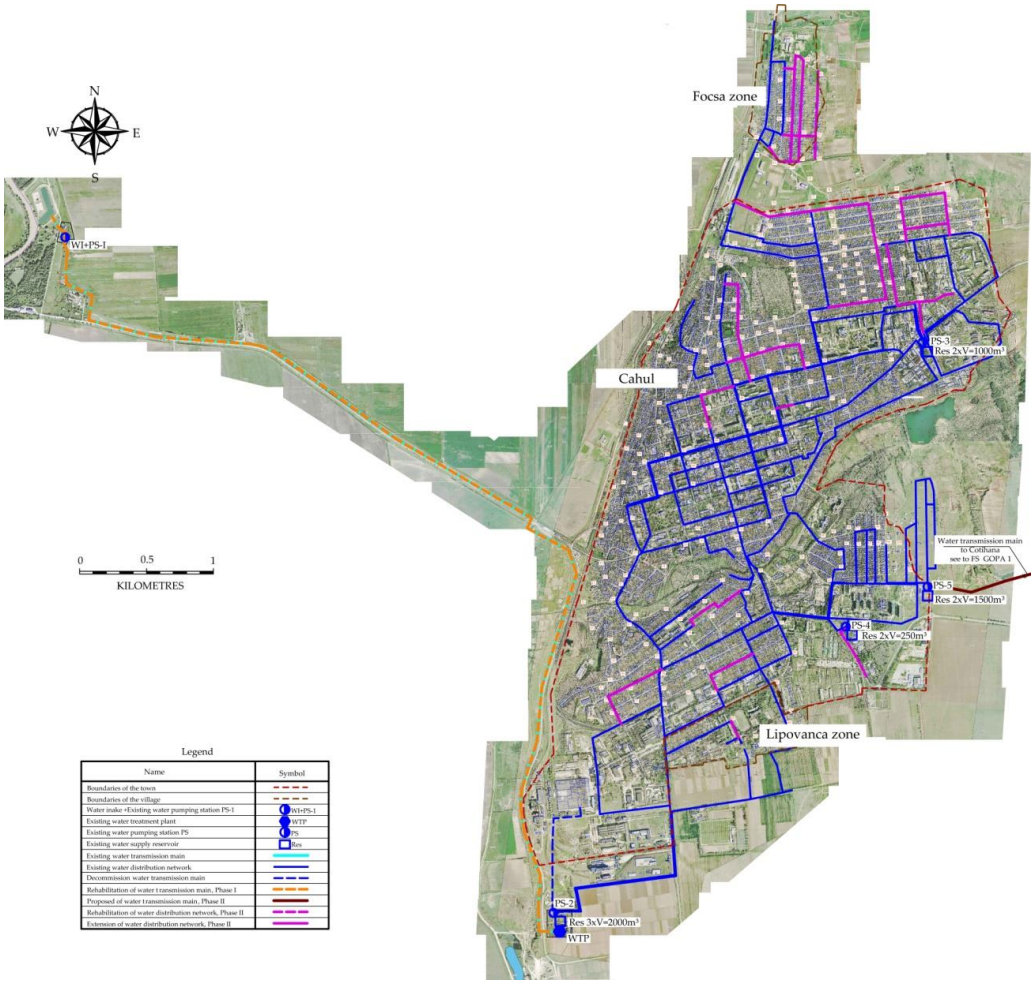
A hydraulic scheme of existing and proposed extensions of the water supply system in the town of Cahul is provided in Figure 5-2.

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



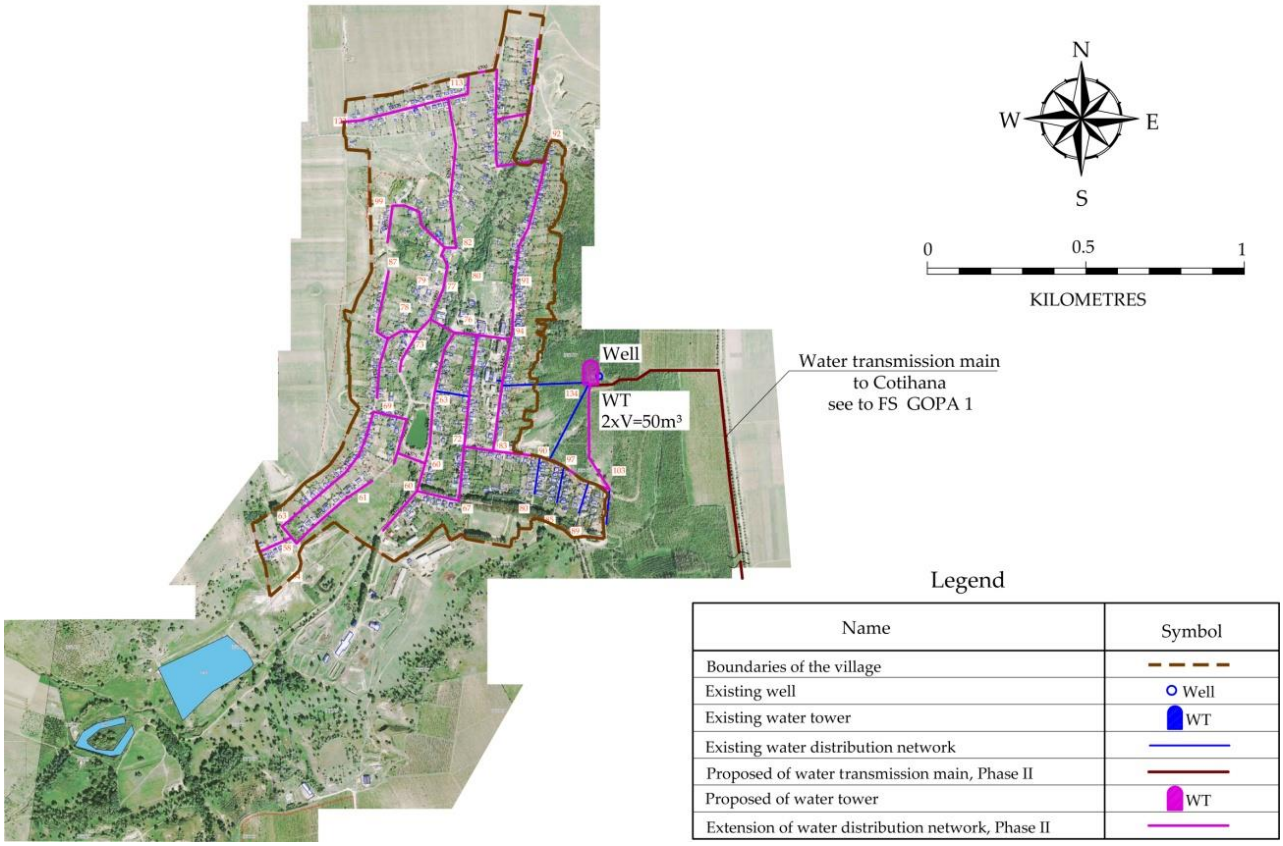
Source: GIZ/MLPS

Figure 5-3: Map of existing and proposed extensions of the water supply system in the town of Cahul



Source: GIZ/MLPS

Figure 5-4: Map of existing and proposed extensions of the water supply system in Cotihana village



Source: GIZ/MLPS

5.6.3 Wastewater

5.6.3.1 Target service connection rates for wastewater

The following table 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 5-7: Development of connection rates wastewater

No	Locality	Population connected to the wastewater system									
		2014		2018		2021		2030		2045	
		n°	%	n°	%	n°	%	n°	%	n°	%
1	Cahul	24,933	63	24,961	63	31,819	80	35,848	90	38,001	95
2	Cotihana	0	0	0	0	0	0	0	0	0	0
3	Crihana Veche	0	0	0	0	1,451	34	2,236	55	3,252	90
4	Manta	0	0	0	0	961	24	1,841	49	3,002	90
5	Pascani	0	0	0	0	439	42	590	60	780	90
Total		**24,933**	**49**	**24,961**	**49**	**34,670**	**69**	**40,515**	**81**	**45,035**	**92**

Source: GIZ/MLPS

5.6.3.2 Identified investment measures – wastewater system

In order to remediate the deficiencies described in Chapter 4, the following improvements have been identified in the water supply and wastewater sector:

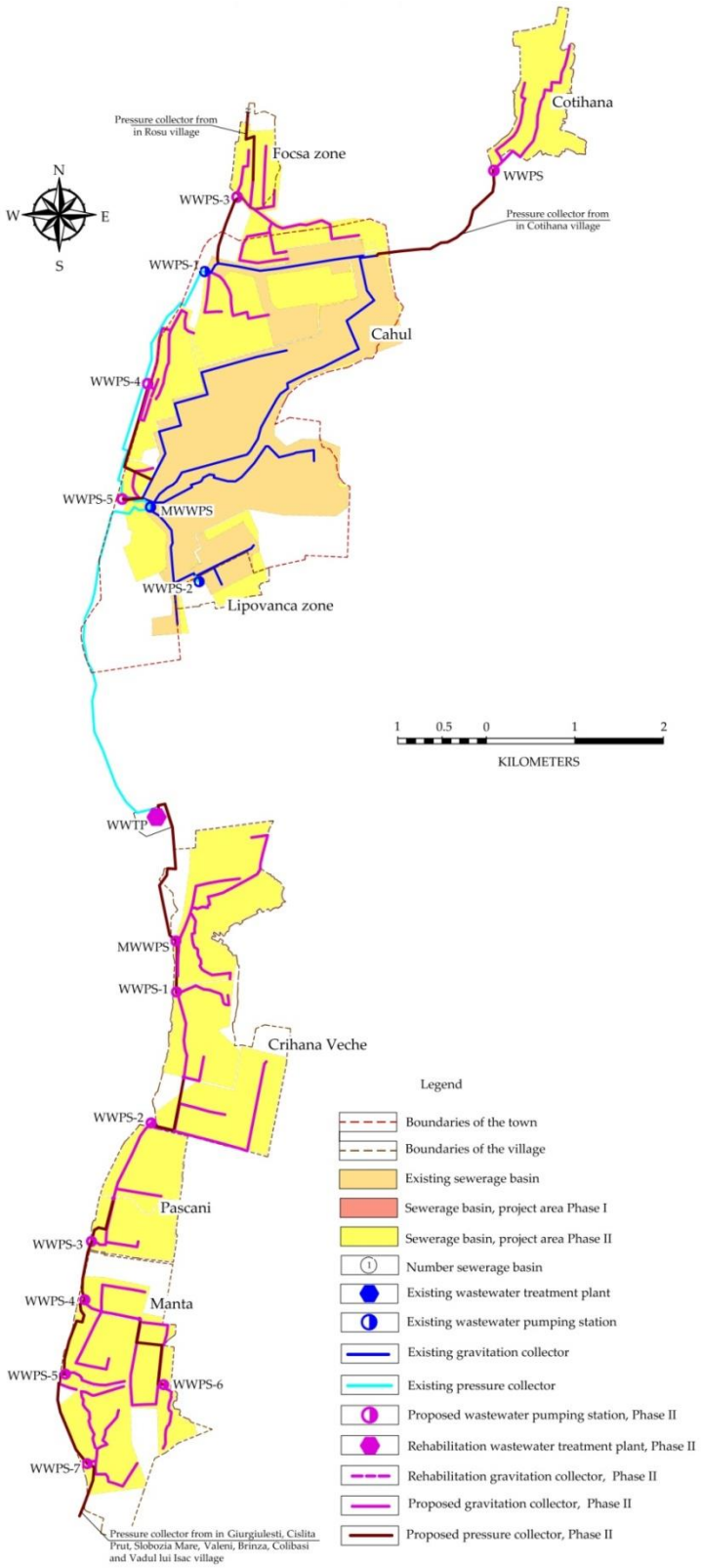
- Rehabilitation of wastewater treatment plant in the town of Cahul;
- Rehabilitation of sewage network in the town of Cahul;
- Extension of sewage network in the town of Cahul;
- Construction of pumping stations in the town of Cahul;
- Extension of sewerage network in Cotihana village;
- Construction of sewerage network and pumping stations in Crihana Veche village;
- Construction of sewerage network and pumping stations in Manta village;
- Construction of sewerage network and pumping stations in Pascani village.

All measures are proposed to be implemented in Phase II.

5.6.3.3 Schemes and maps of the existing and proposed wastewater system

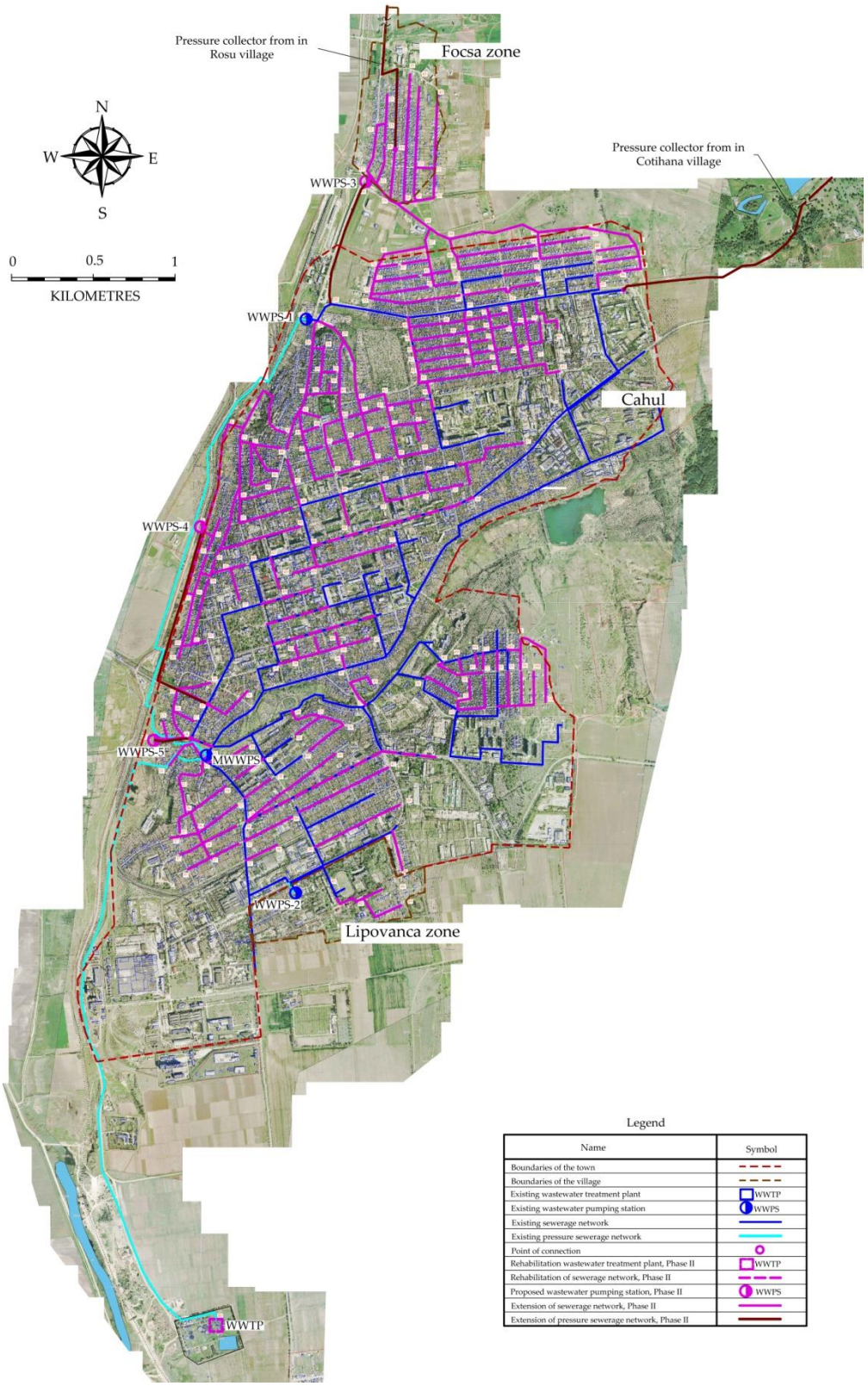
Schemes and maps of the existing and proposed extension of the sewer system in the town of Cahul and the villages of Cotihana, Crihana Veche, Manta and Pascani are provided in the figures below. More detailed information is provided in Annex 11.

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



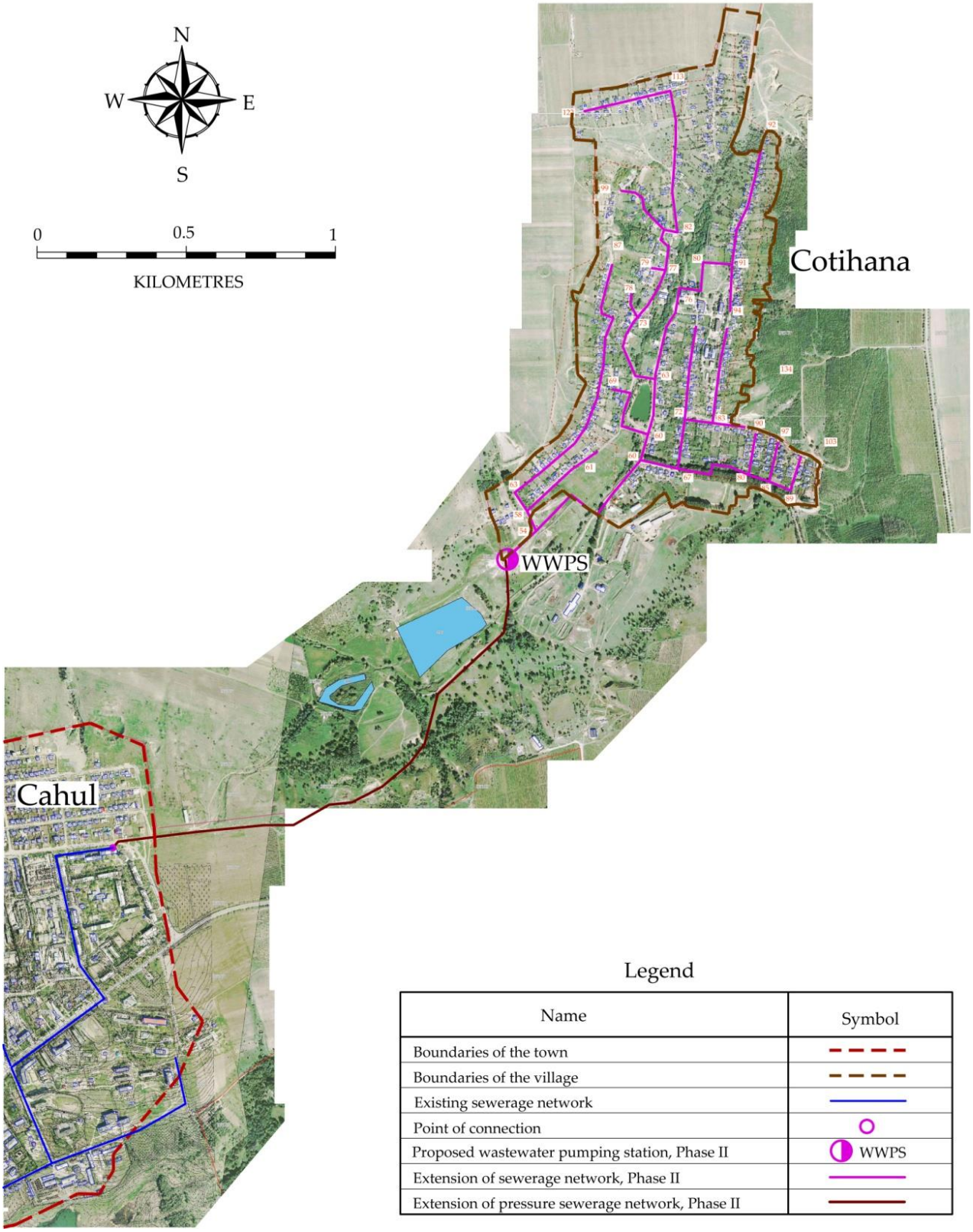
Source: GIZ/MLPS

Figure 5-6: Existing and proposed wastewater system in the town of Cahul



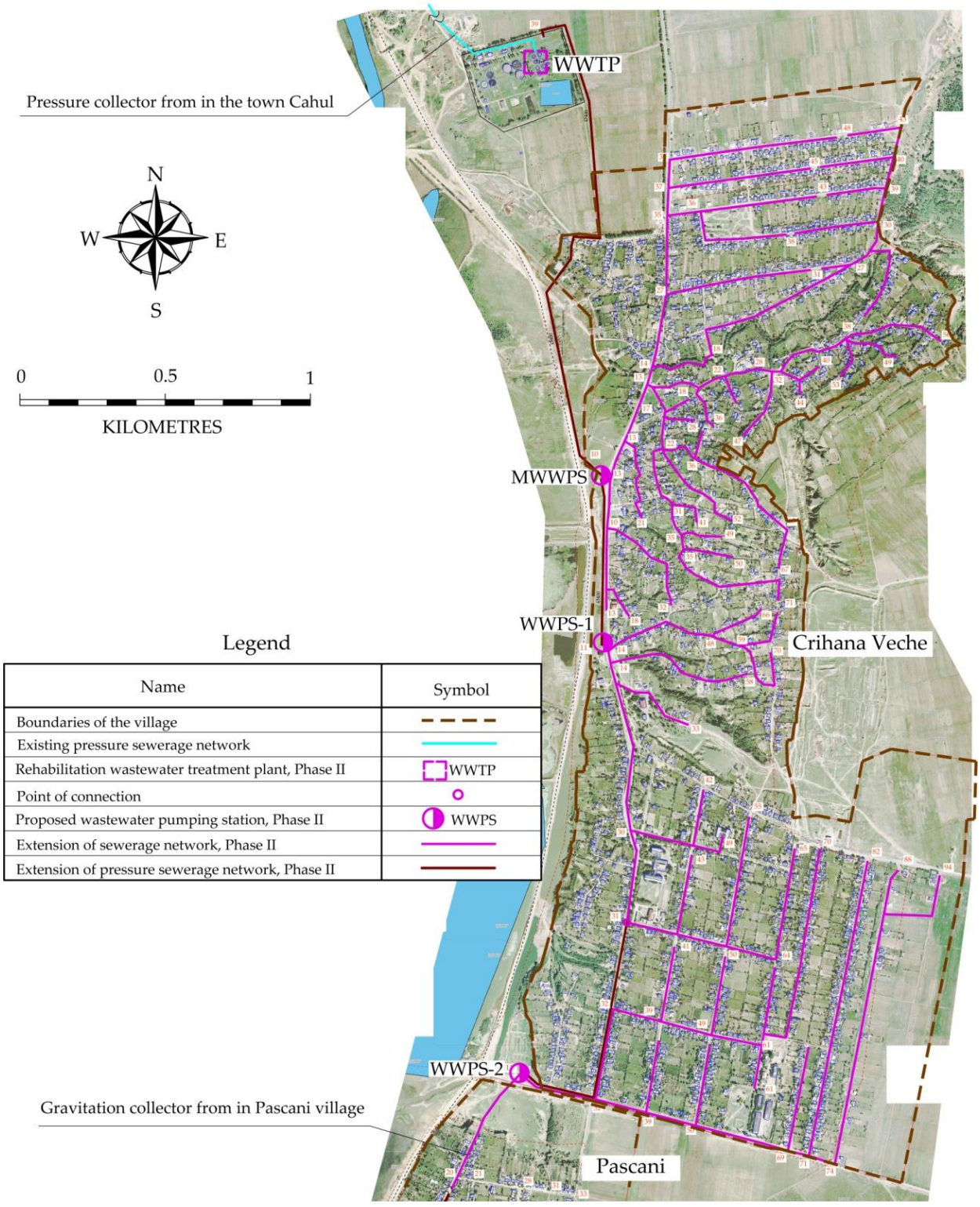
Source: GIZ/MLPS

Figure 5-7: Existing and proposed wastewater system in Cotihana village



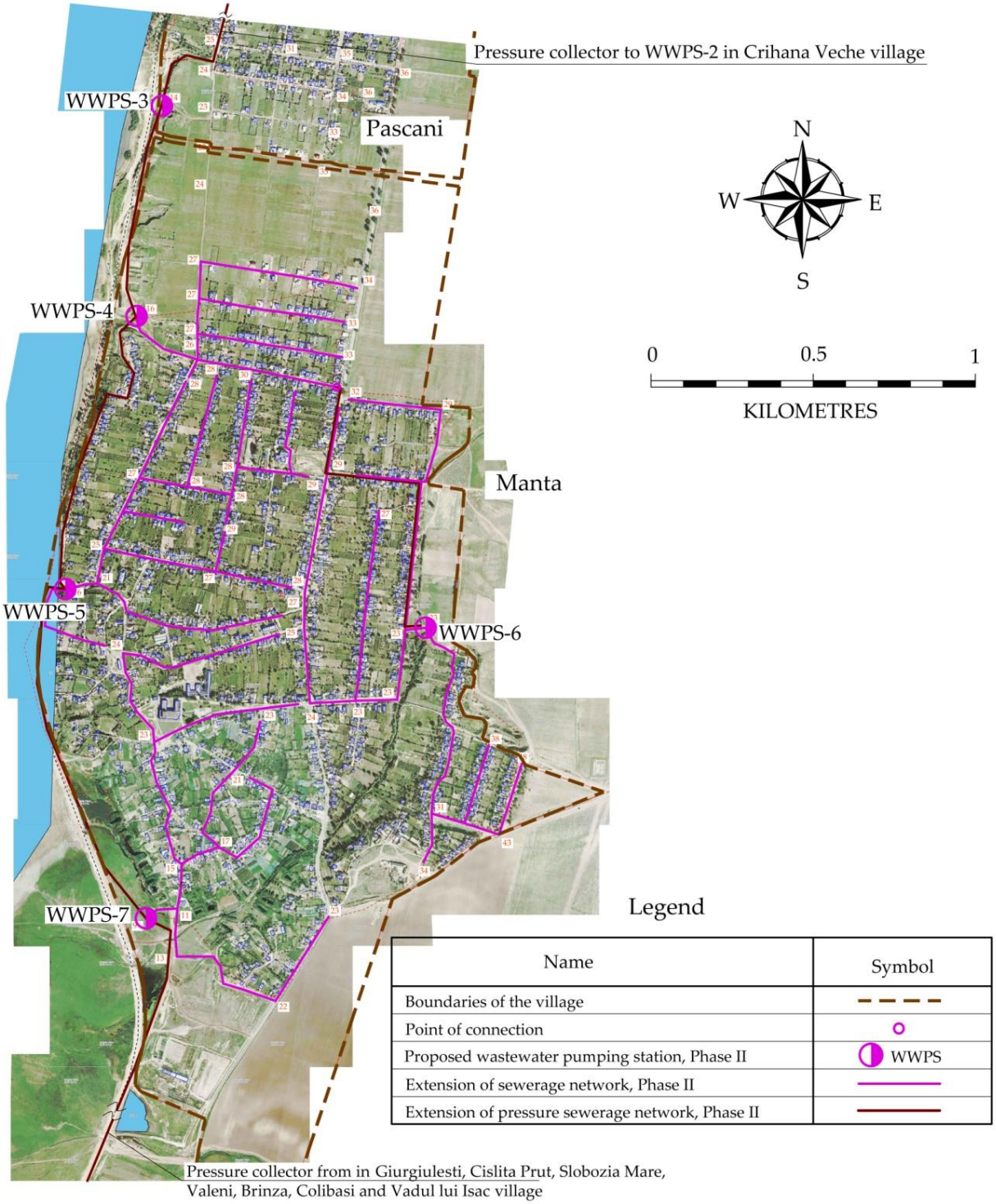
Source: GIZ/MLPS

Figure 5-8: Proposed wastewater system in Crihana Veche village



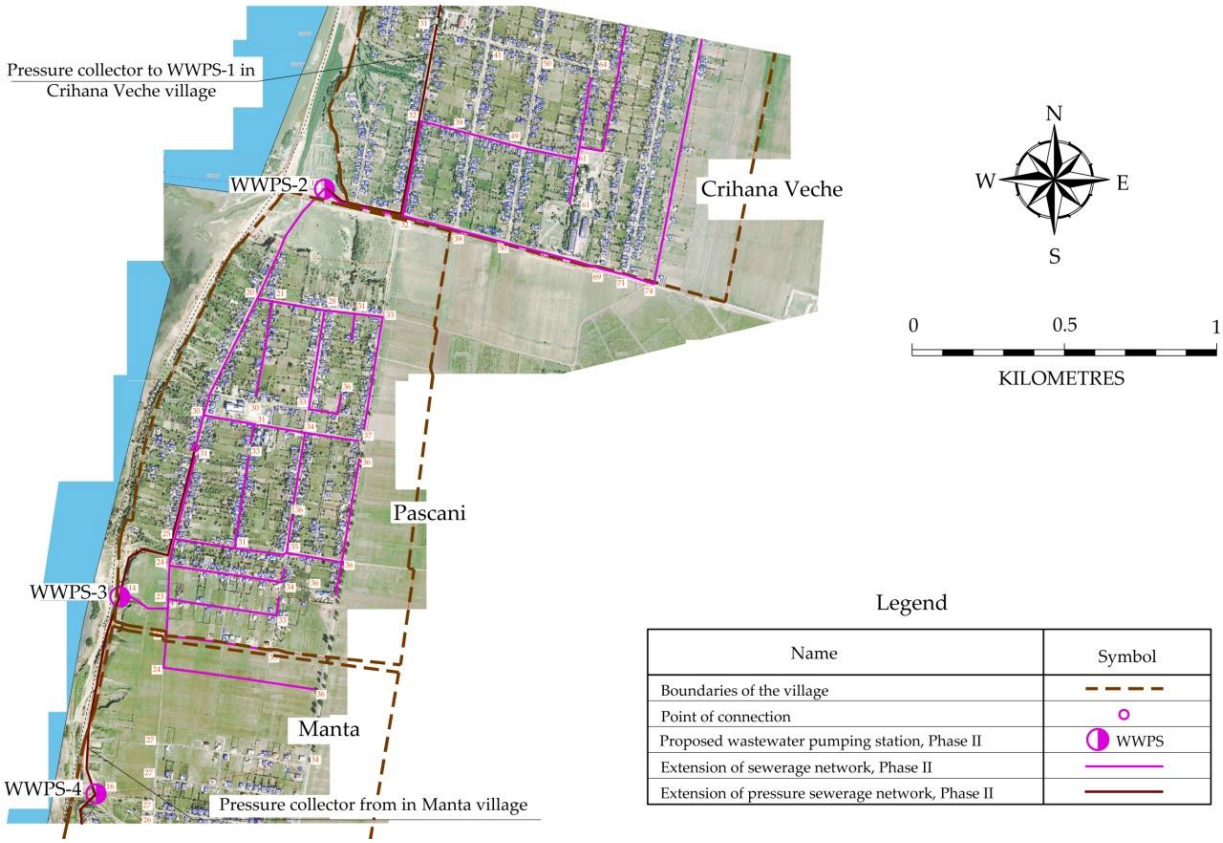
Source: GIZ/MLPS

Figure 5-9: Proposed wastewater system in Manta village



Source: GIZ/MLPS

Figure 5-10: Proposed wastewater system in Pascani village



Source: GIZ/MLPS

5.6.4 Operational improvement

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

- Bulk water meters (flow meters) for measuring water flow at water intake and between villages (taking over points);
- Customer water meters
- Operational equipment for water supply (leak detection equipment, trucks, etc.)
- Operational equipment for wastewater (sewer cleaning trucks)
- Laboratory equipment for measuring key parameters (BOD_5, COD, nitrogen, phosphorus, suspended solids, etc.) and flow meters. It is recommended to measure quality and volume of wastewater effluents at the outlet of the existing main collector during dry and wet weather conditions in order to ensure that sufficient data are available for designing the expansion of the WWTP;
- CCTV inspection equipment in order to assess in detail the condition of the sewer network and based on these results to plan sewer rehabilitation works;

The exact number scope for procurement of operational equipment shall be determined during the detailed design stage (Phase I).

5.6.5 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[28], tender documents and supervision of works).

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

Table 5-8: Technical assistance

Component	Objectives	Measures
Design and Engineering for Phase I investments	To ensure high quality and timely implementation of works and TA-measures through support of the Project Implementing Agency[29] (i) in preparing all necessary documentation for tendering of the works for Phase I Investment measures, (ii) in tendering procedures, (iii) during the implementation period in project management, works supervision and monitoring of TA-measures	**A) Preparation of Detailed Design and Tender Documentation** for Phase I investment measures including (i) works contracts, (ii) equipment, (iii) design built contracts (if applicable), service contracts for follow-up TA measures. The services should also include (i) topographic survey and geotechnical investigations, (ii) all necessary measurements to prepare detailed designs and to confirm and justify the investment measures (e.g. flow measurements at transmission mains, water quality, etc.). The Consultant should further prepare all necessary documentation for obtaining required permits in accordance with the national legislation. B) Support during **tendering** of contracts including (i) preparation of reports and minutes of meetings (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	• 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;

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

[29] Reference is made to Chapter 9.4. – Project Implementation Plan (Set-up of a Project Implementation Structure).

Component	Objectives	Measures
	through improvement of the operational, financial and environmental performance of the operator.	• Financial Performance Improvement including improvements in (i) accounting budgeting and cash management, (ii) billing system and revenue collection procedures, (iii) reporting procedures, (iv) reduction of apparent (commercial) water losses.; • Operational Performance Improvement including (i) staff efficiency, (ii) water loss reduction, (iii) energy efficiency, (iv) operation and maintenance procedures; • Environmental Management including (i) preparation of Environmental and Social Action Plan and support in implementing the action plan (ii) improve overall environmental procedures; • Prepare a Capacity Building Programme for all areas of improvement.
Stakeholder Participation Programme	To ensure that all stakeholders are committed to the investment project and are involved during preparation and implementation phase. In particular the measures aims at enhancing public ownership by encouraging water conservation, increasing public participation in the provision of water services (service quality, rehabilitation activities, tariffs integrating poverty and social issues) and raising public awareness on issues related to the project implementation and water use	Raise customer awareness through education campaigns: • Identification of information needs; • Prepare Information campaign Plan and support the implementation. Facilitation of dialogue between clients and the Company: • Creation of and support to information exchange platform for customers; • Creation of an Advisory Committee comprising all major stakeholders; • To encourage transparency in decision-making; • Sustainability of dialogue.
Water Supply 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

Component	Objectives	Measures
		water loss reduction and leakage control including financial requirements, staff capacities required, time steps, methodology, etc.), (v) prepare a capacity building programme to support the operator in implementing the action plan.
Medium to Long-term Sanitation Study	To prepare a medium to long-term rayon investment plan for sanitation (Master Plan for Sanitation) and define number and capacity of WWTPs.	To assess in detail the required medium and long-term investment needs in the wastewater sector based on (i) detailed assessment of wastewater system including flow and load measurements for sewerage treatment and wastewater network analysis[30], (ii) definition of agglomeration borders in the rayon (as defined in EU Urban Wastewater Treatment Directive EU 91/271/EEC)), (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.

Source: GIZ/MLPS

5.7 Prioritisation and phasing of investment measures

5.7.1 Criteria for phasing

The short-term measures identified above in chapter 5.6 – Proposed Investment Measures are referred to as *Priority Investment Measures* and are again sub-divided into two sub-phases (Phase I and Phase II).

The investment measures were phased according to the following criteria:

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

The main result of this phasing exercise is to identify priority measures which can be implemented immediately after completion of this feasibility study and which should be

[30] 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 recommendations a detailed action plan and draft specifications for a work contract should be prepared.

completed by end of 2017 (first year of operation in 2018). These measures are grouped in Phase I and constitute "*The Project*".

Only one measure is proposed to be implemented in Phase I namely: "Rehabilitation of water transmission main pipeline". All other measures are proposed for Phase II, as further investigations will be necessary.

5.8 Option analysis for investment measures

Possible options for the priority investment measures proposed to be implemented in Phase I were identified and analysed, while for measures in Phase II 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, Table 5-8, p. 3.1. and 3.4).

5.9 Priority investment plan

The phased priority investment plan is presented in the tables below. The total investment costs for Phase I have been estimated at 5.5 MEUR and for Phase II at 47.4 MEUR (see tables below).

Table 5-9: Investment plan for Phase I

No.	Type of works	Units	Quantity	Unit costs , EUR	Total cost, EUR
CAPITAL INVESTMENTS, town of Cahul					
I	Rehabilitation of water transmission main pipeline				
1	Earthworks, installation of pipeline, HDPE PN10 SDR 17, DN 560, fittings, hydraulic verification, pipeline flushing	m	16,400	244	4,001,600
	TOTAL				4,001,600
II	Equipment and Tools				200,000
	TOTAL (CAPITAL INVESTMENTS) **(I+II)**				4,201,600
TECHNICAL ASSISTANCE					
III	Capacity Development				300,000
IV	Design and engineering, 12 % of investment costs				504,192
	TOTAL (TECHNICAL ASSISTANCE) (**III+IV)**				804,192
V	Contingencies, 10 % of (I-IV)				500,579
	Total Cost for Phase I (I+II+III)+(IV+V)+ VI+VII				**5,506,371**

Source: GIZ/MLPS

Table 5-10: Investment plan for Phase II

No.	Type of works	Units	Quantity	Cost per unit,EUR	Total cost,EUR
CAPITAL INVESTMENTS, town of Cahul					
I	Rehabilitation of water distribution network				
1	Earthworks, installation of pipeline, HDPE PN10 SDR 17, DN 90 fittings, pipeline flushing	m	1,150	62	71,300
	TOTAL				71,300
II	Extension of water distribution network				
1.	Earthworks, installation of pipeline, HDPE PN10 SDR 17, DN 90 fittings, hydraulic verification, pipeline flushing	m	10,720	62	664,640
2.	Manholes, d2000	pcs.	29	423	12,267

No.	Type of works	Units	Quantity	Cost per unit,EUR	Total cost,EUR
3.	Household connections	pcs.	2,270	200	454,000
	TOTAL				1,130,907
III	Rehabilitation of Wastewater treatment plant				
1.	Rehabilitation (Construction) of Wastewater treatment plant (13700 m^3/day)	pcs.	1	15,885,720	15,885,720
					15,885,720
IV	Rehabilitation of sewage network				
1.	Earthworks, installation of pipeline, PVC SN 4, fittings	m	4,285	140	599,900
	TOTAL				599,900
V	Extension of sewage network				
1.	Earthworks, installation of pipeline, PVC SN 4, fittings	m	45,500	140	6,370,000
2.	Manholes, d1500	pcs.	910	1,030	937,300
3	Household connections	pcs.	4,730	500	2,365,000
4	Earthworks, installation of pipeline, HDPE,SDR 17 ,PN10,DN 90 fitings,(pressure sewage network)	m	2,545	62	157,790
	TOTAL				9,830,090
VI	Construction of pumping station				
1.	Construction of pumping station	pcs.	1	20,000	20,000
	TOTAL				20,000
VII	Construction of pumping station				
1.	Construction of pumping station	pcs.	1	32,000	32,000
	TOTAL				32,000
VIII	Construction of pumping station				
1.	Construction of pumping station	pcs.	1	50,000	50,000
	TOTAL				50,000
	TOTAL (CAPITAL INVESTMENTS) (I- VIII)				27,619,917
TECHNICAL ASSISTANCE					
III	Design and engineering, 12%				3,314,390
	TOTAL (TECHNICAL ASSISTANCE) (III+IV)				3,314,390
IV	Various and unforeseen expenditures,10 % of (I-IV)				3,093,431
	Total Cost for Cahul town				**34,027,738**
CAPITAL INVESTMENTS, Cotihana village					
I	Extension of water distribution network				
1.	Earthworks, installation of pipeline, HDPE PN10 SDR 17, DN 90 fittings, hydraulic verification, pipeline flush-ing	m	6,880	62	426,560
2.	Manholes, d2000	pcs.	30	423	12,690
3.	Household connections	pcs.	300	200	60,000
	TOTAL				499,250
III	Construction of water tower				
1	Construction of water tower	pcs.	2	25,000	50,000
	TOTAL				50,000
IV	Construction of sewage network				
1.	Earthworks, installation of pipeline, PVC SN 4, fittings	m	7,200	140	1,008,000
2.	Manholes, d1500	pcs.	144	1,030	148,320
3	Household connections	pcs.	425	500	212,500
4	Earthworks, installation of pipeline, HDPE,SDR 17 ,PN10,DN 90 fittings,(pressure sewage network)	m	1,915	62	118,730
	TOTAL				1,487,550
V	Construction of pumping station				
1.	Construction of pumping station	pcs.	1	32,000	32,000
	TOTAL				32,000

No.	Type of works	Units	Quantity	Cost per unit,EUR	Total cost,EUR
	TOTAL (I-V)				2,068,800
TECHNICAL ASSISTANCE					
IV	Design and engineering, 12%				248,256
	TOTAL (TECHNICAL ASSISTANCE) (III+IV)				248,256
V	Various and unforeseen expenditures,10 % of (I-IV)				231,706
	Total Cost for Cotihana village				**2,548,762**
CAPITAL INVESTMENTS, Crihana Veche village					
I	Construction of sewage network				
1.	Earthworks, installation of pipeline, PVC SN 4, fittings	m	19,545	140	2,736,300
2.	Manholes, d1500	pcs.	391	1,030	402,627
3.	Household connections	pcs.	1,030	500	515,000
4	Earthworks, installation of pipeline, HDPE ,SDR 17 ,PN10,DN 90	m	3,300	62	204,600
	TOTAL				3,858,527
II	Construction of main pumping station				
1.	Construction of pumping station	pcs.	1	100,000	100,000
	TOTAL				100,000
III	Construction of pumping station				
1.	Construction of pumping station	pcs.	1	100,000	100,000
	TOTAL				100,000
IV	Construction of pumping station				
1.	Construction of pumping station	pcs.	1	100,000	100,000
	TOTAL				100,000
	TOTAL (CAPITAL INVESTMENTS) (I- IV)				**4,158,527**
TECHNICAL ASSISTANCE					
IV	Design and engineering, 12%				499,023
	TOTAL (TECHNICAL ASSISTANCE) (III+IV)				499,023
V	Various and unforeseen expenditures,10 % of (I-IV)				465,755
	Total Cost for Crihana Veche village				**5,123,305**
CAPITAL INVESTMENTS, Manta village					
I	Construction of sewage network				
1.	Earthworks, installation of pipeline, PVC SN 4, fittings	m	14,315	140	2,004,100
2.	Manholes, d1500	pcs.	286	1,030	294,889
3.	Household connections	pcs.	682	500	341,000
4	Earthworks, installation of pipeline, HDPE ,SDR 17 ,PN10, DN 90 fittings,	m	3,565	62	221,030
	TOTAL				2,861,019
II	Construction of pumping station				
1.	Construction of pumping station	pcs.	3	83,000	249,000
	TOTAL				249,000
III	Construction of pumping station				
1.	Construction of pumping station	pcs.	1	28,000	28,000
	TOTAL				28,000
	TOTAL (CAPITAL INVESTMENTS) (I- IV)				3,138,019
TECHNICAL ASSISTANCE					
IV	Design and engineering, 12%				376,562
	TOTAL (TECHNICAL ASSISTANCE) (III+IV)				376,562
V	Various and unforeseen expenditures,10 % of (I-IV)				351,458
	Total Cost for Manta village				**3,866,039**
CAPITAL INVESTMENTS, Pascani village					
I	Construction of sewage network				
1.	Earthworks, installation of pipeline, PVC SN 4, fittings	m	7,520	140	1,052,800
2.	Manholes, d1500	pcs.	150	1,030	154,912
3.	Household connections	pcs.	312	500	156,000

No.	Type of works	Units	Quantity	Cost per unit,EUR	Total cost,EUR
4	Earthworks, installation of pipeline, HDPE ,SDR 17, PN10, DN 90 fittings,	m	595	62	36,890
	TOTAL				1,400,602
II	Construction of pumping station				
1.	Construction of pumping station	pcs.	1	83,000	83,000
	TOTAL				83,000
	TOTAL (CAPITAL INVESTMENTS) (I- II)				1,483,602
TECHNICAL ASSISTANCE					
IV	Design and engineering, 12%				178,032
	TOTAL (TECHNICAL ASSISTANCE) (III+IV)				178,032
V	Various and unforeseen expenditures,10 % of (I-IV)				166,163
	Total Cost for Pascani village				**1,827,798**
	Total Cost for Phase 2				**47,393,642**
	Total Cost for Phase I and Phase II				**52,900,013**

Source: GIZ/MLPS

6 Financial and economic analysis

6.1 Assumptions for financial and economic analysis

The financial model is structured in nominal Moldovan lei (MDL), forecast begins in 2015.

Financial and economic analysis was based on macroeconomic assumptions on forecast of GDP per capita, wages increase and prices of electricity 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[31] scenario[32], in reference to the EU Guide to Cost-Benefit Analysis (further EU guide) of investment projects.

The BAU scenario was prepared using following assumptions:

- The service area will be extended with 10 975 people connected from 4 villages in with project scenario;
- The connection rate increases in the existing service area to 100% as the targets was set by 2030 and for the new area (new connected villages) to the 70 % of connections rate in the first operational year;
- Apparent losses (Commercial losses) will decrease up to the target set of 15% until 2030 and up to the 5% in 2045;
- Physical losses will decrease up to the target set, that is 25% until 2030 and 20% in 2045;
- Fixed costs depreciation are not changed, except increases in salaries as described in the macroeconomic forecast;
- Variable costs are proportional to the unit water consumption;
- No new investments are forecasted.

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;
- Table 3. Depreciation rates for water;
- Table 4. Summary of investment costs;
- Table 5. Depreciation;
- Table 6. Gross Value of Assets;
- Table 7. Net assets;
- Table 8. Depreciation costs;

[31] Business as Usual.

[32] 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 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.

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 water-sewer 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 rates used was 1 EUR = 20 MDL. It has been assumed that the real exchange rate will change over the period, and the exchange rate forecast is described in the macroeconomic forecast

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[33].

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

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

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.

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

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

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

Source: GIZ/MSPL

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

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

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

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

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

Table 6-3: Gross Domestic Product annual percentage of change (%)

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.

Table 6-4: Gross Domestic Product annual percentage of change projection 2025-2045

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

Source: GIZ/MLPS

In the optimistic scenario, the GDP growth will remain higher, while in the pessimistic scenario there will be stagnation. The base case scenario was used further in the financial analysis and financial calculations.

6.1.2 Wages forecast

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

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

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

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

The gross average salary for the next four years (2015-2018) is described on the macro economic forecast of the Moldovan Ministry of Economy. The following table 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 Ministry of Economy of the Republic of Moldova.

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 following table.

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

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

The base case scenario was used in this feasibility study.

6.1.3 Household income forecast

According to National Bureau of Statistics of the Republic of Moldova the disposable household income was (in 2014), in person per month: MDL 2,292.6 in Chisinau, MDL 1,697.2 in the North, MDL 1,564.3 in the Centre and MDL 1,526.6 in the South Region[34].

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

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

Table 6-9: Forecast of disposable household income, 2015-2020, capita/month, MDL

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, capita/month, MDL

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:

[34] 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

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

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

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

The following table summarizes the assumed future electricity price increases:

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

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

Source: GIZ/MLPS

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

6.2 Evaluation of the financial capacity of the Operator

6.2.1 Analysis of the current financial situation of the Operator

6.2.1.1 Analysis of the Balance Sheet

Based on the Operator's Balance Sheet it can be noticed the increase of the fixed assets in 2013 (see following table).

Table 6-12: Balance sheet of the Municipal Enterprise 'Apa-Canal' Cahul

Balance Sheet	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
ASSETS				
LONG-TERM FIXED ASSETS				
Intangible assets	010	56,470	56,470	56,470
Accumulated Depreciation-Intangible Assets	020	-44,583	-50,717	-56,470
Total Intangible assets	030	1,887	5,753	0
Incomplete fixed assets	040	7,258,212	968,909	968,448
Fixed Assets	060	79,564,063	98,579,768	93,408,864
Depreciation and depletion of long-term fixed assets	080	-42,705,808	-45,622,406	-44,363,802
Long-term fixed assets' book cost	090	44,116,467	53,926,271	50,013,510
Long-term accounts receivables	130	562,623	562,623	562,623
Total Non-Current Assets	180	44,690,980	54,494,647	50,576,133
CURRENT ASSETS				
Stocks of goods and materials				
Raw materials	190	1,234,522	1,235,456	1,163,790
Inventory	210	47,723	339,323	322,466
Goods for sale	240	193,046	130,224	88,236
Stocks of goods and materials	250	1,475,291	1,705,003	1,574,519
Short-term receivables				
Trade accounts receivables	260	2,731,845	2,042,591	2,066,658
Advances	290	74,494	37,683	56,255
Receivables from staff	320	50,976	52,088	60,567
Deferred income	330	1,394	1,443	1,501
Short-term receivables	350	2,858,709	2,133,805	2,184,981
Cash				
Cash	400	39,289	15,441	23,042
Settlement Account	410	5,214,328	3,221,532	566,662
Cash and equivalents	440	5,253,617	3,236,973	589,704
Other current assets	450	65,894	69,457	69,886
Total Current Assets	460	9,653,511	7,145,238	4,419,090
TOTAL - ASSETS	470	54,344,491	61,639,885	54,995,223
PASIV				
EQUITY				
Share capital and capital surplus				
Share capital	480	14,436,045	14,436,045	14,436,045
Share capital and capital surplus	520	14,436,045	14,436,045	14,436,045
Other provisions	550	5,551	5,551	5,551
Provisions	560	5,551	5,551	5,551
Correction of previous periods' results	570	0	1,606	-9,092
Retained profit (uncovered loss) of previous years	580	-4,194,389	-4,194,389	-11,218,727
	590	0	-7,025,944	-13,533,618
Retained earnings (uncovered loss)	610	-4,194,389	-11,218,727	-24,761,437
Subsidies	630	5,753,768	7,407,446	7,588,310
Total Equity	650	16,000,975	10,630,315	-2,731,531
LONG-TERM LIABILITIES				
Long term loans	670	35,591,911	46,514,454	53,295,808
Special purpose funding and receipts	720	0	1,113,788	56,453
Total Long Term Liabilities	770	35,591,911	47,628,242	53,352,261
SHORT-TERM LIABILITIES				
Short-term loans	790	1,394,831	1,509,716	2,780,976
Other short-term financial liabilities	810	107,029	130,359	162,273
Total short-term financial liabilities	820	1,501,860	1,640,075	2,943,249
Short-term accounts payables				
Commercial account payables	830	366,365	478,775	66,018

Balance Sheet	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Short-term accounts payables	860	366,365	478,775	66,018
Wages owed	870	351,804	503,168	518,309
Other employee liabilities	880	2,665	7,103	4,695
Insurance	890	133,735	211,932	191,099
Debt settlement related to the budget	900	149,377	182,301	223,859
VAT and excises to be paid	910	111	0	6,029
Reserves	940	245,608	357,828	415,150
Other current liabilities	950	80	146	6,085
Short-term accrues liabilities	960	883,380	1,262,478	1,365,226
Total Short Term Liabilities	970	2,751,605	3,381,328	4,374,493
TOTAL – EQUITY and LIABILITIES	980	54,344,491	61,639,885	54,995,223

Source: Municipal Enterprise 'Apa-Canal' Cahul

The following conclusions results from the Balance Sheet analysis:

- Regarding the assets, the main element is represented by long-term assets, which is 88.5% from the total assets;
- Regarding the liabilities it is observed that the Operator is financed mainly from permanent capital where we observe an increase of long-term loans and long-term irreparable funds that were offered to rehabilitate the water and wastewater systems;
- The share of short-term debts in 2013 is 78.2% 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 Loss Statement

The Profit and Loss Statement for the period 2012-2014 is shown in the following table.

Table 6-13: Profit and loss statement of the Municipal Enterprise 'Apa-Canal' Cahul

Income Statement	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Income from sales	010	15,461,926	15,128,354	15,697,524
Cost of sales	020	14,304,827	16,324,997	16,455,968
Gross profit (gross loss)	030	1,157,099	-1,196,643	-758,444
Other operating income	040	65,310	1,022,949	17,967
Commercial expenses	050	720,191	1,066,183	1,097,218
General and administrative expenses	060	2,251,524	2,462,665	2,443,209
Other operating expenses	070	592,478	759,200	944,796
Result from operating activities: profit (loss)	080	-2,341,784	-4,461,742	-5,225,700
Result from investing activities: profit (loss)	090			955
Result from financial activities: profit (loss)	100	-285,948	-2,564,202	-8,308,873
Result from financial and economic activities: profit (loss)	110	-2,627,732	-7,025,944	-13,533,618
Extraordinary result: profit (loss)	120			
Profit (loss) before tax	130	-2,627,732	-7,025,944	-13,533,618
Income tax	140			
Net profit (net loss)	150	-2,627,732	-7,025,944	-13,533,618

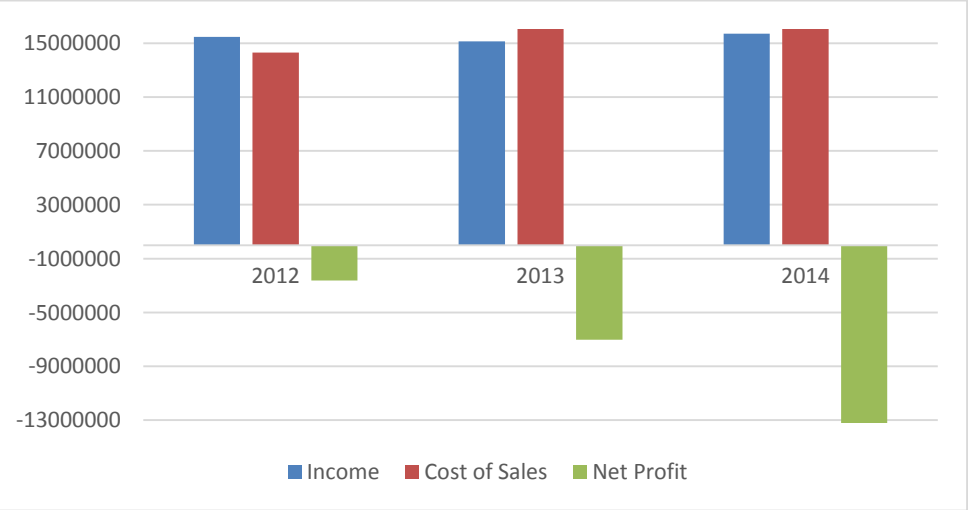
Source: Municipal Enterprise 'Apa-Canal' Cahul

The Operator has losses from operating activities in 2012-2015, which supposes financial risks and does not contribute to provisions accumulation.

The Operator has a loan in currency and during the investment project implementation the difference in exchange rate influenced the financial activity of the entity. According to the loan agreement the Operator should accumulate enough provisions to cover negative differences in exchange.

The evolution of the Operator's income; cost of sales and net profit for the period of 2012-2014 is presented in the following figure.

Figure 6-1: Evolution of Income, Cost of Sales and Net Profit (MDL)



Source: GIZ/MSPL

6.2.1.3 Cash flow analysis

The Cash flow statement for the period 2012-2014 is shown in the following table.

Table 6-14: Cash flow statement of the Municipal Enterprise 'Apa-Canal' Cahul

Cash Flow Statement	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Operating activities				
Cash inflows from sales	010	17,101,006	18,495,550	16,777,076
Cash paid to suppliers and contractors	020	7,707,599	6,728,379	5,820,266
Cash payments to employees and social security contributions	030	6,815,050	8,819,227	9,290,920
Interest payments	040	550,946	631,630	779,088
Income tax payments	050	0	0	
Other cash receipts	060	0	0	
Other cash payments	070	2,110,390	3,157,340	2,010,343
Net cash flow from operating activities	080	-82,979	-841,026	-1,123,541
Investing activities				
Other cash receipts (payments)	130	-17,000		
Net cash flow from investing activities	140	-17,000		
Financing activities				
Cash proceeds from credits and loans	150			99,430
Repayments of loans	160			1,623,158
Other cash receipts (payments)	200	-970,551	- 1,175,618	0

Cash Flow Statement	Row Code	2012 (MDL)	2013 (MDL)	2014 (MDL)
Net cash flow from financial activity	210	-970,551	- 1,175,618	-1,523,728
Net cash flow before extraordinary items	220	-1,070,530	-2,016,644	-2,647,269
Cash proceeds (payments) from extraordinary items	230			
Net cash flow	240	-1,070,530	-2,016,644	-2,647,269
Positive (negative) foreign exchange differences	250			
Cash balance at the beginning of the year	260	6,324,147	5,253,617	3,236,973
Cash balance at the end of the reporting period	270	5,253,617	3,236,973	589,704

Source: Municipal Enterprise 'Apa-Canal' Cahul

6.2.1.4 Financial indicators

A series of indicators derived from the financial statements were calculated based on the data collected (see following table).

Table 6-15: Financial indicators of the Municipal Enterprise 'Apa-Canal' Cahul

No	Financial Indicators	2012	2013	2014	Indicators limits
1	Current Liquidity Ratio	3.51	2.11	1.01	1.0 – 2.0
2	ROE, %	-16.4	-66.1	495.5	
3	ROA, %	-4.8	-11.4	-11.4	
4	Operating Profitability, %	-15.1	-29.5	-29.5	> 0
5	Debts Service Converge Ratio	0.29	0.17	0.17	<1.2
6	Financial Ratio	0.71	0.83	0.83	
7	Accounts Receivable Turnover, days	67	60	60	< 30
8	Accounts Payable Turnover, days	9	9	6	< 30

Source: GIZ/MSPL

6.2.1.5 Revenue analysis

The revenues from the provision of water and wastewater services are presented in the table below.

Table 6-16: Revenues from water supply and wastewater services for 2014 of the Municipal Enterprise 'Apa-Canal' Cahul

Consumers	Revenues		Volumes	
	(MDL)	(%)	(m^3)	(%)
WATER SUPPLY	11,263,500	100.0	947,300	100.0
Population	7,194,500	63.9	791,300	83.5
Budgetary Consumers	878,300	7.8	41,700	4.4
Private Entities	3,190,700	28.3	114,300	12.1
WASTEWATER SERVICES	3,757,000	100.0	734,200	100.0
Population	1,813,600	48.3	458,300	62.4
Budgetary Consumers	175,700	4.7	44,300	6.0
Private Entities	1,767,700	47.1	231,600	31.5

Source: Municipal Enterprise 'Apa-Canal' Cahul

Tariffs used by Municipal Enterprise 'Apa-Canal' Cahul (Operator) are differentiated by user groups and approved by the Local Council (see table below).

Table 6-17: Evolution of tariffs

Tariffs for consumers	2013 (MDL / 1m^3)	2014 (MDL / 1m^3)	2015 (MDL / 1m^3)
Budgetary Consumers	25.00	25.00	25.00
• Water supply	21.00	21.00	21.00
• Wastewater services	4.00	4.00	4.00
Private Entities	33,97	35.60	33.97 / 39.97
• Water supply	27.97	27.97	27,97
• Wastewater services	6.00	7.63	6.00 / 12.00
Population	9.00 / 17.50	13.05	9.00 / 17.50
• Water supply	6.00 / 12.00	9.09	6.00 /12.00
• Wastewater services	3.00 / 5.50	3.96	3.00 / 5.50
Weighted average		17.01	
• Water supply		11.89	
• Wastewater services		5.12	

Source: Municipal Enterprise 'Apa-Canal' Cahul

In the period of 2014 - 2015, the tariffs for water and sanitation services provided by the Operator 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 of water and wastewater services is shown in the following table. As is typical for a water and wastewater utility, the majority of costs are for electricity and salaries.

Table 6-18: Detailed cost structure of the Municipal Enterprise 'Apa-Canal' Cahul, 2014

Detailed cost structure for 2014	Amount (MDL)	Percentage (%)
WATER SUPPLY	11,628,748	100.0
Electricity (for pumping)	2,212,600	19.0
• for pumping	1,103,286	-
• for water treatment	1,074,180	-
• for office, heating and other purposes	35,134	-
Chemicals for water treatment	985,769	8.5
Salaries of employees working at water supply	4,089,300	35.2
• number of employees (pers.)	93	-
• average monthly salary per employee	3,664	-
Social benefits (pension fund/insurance)	1,005,400	8.7
Depreciation	1,994,881	17.2
Maintenance costs for water supply	155,400	1.3
Tax for water capturing	354,943	3.1
Other costs	830,455	7.1
WASTEWATER SERVICES	6,058,233	100.0
Electricity (for wastewater treatment)	541,000	8.9
• for pumping	400,300	-
• for wastewater treatment	135,532	-
• for office, other purposes	5,168	-
Chemicals for wastewater treatment	47,730	0.8
Fuel for transport for wastewater services	156,600	2.6
Salaries of employees working at water supply	2,861,300	47.2

Detailed cost structure for 2014	Amount (MDL)	Percentage (%)
• number of employees (pers.)	79	-
• average monthly salary per employee	2,773	-
Social benefits (pension fund/insurance)	702,300	11.6
Depreciation	1,297,246	21.4
Maintenance costs for wastewater services	21,100	0.4
Other costs	430,957	7.1
ADMINISTRATION AND OVERHEAD	3,254,210	100.0
Salaries of employees working at water supply	898,980	27.6
• number of employees (pers.)	15	-
• average monthly salary per employee	4,994	-
Social benefits (pension fund/insurance)	225,269	6.9
Fuel for transport for administration	20,050	0.6
Insurance costs	21,100	0.7
Other overhead costs	1,277,810	39.3
Financial costs	811,001	24.9

Source: Municipal Enterprise 'Apa-Canal' Cahul

6.2.1.7 Investments

The operator obtained co-financing for external sources for investments and capacity development as in the following table.

Table 6-19: Investments

Investments	Source	Period	Amount (MDL)
Rehabilitation of water system	World Bank	2012-2013	18,048,600
Rehabilitation of water system	GIZ	2013	2,624,000
Total			**20,672,600**

Source: Municipal Enterprise 'Apa-Canal' Cahul

6.2.2 Information on existing loans (if any)

The operator took out a long-term loan in 2004 in amount of USD 2.775 million (tranche I) and in 2008 in amount of 1.500 million (tranche II). The interest rate for the loan is 1.5% per year with a 6 years of grace period and the loan should be repaid till 2033 (tranche I) and till 2038 (tranche II).

6.2.3 Creditworthiness capacity of the operator

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

6.3 Financial analysis

6.3.1 Investment costs

The total investment outlays amount to 110.1 million MDL (5.5 million EUR). The outlays involve the construction of:

- Rehabilitation of water transmission main pipeline 16.4 km;
- Equipment and tools;
- Design and engineering;

- Technical assistance during construction period;
- Contingencies.

The presented construction costs were prepared using conceptual design estimates. Using the information obtained. the costs were estimated based on the team's experience that have many years of engineering in conducting 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 sewerage system established by Local Public Administration and WSS operator. In the calculations the team took into account the different investment conditions. The costs are inclusive of VAT.

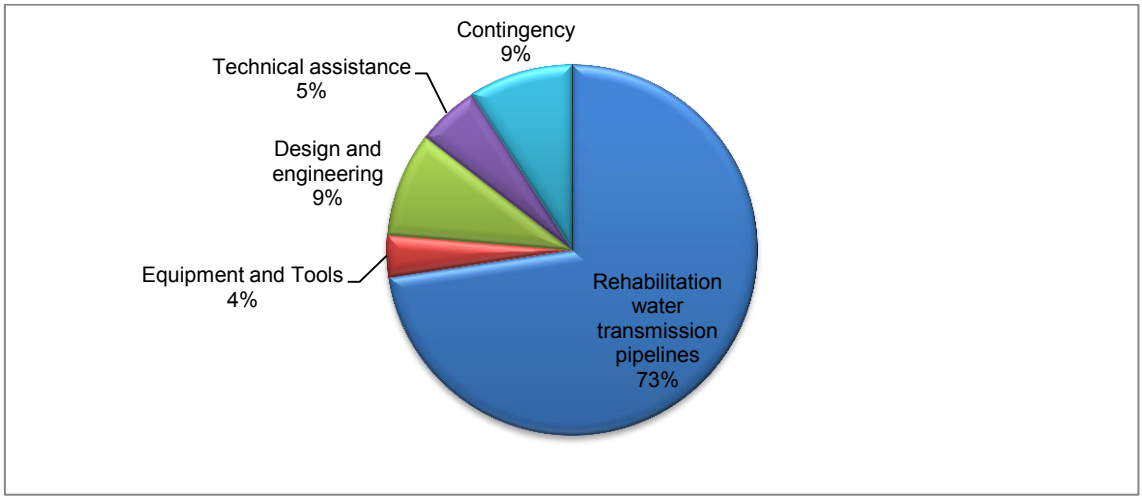
Table 6-20: Summary of the investment costs [MDL M]

Project investment outlays	Amount	%
Rehabilitation of water transmission pipelines	80.03	72.67%
Equipment and Tools	4	3.63%
Design and engineering	10.08	9.16%
Technical assistance	6	5.45%
Contingency	10.01	9.09%
Total	**110.12**	**100%**

Source: GIZ/MSPL

The main part of investment costs (about 73.0 %) will be for the rehabilitation of water transmission main pipeline. Capacity development and technical assistance will be around 15% of the total investment cost. Also, in the project are provided various and unforeseen expenditures in the amount of 10 % of investment costs.

Figure 6-2: Structure of project investment costs, %



Source: GIZ/MSPL

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. The local contributions that are co-financing of capital investment projects by citizens and 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 1,000 MDL per household connected to the system[35].

These funds will be spent for local distribution network. Households already connected to the local water supply system will not contribute because usually they already had been contributing the building of the local network. Thus only households not connected to the water supply were taken into account.

Because the project assume only the rehabilitation of the water main pipelines no households will be connected due to project realization.

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, from the analysis of the required tariff it is clear that the tariff would be too high to be affordable at normal water consumption rates. Therefore, the tariff will not be used to contribute to project financing.

As indicated when calculating the financial gap, project is not profitable (FNPV(K)~=0) when own contribution achieve 26.84 million MDL. This means additional 26.8 million MDL shall be raised from national sources.

6.3.2.2 Financial plan

The total investment outlays will be financed by:

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

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

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

Source of financing	Method used to estimate share in project financing
Citizens providing local contribution	The practice of “local contribution” – co-financing of capital investment projects, including water supply by citizens – is widely used in Moldova. The estimate was based on experience from other projects in Moldova. The estimated contribution of citizens is 1000 MDL per household which will be connected to the system.
Domestic and international donors	The assumption is that remaining part of the investment

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

Source of financing	Method used to estimate share in project financing
	costs will be financed by donors. Donors may not spend more than the estimated "financing gap"[36]. The calculation of the required donor contribution takes into account that the project should not lead to financial losses for residents and communes; thus, 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. Also, currently Apa-Canal Cahul has no creditworthiness capacity.

Source: GIZ/MSPL

The following table presents the investment outlays and their financing:

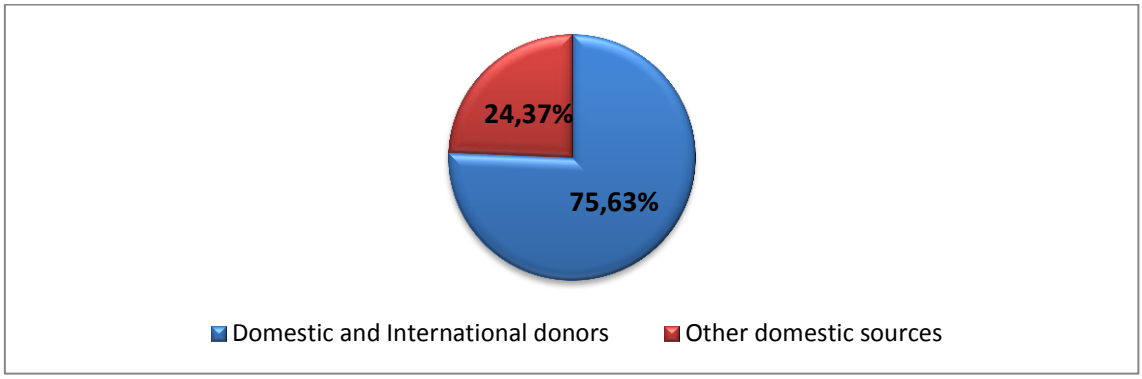
Table 6-22: Summary of the financing sources [MDL M]

Project financing sources	Amount	%
Citizens providing local contribution	0.00	0.00%
Domestic and International donors	83.28	75.63%
Other domestic sources	26.84	24.37%
Water utility	0.00	0.00%
Total	**110.13**	**100.00%**

Source: GIZ/MSPL

The donor contribution was estimated as 75.6 % of the total investment costs, while the local sources' contribution is 24.4 %.

Figure 6-3: Proposed structure of project financing, %



Source: GIZ/MSPL

The project will be implemented during the period of 3 year and implementation schedule is as indicated in the following table. So for the first year is assumed that the project

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

will be implemented in proportion of 10 %. For second year is foreseen 50 % and for third year is 40%.

Table 6-23: Summary of the investment implementation schedule [MDL M]

Project investment outlays	2015	2016	2017	Total
	10%	50%	40%	
Rehabilitation water transmission pipelines	8.00	40.02	32.01	80.03
Equipment and Tools	0.40	2.00	1.60	4.00
Design and engineering	1.01	5.04	4.03	10.08
Technical assistance	0.60	3.00	2.40	6.00
Contingency	1.00	5.01	4.00	10.01
Total	**11.01**	**55.06**	**44.05**	**110.12**

Source: GIZ/MSPL

6.3.3 Forecast of operating costs

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

The following assumptions were used for the expenditure forecast:

- **Direct costs for labour – salaries and benefits**. The project is not entails any changes in enterprise staff. For both options (BAU and with project). An average real growth rate equal to the wages increase forecast was used. Three scenarios of wage increase were prepared (see macroeconomic forecast) and base case is presented in the financial forecast;
- **Direct costs (chemicals for treatment and water abstraction fee).** Currently, the costs are estimated at 0.65 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.** Currently, the electricity consumption for the water pumping stations is estimated at 0.40 kWh/ m^3;
  - **For water treatment plant.** The electricity consumption for the water treatment plant is estimated at 0.37 kWh/ m^3;
  - **For wastewater treatment plant.** The electricity consumption for the wastewater treatment plant is estimated at 0.089 kWh/ m^3;
  - **For wastewater pumping station.** The electricity consumption for the pumping station is estimated at 0.26 kWh/ m^3.

Electricity consumption was forecast, which had an effect on the variable costs (see Table 6-24 below).[37] The current prices were adjusted according to a forecast of real changes of electricity prices):

- **General administration costs.** General administration costs are currently 3.25 million MDL annually. For the expenditure forecast, due to limited expansion of

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

the service area, it is predicted that the costs will change with the forecasted GDP growth rate for both scenarios (BAU and with project). The GDP forecast is presented in the macroeconomic forecasts, where was developed three scenarios of GDP growth (base case. optimistic and pessimistic). For financial forecast the base case scenario is consider;

- **Depreciation.** Currently, the depreciation is at the level of 3.29 million MDL annually. After the project implementation, the depreciation will increase to 5.41 million MDL annually due to investments in new assets.

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 the annex, 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 operating cost projections, MDL M

Water supply service	Unit	0	1	2	3	4	5	10	20	30
Variable costs water		1.46	4.71	4.90	5.10	5.03	5.16	6.35	9.21	13.23
Electricity for pumping	MDL M	1.10	3.26	3.41	3.56	3.52	3.62	4.60	7.23	11.14
Water treatment costs	MDL M	0.35	1.44	1.49	1.54	1.51	1.54	1.75	1.98	2.09
Fixed costs water		10.52	10.52	11.02	12.96	16.57	16.94	19.05	24.65	30.73
Salaries and related costs	MDL M	5.09	5.09	5.25	5.49	5.72	5.95	7.24	10.72	14.55
Maintenance - old assets	MDL M	0.00	0.00	0.00	0.00	2.00	2.04	2.25	2.75	3.20
Maintenance - new assets	MDL M	0.00	0.00	0.11	0.64	1.06	1.06	1.06	1.06	1.06
Fuel	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depreciation of fixed assets	MDL M	1.99	1.99	2.21	3.27	4.12	4.12	4.12	4.12	4.12
General and administrative expenditures	MDL M	2.44	2.44	2.48	2.58	2.68	2.79	3.39	5.02	6.81
Other costs	MDL M	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Total costs for water	MDL M	11.97	15.22	15.93	18.06	21.59	22.11	25.40	33.86	43.96
Sanitation service	**Unit**	**0**	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**
Variable costs wastewater		0.59	0.79	0.81	0.83	0.84	0.81	1.18	1.95	3.43
Electricity for pumping	MDL M	0.54	0.75	0.76	0.78	0.79	0.76	1.11	1.87	3.34
Wastewater treatment costs	MDL M	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.08	0.09
Fixed costs water		6.28	6.28	6.40	6.60	7.30	7.51	8.67	11.77	15.16
Salaries and related costs	MDL M	3.56	3.56	3.67	3.84	4.00	4.16	5.07	7.50	10.18
Maintenance - old assets	MDL M	0.00	0.00	0.00	0.00	0.50	0.51	0.56	0.69	0.80
Maintenance - new assets	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel	MDL M	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Depreciation of fixed assets	MDL M	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
General and administrative expenditures	MDL M	0.81	0.81	0.83	0.86	0.89	0.93	1.13	1.67	2.27
Other costs	MDL M	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Total costs for wastewater	MDL M	6.87	7.08	7.21	7.43	8.15	8.32	9.84	13.72	18.59
TOTAL COSTS	MDL M	18.85	22.30	23.14	25.49	29.74	30.42	35.25	47.58	62.54

Source: GIZ/MSPL

The summary of the variable costs forecast are provided in Annex 6, Table 6-9, whilst Table 6-10 displays the estimate of fixed costs and total costs (fixed and variable) are shown in Table 6-11.

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.

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

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

Table 6-25: Tariff calculation for the option with the project [MDL M]

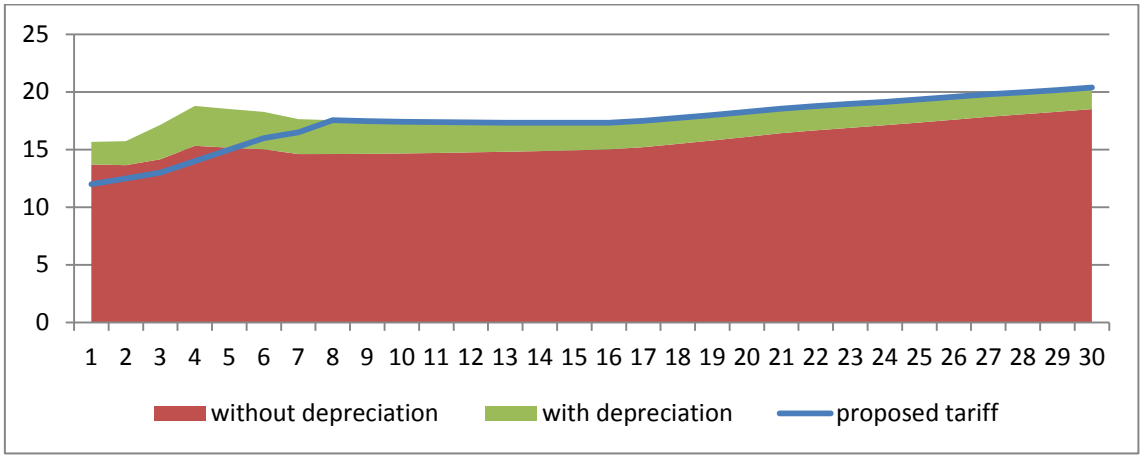
Water supply service	Unit	0	1	2	3	4	5	10	20	30
Variable and fixed costs	MDL M	9.82	13.23	13.72	14.79	17.48	17.99	21.29	29.74	39.84
Depreciation	MDL M	1.99	1.99	2.21	3.27	4.12	4.12	4.12	4.12	4.12
Interest and financial costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reserve for irregular receivables	MDL M	0.00	0.76	0.72	0.72	0.76	0.66	0.64	0.85	1.10
Sale of water	ths m^3	947	1,021	1,058	1,096	1,190	1,230	1,495	1,900	2,212
Tariff without depreciation	MDL/m^3	10.37	13.71	13.64	14.16	15.32	15.16	14.66	16.10	18.51
Tariff with depreciation	MDL/m^3	12.48	15.66	15.73	17.14	18.78	18.51	17.41	18.26	20.37
Proposed average tariff	MDL/m^3	11.89	12.00	12.50	13.00	14.00	15.00	17.41	18.26	20.37
Sanitation service	**Unit**	**0**	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**
Variable and fixed costs	MDL M	5.35	5.78	5.92	6.13	6.85	7.02	8.55	12.42	17.29
Depreciation	MDL M	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
Interest and financial costs	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reserve for irregular receivables	MDL M	0.00	0.35	0.32	0.30	0.29	0.25	0.25	0.34	0.46
Sale of wastewater	ths m^3	734	749	764	778	793	808	1,249	1,512	1,837
Tariff without depreciation	MDL/m^3	7.29	8.19	8.17	8.26	8.99	9.00	7.04	8.44	9.67
Tariff with depreciation	MDL/m^3	9.05	9.92	9.87	9.93	10.63	10.60	8.08	9.30	10.37
Proposed average tariff	MDL/m^3	5.12	8.00	8.00	8.00	8.00	8.00	8.08	9.30	10.37

Source: GIZ/MSPL

The following figure illustrates how the tariff was proposed. During the construction period, when capital costs raises significantly while water sale is limited, it is proposed that tariff does not contain depreciation costs. This would stimulate the water consumption and will keep the tariffs below affordability constrains. After the project is complet-

ed and water consumption will rise, the tariff may include depreciation (so it will be a full cost recovery tariff). 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 10 for sanitation system.

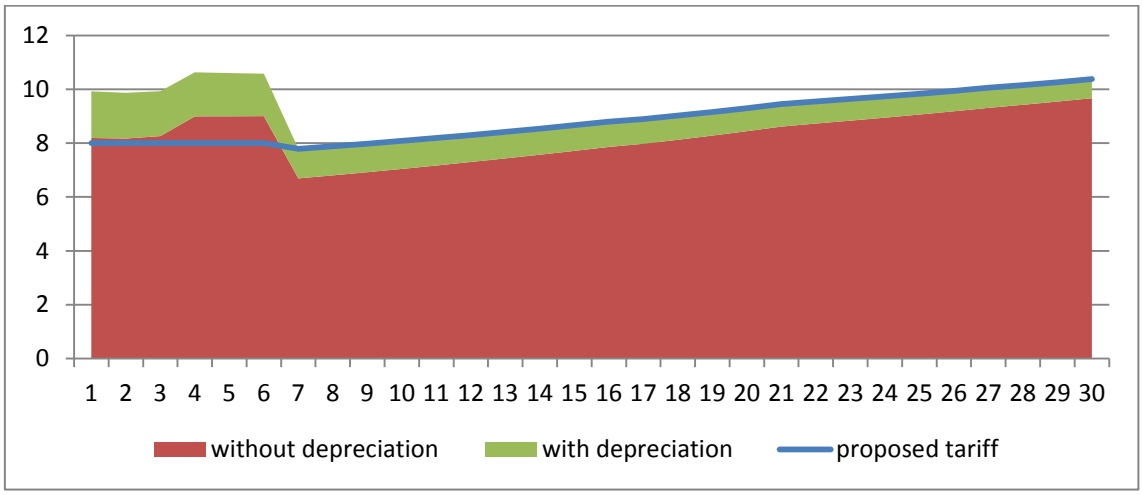
Figure 6-4: Forecast of the tariff for water [MDL/ m^3]



Source: GIZ/MSPL

The tariff of water is forecasted to be about 17.4 MDL per m^3 for the whole projected period. It should be mention, that in the financial projections it is not taking into consideration the effect of inflation. As a result, the real decrease or increase of tariff will depend of variation of costs.

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



Source: GIZ/MSPL

The tariff for wastewater is forecasted to be about 8.9 MDL per m^3 for the whole projected period. Also, in the financial projections it is not considering the effect of inflation, but the real decrease or increase of tariff will depend of variation of costs.

6.3.4.2 Tariff affordability

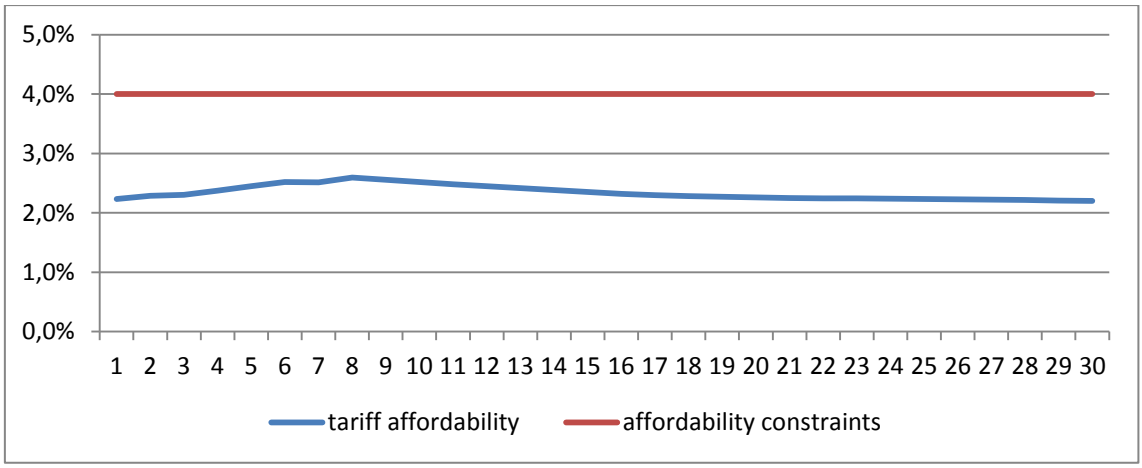
The following table presents the tariff calculation for water and wastewater for households and its relation to the affordability threshold of 4%. As discussed, the tariff should cover at least operating and maintenance costs and shall not exceed a level covering O&M and capital costs (depreciation). In case the calculated tariff is higher than the affordable tariff, a subsidy to the price from the commune should be proposed. The tariff affordability reflecting the bills for water as a percentage of disposable household income is presented in the annex.

In the whole period of the financial projections, the average tariff affordability rate will be 2.3% that means that it is within the limits of affordability rate of 4%.

For the first years of the project implementation, it is proposed that tariff does not contain the component of capital costs (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 and wastewater as a percentage of disposable household income is presented in the following figure.

Figure 6-6: Proposed tariff and tariff affordability [MDL/ m^3]



Source: GIZ/MSPL

6.3.4.3 Revenue forecast

The revenues calculation was based on the demand analysis taking into account water demand and proposed tariff for water. The revenues forecast for each service is presented in the following table.

Table 6-26: Revenues forecast for the option with the project [MDL M]

Water supply service	Unit	0	1	2	3	4	5	10	20	30
Sale of water	ths m^3	947.3	1020.5	1058.2	1095.8	1189.8	1229.9	1495.4	1900.4	2211.9
Weighted average tariff for water	MDL/m^3	11.89	12.00	12.50	13.00	14.00	15.00	17.41	18.26	20.37
Revenues from water service	MDL M	11.27	12.25	13.23	14.24	16.66	18.45	26.04	34.71	45.05
Sanitation service	**Unit**	**0**	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**
Sale of wastewater	ths m^3	734.2	749.0	763.7	778.5	793.3	808.1	1248.6	1511.6	1836.6

The weighted average tariff for wastewater	MDL/m^3	5.12	8.00	8.00	8.00	8.00	8.00	8.08	9.30	10.37
Revenues from sanitation service	MDL M	3.76	5.99	6.11	6.23	6.35	6.46	10.09	14.06	19.05
Total Revenues	**MDL M**	**15.02**	**18.24**	**19.34**	**20.47**	**23.00**	**24.91**	**36.13**	**48.77**	**64.10**

Source: GIZ/MSPL

The water demand will increase from 947.3 ths m^3 per year to 2211.9 m^3 year at the end of projection period. This increase is determined by the growth of water consumption per capita from 57.5 l/c/d to 110 l/c/d in 2045 and the increase of consumers with 10975 people.

The wastewater inflow is calculating proceeding from wastewater demand per capita and the number of consumer. It is assumed that the number of consumers will grow up from actual number of 24 923 people to 37 620 people and the wastewater demand will increase from actual 50.4 l/c/d up to 110 l/c/d in 2045.

The tariff for water services will increase slowly from 12.00 MDL/m^3 to approximately 20.00 MDL/m^3 at the end of projection period. For the sanitation service it is supposed that the average tariff will be 8.9 MDL/m^3 for the whole period.

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, financial losses means that the tariffs do not cover O&M and capital costs.

The financial results regarding the water supply service will be positive with the exception of first seven years where the profit will be negative. The average annually profit will register a negative value of about 70.0 ths MDL. For the sanitation services the financial results of the service will be positive seventh year. The first seven years, the period when the capital investments will done, the financial results will be negative. The cumulated net profit for the projected period will be negative with a value of 6.42 million MDL, which means that the project is social and the company will not make profit on capital investments. The calculation of net profit for each service provided and the option of implementing the project is presented in the table 3-8.

Table 6-27: Net profit forecast for the option with the project [MDL M]

Water supply service	**Unit**	**0**	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**
Sale of water	MDL M	11.27	12.25	13.23	14.24	16.66	18.45	26.04	34.71	45.05
Costs of water services	MDL M	11.82	15.22	15.93	18.06	21.59	22.11	25.40	33.86	43.96
Gross profit from water services	MDL M	-0.55	-2.98	-2.70	-3.81	-4.94	-3.66	0.64	0.85	1.10
Sanitation service	**Unit**	**0**	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**
Sale of wastewater	MDL M	3.76	5.99	6.11	6.23	6.35	6.46	10.09	14.06	19.05
Costs of wastewater services	MDL M	6.65	7.08	7.21	7.43	8.15	8.32	9.84	13.72	18.59
Gross profit from wastewater services	MDL M	-2.89	-1.09	-1.10	-1.20	-1.80	-1.85	0.25	0.34	0.46

Total gross profit	MDL M	-3.44	-4.06	-3.80	-5.02	-6.74	-5.51	0.88	1.19	1.56
Income tax	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.14	0.19
Net profit	MDL M	-3.44	-4.06	-3.80	-5.02	-6.74	-5.51	0.78	1.05	1.38
Cumulated net profit	MDL M		-4.06	-7.86	-12.88	-19.62	-25.13	-27.82	-18.68	-6.42

Source: GIZ/MSPL

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

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 6-18 and 6-19 for with project and business as usual scenario, respectively.

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 assumptions for working capital are presented in the following table.

Table 6-28: Assumptions for working capital

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

Source: GIZ/MSPL

The forecast of working capital is presented in Annex 6, Table 6-16 and 6-17 for the “with project” and BAU scenario, respectively.

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 the following table.

Table 6-29: Cash flow forecast for the option with the project [MDL M]

Project sustainability	Unit	0	1	2	3	4	5	10	20	30
Financial inflows	MDL M	0.00	30.09	74.47	64.66	23.32	25.00	36.25	48.95	64.29
Donor contribution (capital grant)	MDL M	0.00	8.33	41.64	33.31	0.00	0.00	0.00	0.00	0.00
Own contribution	MDL M	0.00	2.68	13.42	10.74	0.00	0.00	0.00	0.00	0.00

Project sustainability	Unit	0	1	2	3	4	5	10	20	30
Revenues from sale	MDL M	0.00	18.24	19.34	20.47	23.00	24.91	36.13	48.77	64.10
Increase in current liabilities	MDL M	0.00	0.84	0.07	0.14	0.31	0.09	0.12	0.18	0.19
Financial outflows	MDL M	0.00	28.04	74.80	65.12	24.74	25.18	30.04	42.46	57.47
Investment costs	MDL M	0.00	11.01	55.06	44.05	0.00	0.00	0.00	0.00	0.00
Costs of providing services	MDL M	0.00	19.01	19.63	20.92	24.33	25.01	29.83	42.16	57.13
Increase in current assets	MDL M	0.00	-1.98	0.10	0.15	0.42	0.17	0.10	0.15	0.15
Income tax	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.14	0.19
Net cash flow (inflow - out-flow)	MDL M	0.00	2.05	-0.33	-0.46	-1.43	-0.18	6.21	6.50	6.83
Cumulated cash	MDL M	0.59	2.64	2.31	1.86	0.43	0.26	24.23	87.80	154.53

Source: GIZ/MSPL

The detailed cash flow analysis is presented in Annex 6, Tables 6-20 and 6-21 for the "with project" and BAU scenario, respectively.

The amount of the financial surplus is not sufficient to repay the new loan for the investment costs of 110.1 Million MDL. 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 years period of time the project will be able to generate 154.5 Million MDL cumulative, which could be used for replacing the pipes that will lead to a reduction in water losses. These additional investments are required to address the critical issues initiated by leakage detection activities.

It has to be emphasised, that in the table 6-22 in Annex 6 – as the major purpose is to present project sustainability – does not present incremental values but values for the "with project" option.

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 the water supply system. 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 its residual value, 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 flows model. This means that the financial projections were constructed in such a manner so as to identify additional cash flows generated by the investment.

Table 6-22 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 delivered. 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. 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. Other investments in the water sector obtain 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)=	-74.44	Million MDL
FRR (C)=	-1%	

Source: GIZ/MSPL

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.

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

FNPV (K) =	0.04	Million MDL
FRR (K) =	5%	

Source: GIZ/MSPL

6.3.8 Cost-benefit analysis / economic analysis

Preparing an economic analysis (Cost-Benefit Analysis, 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.

6.3.8.1 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 not large 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 supply and water distribution network 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 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.

6.3.8.2 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 has 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[38] 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[39] provides estimation of benefits of avoided water-related diseases. Per capita value for Romania (good proxy for Moldova) is 27 EUR per capita and this value was used for the estimation.

Social effects due to uninterrupted water supply

Current working conditions in communes which have water supply are not optimal. The source is often working close to its maximum capacity and sand is often observed. Sand and poor maintenance often cause failure of the pumps. As the result, high pressure fluctuations in the water distribution network occur and sudden interruption of water supply is observed.

The valuation of the social benefits for uninterrupted water supply is difficult, thus it was not quantified.

New business enterprises

Demand analysis uses the annual increase in businesses proportional to the GDP increase. Currently, the 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 the Cahul 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/m^3, as equal to the production price and distribution costs (including distribution by cisterns). The shadow price was applied to the demand from business.

Non-financial benefits

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

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

[39] THE BENEFITS OF COMPLIANCE WITH THE ENVIRONMENTAL ACQUIS FOR THE CANDIDATE COUNTRIES.

Social benefits resulting from additional employment

In a CBA, additional employment is a cost because the project is using labour resources that become unavailable for alternative social purposes.

Two separate methods exist of estimating the social benefits of additional employment:

- Using accounting wages below the current wages in the project;
- Estimating the income multiplier of investment revenues on the social income resulting from the project that will be higher than the income for private investors.

Both methods have disadvantages and limitations. In this CBA results are corrected so that the cost of employing persons from the ranks of unemployed is equal to zero.

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

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

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

Increase in jobs during investment implementation

Project implementation results in additional employment. This will be a temporary effect from the infrastructure investments, in which a significant portion of the investment outlays is associated with labour. Full automation is not possible during construction of the water and 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.

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

Table 6-24 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 2% while the ENPV is -24.23 million MDL 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.

In addition, the main component of the project – rehabilitation of the supply main from the surface water intake at the Prut River – must be undertaken to ensure system reliability. The proposed project is seen as cost-effective measure to address this issue.

7 Institutional development

7.1 Institutional model for regionalisation

From the institutional point of view, regionalisation is achieved by reorganisation of existing public services owned by local authorities. For the current project, regionalisation is achieved through two institutional elements:

- Regional operator, a public equity company founded by one or more administrative-territorial units, to which water supply and wastewater services are delegated through delegated management contract;
- Contract on delegated management services. The administrative-territorial units through local authorities delegate the management of water supply and wastewater services to the regional operator through a single delegated management contract.

The relationship between these institutions will be regulated by constitutive act of the regional operator and by delegated management contract.

7.1.1 Regional operator

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

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

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

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

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

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

In this case the ME 'Apa-Canal' Cahul will not stop the work and will provide other municipal public services.

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

Given the subject of activity, namely the provision of the water supply and wastewater services and legal provisions in force as well, the following are the organisational-legal forms that can be taken in the future: the municipal enterprise with more founders, limited liability company, and joint stock company.

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

	Municipal enterprise (inter-municipal)	Limited liability company	Joint-stock company
Regulatory framework	• Government Decision no. 387 of 06.06.1994 regarding the approval of regulations' model of Municipal Enterprise; • Civil Code (Law no. 1107-XV of June 6, 2002); • Law on entrepreneurship and enterprises no. 845-XII from 01.03.1992; • Law on State Registration of Legal Entities and Individual Entrepreneurs No. 220-XVI from 10.19.2007.	• Law on Limited Liability Companies no. 135-XVI of 06.14.2007; • Civil Code (Law no. 1107-XV of June 6, 2002); • Law on entrepreneurship and enterprises no. 845-XII from 01.03.1992; • Law on State Registration of Legal Entities and Individual Entrepreneurs No. 220-XVI from 10.19.2007.	• Law on Joint Stock Companies no.1134-XIII of 04.02.1997; • Civil Code (Law no. 1107-XV of June 6, 2002); • Law on entrepreneurship and enterprises no. 845-XII from 01.03.1992; • Law on State Registration of Legal Entities and Individual Entrepreneurs No. 220-XVI from 10.19.2007.
Governing bodies	• The head (director); • Boards of directors (if needed).	• General meeting of shareholders; • The council of enterprise; • Enterprise's manager; • Auditor.	• General meeting of shareholders; • The council of enterprise; • Executive body; • Auditing committee.
Responsibilities of governing bodies	• The director manages the daily operations of enterprise; its responsibilities are set out in the employment contract concluded between the founder and head of the company.	• General meeting of shareholders is the supreme body of the enterprise (art. 48-61 of Law no. 135-XVI dated 06.14.2007)); if enterprise has only one shareholder, the rights and liabilities of general meeting are taken over by the latter (art. 62 of Law no. 135-XVI dated 06.14.2007); • Council of the enterprise (at least 3 people) is its executive body (art. 64-68 of Law no. 135-XVI dated 06.14.2007 and constituent act); • The company may have one or more managers (art. 69-76 of Law no. 135-XVI dated 06.14.2007); • Auditor is enterprise's su-	• Shareholders general meeting is the supreme leading body (art. 50-64 of Law no. 1134-XIII dated 04.02.1997); • Council of the enterprise performs general management and control over enterprise's activities (art. 65-68 of Law no. 1134-XIII dated 04.02.1997); • The executive body carries out the management of enterprise's current activities (art. 69-70 of Law no. 1134-XIII dated 04.02.1997); • Auditing Committee exercises control over financial and economic activity of enterprise (art. 71-72 of Law no. 1134-XIII dated 04.02.1997).

	Municipal enterprise (inter-municipal)	Limited liability company	Joint-stock company
		pervisory body; the general meeting may appoint one or more auditors; the enterprise may instead appoint an independent audit censor (art. 77-79 of Law no. 135-XVI dated 05.14.2007).	
Legal liability	• The enterprise is liable for the obligations assumed by entire property it owns under ownership right; • The administrative-territorial units are not responsible for the obligations of municipal enterprises; • Municipal enterprises are not responsible for the obligations of administrative-territorial units.	• The company is liable for its obligations with all its assets; • Shareholders are not liable for enterprise's obligations; they bear the risk of losses resulting from the enterprise's activity within their participation in the share capital.	• The enterprise is liable for its obligations by entire property it owns under ownership right; • The enterprise is not liable for obligations of its shareholders; • Shareholders are not liable for enterprise's obligations and bear the risk of losses within the value of shares belonging to them.
Setting up conditions	• Setting up decision and enterprise charter is adopted by founder (local council); • Incorporation from the moment of registration by State Registration Chamber.	• Enterprise can be set up by one or more natural and/or juridical persons; • Number of associates shall not be more than 50; • Founding agreement is signed by all founders and notarised; charter is approved by single founder; • It is registered by State Registration Chamber.	• Enterprise can be set up by one or more persons; • Both natural and juridical persons can be founders of enterprise; • Shareholders can be natural and juridical persons from Republic of Moldova, other countries, stateless citizens, foreign countries and international organisations; • Contract conclusion (decision taken on enterprise setting up); founders subscription to shares and constituent assembly holding; enterprise contract (statement on enterprise setting up) loses its force since enterprise is registered; charter approval by founding members; • Incorporation from the moment of registration by State Registration Chamber.
Constituent acts	Local council decision on enterprise setting up and its charter	Founding agreement or enterprise charter (art.12 of Law no.135-XVI of 06.14.2007)	Founding agreement (or founding statement) and enterprise charter (art.32 of Law no.1134-XIII of 04.02.1997)
Initial equity	Not regulated	Equity capital shall not be less than 5,400 MDL (art. 21 para 2 of Law no. 135-XVI of 06.14.2007)	Equity capital shall not be less than 20,000 MDL (art. 40 of Law no. 1134-XIII of 04.02.1997)

	Municipal enterprise (inter-municipal)	Limited liability company	Joint-stock company
New members acceptance	No members	Allowed in accordance with charter provisions	Allowed in accordance with charter provisions
Strengths	• The best known organisational-legal form for public services provision; • A separate legal entity having own property and budget; • The loans taken are guaranteed by the local public administration; • Subsidies from local public authorities.	• The most applicable; • Organisational-legal form for delegated public services in the rural area; • More mobility and capacity to respond to the economic and financial changes; • Possibility to access loans for investments; • Independence from local public authorities; • More simple procedure on setting up and registration.	• Possibility to attract investments for development; • More mobility and capacity to respond to the economic and financial changes; • More profitable services when provided on larger area (regional or rayon level); • Higher transparency of activity and management of public goods.
Weaknesses	• Outdated legal regulations in this sector; • Limited possibility for investments; • Dependence on founding local public authorities; • High probability on budgeting dependence and political influence on tariffs level.	• It is subject to all risks of market economy; • It is seen through concern for personal benefits to the detriment of the public interest.	• It is subject to all risks of market economy; • More complex registration procedures; • More complex structure and operating mode; • Not practical for rural areas.

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

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

The implementation of Phase I of this Feasibility Study does not depend on the establishment of the regional operator, but as Phase II begins, the work to establish the regional operator will be completed.

7.1.2 Delegated management contract

Under a delegated management contract, a LPA as delegator assigns to a licensed operator as a delegate, acting on own risk and responsibility, the rights and obligations to provide full water supply and wastewater services for a specified period of time. Alternatively, only some specific activities may be delegated to the operator, including the rights and obligations to manage and operate the technical infrastructure associated with services provided, in return for a management fee.

The delegated management contract establishes specific rights and obligations of each party on the provision of water supply and wastewater services, development of in-

vestment programs, and achievement of the certain performance levels. The provisions of the delegated management contract are stipulated in Law no. 303[40].

In this way, the regional operator bears responsibility for the management, operation, maintenance, renovation and expansion of fixed assets, pursuant to the contract.

In the regionalisation process, a delegated management contract for water supply and wastewater services is an agreement between regional operator (delegatee), on the one hand, and the local authority (delegator) on the other.

One approach would be to draw up a single contract for the entire project area (town of Cahul and villages of Cotihana, Crihana Veche, Manta and Pascani)), corresponding to the jurisdiction of all administrative-territorial units that delegate water supply and wastewater services to the operator.

The following addendums are mandatory to be attached to the delegated management contract:

- Technical specifications regarding provision of service;
- Regulations on provision of service;
- Inventory of movable and immovable assets, which are associated with the service provided, including public or private property;
- Protocols on the take-over assets listed in the 3rd subparagraph.

Regardless of the stipulations in the contract, the ownership of public assets and the responsibility for providing water supply and wastewater services at affordable prices remains with the local public authorities. Since the assets remain under public ownership, they need to be reclaimed by their owner (administrative-territorial units) upon termination of the contract.

The delegated management contract is typically concluded for a long period of time. The tariff policy aims at full cost recovery and is applied by the regional operator in accordance with the applicable regulations issued by ANRE, under the control and with the approval of the administrative-territorial unit. The financing and commercial risk is assumed by reorganised operator.

Delegating management is made by direct award, as stipulated in Law no. 303[41].

7.2 Steps to implement institutional framework

7.2.1 Selecting the management model of water supply and wastewater public services

At this stage, local public authorities (town of Cahul and villages of Cotihana, Crihana Veche, Manta and Pascani)) should decide on the management model for water supply and wastewater services, specifically direct management or delegated management.

Under Law no. 303[42], this phase begins with the preparation by local authorities of a study to substantiate and identify optimal solutions for water supply and wastewater services delegation.

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

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

Based on the study findings and proposed solutions, local councils then adopt decisions on the management model. A decision on delegation of service management to a single / regional operator provides the grounds for taking the next step.

7.2.2 Regional operator

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

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

Adoption of the decision on reorganisation through transformation of the ME 'Apa-Canal' Cahul or decision on new business enterprise setting up.

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

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

7.2.3 Delegation of water supply and wastewater services

The activities necessary for the delegation of water supply and wastewater public services to regional operator are under competence of deliberative authorities from administrative-territorial units. Thus, local councils of the town of Cahul and villages of Cotihana, Crihana Veche, Manta and Pascani are responsible for:

- Drawing up and approving the delegated management contract and awarding this contract directly to the regional operator;
- Defining and elaborating performance indicators for water supply and wastewater services provided to consumers;
- Elaborating and approving the regulations and specifications of water supply and wastewater services;
- Ensuring the signature of the contract by executive authorities, for and on behalf of administrative-territorial units.

Timeframe for regionalisation process of water supply and wastewater services:

The regionalisation of the water supply and wastewater services needs time because the legislation is quite rigid regarding deadlines that must be followed and the required activities are complex and time-consuming. In addition, local authorities in Moldova point to the lack of legal and regulatory framework that would guide the entire regionalisation process.

Given the steps needed to introduce regionalisation of services, as well as time limits imposed by legislation, an outline time schedule with approximate limits is as follows:

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

Table 7-2: Outline time schedule

No.	Method chosen for setting up the regional operator	Steps	Time
a)	Reorganisation of ME 'Apa-Canal' Cahul	Reorganisation of the ME 'Apa-Canal' Cahul into Joint Stock Company with Cahul Town Council as a sole shareholder. Increase of the authorised capital stock through acceptance of the new shareholders, in person of administrative-territorial units villages of Cotihana, Crihana Veche, Manta and Pascani. Delegation of the management of the water supply and wastewater services to the new set up operator.	5-7 months 5-7 months 3 months
b)	Setting up of a new business enterprise	Setting up of the Joint Stock Company. Delegation of the management of the water supply and wastewater services to the new set up operator.	6-9 months 3 months

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

Following the deadlines foreseen by legislation in force and taking into account the practical aspects of regionalisation of water supply and wastewater services, it can be stated that the whole process will coincide with Phase I of the feasibility study implementation (the Project). Once Phase II starts, the full regionalisation of water supply and wastewater services within the localities of the Cahul Rayon will be completed.

7.3 FOPIP

Because the process of regionalisation of water supply and wastewaters services requires a relatively long period of time comprising several stages that have to be completed in order to implement the institutional framework, active support of the national / local authorities is absolutely necessary to complete this process successfully.

Also, given the need for sequencing in the process of establishment of the regional operator, based on the existing services operator *ME 'Apa-Canal' Cahul*, 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

The design and construction of water supply and sewerage systems are important to be done in accordance with the national and EU environmental legislation and therefore, an assessment of the environmental impact (EIA) for all activities must be elaborated. As best practices, the environmental procedure is performed for each investment project and it is one of the most important aspects in the selection of the projects and the approval process for implementation.

There are specific aspects regarding the comparison between the investments in the water and sewerage sectors.

Investments in drinking water system may have:

- A positive impact: reducing the risk for the population's health;
- A negative impact: Exhaustion of surface water source (with impact on the consumers downstream) and of aquatic eco-systems. The impact on the groundwater level, with consequences for the biotope, the wet zones and for agriculture and fishing.

Investments for sewerage, treatment and discharge of wastewater may have:

- A positive impact: reducing the risk for the population's health and for the environment by the sewerage and treatment of wastewater;
- A negative impact: The impact of pollution of the recipient water body with wastewater that is insufficiently treated (massive flow of pollutants in the recipient water body and respectively impact on aquatic biotope and on downstream users, in case of inadequate treatment); the impact on the soil and subsoil (pollution of soil and groundwater due to the wastewater losses from the sewerage network and/or inadequately operated septic tanks.

Special attention should be given to projects, as in our case, for rehabilitation and/or extension of sewerage, treatment and discharge systems, which should be implemented, maintained and operated in such a way that the environmental impact is positive, as they could represent a potential risk source for the population's health or environment.

A checklist of potential environmental consequences of the activities related to the improvement of water supply and sanitation services is presented in the following table.

Table 8-1: Environmental aspects

Specific environmental conditions	The rayon of Cahul is located in the South part of the Republic of Moldova, at the border with Ukraine (South) and Romania (West). The landscape is made by small hills with altitudes ranging between 230-240 (Tigheni plateau) and 5-10 m (near Danube River). The climate is continental temperate. The region is considered the driest in Moldova, with 2-3 degrees Celsius higher temperatures. The annual precipitations amount to 400-550 mm and are not regular. The droughts are frequent. Circa 11.5% of the rayon is covered by forest. The river network formed by Prut and Danube create meanders, lagoons and natural lakes. The lakes Manta (21 km^2) and Beleu (11 km^2) are the biggest in Moldova. In Cahul is located the Natural Reserve Lower Prut. The population of the rayon is 125 thousands, with 39 thousand living in urban area.

A. CHECKLIST FOR ENVIRONMENTAL CONSEQUENCES (Y. M. N or B):			
Resource affected	**Type of effect or reason for effect**	**Occur-rence**	**Explanation**
Earth Resources	grading, trenching, or excavation in cubic meters or hectare; geologic hazards (faults, landslides, liquefaction, un-engineered fill, etc.); contaminated soils or ground water on the site offsite overburden/waste disposal or borrow pits required in cubic meters or tons; loss of high-quality farmlands in hectares;	Y	Volume 190,058 m^3 (The installation trench was considered 0.8m width, 1.5/2.5 m depth for W/WS respectively)
Agricultural and Agrochemical	impacts of inputs such as seeds and fertilizers; impact of production process on human health and environment; other adverse impacts;	N	NA
Industries	impacts of run-off and run-on water; impact of farming such as intensification or extensification; impact of other factors;	N	NA
Air Quality	substantial increase in onsite air pollutant emissions (construction/operation); violation of applicable air pollutant emissions or ambient concentration standards; substantial increase in vehicle traffic during construction or operation; demolition or blasting for construction; substantial increase in odor during construction or operation; substantial alteration of microclimate;	N	NA
Water Resources and Quality	river, stream or lake onsite or within 30 meters of construction; withdrawals from or discharges to surface or ground water; excavation or placing of fill, removing gravel from, a river, stream or lake; onsite storage of liquid fuels or hazardous materials in bulk quantities;	B	Extension of the sewerage collection system has a beneficial impact on surface water since it will lead to reduction of onsite latrines. Rehabilitation of water and wastewater lines will reduce the leaks/runoffs, soil erosion and contamination of surface waters.
Cultural Resources	prehistoric, historic, or paleontological resources within 30 meters of construction; site/facility with unique cultural or ethnic values;	N	NA
Biological Resources	vegetation removal or construction in wetlands or riparian areas in hectare; use of pesticides/rodenticides, insecticides, or herbicides in hectare; construction in or adjacent to a designated wildlife refuge;	N	NA
Planning and Land Use	potential conflict with adjacent land uses; non-compliance with existing codes, plans, permits or design factors; construction in national park or designated recreational area; create substantially annoying source of light or glare; relocation of >10 individuals for +6 months; interrupt necessary utility or municipal service >	N	NA

	10 individuals for +6 months; substantial loss of inefficient use of mineral or non-renewable resources; increase existing noise levels >5 decibels for +3 months;		
Traffic, Transportation and Circulation	increase vehicle trips >20% or cause substantial congestion; design features cause or contribute to safety hazards; inadequate access or emergency access for anticipated volume of people or traffic;	Y	Excavation in urban/rural area will cause traffic disruption. Access for emergency vehicles will be maintained.
Hazards	substantially increase risk of fire, explosion, or hazardous chemical release; bulk quantities of hazardous materials or fuels stored on site +3 months; create or substantially contribute to human health hazard;	N	NA
Other Issues (not covered above)	substantial adverse impact; adverse impact; minimal impact;	N	NA
B. Site specific social and gender elements (incl. no of kindergartens, schools, hospital, etc.)			
As a result of implementation of the PPC the access to water/wastewater systems will improve for 8 schools, 7 kindergartens and 3 health institutions (see Annex 2).			
C. Moldovan EIA requirements			
Based on the preliminary analysis, it has been concluded that the proposed concept does not require an environmental impact assessment. For detailed design phase, it is needed to prepare the required documentation for passing State Ecological Expertise.			
D. Operational policy requirements of World Bank			
Category C Project has minimal impacts on environment.			
E. European Union EIA directive requirements			
91/271/EC Directive for Wastewater, including definition of agglomeration 98/83/EC Directive regarding potable water			
F. Public consultations and disclosure requirements			
Public hearings are not needed, but informational campaigns are recommended, so that the population will accept easier the inconveniences due to excavation necessary for pipe installation. A good campaign will also focus on the benefits resulting from the extension of the services, and will iterate that the services need to be paid in order to be sustainable.			

Note: Y = Yes; N = No; M = Maybe; B = Beneficial.

Source: GIZ/MSPL

Result of the Environmental Assessment

An Environmental and Assessment (EA) was prepared in order to facilitate the implementation of the VPC Cahul and to ensure that the envisaged project components 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 components of the VPC Cahul. The EA is part of the Feasibility Study and is provided in Annex 8.

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 VPC Cahul is subject to a full scale EIA on the national level.

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

The environmental impacts of the proposed VPC Cahul have been assessed in this Environmental Assessment report. The results of analysing the environmental impacts and mitigation measures are presented in Annex 8 “Environmental impacts and mitigation measures”. Potential environmental impacts arising from the project along with a set of the mitigation measures to reduce the impacts to acceptable levels is provided.

The analysis reveals that the environmental impacts associated with the implementation of the VPC Cahul are site specific, small scale and mostly limited to the construction stage of the project components. 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 components of the VPC Cahul. 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 citizens of Cahul town and of the nearby villages of Cotihana, Crihana Veche, Manta and Pascani will benefit from the collection and treatment of the wastewater and provision of good quality drinking water. The Project will stimulate economic growth. Standard of individual and public health will improve as a result of the project and new job opportunities will be created.

9 Procurement strategy and implementation plan

9.1 General

The following chapter describes all actions for the procurement of services and works for a successful and efficient project implementation including an envisaged time schedule. The project measures for Cahul in Phase I 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 I measures are as follows:

- Technical Assistance components:
  - Design and Engineering for Phase I investments;
  - Corporate Development Program;
  - Stakeholder Participation Program;
  - Water Supply Network Analysis and Water Loss Reduction Programme;
  - Medium to Long-term Sanitation Study.
- Capital investments and goods:
  - Rehabilitation of 16.4 km water transmission main to the town of Cahul;
  - 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.

9.3 Procurement strategy

It is proposed to arrange procurement into four different contracts:

- Design & Engineering Contract;
- Works Contract;
- Supply Contract;
- Technical Assistance.

Design & Engineering Contract / Technical Assistance

Design and Engineering is proposed to be procured separately from the remaining Technical Assistance Tasks (Corporate Development Program, Stakeholder Participation Program, Water Supply Network Analysis and Water Loss Reduction Programme, Medium to Long-term Sanitation Study) as the requirements for the consulting company are different.

Capital investment and goods

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

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

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

Table 9-1: Summary cost breakdown per contract

N°	Component	Total project costs	Design & Engineering	Construction works	Supply of equipment	Technical assistance
1	Water supply					
1.1	Rehabilitation of 16.4 km water transmission main to the town of Cahul	4,001,600		4,001,600		
3	Equipment and tools for operational performance improvement (water supply and wastewater)	200,000			200,000	
4	Technical assistance					
4.1	Design and Engineering for Phase I investments (12% of investment costs)	504,192	504,192			
4.2	Technical assistance (Corporate Development Program, Stakeholder Participation Program, Water Supply Network Analysis and Water Loss Reduction Programme, Medium to Long-term Sanitation Study)	300,000				300,000
5	Contingencies (10 % of 1+2+3+4)	500,579	50,419	400,160	20,000	30,000
GT	Total costs for per contract	5,506,371	554,611	4,401,760	220,000	330,000

Table 9-2: Procurement plan

N°	Description	Estimated contract value[43], EUR	Contract type	Procurement method
1	Design and Engineering for Phase I investments	554,611	Consulting services	Competitive
2	Construction works: Rehabilitation and extension of water supply network and sewer network in Cahul Town	4,401,760	Works	Open
3	Supply of equipment for Operational performance improvement	220,000	Supply of goods	Shopping
4	Technical assistance: Corporate Development Program, Stakeholder Participation Program, Water Supply Network Analysis and Water Loss Reduction Programme, Medium to Long-term Sanitation Study	330,000	Consulting services	Competitive
GT	**Total Amount**	**5,506,371**		

9.4 Project implementation plan

9.4.1 Key steps of project implementation

Key steps in project implementation will be the following:

Concluding of funding arrangements

In order to conclude on the funding arrangements the following will be necessary:

- Agreement of all relevant stakeholders (i.e. local authorities, ministries, relevant funding institutions) on project volume, funding sources, financing plan;
- Conclusion of funding agreements as basis for project start.

Setting-up of project implementation structures

In order to establish a sound and efficient project steering and project management a proper project implementation structure shall be established by the client of the project (the Employer). The client will either[44] be the LPA Cahul, which is the owner of the assets or the ME 'Apa-Canal' Cahul, which manages and operates these assets. Further, relevant stakeholders shall be involved in the project implementation structure in order to have coordinated decisions and processes.

The project implementation shall be managed by a Project Manager (PM), appointed by the Employer.

The main tasks of a project implementation structure are:

- Establish adequate conditions for operation, location, and endowment;
- Selection of a qualified staff;
- Develop implementation plan for the project;
- Tendering process for services and works contracts;

[43] Including Contingencies.

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

- Monitor the implementation of the service and works contracts;
- Organize in due time all required licenses, permits and conclusions;
- Financial management and reporting;
- Maintain records for all the documents and communications;
- Monitor of disbursements and reporting to the funding institution.

Procurement and implementation of consulting services

The first key activity directly related with project implementation will be the timely and successful procurement of the required consulting services for detailed design, tendering and construction supervision of the identified rehabilitation works, supplies and their installation.

The steps 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.

Procurement and Implementation of works and supplies contracts

In cooperation with the Engineer the Employer (project implementation structure) will hold responsible for the procurement process for the works contracts comprising following steps:

- Invitation for tendering and issuing of tender documents;
- Tender period;
- Receiving of bids;
- Bid evaluation and preparation of evaluation report;
- Contract award for work contracts;
- Implementation of works contract;
- Defects liability period.

Project monitoring and evaluation

Project monitoring during implementation of the project and internal as well as external evaluation at the end of the project implementation period shall be carried out.

- Monitoring is an instrument for systematic collection of data on specific indicators to provide the management and the main stakeholder relevant information on the project progress and the achievement of objectives;
- Evaluation is the systematic and objective assessment of the on-going or completed project, its design, implementation and results. The aim is to determine the relevance and fulfilment of objectives, development efficiency, effectiveness, impact and sustainability.

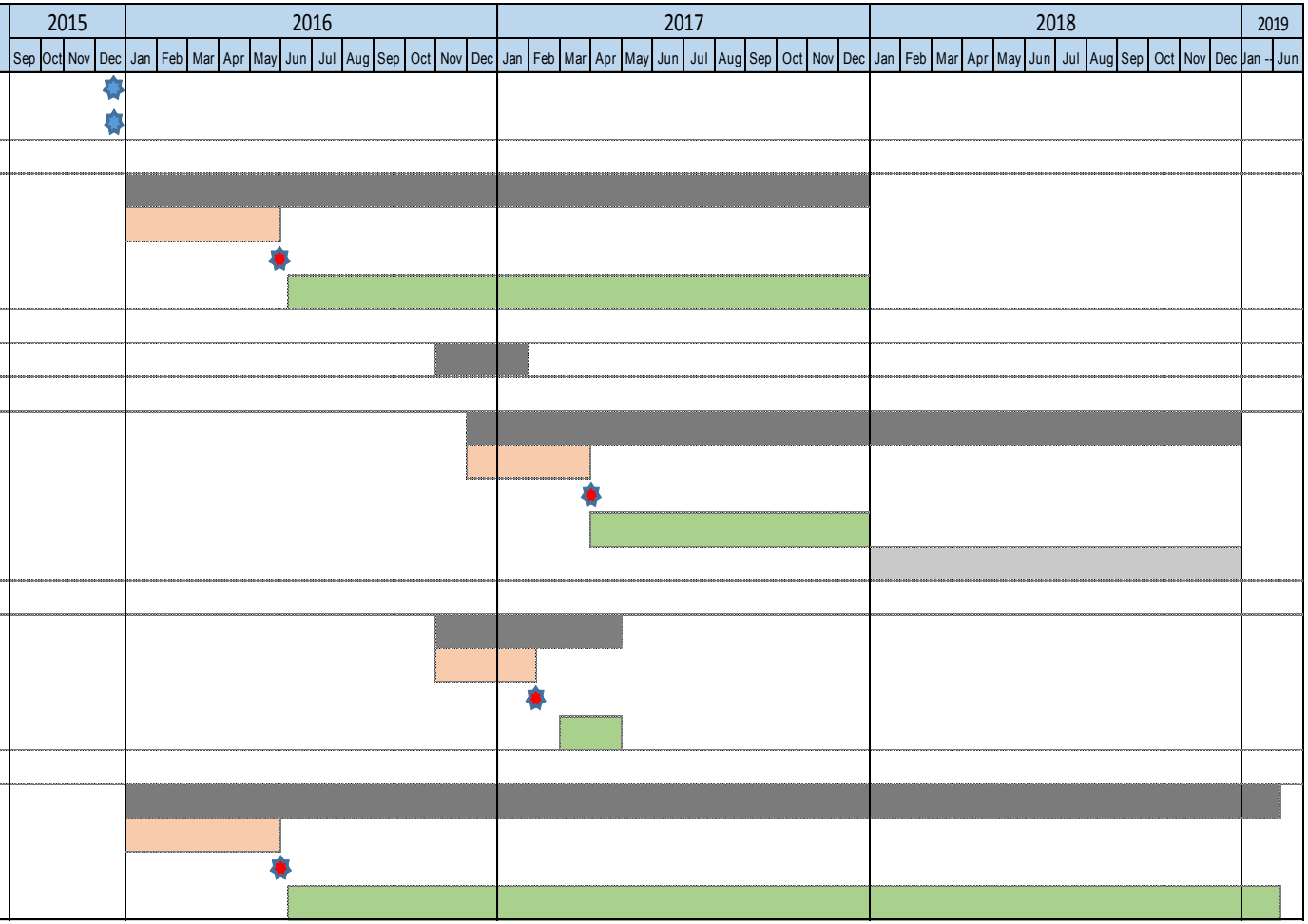
For both instruments the setting of targets and indicators as well as the methodology and administration of data collection need to be organized.

9.4.2 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

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[45].

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[46]."

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[47]". 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 on the water demand and wastewater flow projection;
- The connection rate to the water systems will increase as a result of the investments and technical assistance;

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

[46] Ibid., p 69.

[47] Ibid., p. 71.

- The operators will implement unified tariffs for the entire area of their operations;
- As a target for the tariff strategy, we have considered that the affordability ratio should be somewhere between 3% and 3.5% of average household income.

It is also assumed that the local authorities, as owners of the assets operated by the target water utility will commit themselves to support the implementation of the Project and the Priority Investment Programme.

It is finally assumed that the sensitivity analysis covers overall changes in investment costs, operating costs and revenues, and the overall impacts of these changes on project effectiveness. Specific aspects of risk are covered in the following risk matrix.

10.3 Identification of adverse events and risks

As an input to the risk matrix, a list of adverse events to which the project is exposed needs to be developed. The following list is offered, together with a brief description of each risk:

- Political and policy risks, including:
  - Political risk from national and local elections – possibly delaying key decisions and policy changes;
  - Political risk from interference in day-to-day operations – causing both instability and delay in implementing day to day operational decisions;
  - Financial crisis at national level – limiting domestic financing sources;
  - Legal and regulatory framework – sectoral policy: delays in establishment of new tariff policy for the regional and local water companies by the National Agency for Energy Regulation (ANRE);
  - Legal and regulatory framework – sectoral policy: Lack of regulation regarding the elaboration of PAAS (Water Supply and Sanitation plans);
  - Legal and regulatory framework – sectoral policy: Lack of legal framework on ownership of land and public infrastructure at the regional level.
- Institutional risks, including:
  - Limited understanding of functioning of commercial companies – raising risk that the operator will not make necessary improvements to improve and expand its services;
  - Operator size – operators are rather small in Moldova, making regionalization of services difficult;
  - Institutional capacity – weak institutional capacity on the operational level in Water Supply and Sanitation (WSS), including financial weaknesses of the institutions to attract investments, manage assets, as well as provide quality services to the population;
  - Institutional capacity – ongoing and delayed decentralization process which leads to uncertainty in the WSS sector and artificial fragmentation of the areas managed by the specialized institutions;
  - Institutional capacity – financial weakness of the institutions which increases the perceived risks of making investments in WSS.
- Operational risks, including:
  - Lack of connection by customers when networks extended – raising the risks that revenues will not be realised;

  - Lack of reliable data collection and recording on the part of the operator – increasing the number of assumptions required in any study, thus raising the uncertainty, as well as reducing the likelihood that project impacts will be properly tracked in the future;
  - Delay in obtaining the construction permits due to delay in submission or approval by the local authorities.
- Financial risks, including:
  - Low financial absorption capacity at national and local level;
  - Lack of expressed co-financing commitment from donors for priority projects;
  - Lower number of actual consumers than estimated after the investment implementation;
  - Political interference in tariff adjustments.
- Project implementation and management risks, including:
  - Insufficient technical expertise at local level that creates serious difficulties in supplementing project teams with qualified staff;
  - Insufficient project management and implementation experience at local level;
  - Construction delays;
  - Cost overruns;
  - Outdated construction standards of materials and technologies applied for design and project implementation.

10.3.1 Risk matrix

The risk matrix is presented in the following tables.

Key:

Probability of occurrence: A. Very unlikely (0–10 % probability); B. Unlikely (10–33 % probability); C. About as likely as not (33–66% probability); D. Likely (66–90% probability); E. Very likely (90–100% probability).

Severity of impact: I – No relevant effect on social welfare, even without remedial actions.; II – Minor loss of the social welfare generated by the project, minimally affecting the project long run effects- However, remedial or corrective actions are needed.; III – Moderate: social welfare loss generated by the project, mostly financial damage, even in the medium-long run. Remedial actions may correct the problem; IV – Critical: High social welfare loss generated by the project; the occurrence of the risk causes a loss of the primary function(s) of the project. Remedial actions, even large in scope, are not enough to avoid serious damage; V Catastrophic: Project failure that may result in serious or even total loss of the project functions.

Table 10-1: Risk matrix, political and policy risks

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
Delay in key decisions and policy changes	n/a	National and/or local elections	Reduced project efficiency	Medium	Delay in establishing positive cash flow	D	III	High	Intensify work within partner systems to ensure policy decisions are taken in a timely manner and followed by subsequent regimes	High, but cannot be modelled
Instability and delay in implementing day to day operational decisions	Operating costs	Political interference in day-to-day operations	Reduced project efficiency	Medium	Negative	C	III	Moderate	Corporate development programme as part of technical assistance	Low to moderate
Limited availability of domestic financing sources	n/a	Financial crisis at national level	Delay in project start	Short	Delay in establishing positive cash flow and benefits to public	E	IV	Very high	Policy recommendations at national level to consolidate funding sources. Supporting unified policy to external donors	Moderate
Unclear tariff regime	Operating revenues	Delays in establishment of new tariff policy for the regional and local water companies	Reduced project efficiency and financial stability of operator	Medium	Negative	C	III	Moderate	Policy recommendations at national level; Corporate development programme as part of technical assistance	Low to moderate
Planning uncertainty	n/a	Lack of regulation regarding the elaboration of PAAS (Water Supply and Sanitation	Reduced project efficiency; project not meeting local	Medium to long-term	Negative	C	III	Moderate	Regional sector programmes; intensive cooperation with local partners to identify needs; Corporate development programme	Low

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
		plans)	needs						as part of technical assistance	
Uncertainty in ownership of assets at regional operator	n/a	Lack of legal framework on ownership of land and public infrastructure at the regional level	Reduced project efficiency and financial stability of operator	Medium to long-term	Negative	B	III	Moderate	Corporate development programme as part of technical assistance; Road map for establishment of regional operator	Low

Table 10-2: Risk matrix, institutional risks

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
AC will not make necessary improvements to improve and expand its services	Operating revenues	Limited understanding of functioning of commercial companies	Reduced operator efficiency; delays in provision of improved services	Medium to long-term	Negative	C	III	Moderate	Corporate development programme as part of technical assistance; Road map for establishment of regional operator	Low to moderate
Regionalization of services will not be achieved	Operating revenues	Small existing operators; lack of national level policy guidance	Reduced operator efficiency; delays in provision of improved services	Medium to long-term	Negative	C	III	Moderate	Corporate development programme as part of technical assistance; Road map for es-	Low to moderate

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
									tablishment of regional operator; National level policy advise	
Expansion of higher quality services is delayed	n/a	Weak institutional capacity on the operational level in WSS, including financial weaknesses of the institutions to attract investments, manage investments, as well as provide quality services to the population	Delay in project start	Short	Delay in establishing positive cash flow and benefits to public	E	IV	Very high	Policy recommendations at national level to consolidate funding sources. Supporting unified policy to external donors	Moderate
Unclear tariff regime ongoing and delayed decentralization process which leads to uncertainty in WSS sector and artificial fragmentation of the areas managed by the specialized institutions	Operating revenues	Delays in establishment of new tariff policy for the regional and local water companies ongoing and delayed decentralization process which leads to uncertainty in WSS sector and artificial frag-	Reduced project efficiency and financial stability of operator	Medium	Negative	C	III	Moderate	Policy recommendations at national level; Corporate development programme as part of technical assistance	Low to moderate

Adverse event	Variable	Causes	Effect	Timing (short, medium, long-term)	Effect on cash flows	Probability	Severity	Risk level	Prevention and/or mitigation measures	Residual risk
		mentation of the areas managed by the specialized institutions								
Planning uncertainty financial weakness of the institutions which increases the perceived risks of making investments in WSS	n/a	financial weakness of the institutions which increases the perceived risks of making investments in WSS	Reduced project efficiency; project not meeting needs	Medium and long-term	Negative	C	III	Moderate	Regional sector programmes; intensive cooperation with local partners to identify needs; Corporate development programme as part of technical assistance	Low
Uncertainty in ownership of assets at regional operator	n/a	Lack of legal framework on ownership of land and public infrastructure at the regional level	Delays in implementation; depreciation not calculated in tariff	Short to medium-term	Negative	B	III	Moderate	Corporate development programme as part of technical assistance	Low

Table 10-3: Risk matrix, financial risks

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

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

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

Table 10-5: Risk level

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

10.3.2 Interpretation of risk matrix

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

The main mitigation measures are related to lobbying within partner systems (work with line ministries), establishment and assistance to a Project Implementation Unit, and technical assistance to the WSS operator through a corporate development programme. The corporate development programme is described in Chapter 5.6.5 – Technical Assistance.

Annexes

Annex 3	Legal and regulatory framework
Annex 5	Investment Programme
Annex 6	Financial and economic analysis
Annex 7	Institutional development
Annex 8	Environmental impacts and mitigation measures
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 5

Investment Programme

Annex 5: Investment Programme

Annex 5-1: Water demand projection

N°	Parameter	Unit	2014*	2015	2016	2017	2018**	2019	2020	2021***	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	**Population in the project area served with water**																																	
1.1	Total population serviced	N°	40,686	40,686	40,695	40,701	44,455	44,444	44,430	46,580	46,747	46,913	47,077	47,240	47,401	47,561	47,720	47,877	48,033	48,110	48,185	48,258	48,328	48,397	48,464	48,528	48,591	48,652	48,710	48,767	48,822	48,874	48,925	48,974
1.2	In urban settlements	N°	37,738	37,738	37,752	37,767	37,781	37,795	37,810	39,138	39,214	39,291	39,368	39,445	39,522	39,599	39,677	39,754	39,831	39,842	39,854	39,865	39,876	39,888	39,899	39,911	39,922	39,933	39,945	39,956	39,967	39,979	39,990	40,002
1.3	In rural settlements	N°	2,948	2,948	2,942	2,934	6,674	6,648	6,620	7,443	7,533	7,621	7,708	7,794	7,879	7,962	8,043	8,124	8,203	8,268	8,331	8,392	8,452	8,509	8,564	8,618	8,669	8,718	8,766	8,811	8,854	8,896	8,935	8,972
2	**Volume of water sold in total and disaggr. for different consumers**																																	
2.1	Total volume sold	m³/y	947,300	1,020,525	1,058,150	1,095,760	1,189,782	1,229,936	1,270,047	1,366,384	1,412,486	1,458,842	1,505,447	1,552,299	1,599,395	1,646,732	1,694,306	1,742,115	1,790,156	1,821,690	1,853,265	1,884,876	1,916,521	1,948,196	1,979,897	2,011,621	2,043,365	2,075,124	2,106,896	2,138,676	2,170,461	2,202,248	2,234,034	2,265,813
2.2	Domestic customers	m³/y	791,300	848,968	874,295	899,603	974,789	1,002,068	1,029,307	1,102,586	1,134,576	1,166,746	1,199,093	1,231,615	1,264,309	1,297,173	1,330,204	1,363,401	1,396,760	1,427,952	1,459,191	1,490,475	1,521,800	1,553,162	1,584,557	1,615,983	1,647,435	1,678,911	1,710,406	1,741,917	1,773,440	1,804,973	1,836,511	1,868,051
2.3	Industrial customers	m³/y	114,300	120,111	125,927	131,746	137,570	143,398	149,230	160,452	166,759	173,090	179,445	185,824	192,226	198,653	205,103	211,576	218,074	216,136	214,199	212,261	210,323	208,386	206,448	204,510	202,572	200,635	198,697	196,759	194,822	192,884	190,946	189,009
2.4	Institutional customers	m³/y	41,700	51,446	57,929	64,410	77,422	84,470	91,510	103,346	111,151	119,006	126,909	134,861	142,860	150,907	158,999	167,138	175,322	175,602	175,875	176,140	176,398	176,649	176,892	177,128	177,357	177,579	177,793	178,000	178,199	178,392	178,577	178,754
3	**Total water sold disaggr. for urban and rural areas**																																	
3.1	Urban Settlements	m³/y	947,668	982,777	1,018,279	1,053,807	1,089,359	1,124,934	1,160,532	1,237,704	1,276,618	1,315,676	1,354,878	1,394,226	1,433,718	1,473,355	1,513,137	1,553,064	1,593,137	1,618,234	1,643,346	1,668,472	1,693,611	1,718,765	1,743,933	1,769,115	1,794,311	1,819,521	1,844,745	1,869,983	1,895,236	1,920,502	1,945,782	1,971,077
3.2	Rural settlements	m³/y	35,544	37,748	39,871	41,953	100,423	105,002	109,515	128,679	135,869	143,166	150,569	158,074	165,677	173,377	181,169	189,051	197,019	203,456	209,919	216,404	222,910	229,431	235,964	242,507	249,054	255,603	262,151	268,693	275,226	281,747	288,251	294,737
4	**Non-Revenue Water (NRW) volume dissagregated for total NRW, apparent losses, and real losses**																																	
4.1	Total NRW	m³/y	1,101,119	1,186,234	1,224,872	1,263,153	1,118,003	1,123,609	1,127,960	1,179,688	1,185,424	1,190,042	1,193,572	1,196,042	1,197,481	1,197,916	1,197,370	1,195,870	1,193,437	1,181,096	1,168,362	1,155,247	1,141,757	1,127,903	1,113,692	1,099,133	1,084,234	1,069,003	1,053,448	1,037,575	1,021,394	1,004,910	988,130	971,063
4.2	Apparent losses	m³/y	338,984	365,187	375,450	385,496	374,758	379,759	384,458	405,567	411,143	416,475	421,571	426,438	431,081	435,507	439,722	443,731	447,539	430,399	412,956	395,216	377,188	358,878	340,295	321,445	302,335	282,971	263,362	243,513	223,430	203,120	182,589	161,844
4.3	Real losses (physical losses)	m³/y	762,135	821,047	849,421	877,657	743,245	743,850	743,502	774,121	774,282	773,567	772,001	769,605	766,400	762,408	757,648	752,139	745,898	750,696	755,407	760,031	764,570	769,025	773,397	777,689	781,900	786,032	790,086	794,063	797,964	801,790	805,541	809,219
5	**The water demand figures considering the demand variation factors**																																	
5.1	Yearly water demand/production	m³/y	2,048,419	2,206,759	2,283,022	2,358,913	2,307,785	2,353,544	2,398,007	2,546,072	2,597,911	2,648,884	2,699,019	2,748,342	2,796,877	2,844,647	2,891,676	2,937,985	2,983,594	3,002,786	3,021,627	3,040,123	3,058,278	3,076,099	3,093,589	3,110,755	3,127,599	3,144,128	3,160,344	3,176,251	3,191,855	3,207,158	3,222,164	3,236,876
5.2	Average daily water demand	m³/d	5,612	6,046	6,255	6,463	6,323	6,448	6,570	6,976	7,118	7,257	7,395	7,530	7,663	7,794	7,922	8,049	8,174	8,227	8,278	8,329	8,379	8,428	8,476	8,523	8,569	8,614	8,658	8,702	8,745	8,787	8,828	8,868
5.3	Maximum daily water demand	m³/d	5,872	6,326	6,545	6,763	6,649	6,785	6,918	7,350	7,505	7,657	7,807	7,955	8,101	8,245	8,387	8,527	8,665	8,726	8,786	8,846	8,904	8,961	9,018	9,074	9,129	9,183	9,236	9,288	9,339	9,390	9,440	9,489
5.4	Average hourly water demand	m³/h	234	252	261	269	263	269	274	291	297	302	308	314	319	325	330	335	341	343	345	347	349	351	353	355	357	359	361	363	364	366	368	370
5.5	Max. hourly water demand	m³/h	352	379	392	406	411	422	432	461	472	484	495	507	518	530	541	552	563	569	576	582	588	594	600	605	611	617	623	629	634	640	646	651

*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°	24,933	24,933	24,942	24,952	24,961	24,971	24,980	34,670	35,295	35,927	36,565	37,208	37,858	38,513	39,175	39,842	40,515	40,802	41,091	41,381	41,674	41,969	42,267	42,566	42,867	43,171	43,476	43,784	44,094	44,405	44,719	45,035
1.2	In urban settlements	N°	24,933	24,933	24,942	24,952	24,961	24,971	24,980	31,819	32,265	32,711	33,158	33,605	34,053	34,501	34,950	35,398	35,848	35,991	36,134	36,277	36,420	36,564	36,707	36,851	36,994	37,138	37,282	37,425	37,569	37,713	37,857	38,001
1.3	In rural settlements	N°	0	0	0	0	0	0	0	2,851	3,030	3,216	3,407	3,603	3,805	4,012	4,225	4,443	4,667	4,811	4,957	5,104	5,254	5,406	5,559	5,715	5,873	6,033	6,194	6,358	6,524	6,692	6,862	7,034
2	**Volume of wastewater charged in total and disaggr. for different customers**																																	
2.1	Total volume of wastewater gen.	m³/y	734,200	748,956	763,723	778,498	793,283	808,077	822,879	1,115,909	1,154,959	1,194,915	1,235,789	1,277,593	1,320,342	1,364,048	1,408,725	1,454,385	1,501,043	1,538,131	1,575,644	1,613,584	1,651,956	1,690,763	1,730,009	1,769,697	1,809,832	1,850,417	1,891,455	1,932,951	1,974,909	2,017,331	2,060,222	2,103,586
2.2	by domestic customers	m³/y	458,300	475,980	493,673	511,379	529,096	546,826	564,566	784,423	821,958	860,430	899,852	940,232	981,583	1,023,913	1,067,235	1,111,559	1,156,895	1,192,155	1,227,830	1,263,925	1,300,443	1,337,388	1,374,764	1,412,574	1,450,823	1,489,514	1,528,650	1,568,236	1,608,275	1,648,771	1,689,728	1,731,149
2.3	by industrial customers	m³/y	231,600	225,741	219,877	214,008	208,134	202,254	196,370	242,537	238,238	233,729	229,010	224,081	218,941	213,589	208,027	202,253	196,267	197,050	197,833	198,617	199,402	200,187	200,972	201,758	202,544	203,330	204,117	204,905	205,692	206,481	207,269	208,058
2.4	by Institutional customers	m³/y	44,300	47,235	50,172	53,112	56,054	58,997	61,943	88,949	94,764	100,756	106,927	113,280	119,819	126,546	133,463	140,574	147,881	148,927	149,981	151,042	152,112	153,189	154,273	155,365	156,465	157,573	158,688	159,811	160,941	162,080	163,226	164,379
3	**Total wastewater charged disaggr. for urban and rural areas**																																	
3.1	in urban Settlements	m³/y	734,200	748,956	763,723	778,498	793,283	808,077	822,879	1,066,621	1,100,298	1,134,507	1,169,249	1,204,525	1,240,335	1,276,680	1,313,561	1,350,979	1,388,933	1,419,741	1,450,752	1,481,967	1,513,387	1,545,010	1,576,839	1,608,872	1,641,109	1,673,552	1,706,200	1,739,053	1,772,112	1,805,377	1,838,847	1,872,523
3.2	in rural settlements	m³/y	0	0	0	0	0	0	0	49,287	54,661	60,408	66,539	73,068	80,007	87,368	95,164	103,407	112,109	118,391	124,892	131,617	138,570	145,753	153,170	160,826	168,722	176,864	185,255	193,898	202,796	211,954	221,375	231,063
4	**The sewer infiltration water based on the determined infiltration rate**																																	
4.1	**Sewer Infiltration water**	m³/y	367,100	365,116	362,768	360,056	356,978	282,827	205,720	167,386	173,244	179,237	185,368	191,639	198,051	204,607	211,309	218,158	225,156	230,720	236,347	242,038	247,793	253,614	259,501	265,455	271,475	277,562	283,718	289,943	296,236	302,600	309,033	315,538
5	**The wastewater generation figures considering the variation factors**																																	
5.1	Avg. wastewater flow (dry weather)	m³/y	1,101,300	1,114,072	1,126,491	1,138,554	1,150,261	1,090,904	1,028,599	1,283,295	1,328,203	1,374,152	1,421,157	1,469,232	1,518,393	1,568,656	1,620,034	1,672,543	1,726,199	1,768,851	1,811,991	1,855,622	1,899,750	1,944,377	1,989,510	2,035,152	2,081,307	2,127,979	2,175,173	2,222,894	2,271,145	2,319,931	2,369,256	2,419,124
5.2	Max. daily dry weather flow (Qdmax)	m³/d	3,218	3,257	3,296	3,333	3,369	3,210	3,044	3,822	3,955	4,092	4,232	4,375	4,522	4,671	4,824	4,981	5,141	5,268	5,396	5,526	5,657	5,790	5,925	6,061	6,198	6,337	6,478	6,620	6,763	6,909	7,056	7,204
5.3	Max. hourly dry weather flow (QDW	m³/h	217	220	224	227	230	225	220	285	295	306	316	327	338	349	360	372	384	393	403	413	422	432	442	453	463	473	484	494	505	516	527	538
5.4	Max. hourly Storm Water Flow (QS	m³/h	282	286	291	295	299	293	286	371	384	397	411	425	439	453	468	483	499	511	524	536	549	562	575	588	602	615	629	643	656	671	685	699
6	**Population equivalents in total and disaggr, for different customers**																																	
6.1	Total population equivalent	PE_{60}	27,767	27,737	27,717	27,696	27,676	27,655	27,634	38,075	38,717	39,364	40,016	40,674	41,338	42,008	42,683	43,364	44,051	44,356	44,664	44,974	45,286	45,600	45,916	46,235	46,556	46,879	47,204	47,531	47,860	48,192	48,526	48,862
6.2	by domestic customers	PE_{60}	24,933	24,933	24,942	24,952	24,961	24,971	24,980	34,670	35,295	35,927	36,565	37,208	37,858	38,513	39,175	39,842	40,515	40,802	41,091	41,381	41,674	41,969	42,267	42,566	42,867	43,171	43,476	43,784	44,094	44,405	44,719	45,035
6.3	by Industrial and instit. customers	PE_{60}	2,835	2,805	2,774	2,744	2,714	2,684	2,654	3,406	3,421	3,436	3,451	3,466	3,480	3,495	3,508	3,522	3,536	3,555	3,573	3,592	3,611	3,631	3,650	3,669	3,688	3,708	3,727	3,747	3,767	3,787	3,806	3,826
7	**Pollution load – BOD in total and disaggr, for different customers**																																	
7.1	The total BOD_5 load	kg/d	1,666	1,664	1,663	1,662	1,661	1,659	1,658	2,285	2,323	2,362	2,401	2,440	2,480	2,520	2,561	2,602	2,643	2,661	2,680	2,698	2,717	2,736	2,755	2,774	2,793	2,813	2,832	2,852	2,872	2,892	2,912	2,932
7.2	by domestic customers	kg/d	1,496	1,496	1,497	1,497	1,498	1,498	1,499	2,080	2,118	2,156	2,194	2,232	2,271	2,311	2,350	2,391	2,431	2,448	2,465	2,483	2,500	2,518	2,536	2,554	2,572	2,590	2,609	2,627	2,646	2,664	2,683	2,702
7.3	by industrial and instit. customers	kg/d	170	168	166	165	163	161	159	204	205	206	207	208	209	210	211	211	212	213	214	216	217	218	219	220	221	222	224	225	226	227	228	230

*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	Cahul	95%	95%	95%	95%	95%	95%	95%	99%	99%	99%	99%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2	Cotihana	34%	34%	34%	34%	34%	34%	34%	70%	71%	72%	73%	74%	75%	77%	78%	80%	81%	82%	83%	85%	86%	87%	88%	90%	91%	92%	94%	95%	96%	97%	99%	100%
3	Crihana Veche	56%	56%	56%	56%	60%	60%	60%	65%	66%	67%	69%	70%	72%	73%	75%	76%	78%	79%	81%	82%	84%	85%	87%	88%	90%	91%	93%	94%	95%	97%	98%	100%
4	Manta	0%	0%	0%	0%	70%	70%	70%	73%	74%	75%	76%	78%	79%	80%	81%	82%	83%	84%	86%	87%	88%	89%	90%	91%	92%	93%	94%	95%	97%	98%	99%	100%
5	Pascani	0%	0%	0%	0%	70%	70%	70%	73%	74%	75%	76%	78%	79%	80%	81%	82%	83%	84%	86%	87%	88%	89%	90%	91%	92%	93%	94%	95%	97%	98%	99%	100%
TOT	**Total**	**80%**	**80%**	**80%**	**81%**	**88%**	**88%**	**88%**	**92%**	**93%**	**93%**	**94%**	**94%**	**94%**	**95%**	**95%**	**96%**	**96%**	**96%**	**97%**	**97%**	**97%**	**97%**	**98%**	**98%**	**98%**	**98%**	**99%**	**99%**	**99%**	**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	Cahul	37,738	37,738	37,752	37,767	37,781	37,795	37,810	39,138	39,214	39,291	39,368	39,445	39,522	39,599	39,677	39,754	39,831	39,842	39,854	39,865	39,876	39,888	39,899	39,911	39,922	39,933	39,945	39,956	39,967	39,979	39,990	40,002
2	Cotihana	479	479	478	477	475	474	472	962	973	984	994	1,005	1,016	1,026	1,037	1,048	1,059	1,068	1,076	1,083	1,091	1,098	1,105	1,112	1,118	1,125	1,131	1,136	1,142	1,147	1,152	1,157
3	Crihana Veche	2,469	2,469	2,464	2,457	2,635	2,625	2,614	2,793	2,840	2,885	2,930	2,974	3,018	3,060	3,102	3,143	3,183	3,218	3,252	3,286	3,318	3,350	3,380	3,410	3,439	3,466	3,493	3,519	3,544	3,568	3,591	3,613
4	Manta	0	0	0	0	2,829	2,818	2,806	2,926	2,953	2,978	3,004	3,028	3,052	3,076	3,099	3,122	3,144	3,161	3,178	3,194	3,209	3,224	3,238	3,251	3,264	3,276	3,288	3,299	3,309	3,318	3,327	3,335
5	Pascani	0	0	0	0	735	732	729	760	767	774	780	787	793	799	805	811	817	821	826	830	834	838	841	845	848	851	854	857	860	862	864	867
TOT	**Total**	**40,686**	**40,686**	**40,695**	**40,701**	**44,455**	**44,444**	**44,430**	**46,580**	**46,747**	**46,913**	**47,077**	**47,240**	**47,401**	**47,561**	**47,720**	**47,877**	**48,033**	**48,110**	**48,185**	**48,258**	**48,328**	**48,397**	**48,464**	**48,528**	**48,591**	**48,652**	**48,710**	**48,767**	**48,822**	**48,874**	**48,925**	**48,974**

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	Cahul	63	63	63	63	63	63	63	80	81	82	83	85	86	87	88	89	90	90	91	91	91	92	92	92	93	93	93	94	94	94	95	95
2	Cotihana	0	0	0	0	0	0	0	0	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	Crihana Veche	0	0	0	0	0	0	0	34	36	38	40	42	44	47	49	52	55	57	59	61	63	65	67	69	72	74	77	79	82	84	87	90
4	Manta	0	0	0	0	0	0	0	24	26	29	31	34	36	39	42	45	49	51	53	56	58	61	63	66	68	71	74	77	80	83	87	90
5	Pascani	0	0	0	0	0	0	0	42	44	46	48	50	52	54	56	58	60	62	64	66	67	69	71	73	75	77	79	81	83	85	88	90
TOT	**Total**	**49**	**49**	**49**	**49**	**49**	**49**	**49**	**69**	**70**	**71**	**73**	**74**	**75**	**77**	**78**	**80**	**81**	**82**	**82**	**83**	**84**	**85**	**85**	**86**	**87**	**87**	**88**	**89**	**90**	**90**	**91**	**92**

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	Cahul	24,933	24,933	24,942	24,952	24,961	24,971	24,980	31,819	32,265	32,711	33,158	33,605	34,053	34,501	34,950	35,398	35,848	35,991	36,134	36,277	36,420	36,564	36,707	36,851	36,994	37,138	37,282	37,425	37,569	37,713	37,857	38,001
2	Cotihana	0	0	0	0	0	0	0	0	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	Crihana Veche	0	0	0	0	0	0	0	1,451	1,530	1,612	1,696	1,781	1,868	1,957	2,049	2,142	2,236	2,298	2,361	2,425	2,490	2,555	2,621	2,688	2,756	2,824	2,893	2,964	3,034	3,106	3,179	3,252
4	Manta	0	0	0	0	0	0	0	961	1,044	1,132	1,222	1,317	1,414	1,516	1,621	1,729	1,841	1,910	1,980	2,052	2,124	2,198	2,273	2,349	2,427	2,505	2,585	2,666	2,748	2,832	2,916	3,002
5	Pascani	0	0	0	0	0	0	0	439	456	472	489	505	522	539	556	573	590	603	615	628	640	653	665	678	691	703	716	729	741	754	767	780
TOT	**Total**	**24,933**	**24,933**	**24,942**	**24,952**	**24,961**	**24,971**	**24,980**	**34,670**	**35,295**	**35,927**	**36,565**	**37,208**	**37,858**	**38,513**	**39,175**	**39,842**	**40,515**	**40,802**	**41,091**	**41,381**	**41,674**	**41,969**	**42,267**	**42,566**	**42,867**	**43,171**	**43,476**	**43,784**	**44,094**	**44,405**	**44,719**	**45,035**

Annex 6

Financial and economic analysis

Annex 6: Financial and economic analysis

Table 6-1: Macroeconomic forecast

Table 1. Macroeconomic forecast	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	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	37.0%	1.0%	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	37.0%	1.0%	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	37.0%	1.8%	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	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%	1.0%

	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
	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 – water, M MDL

			TOTAL	1	2	3	4	5
Equipment and tools		MDL M	4.00	0.40	2.00	1.60		
Pipelines		MDL M	80.03	8.00	40.02	32.01		
Water towers								
TOTAL Construction and installation costs		**MDL M**	**84.03**	**8.40**	**42.02**	**33.61**	**0.00**	**0.00**
Design and engineering		MDL M	10.08	1.01	5.04	4.03	0.00	0.00
Technical assistance		MDL M	6.00	0.60	3.00	2.40	0.00	0.00
Contingencies		MDL M	10.01	1.00	5.01	4.00	0.00	0.00
Subtotal water		**MDL M**	**110.13**	**11.01**	**55.06**	**44.05**	**0.00**	**0.00**

Table 6-3: Depreciation rates for water

		years	%
1	Pipelines	50	2.0%
2	Water towers	16	6.3%
3	Reservoirs	20	5.0%
4	Pumping stations	16	6.3%
5	Equipment and tools	10	10.0%
6	Water treatment plant	10	10.0%
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, MDL M

			1	2	3	4	5	6
1	Pipelines	MDL M	8.0	40.0	32.0	0.0	0.0	0.0
2	Water towers	MDL M	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
4	Pumping stations	MDL M	0.0	0.0	0.0	0.0	0.0	0.0
5	Equipment and tools	MDL M	0.0	0.0	0.0	0.0	0.0	0.0
6	Water treatment plant	MDL M	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
8	Technical assistance	MDL M	1.6	8.0	6.4	0.0	0.0	0.0
9	Contingency	MDL M	1.0	5.0	4.0	0.0	0.0	0.0
		MDL M	10.6	53.1	42.5	0.0	0.0	0.0

Table 6-5: Depreciation for water

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Pipelines	MDL M		0.2	1.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Water treatment plant	MDL M		0.0	0.0	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	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	TOTAL Depreciation costs	MDL M	**0.0**	**0.2**	**1.3**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Pipelines	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
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Water treatment plant	MDL M	0.0	0.0	0.0	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	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	TOTAL Depreciation costs	MDL M	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**

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

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Pipelines	MDL M	8.0	48.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Water treatment plant	MDL M	0.0	0.0	0.0	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	1.6	9.7	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1
9	Contingency	MDL M	1.0	6.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	TOTAL	MDL M	**10.6**	**63.7**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Pipelines	MDL M	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Water treatment plant	MDL M	0.0	0.0	0.0	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	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1
9	Contingency	MDL M	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	TOTAL	MDL M	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**	**106.1**

Table 6-7: Net assets for water

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Pipelines	MDL M	8.0	47.9	78.9	77.3	75.7	74.1	72.5	70.9	69.3	67.7	66.1	64.5	62.9	61.3	59.7
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Water treatment plant	MDL M	0.0	0.0	0.0	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	1.6	9.6	15.9	15.5	15.2	14.9	14.6	14.3	13.9	13.6	13.3	13.0	12.6	12.3	12.0
9	Contingency	MDL M	1.0	6.0	9.9	9.7	9.5	9.3	9.1	8.9	8.7	8.5	8.3	8.1	7.9	7.7	7.5
	TOTAL	MDL M	**10.6**	**63.5**	**104.6**	**102.5**	**100.4**	**98.3**	**96.2**	**94.0**	**91.9**	**89.8**	**87.7**	**85.5**	**83.4**	**81.3**	**79.2**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Pipelines	MDL M	58.1	56.5	54.9	53.3	51.7	50.1	48.5	46.9	45.3	43.7	42.1	40.5	38.9	37.3	35.7
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Water treatment plant	MDL M	0.0	0.0	0.0	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	11.7	11.4	11.0	10.7	10.4	10.1	9.7	9.4	9.1	8.8	8.5	8.1	7.8	7.5	7.2
9	Contingency	MDL M	7.3	7.1	6.9	6.7	6.5	6.3	6.1	5.9	5.7	5.5	5.3	5.1	4.9	4.7	4.5
	TOTAL	MDL M	**77.0**	**74.9**	**72.8**	**70.7**	**68.6**	**66.4**	**64.3**	**62.2**	**60.1**	**57.9**	**55.8**	**53.7**	**51.6**	**49.5**	**47.3**

Table 6-8: Depreciation costs for water

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Pipelines	MDL M		0.2	1.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Water treatment plant	MDL M		0.0	0.0	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	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	TOTAL	**MDL M**		**0.2**	**1.3**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Pipelines	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
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Water treatment plant	MDL M	0.0	0.0	0.0	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	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	TOTAL	**MDL M**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**

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	3.26	3.41	3.56	3.52	3.62	3.73	3.97	4.17	4.38	4.60	4.82	5.05	5.27	5.49	5.71
2	Water treatment costs	MDL M	1.44	1.49	1.54	1.51	1.54	1.57	1.66	1.69	1.72	1.75	1.79	1.82	1.85	1.88	1.91
	TOTAL variable costs for water	MDL M	4.707	4.903	5.101	5.026	5.161	5.295	5.627	5.862	6.104	6.352	6.608	6.870	7.115	7.365	7.621
	Wastewater																
1	Electricity for pumping	MDL M	0.745	0.761	0.777	0.793	0.760	0.723	0.964	1.012	1.062	1.114	1.169	1.226	1.279	1.334	1.391
2	Wastewater treatment costs	MDL M	0.05	0.05	0.05	0.05	0.05	0.04	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07
	TOTAL variable costs for water		0.794	0.810	0.826	0.843	0.807	0.768	1.023	1.072	1.123	1.177	1.232	1.290	1.344	1.401	1.459

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Water supply																
1	Electricity for pumping	MDL M	5.94	6.13	6.48	6.84	7.23	7.63	8.06	8.42	8.81	9.21	9.62	10.06	10.41	10.77	11.14
2	Water treatment costs	MDL M	1.94	1.95	1.96	1.97	1.98	2.00	2.01	2.02	2.03	2.04	2.05	2.06	2.07	2.08	2.09
	TOTAL variable costs for water	MDL M	7.883	8.081	8.439	8.815	9.210	9.626	10.063	10.441	10.835	11.244	11.671	12.115	12.475	12.847	13.230
	Wastewater																
1	Electricity for pumping	MDL M	1.450	1.519	1.630	1.748	1.875	2.009	2.153	2.285	2.424	2.571	2.726	2.889	3.033	3.182	3.338
2	Wastewater treatment costs	MDL M	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09
	TOTAL variable costs for water	MDL M	1.519	1.590	1.702	1.822	1.950	2.086	2.232	2.365	2.506	2.654	2.811	2.976	3.121	3.272	3.430

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	0.11	0.64	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
3	Salaries and related costs	MDL M	5.09	5.25	5.49	5.72	5.95	6.19	6.44	6.70	6.97	7.24	7.53	7.83	8.15	8.47	8.81
4	Fuel	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	General and administrative expenditures	MDL M	2.44	2.48	2.58	2.68	2.79	2.90	3.01	3.13	3.26	3.39	3.53	3.67	3.81	3.97	4.12
6	Other costs	MDL M	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
	TOTAL fixed costs for water	MDL M	8.521	8.816	9.687	12.451	12.827	13.218	13.623	14.043	14.480	14.933	15.403	15.892	16.399	16.925	17.471
	Wastewater	MDL M															
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	3.56	3.67	3.84	4.00	4.16	4.33	4.50	4.68	4.87	5.07	5.27	5.48	5.70	5.93	6.16
4	Fuel	MDL M	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
5	General and administrative expenditures	MDL M	0.81	0.83	0.86	0.89	0.93	0.97	1.01	1.05	1.09	1.13	1.18	1.22	1.27	1.32	1.38
6	Other costs	MDL M	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
	TOTAL fixed costs for wastewater	MDL M	4.986	5.105	5.307	6.007	6.213	6.427	6.649	6.880	7.120	7.369	7.628	7.898	8.178	8.468	8.771

	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	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
3	Salaries and related costs	MDL M	9.17	9.53	9.91	10.31	10.72	11.15	11.49	11.83	12.19	12.55	12.93	13.32	13.72	14.13	14.55
4	Fuel	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	General and administrative expenditures	MDL M	4.29	4.46	4.64	4.82	5.02	5.22	5.37	5.54	5.70	5.87	6.05	6.23	6.42	6.61	6.81
6	Other costs	MDL M	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
	TOTAL fixed costs for water	MDL M	18.039	18.627	19.239	19.874	20.533	21.218	21.751	22.299	22.863	23.444	24.041	24.656	25.288	25.939	26.608
	Wastewater	MDL M															
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	6.41	6.67	6.93	7.21	7.50	7.80	8.03	8.28	8.52	8.78	9.04	9.31	9.59	9.88	10.18
4	Fuel	MDL M	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
5	General and administrative expenditures	MDL M	1.43	1.49	1.55	1.61	1.67	1.74	1.79	1.85	1.90	1.96	2.02	2.08	2.14	2.20	2.27
6	Other costs	MDL M	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
	TOTAL fixed costs for wastewater	MDL M	9.085	9.411	9.750	10.103	10.469	10.850	11.146	11.452	11.766	12.090	12.423	12.766	13.120	13.483	13.858

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	5.50	5.71	5.93	5.87	5.97	6.06	6.65	6.93	7.23	7.53	7.84	8.16	8.46	8.77	9.08
2	Fixed costs	MDL M	13.51	13.92	14.99	18.46	19.04	19.64	20.27	20.92	21.60	22.30	23.03	23.79	24.58	25.39	26.24
3	Depreciation	MDL M	3.29	3.50	4.57	5.41	5.41	5.41	5.41	5.41	5.41	5.41	5.41	5.41	5.41	5.41	5.41
	TOTAL costs	MDL M	22.300	23.139	25.488	29.741	30.422	31.122	32.337	33.272	34.242	35.246	36.286	37.365	38.450	39.573	40.736

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Variable costs	MDL M	9.40	9.67	10.14	10.64	11.16	11.71	12.29	12.81	13.34	13.90	14.48	15.09	15.60	16.12	16.66
2	Fixed costs	MDL M	27.12	28.04	28.99	29.98	31.00	32.07	32.90	33.75	34.63	35.53	36.46	37.42	38.41	39.42	40.47
3	Depreciation	MDL M	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12
	TOTAL costs	MDL M	38.647	39.832	41.253	42.736	44.285	45.902	47.314	48.680	50.093	51.555	53.069	54.635	56.127	57.664	59.249

Table 6-12: Calculation of the water and wastewater tariffs

	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	9.82	13.23	13.72	14.79	17.48	17.99	18.51	19.25	19.91	20.58	21.29	22.01	22.76	23.51	24.29	25.09
2	Depreciation	MDL M	1.99	1.99	2.21	3.27	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12
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	0.76	0.72	0.72	0.76	0.66	0.57	0.58	0.60	0.62	0.64	0.65	0.67	0.69	0.71	0.73
5	Sale of water	m3	947,300	1,020,525	1,058,150	1,095,760	1,189,782	1,229,936	1,270,047	1,358,030	1,403,587	1,449,380	1,495,406	1,541,660	1,588,141	1,634,845	1,681,769	1,728,909
6	Tariff without depreciation	MDL M/m3	10.37	13.71	13.64	14.16	15.32	15.16	15.02	14.61	14.61	14.63	14.66	14.70	14.76	14.81	14.87	14.94
7	Tariff with depreciation	MDL M/m3	12.48	15.66	15.73	17.14	18.78	18.51	18.26	17.64	17.54	17.47	17.41	17.37	17.35	17.32	17.31	17.32
8	**Proposed avarage tariff**	**MDL/m3**	**11.89**	**12.00**	**12.50**	**13.00**	**14.00**	**15.00**	**16.00**	**16.50**	**17.54**	**17.47**	**17.41**	**17.37**	**17.35**	**17.32**	**17.31**	**17.32**
	Wastewater services																	
1	Variable and fixed costs	MDL M	5.35	5.78	5.92	6.13	6.85	7.02	7.19	7.67	7.95	8.24	8.55	8.86	9.19	9.52	9.87	10.23
2	Depreciation	MDL M	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
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	0.35	0.32	0.30	0.29	0.25	0.21	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29
5	Sale of wastewater	m3	734,200	748,956	763,723	778,498	793,283	808,077	822,879	1,180,290	1,202,974	1,225,735	1,248,575	1,271,492	1,294,487	1,317,561	1,340,712	1,363,942
6	Tariff without depreciation	MDL M/m3	7.29	8.19	8.17	8.26	8.99	9.00	9.00	6.69	6.80	6.92	7.04	7.17	7.30	7.43	7.57	7.71
7	Tariff with depreciation	MDL M/m3	9.05	9.92	9.87	9.93	10.63	10.60	10.58	7.79	7.88	7.98	8.08	8.19	8.30	8.42	8.54	8.66
8	**Proposed avarage tariff**	**MDL/m3**	**5.12**	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**	**7.79**	**7.88**	**7.98**	**8.08**	**8.19**	**8.30**	**8.42**	**8.54**	**8.66**
	Dynamic prime costs for water	**MDL/m3**		**19.15**														
	Dynamic prime costs for wastewater	**MDL/m3**		**7.88**														

	Water Supply		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Variable and fixed costs	MDL M	25.92	26.71	27.68	28.69	29.74	30.84	31.81	32.74	33.70	34.69	35.71	36.77	37.76	38.79	39.84
2	Depreciation	MDL M	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12
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	0.75	0.77	0.79	0.82	0.85	0.87	0.90	0.92	0.95	0.97	1.00	1.02	1.05	1.07	1.10
5	Sale of water	m3	1,776,262	1,807,235	1,838,244	1,869,284	1,900,354	1,931,449	1,962,567	1,993,704	2,024,857	2,056,024	2,087,200	2,118,384	2,149,570	2,180,758	2,211,942
6	Tariff without depreciation	MDL M/m3	15.02	15.21	15.49	15.79	16.10	16.42	16.67	16.88	17.11	17.34	17.59	17.84	18.06	18.28	18.51
7	Tariff with depreciation	MDL M/m3	17.33	17.48	17.73	17.99	18.26	18.55	18.77	18.95	19.14	19.35	19.56	19.78	19.97	20.17	20.37
8	**Proposed avarage tariff**	**MDL/m3**	**17.33**	**17.48**	**17.73**	**17.99**	**18.26**	**18.55**	**18.77**	**18.95**	**19.14**	**19.35**	**19.56**	**19.78**	**19.97**	**20.17**	**20.37**
	Wastewater services																
1	Variable and fixed costs	MDL M	10.60	11.00	11.45	11.92	12.42	12.94	13.38	13.82	14.27	14.74	15.23	15.74	16.24	16.76	17.29
2	Depreciation	MDL M	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
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	0.30	0.31	0.32	0.33	0.34	0.36	0.37	0.38	0.39	0.40	0.41	0.43	0.44	0.45	0.46
5	Sale of wastewater	m3	1,387,250	1,418,020	1,448,993	1,480,171	1,511,552	1,543,138	1,574,927	1,606,921	1,639,120	1,671,524	1,704,132	1,736,946	1,769,964	1,803,188	1,836,618
6	Tariff without depreciation	MDL M/m3	7.86	7.97	8.12	8.28	8.44	8.61	8.73	8.83	8.94	9.06	9.18	9.31	9.42	9.54	9.67
7	Tariff with depreciation	MDL M/m3	8.79	8.89	9.02	9.16	9.30	9.45	9.55	9.64	9.74	9.84	9.94	10.06	10.16	10.26	10.37
8	**Proposed avarage tariff**	**MDL/m3**	**8.79**	**8.89**	**9.02**	**9.16**	**9.30**	**9.45**	**9.55**	**9.64**	**9.74**	**9.84**	**9.94**	**10.06**	**10.16**	**10.26**	**10.37**

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		21.30	22.82	24.40	26.98	29.67	32.47	34.32	37.38	38.11	38.87	39.67	40.49	41.32	42.17	43.06
2	Avarage bill for wastewater (per person)	MDL/month		14.20	14.61	15.01	15.42	15.83	16.23	16.20	16.79	17.40	18.04	18.70	19.38	20.07	20.79	21.54
3	Avarage bill for water and wastewater (per perso	MDL/month		35.50	37.43	39.41	42.40	45.50	48.70	50.52	54.17	55.51	56.91	58.36	59.87	61.39	62.97	64.60
4	Disposable households income	MDL/month		1589.82	1637.51	1712.84	1786.49	1857.95	1932.27	2009.56	2089.94	2173.54	2260.48	2350.90	2444.93	2542.73	2644.44	2750.22
5	Tariff affordability	%		2.2%	2.3%	2.3%	2.4%	2.4%	2.5%	2.5%	2.6%	2.6%	2.5%	2.5%	2.4%	2.4%	2.4%	2.3%
6	Affordability constrains	%		4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Avarage bill for water (per person)	MDL/month	43.98	45.25	46.79	48.39	50.06	51.79	53.34	54.83	56.36	57.94	59.58	61.26	62.86	64.50	66.18
2	Avarage bill for wastewater (per person)	MDL/month	22.31	23.01	23.80	24.63	25.49	26.39	27.15	27.89	28.66	29.46	30.29	31.14	31.97	32.82	33.70
3	Avarage bill for water and wastewater (per perso	MDL/month	66.30	68.26	70.59	73.02	75.55	78.19	80.49	82.72	85.02	87.40	89.86	92.40	94.82	97.32	99.88
4	Disposable households income	MDL/month	2860.23	2974.64	3093.62	3217.37	3346.06	3479.90	3584.30	3691.83	3802.58	3916.66	4034.16	4155.19	4279.84	4408.24	4540.49
5	Tariff affordability	%	2.3%	2.3%	2.3%	2.3%	2.3%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%
6	Affordability constrains	%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%

Table 6-14: Profit and loss – with project

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Sale of water	MDL M	12.25	13.23	14.24	16.66	18.45	20.32	22.41	24.62	25.32	26.04	26.78	27.55	28.32	29.12	29.94
2	Sale of wastewater	MDL M	5.99	6.11	6.23	6.35	6.46	6.58	9.19	9.48	9.78	10.09	10.41	10.75	11.09	11.45	11.81
3	Other revenues	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	**Total revenues**	**MDL M**	**18.24**	**19.34**	**20.47**	**23.00**	**24.91**	**26.90**	**31.60**	**34.10**	**35.10**	**36.13**	**37.19**	**38.30**	**39.41**	**40.56**	**41.75**
5	Costs of water services	MDL M	15.22	15.93	18.06	21.59	22.11	22.63	23.37	24.02	24.70	25.40	26.13	26.88	27.63	28.41	29.21
	variable costs	MDL M	4.71	4.90	5.10	5.03	5.16	5.30	5.63	5.86	6.10	6.35	6.61	6.87	7.11	7.36	7.62
	fixed costs	MDL M	8.52	8.82	9.69	12.45	12.83	13.22	13.62	14.04	14.48	14.93	15.40	15.89	16.40	16.92	17.47
	depreciation	MDL M	1.99	2.21	3.27	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12
6	Costs of wastewater services	MDL M	7.08	7.21	7.43	8.15	8.32	8.49	8.97	9.25	9.54	9.84	10.16	10.49	10.82	11.17	11.53
	variable costs	MDL M	0.79	0.81	0.83	0.84	0.81	0.77	1.02	1.07	1.12	1.18	1.23	1.29	1.34	1.40	1.46
	fixed costs	MDL M	4.99	5.11	5.31	6.01	6.21	6.43	6.65	6.88	7.12	7.37	7.63	7.90	8.18	8.47	8.77
	depreciation	MDL M	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
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**	**22.30**	**23.14**	**25.49**	**29.74**	**30.42**	**31.12**	**32.34**	**33.27**	**34.24**	**35.25**	**36.29**	**37.36**	**38.45**	**39.57**	**40.74**
10	**Gross profit**	**MDL M**	-4.06	-3.80	-5.02	-6.74	-5.51	-4.22	-0.74	0.83	0.86	0.88	0.91	0.93	0.96	0.99	1.02
11	**Income tax**	MDL M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
12	**Net profit**	**MDL M**	-4.06	-3.80	-5.02	-6.74	-5.51	-4.22	-0.74	0.73	0.75	0.78	0.80	0.82	0.85	0.87	0.90

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sale of water	MDL M	30.79	31.60	32.59	33.63	34.71	35.83	36.83	37.78	38.76	39.78	40.83	41.91	42.93	43.98	45.05
2	Sale of wastewater	MDL M	12.20	12.61	13.07	13.55	14.06	14.59	15.04	15.49	15.96	16.44	16.94	17.47	17.98	18.50	19.05
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**	**42.99**	**44.20**	**45.66**	**47.18**	**48.77**	**50.42**	**51.87**	**53.27**	**54.72**	**56.22**	**57.77**	**59.38**	**60.90**	**62.48**	**64.10**
5	Costs of water services	MDL M	30.04	30.83	31.80	32.81	33.86	34.96	35.93	36.86	37.82	38.81	39.83	40.89	41.88	42.90	43.96
	variable costs	MDL M	7.88	8.08	8.44	8.82	9.21	9.63	10.06	10.44	10.83	11.24	11.67	12.11	12.48	12.85	13.23
	fixed costs	MDL M	18.04	18.63	19.24	19.87	20.53	21.22	21.75	22.30	22.86	23.44	24.04	24.66	25.29	25.94	26.61
	depreciation	MDL M	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12
6	Costs of wastewater services	MDL M	11.90	12.30	12.75	13.22	13.72	14.23	14.68	15.11	15.57	16.04	16.53	17.04	17.54	18.05	18.59
	variable costs	MDL M	1.52	1.59	1.70	1.82	1.95	2.09	2.23	2.37	2.51	2.65	2.81	2.98	3.12	3.27	3.43
	fixed costs	MDL M	9.08	9.41	9.75	10.10	10.47	10.85	11.15	11.45	11.77	12.09	12.42	12.77	13.12	13.48	13.86
	depreciation	MDL M	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
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**	**41.94**	**43.12**	**44.55**	**46.03**	**47.58**	**49.19**	**50.61**	**51.97**	**53.38**	**54.85**	**56.36**	**57.93**	**59.42**	**60.96**	**62.54**
10	**Gross profit**	**MDL M**	1.05	1.08	1.11	1.15	1.19	1.23	1.27	1.30	1.33	1.37	1.41	1.45	1.49	1.52	1.56
11	**Income tax**	MDL M	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
12	**Net profit**	**MDL M**	0.92	0.95	0.98	1.01	1.05	1.08	1.11	1.14	1.17	1.21	1.24	1.27	1.31	1.34	1.38

Table 6-15: Profit and loss – without project

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Sale of water	MDL M	12.25	13.23	14.24	16.66	18.45	20.32	21.97	20.07	20.87	21.71	22.57	23.48	24.39	25.33	26.31
2	Sale of wastewater	MDL M	5.99	6.11	6.23	6.35	6.46	6.58	8.58	8.85	9.13	9.43	9.73	10.05	10.38	10.72	11.07
3	Other revenues	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	**Total revenues**	**MDL M**	**18.24**	**19.34**	**20.47**	**23.00**	**24.91**	**26.90**	**30.54**	**28.92**	**30.01**	**31.13**	**32.31**	**33.53**	**34.77**	**36.05**	**37.38**
5	Costs of water services	MDL M	15.22	15.62	16.17	16.99	17.55	18.14	18.84	19.58	20.36	21.18	22.02	22.90	23.79	24.71	25.67
	variable costs	MDL M	4.71	4.91	5.12	5.60	5.83	6.06	6.40	6.77	7.16	7.56	7.98	8.42	8.85	9.29	9.75
	fixed costs	MDL M	8.52	8.71	9.05	9.39	9.73	10.08	10.44	10.82	11.21	11.62	12.04	12.49	12.95	13.43	13.92
	depreciation	MDL M	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99
6	Costs of wastewater services	MDL M	7.08	7.23	7.45	7.68	7.90	8.13	8.37	8.63	8.91	9.20	9.50	9.81	10.13	10.46	10.80
	variable costs	MDL M	0.80	0.82	0.85	0.87	0.90	0.92	0.95	1.00	1.04	1.09	1.15	1.20	1.25	1.30	1.36
	fixed costs	MDL M	4.99	5.11	5.31	5.51	5.70	5.91	6.12	6.34	6.57	6.81	7.05	7.31	7.58	7.86	8.15
	depreciation	MDL M	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
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**	**22.31**	**22.85**	**23.62**	**24.66**	**25.45**	**26.26**	**27.20**	**28.22**	**29.27**	**30.37**	**31.52**	**32.71**	**33.92**	**35.17**	**36.47**
10	**Gross profit**	**MDL M**	-4.07	-3.51	-3.15	-1.66	-0.54	0.64	3.34	0.71	0.73	0.76	0.79	0.82	0.85	0.88	0.91
11	**Income tax**	MDL M	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
12	**Net profit**	**MDL M**	-4.07	-3.51	-3.15	-1.66	-0.54	0.57	2.94	0.62	0.64	0.67	0.69	0.72	0.75	0.77	0.80

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Sale of water	MDL M	27.33	28.26	29.44	30.68	31.98	33.35	34.61	35.82	37.08	38.39	39.75	41.17	42.49	43.86	45.28
2	Sale of wastewater	MDL M	11.44	11.83	12.27	12.73	13.22	13.72	14.15	14.58	15.03	15.49	15.97	16.47	16.96	17.46	17.98
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**	**38.77**	**40.09**	**41.71**	**43.41**	**45.20**	**47.07**	**48.77**	**50.40**	**52.11**	**53.88**	**55.72**	**57.64**	**59.45**	**61.32**	**63.26**
5	Costs of water services	MDL M	26.66	27.58	28.73	29.93	31.20	32.53	33.77	34.95	36.18	37.45	38.78	40.17	41.46	42.79	44.18
	variable costs	MDL M	10.23	10.60	11.19	11.82	12.48	13.18	13.93	14.60	15.31	16.05	16.82	17.64	18.34	19.08	19.84
	fixed costs	MDL M	14.44	14.98	15.54	16.12	16.73	17.36	17.85	18.35	18.87	19.41	19.96	20.53	21.12	21.72	22.34
	depreciation	MDL M	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99
6	Costs of wastewater services	MDL M	11.16	11.54	11.97	12.42	12.89	13.39	13.81	14.23	14.66	15.11	15.58	16.07	16.54	17.03	17.54
	variable costs	MDL M	1.41	1.48	1.58	1.69	1.81	1.94	2.08	2.20	2.33	2.47	2.61	2.77	2.90	3.04	3.19
	fixed costs	MDL M	8.45	8.76	9.09	9.43	9.78	10.15	10.44	10.73	11.03	11.35	11.67	12.00	12.34	12.69	13.06
	depreciation	MDL M	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
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**	**37.82**	**39.12**	**40.70**	**42.36**	**44.10**	**45.92**	**47.58**	**49.17**	**50.84**	**52.57**	**54.36**	**56.23**	**58.00**	**59.83**	**61.72**
10	**Gross profit**	**MDL M**	0.95	0.98	1.02	1.06	1.10	1.15	1.19	1.23	1.27	1.31	1.36	1.41	1.45	1.50	1.54
11	**Income tax**	MDL M	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
12	**Net profit**	**MDL M**	0.83	0.86	0.90	0.93	0.97	1.01	1.05	1.08	1.12	1.16	1.20	1.24	1.28	1.32	1.36

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**	**3.76**	**1.78**	**1.88**	**2.03**	**2.44**	**2.61**	**2.79**	**3.19**	**3.41**	**3.50**	**3.60**	**3.70**	**3.81**	**3.92**	**4.03**	**4.14**
1	Inventories	MDL M	1.57	0.28	0.29	0.35	0.55	0.56	0.58	0.59	0.60	0.62	0.63	0.65	0.66	0.68	0.69	0.71
2	Accounts receivable	MDL M	2.18	1.50	1.59	1.68	1.89	2.05	2.21	2.60	2.80	2.88	2.97	3.06	3.15	3.24	3.33	3.43
	Increase in current assets	MDL M		-1.98	0.10	0.15	0.42	0.17	0.18	0.40	0.22	0.10	0.10	0.10	0.11	0.11	0.11	0.11
B	**Current liabilities**	**MDL M**	**1.43**	**2.27**	**2.35**	**2.49**	**2.80**	**2.89**	**2.98**	**3.11**	**3.23**	**3.34**	**3.46**	**3.59**	**3.72**	**3.85**	**3.99**	**4.13**
1	Liabilities to suppliers	MDL M	0.07	1.56	1.61	1.72	2.00	2.06	2.11	2.21	2.29	2.37	2.45	2.54	2.63	2.72	2.81	2.90
2	Liabilities to employees	MDL M	1.37	0.71	0.73	0.77	0.80	0.83	0.86	0.90	0.94	0.97	1.01	1.05	1.09	1.14	1.18	1.23
3	Increase in current liabilities	MDL M		0.84	0.07	0.14	0.31	0.09	0.09	0.13	0.11	0.12	0.12	0.13	0.13	0.13	0.14	0.14

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Current assets**	**MDL M**	**4.26**	**4.38**	**4.52**	**4.66**	**4.81**	**4.97**	**5.11**	**5.24**	**5.38**	**5.52**	**5.66**	**5.81**	**5.96**	**6.11**	**6.26**
1	Inventories	MDL M	0.73	0.75	0.77	0.79	0.81	0.83	0.84	0.86	0.88	0.90	0.91	0.93	0.95	0.97	0.99
2	Accounts receivable	MDL M	3.53	3.63	3.75	3.88	4.01	4.14	4.26	4.38	4.50	4.62	4.75	4.88	5.01	5.14	5.27
	Increase in current assets	MDL M	0.12	0.12	0.14	0.14	0.15	0.16	0.14	0.13	0.14	0.14	0.15	0.15	0.14	0.15	0.15
B	**Current liabilities**	**MDL M**	**4.28**	**4.43**	**4.60**	**4.78**	**4.96**	**5.16**	**5.32**	**5.48**	**5.64**	**5.82**	**5.99**	**6.18**	**6.35**	**6.54**	**6.73**
1	Liabilities to suppliers	MDL M	3.00	3.10	3.22	3.34	3.47	3.60	3.71	3.83	3.94	4.06	4.19	4.32	4.44	4.57	4.70
2	Liabilities to employees	MDL M	1.28	1.33	1.38	1.44	1.50	1.56	1.60	1.65	1.70	1.75	1.81	1.86	1.92	1.97	2.03
3	Increase in current liabilities	MDL M	0.15	0.15	0.17	0.18	0.18	0.19	0.16	0.16	0.17	0.17	0.18	0.18	0.18	0.18	0.19

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**	**3.76**	**1.78**	**1.87**	**1.98**	**2.19**	**2.36**	**2.53**	**2.84**	**2.72**	**2.82**	**2.92**	**3.03**	**3.14**	**3.25**	**3.37**	**3.49**
1	Inventories	MDL M	1.57	0.28	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.41	0.42
2	Accounts receivable	MDL M	2.18	1.50	1.59	1.68	1.89	2.05	2.21	2.51	2.38	2.47	2.56	2.66	2.76	2.86	2.96	3.07
	Increase in current assets	MDL M		-1.98	0.09	0.10	0.22	0.17	0.17	0.31	-0.12	0.10	0.10	0.11	0.11	0.11	0.12	0.12
B	**Current liabilities**	**MDL M**	**1.43**	**2.27**	**2.34**	**2.44**	**2.56**	**2.65**	**2.75**	**2.86**	**2.98**	**3.11**	**3.24**	**3.37**	**3.51**	**3.66**	**3.80**	**3.96**
1	Liabilities to suppliers	MDL M	0.07	1.56	1.61	1.67	1.76	1.82	1.89	1.97	2.05	2.14	2.23	2.32	2.42	2.52	2.62	2.73
2	Liabilities to employees	MDL M	1.37	0.71	0.73	0.77	0.80	0.83	0.86	0.90	0.94	0.97	1.01	1.05	1.09	1.14	1.18	1.23
3	Increase in current liabilities	MDL M		0.84	0.07	0.10	0.12	0.10	0.10	0.11	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Current assets**	**MDL M**	**3.62**	**3.74**	**3.89**	**4.05**	**4.21**	**4.38**	**4.53**	**4.68**	**4.83**	**4.99**	**5.16**	**5.33**	**5.49**	**5.66**	**5.84**
1	Inventories	MDL M	0.43	0.45	0.46	0.48	0.49	0.51	0.52	0.54	0.55	0.56	0.58	0.59	0.61	0.62	0.64
2	Accounts receivable	MDL M	3.19	3.30	3.43	3.57	3.71	3.87	4.01	4.14	4.28	4.43	4.58	4.74	4.89	5.04	5.20
	Increase in current assets	MDL M	0.13	0.12	0.15	0.15	0.16	0.17	0.15	0.15	0.15	0.16	0.17	0.17	0.16	0.17	0.18
B	**Current liabilities**	**MDL M**	**4.12**	**4.28**	**4.46**	**4.65**	**4.85**	**5.06**	**5.24**	**5.42**	**5.61**	**5.80**	**6.00**	**6.21**	**6.41**	**6.62**	**6.83**
1	Liabilities to suppliers	MDL M	2.84	2.94	3.07	3.21	3.35	3.50	3.64	3.77	3.91	4.05	4.20	4.35	4.50	4.65	4.80
2	Liabilities to employees	MDL M	1.28	1.33	1.38	1.44	1.50	1.56	1.60	1.65	1.70	1.75	1.81	1.86	1.92	1.97	2.03
3	Increase in current liabilities	MDL M	0.16	0.16	0.18	0.19	0.20	0.21	0.18	0.18	0.19	0.19	0.20	0.21	0.20	0.21	0.21

Table 6-18: Balance sheet – with project

			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	**Assets**	**MDL M**	**55.00**	**62.79**	**114.12**	**153.30**	**146.87**	**141.45**	**137.33**	**136.72**	**137.57**	**138.44**	**139.34**	**140.26**	**141.21**	**142.19**	**143.20**	**144.24**
1	Fixed assets	MDL M	50.58	58.30	109.86	149.34	143.93	138.51	133.10	127.68	122.27	116.85	111.44	106.02	100.61	95.19	89.78	84.37
2	Current assets	MDL M	4.42	4.49	4.27	3.96	2.95	2.94	4.23	9.04	15.30	21.59	27.90	34.24	40.60	47.00	53.42	59.87
3	Inventories	MDL M	1.57	0.28	0.29	0.35	0.55	0.56	0.58	0.59	0.60	0.62	0.63	0.65	0.66	0.68	0.69	0.71
4	Short-term receivables	MDL M	2.18	1.50	1.59	1.68	1.89	2.05	2.21	2.60	2.80	2.88	2.97	3.06	3.15	3.24	3.33	3.43
5	Cash and other financial assets	MDL M	0.59	2.64	2.31	1.86	0.43	0.26	1.37	5.78	11.82	18.01	24.23	30.46	36.72	43.01	49.32	55.66
6	Other current assets	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	0.07
B	**Liabilities**	**MDL M**	**55.00**	**62.79**	**114.12**	**153.30**	**146.87**	**141.45**	**137.33**	**136.72**	**137.57**	**138.44**	**139.34**	**140.26**	**141.21**	**142.19**	**143.20**	**144.24**
1	Equity capital	MDL M	-2.73	-6.79	-10.60	-15.61	-22.35	-27.86	-32.08	-32.81	-32.08	-31.33	-30.55	-29.75	-28.93	-28.08	-27.21	-26.32
2	Long-term liabilities	MDL M	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35
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	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94
5	Short-term loan	MDL M	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94
6	Current liabilities to suppliers	MDL M	0.07	1.56	1.61	1.72	2.00	2.06	2.11	2.21	2.29	2.37	2.45	2.54	2.63	2.72	2.81	2.90
7	Current liabilities	MDL M	1.37	0.71	0.73	0.77	0.80	0.83	0.86	0.90	0.94	0.97	1.01	1.05	1.09	1.14	1.18	1.23
8	Accruals	MDL M	0.00	11.01	66.08	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Assets**	**MDL M**	**145.31**	**146.41**	**147.56**	**148.75**	**149.98**	**151.25**	**152.53**	**153.83**	**155.17**	**156.55**	**157.97**	**159.43**	**160.91**	**162.44**	**164.00**
1	Fixed assets	MDL M	78.95	73.54	68.12	62.71	57.29	51.88	46.46	41.05	35.63	30.22	24.80	19.39	13.97	8.56	3.15
2	Current assets	MDL M	66.36	72.87	79.44	86.04	92.69	99.38	106.07	112.79	119.54	126.33	133.17	140.04	146.94	153.88	160.86
3	Inventories	MDL M	0.73	0.75	0.77	0.79	0.81	0.83	0.84	0.86	0.88	0.90	0.91	0.93	0.95	0.97	0.99
4	Short-term receivables	MDL M	3.53	3.63	3.75	3.88	4.01	4.14	4.26	4.38	4.50	4.62	4.75	4.88	5.01	5.14	5.27
5	Cash and other financial assets	MDL M	62.03	68.42	74.85	81.31	87.80	94.34	100.89	107.48	114.10	120.75	127.43	134.16	140.91	147.70	154.53
6	Other current assets	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
B	**Liabilities**	**MDL M**	**145.31**	**146.41**	**147.56**	**148.75**	**149.98**	**151.25**	**152.53**	**153.83**	**155.17**	**156.55**	**157.97**	**159.43**	**160.91**	**162.44**	**164.00**
1	Equity capital	MDL M	-25.40	-24.45	-23.47	-22.45	-21.41	-20.32	-19.21	-18.07	-16.89	-15.69	-14.45	-13.17	-11.87	-10.52	-9.15
2	Long-term liabilities	MDL M	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35
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	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94
5	Short-term loan	MDL M	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94
6	Current liabilities to suppliers	MDL M	3.00	3.10	3.22	3.34	3.47	3.60	3.71	3.83	3.94	4.06	4.19	4.32	4.44	4.57	4.70
7	Current liabilities	MDL M	1.28	1.33	1.38	1.44	1.50	1.56	1.60	1.65	1.70	1.75	1.81	1.86	1.92	1.97	2.03
8	Accruals	MDL M	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13	110.13

Table 6-19: Balance sheet – without project

			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	**Assets**	**MDL M**	**55.00**	**51.77**	**48.33**	**45.28**	**43.73**	**43.30**	**43.96**	**47.01**	**47.75**	**48.52**	**49.32**	**50.15**	**51.01**	**51.90**	**52.82**	**53.78**
1	Fixed assets	MDL M	50.58	47.28	43.99	40.70	37.41	34.12	30.82	27.53	24.24	20.95	17.65	14.36	11.07	7.78	4.49	1.19
2	Current assets	MDL M	4.42	4.49	4.34	4.58	6.33	9.18	13.14	19.48	23.51	27.57	31.66	35.78	39.94	44.12	48.33	52.58
3	Inventories	MDL M	1.57	0.28	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.41	0.42
4	Short-term receivables	MDL M	2.18	1.50	1.59	1.68	1.89	2.05	2.21	2.51	2.38	2.47	2.56	2.66	2.76	2.86	2.96	3.07
5	Cash and other financial assets	MDL M	0.59	2.64	2.39	2.53	4.06	6.75	10.54	16.57	20.73	24.69	28.68	32.69	36.73	40.80	44.89	49.02
6	Other current assets	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	0.07
B	**Liabilities**	**MDL M**	**55.00**	**51.77**	**48.33**	**45.28**	**43.73**	**43.30**	**43.96**	**47.01**	**47.75**	**48.52**	**49.32**	**50.15**	**51.01**	**51.90**	**52.82**	**53.78**
1	Equity capital	MDL M	-2.73	-6.80	-10.31	-13.46	-15.12	-15.65	-15.09	-12.15	-11.53	-10.88	-10.21	-9.52	-8.80	-8.05	-7.28	-6.48
2	Long-term liabilities	MDL M	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35
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	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94
5	Short-term loan	MDL M	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94
6	Current liabilities to suppliers	MDL M	0.07	1.56	1.61	1.67	1.76	1.82	1.89	1.97	2.05	2.14	2.23	2.32	2.42	2.52	2.62	2.73
7	Current liabilities	MDL M	1.37	0.71	0.73	0.77	0.80	0.83	0.86	0.90	0.94	0.97	1.01	1.05	1.09	1.14	1.18	1.23
8	Accruals	MDL M	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Assets**	**MDL M**	**54.77**	**55.79**	**56.86**	**57.99**	**59.16**	**60.38**	**61.61**	**62.87**	**64.17**	**65.52**	**66.92**	**68.36**	**69.84**	**71.37**	**72.94**
1	Fixed assets	MDL M	-2.10	-5.39	-8.68	-11.97	-15.27	-18.56	-21.85	-25.14	-28.43	-31.73	-35.02	-38.31	-41.60	-44.90	-48.19
2	Current assets	MDL M	56.87	61.18	65.55	69.96	74.42	78.94	83.46	88.01	92.61	97.25	101.94	106.68	111.45	116.26	121.13
3	Inventories	MDL M	0.43	0.45	0.46	0.48	0.49	0.51	0.52	0.54	0.55	0.56	0.58	0.59	0.61	0.62	0.64
4	Short-term receivables	MDL M	3.19	3.30	3.43	3.57	3.71	3.87	4.01	4.14	4.28	4.43	4.58	4.74	4.89	5.04	5.20
5	Cash and other financial assets	MDL M	53.18	57.36	61.59	65.85	70.15	74.49	78.86	83.26	87.71	92.19	96.71	101.28	105.88	110.53	115.22
6	Other current assets	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
B	**Liabilities**	**MDL M**	**54.77**	**55.79**	**56.86**	**57.99**	**59.16**	**60.38**	**61.61**	**62.87**	**64.17**	**65.52**	**66.92**	**68.36**	**69.84**	**71.37**	**72.94**
1	Equity capital	MDL M	-5.65	-4.79	-3.89	-2.96	-1.99	-0.98	0.07	1.15	2.27	3.43	4.62	5.86	7.13	8.45	9.81
2	Long-term liabilities	MDL M	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35	53.35
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	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94
5	Short-term loan	MDL M	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94
6	Current liabilities to suppliers	MDL M	2.84	2.94	3.07	3.21	3.35	3.50	3.64	3.77	3.91	4.05	4.20	4.35	4.50	4.65	4.80
7	Current liabilities	MDL M	1.28	1.33	1.38	1.44	1.50	1.56	1.60	1.65	1.70	1.75	1.81	1.86	1.92	1.97	2.03
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**		**30.09**	**74.47**	**64.66**	**23.32**	**25.00**	**26.99**	**31.74**	**34.22**	**35.21**	**36.25**	**37.32**	**38.43**	**39.54**	**40.70**	**41.90**
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		8.33	41.64	33.31	0.00	0.00										
3	Own contribution	MDL M		2.68	13.42	10.74	0.00	0.00										
4	Revenues from sale	MDL M		18.24	19.34	20.47	23.00	24.91	26.90	31.60	34.10	35.10	36.13	37.19	38.30	39.41	40.56	41.75
5	Increase in current liabilities	MDL M		0.84	0.07	0.14	0.31	0.09	0.09	0.13	0.11	0.12	0.12	0.13	0.13	0.13	0.14	0.14
B	**Financial outflows**	**MDL M**		**28.04**	**74.80**	**65.12**	**24.74**	**25.18**	**25.88**	**27.32**	**28.18**	**29.03**	**30.04**	**31.08**	**32.17**	**33.26**	**34.39**	**35.56**
1	Investment costs	MDL M		11.01	55.06	44.05	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		19.01	19.63	20.92	24.33	25.01	25.71	26.92	27.86	28.83	29.83	30.87	31.95	33.04	34.16	35.32
3	Long term loan repayment	MDL M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Increase in current assets	MDL M		-1.98	0.10	0.15	0.42	0.17	0.18	0.40	0.22	0.10	0.10	0.10	0.11	0.11	0.11	0.11
5	Income tax	MDL M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.12
C	Net cash flow (inflow - outflow)	**MDL M**		2.05	-0.33	-0.46	-1.43	-0.18	1.11	4.41	6.04	6.19	6.21	6.24	6.26	6.29	6.31	6.34
D	Cumulated cash	**MDL M**	0.59	2.64	2.31	1.86	0.43	0.26	1.37	5.78	11.82	18.01	24.23	30.46	36.72	43.01	49.32	55.66

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Financial inflows**	**MDL M**	**43.14**	**44.35**	**45.83**	**47.36**	**48.95**	**50.62**	**52.03**	**53.43**	**54.89**	**56.39**	**57.95**	**59.56**	**61.08**	**62.66**	**64.29**
1	Loan disbursement	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Donor contribution (capital grant)	MDL M															
3	Own contribution	MDL M															
4	Revenues from sale	MDL M	42.99	44.20	45.66	47.18	48.77	50.42	51.87	53.27	54.72	56.22	57.77	59.38	60.90	62.48	64.10
5	Increase in current liabilities	MDL M	0.15	0.15	0.17	0.18	0.18	0.19	0.16	0.16	0.17	0.17	0.18	0.18	0.18	0.18	0.19
B	**Financial outflows**	**MDL M**	**36.77**	**37.96**	**39.40**	**40.90**	**42.46**	**44.08**	**45.48**	**46.84**	**48.27**	**49.74**	**51.26**	**52.84**	**54.33**	**55.87**	**57.47**
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	36.52	37.71	39.13	40.61	42.16	43.78	45.19	46.56	47.97	49.43	50.95	52.51	54.00	55.54	57.13
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	0.12	0.12	0.14	0.14	0.15	0.16	0.14	0.13	0.14	0.14	0.15	0.15	0.14	0.15	0.15
5	Income tax	MDL M	0.13	0.13	0.13	0.14	0.14	0.15	0.15	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.19
C	Net cash flow (inflow - outflow)	**MDL M**	6.37	6.39	6.43	6.46	6.50	6.53	6.56	6.59	6.62	6.65	6.69	6.72	6.76	6.79	6.83
D	Cumulated cash	**MDL M**	62.03	68.42	74.85	81.31	87.80	94.34	100.89	107.48	114.10	120.75	127.43	134.16	140.91	147.70	154.53

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**		**19.08**	**19.40**	**20.57**	**23.12**	**25.01**	**27.00**	**30.66**	**29.04**	**30.13**	**31.26**	**32.44**	**33.67**	**34.91**	**36.20**	**37.54**
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		18.24	19.34	20.47	23.00	24.91	26.90	30.54	28.92	30.01	31.13	32.31	33.53	34.77	36.05	37.38
5	Increase in current liabilities	MDL M		0.84	0.07	0.10	0.12	0.10	0.10	0.11	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15
B	**Financial outflows**	**MDL M**		**17.04**	**19.65**	**20.43**	**21.59**	**22.32**	**23.22**	**24.62**	**24.89**	**26.17**	**27.28**	**28.43**	**29.63**	**30.84**	**32.10**	**33.41**
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		19.01	19.55	20.33	21.37	22.16	22.97	23.91	24.93	25.98	27.08	28.23	29.42	30.63	31.88	33.18
3	Long term loan repayment	MDL M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Increase in current assets	MDL M		-1.98	0.09	0.10	0.22	0.17	0.17	0.31	-0.12	0.10	0.10	0.11	0.11	0.11	0.12	0.12
				0.00	0.00	0.00	0.00	0.00	0.08	0.40	0.08	0.09	0.09	0.09	0.10	0.10	0.11	0.11
C	**Net cash flow (inflow - outflow)**	**MDL M**		2.05	-0.24	0.14	1.53	2.69	3.79	6.04	4.16	3.96	3.99	4.01	4.04	4.07	4.10	4.13
D	**Cumulated cash**	**MDL M**	0.59	2.64	2.39	2.53	4.06	6.75	10.54	16.57	20.73	24.69	28.68	32.69	36.73	40.80	44.89	49.02

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Financial inflows**	**MDL M**	**38.93**	**40.25**	**41.90**	**43.61**	**45.40**	**47.28**	**48.95**	**50.58**	**52.29**	**54.07**	**55.92**	**57.85**	**59.65**	**61.53**	**63.48**
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	38.77	40.09	41.71	43.41	45.20	47.07	48.77	50.40	52.11	53.88	55.72	57.64	59.45	61.32	63.26
5	Increase in current liabilities	MDL M	0.16	0.16	0.18	0.19	0.20	0.21	0.18	0.18	0.19	0.19	0.20	0.21	0.20	0.21	0.21
B	**Financial outflows**	**MDL M**	**34.77**	**36.06**	**37.67**	**39.35**	**41.10**	**42.94**	**44.58**	**46.18**	**47.85**	**49.59**	**51.40**	**53.28**	**55.05**	**56.89**	**58.79**
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	34.53	35.82	37.40	39.06	40.80	42.63	44.28	45.88	47.54	49.27	51.07	52.94	54.71	56.54	58.43
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	0.13	0.12	0.15	0.15	0.16	0.17	0.15	0.15	0.15	0.16	0.17	0.17	0.16	0.17	0.18
			0.11	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15	0.16	0.16	0.17	0.17	0.18	0.19
C	**Net cash flow (inflow - outflow)**	**MDL M**	4.16	4.19	4.22	4.26	4.30	4.34	4.37	4.41	4.44	4.48	4.52	4.56	4.60	4.65	4.69
D	**Cumulated cash**	**MDL M**	53.18	57.36	61.59	65.85	70.15	74.49	78.86	83.26	87.71	92.19	96.71	101.28	105.88	110.53	115.22

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**	**0.04**	**0.19**	**-0.01**	**-0.01**	**1.08**	**5.17**	**5.08**	**4.99**	**4.88**	**4.76**	**4.63**	**4.50**	**4.36**
1	Incremental revenues from sales	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	1.06	5.18	5.09	4.99	4.89	4.77	4.64	4.51	4.37
2	Incremental increase in current liabilities	MDL M	0.00	0.01	0.04	0.19	-0.01	-0.01	0.02	-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**	**9.03**	**55.25**	**44.79**	**3.37**	**3.02**	**2.92**	**3.41**	**3.15**	**2.94**	**2.85**	**2.75**	**2.63**	**2.52**	**2.39**	**2.26**
1	Investment costs	MDL M	11.01	55.06	44.05	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 costs of providing services	MDL M	-0.01	0.08	0.59	2.96	2.85	2.74	3.01	2.93	2.85	2.75	2.64	2.53	2.41	2.28	2.14
3	Incremental increase in current assets	MDL M	-1.98	0.10	0.15	0.42	0.17	0.18	0.40	0.22	0.10	0.10	0.10	0.11	0.11	0.11	0.11
C	Net cash flow (inflow - outflow)	**MDL M**	-9.03	-55.24	-44.75	-3.18	-3.03	-2.92	-2.33	2.02	2.14	2.14	2.13	2.12	2.12	2.11	2.10
D	FNPV(C)	**MDL M**	**-74.44**														
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**	**4.21**	**4.10**	**3.93**	**3.75**	**3.55**	**3.34**	**3.09**	**2.85**	**2.59**	**2.32**	**2.02**	**1.71**	**1.43**	**1.13**	**52.15**
1	Incremental revenues from sales	MDL M	4.22	4.11	3.94	3.76	3.57	3.36	3.11	2.87	2.61	2.34	2.05	1.74	1.45	1.16	0.84
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	-0.03
3	Residual value	MDL M															51.33
B	**Financial outflows**	**MDL M**	**2.11**	**2.00**	**1.86**	**1.69**	**1.51**	**1.31**	**1.04**	**0.81**	**0.56**	**0.30**	**0.02**	**-0.28**	**-0.56**	**-0.85**	**-1.15**
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 costs of providing services	MDL M	1.99	1.89	1.73	1.55	1.36	1.15	0.91	0.67	0.43	0.16	-0.12	-0.43	-0.70	-0.99	-1.30
3	Incremental increase in current assets	MDL M	0.12	0.12	0.14	0.14	0.15	0.16	0.14	0.13	0.14	0.14	0.15	0.15	0.14	0.15	0.15
C	Net cash flow (inflow - outflow)	**MDL M**	2.09	2.10	2.07	2.06	2.04	2.03	2.04	2.04	2.03	2.02	2.00	1.99	1.99	1.98	53.30

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**	**8.33**	**41.65**	**33.36**	**0.19**	**-0.01**	**-0.01**	**1.08**	**5.17**	**5.08**	**4.99**	**4.88**	**4.76**	**4.63**	**4.50**	**4.36**
1	Incremental revenues from sales	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	1.06	5.18	5.09	4.99	4.89	4.77	4.64	4.51	4.37
2	Incremental increase in current liabilities	MDL M	0.00	0.01	0.04	0.19	-0.01	-0.01	0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
3	Donor contribution (capital grant)	MDL M	8.33	41.64	33.31	0.00	0.00										
4	Residual value	MDL M															
B	**Financial outflows**	**MDL M**	**9.03**	**55.25**	**44.79**	**3.37**	**3.02**	**2.92**	**3.41**	**3.15**	**2.94**	**2.85**	**2.75**	**2.63**	**2.52**	**2.39**	**2.26**
1	Investment costs	MDL M	11.01	55.06	44.05	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 costs of providing services	MDL M	-0.01	0.08	0.59	2.96	2.85	2.74	3.01	2.93	2.85	2.75	2.64	2.53	2.41	2.28	2.14
3	Incremental increase in current assets	MDL M	-1.98	0.10	0.15	0.42	0.17	0.18	0.40	0.22	0.10	0.10	0.10	0.11	0.11	0.11	0.11
C	**Net cash flow (inflow - outflow)**	**MDL M**	-0.70	-13.60	-11.43	-3.18	-3.03	-2.92	-2.33	2.02	2.14	2.14	2.13	2.12	2.12	2.11	2.10
D	**FNPV(K) - Financial Net Present value of the Capit**	**MDL M**	**0.04**														
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**	**4.21**	**4.10**	**3.93**	**3.75**	**3.55**	**3.34**	**3.09**	**2.85**	**2.59**	**2.32**	**2.02**	**1.71**	**1.43**	**1.13**	**52.15**
1	Incremental revenues from sales	MDL M	4.22	4.11	3.94	3.76	3.57	3.36	3.11	2.87	2.61	2.34	2.05	1.74	1.45	1.16	0.84
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	-0.03
3	Donor contribution (capital grant)	MDL M															
4	Residual value	MDL M															51.33
B	**Financial outflows**	**MDL M**	**2.11**	**2.00**	**1.86**	**1.69**	**1.51**	**1.31**	**1.04**	**0.81**	**0.56**	**0.30**	**0.02**	**-0.28**	**-0.56**	**-0.85**	**-1.15**
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 costs of providing services	MDL M	1.99	1.89	1.73	1.55	1.36	1.15	0.91	0.67	0.43	0.16	-0.12	-0.43	-0.70	-0.99	-1.30
3	Incremental increase in current assets	MDL M	0.12	0.12	0.14	0.14	0.15	0.16	0.14	0.13	0.14	0.14	0.15	0.15	0.14	0.15	0.15
C	**Net cash flow (inflow - outflow)**	**MDL M**	2.09	2.10	2.07	2.06	2.04	2.03	2.04	2.04	2.03	2.02	2.00	1.99	1.99	1.98	53.30

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**	**-9.03**	**-55.24**	**-44.75**	**-3.18**	**-3.03**	**-2.92**	**-2.33**	**2.02**	**2.14**	**2.14**	**2.13**	**2.12**	**2.12**	**2.11**	**2.10**
1	Social costs	MDL M	0.00	0.00	0.00	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.10	-0.11	-0.12	-0.14	-0.15	-0.17
2	Shadow prices - electricity	MDL M	0.00	0.00	0.00	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.10	-0.11	-0.12	-0.14	-0.15	-0.17
B	**Social benefits**	**MDL M**	**4.96**	**24.78**	**19.82**	**0.00**	**0.00**	**0.00**	**4.66**	**0.10**	**0.09**	**0.08**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**
1	Tax correction - VAT	MDL M	2.20	11.01	8.81	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	2.75	13.77	11.01	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	0.00	0.00	0.00	0.10	0.10	0.09	0.08	0.07	0.05	0.04	0.03	0.02
4	Benefits of avoiding water related disease	MDL M	0.00	0.00	0.00	0.00	0.00	0.00	4.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C	**Net cash flow (inflow - outflow)**	**MDL M**	-4.07	-30.46	-24.92	-3.13	-2.97	-2.86	2.39	2.19	2.32	2.31	2.31	2.30	2.30	2.29	2.29
D	**ENPV**	**MDL M**	**-24.23**														
E	**ERR**	%	**2%**														

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	**Net cash flow (inflow - outflow)**	**MDL M**	**2.09**	**2.10**	**2.07**	**2.06**	**2.04**	**2.03**	**2.04**	**2.04**	**2.03**	**2.02**	**2.00**	**1.99**	**1.99**	**1.98**	**53.30**
1	Social costs	MDL M	-0.19	-0.20	-0.22	-0.24	-0.26	-0.28	-0.31	-0.33	-0.36	-0.38	-0.41	-0.44	-0.47	-0.50	-0.53
2	Shadow prices - electricity	MDL M	-0.19	-0.20	-0.22	-0.24	-0.26	-0.28	-0.31	-0.33	-0.36	-0.38	-0.41	-0.44	-0.47	-0.50	-0.53
B	**Social benefits**	**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**
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	0.00	0.00	0.00	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	Benefits of avoiding water related disease	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
C	**Net cash flow (inflow - outflow)**	**MDL M**	2.28	2.30	2.29	2.30	2.30	2.31	2.35	2.37	2.39	2.40	2.42	2.43	2.46	2.48	53.83

Annex 7

Institutional development

Annex 7: Institutional development

Potential for WSS service area extension

Conceptul de proiect viabil (CPV) Cahul include următoarele unități administrativ-teritoriale: orașul Cahul; satul Crihana Veche; comuna Manta cu localitățile Manta și Pașcani.

Referitor la regionalizarea serviciilor de alimentare cu apă și de canalizare în unitățile administrativ-teritoriale ale proiectului, prin operarea, în comun, a serviciului și realizarea, în comun, a proiectelor de dezvoltare a infrastructurii aferente acestora, părțile au fost unitare.

Reprezentanții autorităților publice locale din orașul Cahul, satul Crihana Veche și comuna Manta, au fost unitari, în ceea ce privește existența unui operator comun, căruia îi vor delega gestiunea serviciului public de alimentare cu apă și de canalizare.

În raionul Cahul procesul de regionalizare a serviciilor de alimentare cu apă și de canalizare a demarat în anul 2012, prin angajarea unei echipe de experți pentru a constata oportunitatea delegării serviciului și operării la nivel regional. Soluţia optimă, pentru obţinerea celui mai bun raport calitate/cost pentru serviciul de alimentare cu apă și de canalizare în orașul Cahul, satele Roșu, Manta, Crihana Veche, statuat în concluziile studiului de oportunitate, constă în delegarea gestiunii serviciului către un operator unic la nivelul raionului Cahul.

În temeiul acestui studiu, Consiliul orășenesc Cahul a aprobat extinderea ariei de furnizare a serviciilor de alimentare cu apă de către Întreprinderea Municipală ”Apă-canal” Cahul în unitățile administrativ-teritoriale adiacente orașului Cahul(Decizia Consiliul orășenesc Cahul nr. 8/2(15/2)-XXIV din 4 octombrie 2012).

Această extindere, era posibilă cu respectarea următoarelor condiții: a) predarea în gestiune a infrastructurii existente și nou construită de alimentare cu apă către operatorul Î.M. ”Apă-canal” Cahul; b) recepționarea bunurilor sau lucrărilor efectuate pe teritoriul unităților administrativ-teritoriale asociate să se facă cu participarea obligatorie a specialiștilor Î.M. ”Apă-canal” Cahul; c) din motive de ordin tehnic, se impune obligativitatea racordării la sistemul centralizat de alimentare cu apă a cel puțin 50% din gospodăriile fiecărei unități administrativ-teritoriale asociate, d) inventarierea și predarea în gestiune către Î.M. ”Apă-canal” Cahul a surselor de apă alternative, proprietate publică, din aria unităților administrativ-teritoriale asociate; e) facturarea apei furnizate consumatorilor se va face numai în baza datelor apometrelor instalate.

Referitor la politica tarifară, aceeași decizie stipulează că Î.M. ”Apă-canal” Cahul va furniza serviciul de alimentare cu apă în unitățile administrativ-teritoriale Roșu, Crihana Veche, Pașcani și Manta la un nivel calitativ și cantitativ nu mai jos decât pentru orașul Cahul la tarife unice pentru toate unitățile administrativ-teritoriale asociate stabilite și adoptate de Consiliul orășenesc Cahul.

Această decizie, reprezentând o primă etapă în procesul de regionalizare a serviciului de alimentare cu apă și de canalizare în raionul Cahul, enumeră doar condițiile tehnice de furnizare a serviciilor de alimentare cu apă pe teritoriul unităților administrativ-teritoriale adiacente. Ulterior, este necesară identificarea modelului instituțional de regionalizare a serviciului de alimentare cu apă și de canalizare în raionul Cahul și implementarea acestuia.

Aceleași unități administrativ-teritoriale vizate în decizia Consiliului orășenesc Cahul (mai puțin satul Roșu) sunt beneficiare a prezentului studiu de fezabilitate.

Prin urmare, acest capitol va prezenta modelul instituțional de regionalizare a serviciilor de alimentare cu apă și de canalizare în unitățile administrativ-teritoriale implicate în proiect. Astfel, consiliile locale respective nu vor mai deține fiecare câte un singur operator, care operează la nivelul respectivei unități administrativ-teritoriale, ci vor participa la o societate comercială, cu statut de operator regional, care va deservi un număr de orașe și comunități participante.

Acest model poate fi replicat și în cazul altor unități administrativ-teritoriale din raionul Cahul, care își vor înainta intenția de a deveni parte a operatorului regional căruia să-i delege gestiunea serviciului public de alimentare cu apă și de canalizare din localitate.

Competence of local public administration and inter-municipal cooperation

Constituția Republicii Moldova statuează în articolul 109 că administraţia publică în unităţile administrativ-teritoriale se întemeiază pe principiile autonomiei locale, ale descentralizării serviciilor publice, ale eligibilităţii autorităţilor administraţiei publice locale şi ale consultării cetăţenilor în problemele locale de interes deosebit. Astfel, Republica Moldova s-a întors la principiul autonomiei prin descentralizare și transferarea responsabilităților majore către autoritățile publice locale.

Autoritățile deliberative ale unităților administrativ-teritoriale au competența exclusivă privind înființarea, organizarea, coordonarea, monitorizarea şi controlul funcţionării serviciilor publice de alimentare cu apă și de canalizare, precum şi crearea, administrarea şi exploatarea bunurilor proprietate publică din infrastructura tehnico-edilitară a unităţilor administrativ-teritoriale aferente acestui serviciu.

Potrivit Legii privind serviciul public de alimentare cu apă și de canalizare nr. 303 din 13.12.2013, consiliile locale au competența privind:

- Elaborarea și implementarea planurilor proprii de dezvoltare și de funcționare, pe termen scurt, mediu și lung, a serviciului public de alimentare cu apă și de canalizare;
- Aprobarea tarifelor pentru serviciul public de alimentare cu apă și de canalizare;
- Administrarea sistemului public de alimentare cu apă și de canalizare, ca parte a infrastructurii tehnico-edilitare a unităților administrative-teritoriale;
- Aprobarea regulamentelor și a caietului de sarcini ale serviciului;
- Adoptarea modalității de gestiune și aprobarea documentației privind organizarea și derularea procedurii de delegare a gestiunii;
- Aprobă indicatorii de performanță ai serviciului.

Gestiunea serviciilor privește organizarea, funcționarea și controlul furnizării/prestării serviciilor de alimentare cu apă și de canalizare conform condițiilor stabilite de autoritățile administrației publice locale.

Gestiunea serviciilor publice de alimentare cu apă și de canalizare poate fi organizată în două modalități, alegerea fiind făcută printr-o decizie a autorităților administrației publice locale:

- Gestiune directă, realizata prin intermediul unor structuri specializate (secție, direcție) organizate în cadrul autorităților administrației publice locale.

- Gestiune delegată, definită ca o modalitate de management prin care autoritățile administrației publice locale atribuie unuia sau mai multor operatori gestiunea propriu-zisă a serviciului, respectiv administrarea și exploatarea sistemelor de alimentare cu apă și canalizare aferente acestuia, în baza unui contract de delegare a gestiunii. Gestiunea delegată se realizează prin intermediul unui contract de delegare a gestiunii încheiat între una sau mai multe unități administrativ-teritoriale, în calitate de delegatar, și un operator, în calitate de delegat. Principiul pentru atribuirea unui astfel de contract de delegare a gestiunii îl constituie licitația publică, cu respectarea procedurilor aplicabile.

Modalitatea de gestiune se stabilește prin decizii ale autorităților deliberative ale unităților administrativ-teritoriale, în funcție de natura și starea serviciului, de necesitatea asigurării celui mai bun raport preț/calitate, de interesele actuale și de perspectivă ale unităților administrativ-teritoriale, precum și de mărimea și complexitatea sistemelor de utilități publice.

Temeiul legal al cooperării autorităților publice locale în dezvoltarea serviciului public de alimentare cu apă și de canalizare îl constituie prevederile art. 8 din Legea nr. 303 din 13.12.2013. Astfel, autoritățile administrației publice locale de nivelul întâi:

- Decid asocierea unităților administrativ-teritoriale în vederea înființării și organizării serviciului public de alimentare cu apă și de canalizare și a încurajării investițiilor în sistemele publice de alimentare cu apă și de canalizare;
- Participă cu mijloace financiare și/sau cu bunuri la constituirea patrimoniului operatorilor pentru realizarea de lucrări și pentru furnizarea serviciului de alimentare cu apă și de canalizare.

Din studiile efectuate la nivelul autorităților locale a rezultat că pentru buna funcționare a serviciilor de apă și canalizare sunt necesare investiții financiare importante în sistemele publice de alimentare cu apă și de canalizare, care depășesc în mod considerabil capacitățile financiare ale majorității autorităților publice locale. De asemenea, la nivelul comunităților medii și mici, se remarcă o lipsă de personal specializat în furnizarea/prestarea serviciului, lipsa experienței în pregătirea proiectelor de investiții și implementarea acestora.

Astfel, soluția recomandată pentru rezolvarea acestor probleme o reprezintă organizarea și operarea acestor servicii la nivel regional pentru a asigura o dezvoltare durabilă și eficientizare a activităților prin efectul economiilor de scară.

Annex 8

Environmental impacts and mitigation measures

Annex 8: Environmental impacts and mitigation measures

1 Executive summary and conclusions

It is proposed to rehabilitate and extend the water supply and sanitary system in Cahul town and the nearby villages of Cotihana and Pascani.

The VPC Cahul is one out of 12 VPCs that have been developed in the WSS sector of the MLPS-Project (Intervention Area 2). It consists of the following components:

Water Supply Sector:

- Rehabilitation of aqueduct from the pumping station SP1 to the water treatment plant in the town of Cahul – 8,200 m;
- Rehabilitation of water distribution network in the town of Cahul – 1,020 m;
- Extension of water distribution network in the town of Cahul – 2,270 m;
- Extension of water distribution network in the micro raion Focșa (localities situated at the territory of the Roşu village, but are administered by the town of Cahul) – 3,830 m;
- Extension of water distribution network in the Cotihana village– 4,530 m;

Water Sanitation Sector:

- Rehabilitation of sewerage network in the town of Cahul – 3,770 m;
- Extension of sewerage network in the town of Cahul, incl. micro raion Lipovanca (localities situated at the territory of the Crihana Veche village, but are administered by the town of Cahul) – 43,000 m;
- Extension of sewerage network in the micro raion Focșa (localities situated at the territory of the Roşu village ,but are administered by the town of Cahul) – 6,600 m;
- Rehabilitation of wastewater treatment station in the town of Cahul – 1 pcs.;
- Construction of sewerage network in the Cotihana village and connection to the centralised sewerage system in the town of Cahul – 10,400 m;
- Construction of sewerage network in the Pașcani village– 24,000 m;
- Construction of wastewater treatment plant in the Pașcani village– 1 pcs.

An Environmental Assessment (EA) was prepared in order to facilitate the implementation of the VPC Cahul and to ensure that the envisaged project components 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 components of the VPC Cahul.

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 VPC Cahul is subject to a full scale EIA on the national level.

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

The environmental impacts of the proposed VPC Cahul have been assessed in this Environmental Assessment report. The results of analysing the environmental impacts and mitigation measures are presented in chapter 9 “Environmental Impacts and Mitigation measures”. Potential environmental impacts arising from the project along with a set of mitigation measures to reduce the impacts to acceptable levels is provided.

The analysis reveals that the environmental impacts associated with the implementation of the VPC Cahul are site specific, small scale and mostly limited to the construction stage of the project components. 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 components of the VPC Cahul. 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 citizens of Cahul town and the near-by villages Cotihana and Pascani will benefit from the collection and treatment of the wastewater and provision of good quality drinking water. The Project will stimulate economic growth. Standard of individual and public health will improve as a result of the project. The VPC will generate new job opportunities.

2 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.

[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.

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.

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);

[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.

- 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.

3 Environmental assessment for Cahul

An Environmental Assessment (EA) was prepared in order to facilitate the implementation of the VPC Cahul and to ensure that the envisaged project components 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 components of the VPC Cahul.

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 VPC Cahul is subject to a full scale EIA on the national level.

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

The environmental impacts of the proposed VPC Cahul have been assessed in this Environmental Assessment report. The results of analysing the environmental impacts and mitigation measures are presented in chapter 9 "Environmental Impacts and Mitigation measures". Potential environmental impacts arising from the project along with a set of mitigation measures to reduce the impacts to acceptable levels is provided.

The analysis reveals that the environmental impacts associated with the implementation of the VPC Cahul are site specific, small scale and mostly limited to the construction stage of the project components. 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 components of the VPC Cahul. 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 citizens of Cahul town and the nearby villages Cotihana and Pascani will benefit from the collection and

treatment of the wastewater and provision of good quality drinking water. The Project will stimulate economic growth. Standard of individual and public health will improve as a result of the project. The VPC will generate new job opportunities.

4 Introduction

In the WSS sector altogether 12 VPCs have been selected in the 3 Development Regions (DR) for purpose of further development to Ready-to Go Projects (RTG).

This document presents the Environmental Assessment (EA) report for the VPC (Viable Project Concept) Cahul. The Environmental Assessment Report is part of the Feasibility Study (FS).

4.1. Objective of the environmental assessment

The objective of the ea is to facilitate the implementation and to ensure that the envisaged components of the VPC Cahul will comply with Moldova's environmental and social legislation, procedures and policies and international and EU conventions. In addition the ESA Report addresses the environmental and social impacts, mitigation measures and management issues associated with the proposed components of the VPC Cahul.

4.2. Methodology

The methodology used for the preparation of this Environmental and Social Assessment Report was based upon the review of the Project documents that were so far prepared, particularly the Regional Sector Programme in the WSS sector for the Development Region Centre (DRC) and the documents prepared in the PPC (Possible Project Concept) stage of the Project Development Pathway.

In addition the existing Moldovan environmental and social legislation and the pertinent safeguard requirements of International Financing Agencies (IFA) were obeyed.

4.3. Study area

The Project Area of Influence (PAI) comprises the territory of the town of Cahul (neighbourhood units Lipovanca and Focsa) and the nearby villages of Cotihana and Pascani.

The area that is foreseen for water supply rehabilitation and extension and the proposed sewerage area for rehabilitation and extension is shown in the figures in chapter 6 "Project Description and Location".

5 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 VPC Cahul is subject to EIA.

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

A separate document has been prepared on the legal approval procedure (document name: 2015-02_06_EIA_Legal_Review_TI_EN). The document describes in detail the legal framework conditions and the SEE approval process.

6 Project description and location

The VPC Cahul involves the improvement of water supply services and waste water collection services for the town of Cahul and adjacent villages.

Based on the existing situation the VPC foresees the improvement of water supply and wastewater collection services in the town of Cahul (microrayon Lipovanca and micro rayon Focşa) and in Cotihana and Pașcani villages, as follows:

Water Supply Sector:

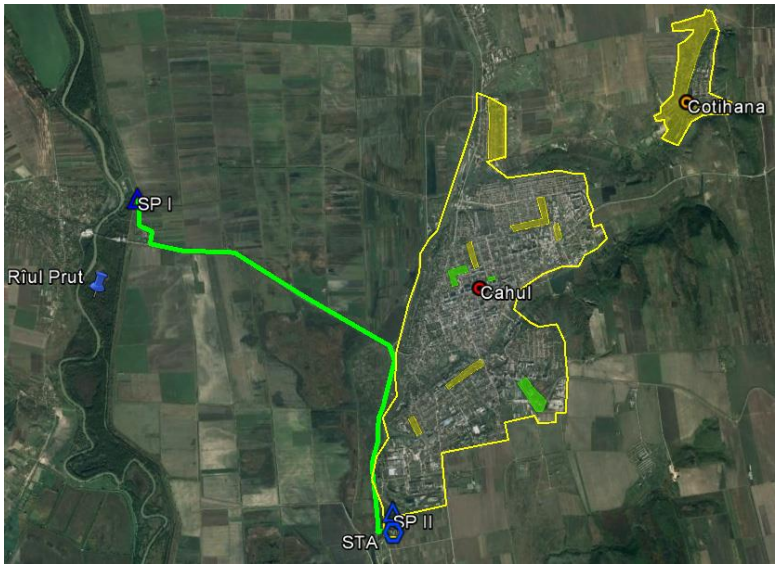
- Rehabilitation of aqueduct from the pumping station SP1 to the water treatment plant in the town of Cahul – 8.200 m;
- Rehabilitation of water distribution network in the town of Cahul – 1.020 m;
- Extension of water distribution network in the town of Cahul – 2.270 m;
- Extension of water distribution network in the micro rayon Focșa (localities situated at the territory of the Roşu village, but are administered by the town of Cahul) – 3.830 m;
- Extension of water distribution network in the Cotihana village– 4.530 m;

Water Sanitation Sector:

- Rehabilitation of sewerage network in the town of Cahul – 3.770 m;
- Extension of sewerage network in the town of Cahul, incl. micro rayon Lipovanca (localities situated at the territory of the Crihana Veche village ,but are administered by the town of Cahul) – 43.000 m;
- Extension of sewerage network in the micro rayon Focșa (localities situated at the territory of the Roşu village ,but are administered by the town of Cahul) – 6.600 m;
- Rehabilitation of wastewater treatment station in the town of Cahul – 1 pcs.;
- Construction of sewerage network in the Cotihana village and connection to the centralised sewerage system in the town of Cahul – 10.400 m;
- Construction of sewerage network in the Pașcani village– 24.000 m;
- Construction of wastewater treatment plant in the Pașcani village– 1 pcs.

Estimated borders of water supply area of the VPC are presented in the following figure 6-1.

Figure 6-1: Estimated borders of the water supply area of the VPC Cahul



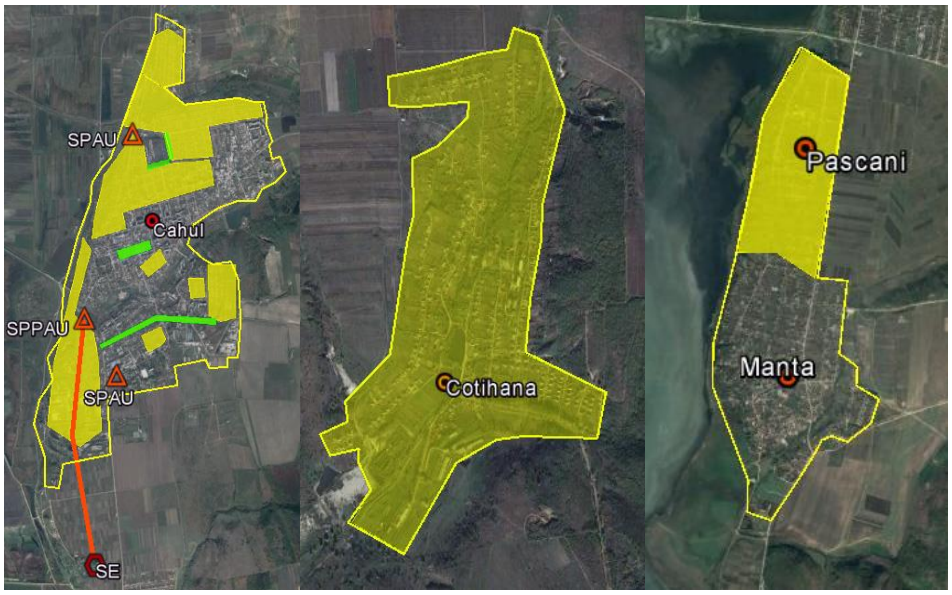
Water supply area proposed for extension

Water supply area proposed for rehabilitation

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

The estimated borders of the sewerage area of the VPC are presented in the following figure 6-2:

Figure 6-2: Estimated borders of the sewerage area of the VPC Cahul



Proposed sewerage area for extension

Proposed sewerage area for rehabilitation

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

7 Project 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.

7.1. Construction stage

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

- Rehabilitation of aqueduct from the pumping station SP1 to the water treatment plant in the town of Cahul – 8.200 m;
- Rehabilitation of water distribution network in the town of Cahul – 1.020 m;
- Extension of water distribution network in the town of Cahul – 2.270 m;
- Extension of water distribution network in the micro rayon Focșa (localities situated at the territory of the Roşu village, but are administered by the town of Cahul) – 3.830 m;
- Extension of water distribution network in the Cotihana village– 4.530 m.

The existing aqueduct from the pumping station SP1 to the water treatment plant in the town of Cahul will be rehabilitated. The length of the scheme is 8.200 m. In addition the existing water distribution network in the Project area will be extended and partly rehabilitated. The new pipes for installing will be steel and polyethylene and in the case of the aqueduct the proposed diameter is 630 mm. Pipes of smaller diameter will be laid for rehabilitation and extension of the distribution network in Cahul, the micro rayons Focsa and Rosu and in Cotihana village. Trenches for new pipe sections will be dug using a backhoe digger, supplemented by manual digging.

Excavated soil from trenches will be placed alongside the open trenches and the pipes will be placed in the trench. Pipes will be joined, after which excavated soil will then be replaced on beneath and sides. The trench will be refilled with excavated soil and sand and compacted manually. The depth of trench will be 1.5 m – 2.5 m depending on topographical conditions. Width of the trench will be 0.8 m. After construction part of trench will be occupied by pipe and sand layer, and trench is refilled with the excavated material.

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

- Rehabilitation of sewerage network in the town of Cahul – 3.770 m;
- Extension of sewerage network in the town of Cahul, incl. micro rayon Lipovanca (localities situated at the territory of the Crihana Veche village ,but are administered by the town of Cahul) – 43.000 m;
- Extension of sewerage network in the micro rayon Focsa (localities situated at the territory of the Roşu village ,but are administered by the town of Cahul) – 6.600 m;
- Rehabilitation of wastewater treatment station in the town of Cahul – 1 pcs.;
- Construction of sewerage network in the Cotihana village and connection to the centralised sewerage system in the town of Cahul – 10.400 m;

- Construction of sewerage network in the Pascani village– 24.000 m;
- Construction of wastewater treatment plant in the Pașcani village– 1 pcs.

Construction practices for these works are described in the following.

The sewer lines for extension and rehabilitation of the network in Cahul, micro rayon Lipovanca and micro rayon Focsa, and in the villages of Cotihana and Pascani will be laid alongside existing streets, lanes or other linear structures, thus keeping the involved environmental impacts and land acquisition requirements to a minimum. The depth of the trench will be between 1.5 – 2.5 m. Width of the trench will be 0.8 m. Excavated soil will be placed alongside the open trenches, and the pipes will be placed in the trench. Pipes will be joined, after which excavated soil will then be replaced on beneath and sides. The trench will be refilled with excavated soil and sand and compacted manually. The depth of trench will be 1.5 m – 2.5 m depending on topographical conditions. Width of the trench will be 0.8. m. After construction part of trench will be occupied by pipe and sand layer, and trench is refilled with the excavated material.

The existing waste water treatment plant in Cahul will be rehabilitated. Therefore no additional land acquisition and other significant impacts on the nearby environment are expected to occur.

The construction of the new waste water treatment plant in Pascani village involves the following activities:

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

All tanks will be constructed as compact concrete structures, reducing the requirements for space in comparison with more nature oriented technologies as ponds or constructed wetlands. Main construction materials used for the various components of the WWTP are concrete and steel. Area of influence during construction comprises the construction site exhibiting, the borrow areas required for material extraction and the haulage routes. Impacts arising within these areas during construction activities are described in the chapter on impacts and mitigation measures.

Required construction materials such as sand and aggregates will be sourced from licensed borrow areas. There is no designated disposal site for construction waste. It is generally disposed in low lying areas.

Water needed for civil works comprises potable water and construction water. Potable water shall comply with the national quality standards and shall not compete with the needs of the local population. Construction water and water to be used for dust suppression measures may be taken from Prut River or other surface waters in the vicinity of construction site.

Transportation routes. Construction site is accessible via the Regional Road R34 and local roads.

For mitigation measures please refer to subsequent chapters.

7.2. Operation stage

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

leaks will be mainly limited to joints between pipes. Repair work will be conducted in the same way the pipe was laid, after locating the leaking section.

The wastewater system will require repair and maintenance activities like cleaning and inspection. Repair work will be conducted in the same way the pipe was laid.

The WWTP will require inspection and maintenance activities like physical and chemical analyses and disposal of stabilized sludge and compacted waste on a waste disposal site.

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

8 Environmental and social baseline conditions

8.1. Physical environment

VPC Cahul is located in the South Development Region, in the extreme south western part of Moldova, adjacent to the River Prut.

Most of the study area is built up area. The adjoining area is mainly under agricultural use. To the west of the study area the Prut river and its floodplain is located.

According to the geologic map of Moldova the VPC Cahul is mainly characterized by Pliocene and Quaternary deposits. These overlay older sediments and metamorphic rocks of Palaeozoic and Mesozoic age. The Quaternary deposits within the Project's area of influence are either of alluvial origin, e. g. fluvial sediments within the Prut River valley, or loess deposits. According to the geologic map of Moldova nearly the whole south of Moldova is dominated by loess sediments. The prevailing soil type within the study area is chernozem. Within the floodplain of the Prut River azonal riverside soils occur. The soils in the study area show a high fertility.

The regional climate in the SW of the country is temperate continental as is typical for all of Moldova. Rainfall gradually decreases from the central western part of Moldova to the SE. The average rainfall per year for Cahul is 557 mm. As is the case in other parts of the country nearly half of that annual precipitation falls during the months of Mai to September. Snowfall generally occurs between December and March and the freezing period usually lasts 60 to 65 days.

Hydrologically the VPC Cahul is entirely located in the basin of River Prut. River Prut has its source in the Carpathian Mountains, crosses a depression near the Black Sea and discharges into the Danube near the village Giurgiulesti (District Vulcanesti). River Prut is about 850 km long. By most normal standards, the river's water quality is fairly good throughout much of its length between Moldova and Romania. The heavy rainfalls are likely to flood settlements that lay out close to the Prut River Meadow.

8.2. Biological environment

The VPC Cahul is located in the southern steppe zone of the country. The natural vegetation of that region is characterized by grass species that are specifically adapted to arid conditions and various species of oak. Built up area and agricultural land use have substituted the natural habitats in the Project area.

Towards the west of the study area biodiversity is significantly increasing when approaching the Prut River and its floodplain. In the Prut meadows significant populations of amphibians and reptiles are expected to occur. Examples are the common spade-

foot (Pelobates fuscus), the green toad (Bufo viridis), the crested newt (Triturus cristatus), the tree frog (Hyla arborea) and the grass snake (Natrix natrix).

9 Environmental Impacts and mitigation measures

In the previous project stage (PPC stage) the environmental analysis consisted in the elaboration of a checklist of potential environmental consequences of the activities related to the improvement of water supply and sanitation services. The conclusions were presented in the form of a table.

In the present project stage (VPC stage / Feasibility Study) a more detailed analysis is provided for the mitigation of the environmental impacts arising during construction and operation of the various components of the investment scheme. In the following table, environmental impacts are described for the 3 different phases of Project implementation, the pre-construction, construction phase and the operation phase.

Environmental protection- and mitigation measures are assigned to the respective impact and activity.

Ultimately, all proposed measures for impact avoidance or mitigation that relate to construction need to be incorporated into the bidding or contract documents thereby becoming binding elements of the construction and construction supervision contracts.

Table 9-1: Environmental Impacts and mitigation measures

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
Pre-Construction				
Possible removal of terrestrial habitat. Loss of vegetation and top soil	Construction site rehabilitation by contractor after finalization of construction activities. Vegetation planting and stabilization of site, including replacement of any native plant species that were removed during construction activities.	Construction Contractor	Construction and labour camp, storage area. Aqueduct, distribution network, waste water treatment plant..	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	Construction Company	Excavation areas for trenches at aqueduct and distribution network. Construction site for waste water treatment plant.	Part of construction cost

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
	access by fencing;			
	The Contractor shall coordinate with local Traffic Management Department to minimize construction traffic impact in the following topics: Temporary parking restrictions, Pedestrian and cyclist diversion routes where construction prevents access, Temporary traffic signals, One way scheme, Maintaining local residential access at all times, General traffic diversion routes where roads are closed. Sound barriers should be erected at schools and hospitals if the distance to the construction site is less than 50 m	Contractor	Transportation routes of construction material	Part of construction cost
Noise Pollution	Maintain machinery and vehicle silencer units to minimize noise; Keep noise generating activities associated with construction activities to a minimum and within working hours; Notify the residents close to the Project area prior to commencement of the construction phase; Vehicles and machinery that are used intermittently should not be left in idling condition for long period of time; Equipment used on site will be quietest reasonably available; Haul routes for construction traffic entering and leaving the site will be selected to ensure noise levels at noise sensitive receptors are kept at a minimum;	Construction Contractor	Construction sites of the VPC	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 run-	Construction Contractor	Project area	Part of construction cost

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
	off from upland areas will not enter the site Ensure that drains are not blocked with excavated soil			
Soil Contamination	The contractors will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination. Solid waste generated during construction and at campsites will be properly treated and safely disposed of only in demarcated waste disposal sites. Construction chemicals will be managed property Clearly labelling all dangerous products, Fuel tanks (diesel or oil) should be placed in a concrete pool with perimeter walls that are at least 1.0 m high, A proper floor drain should be installed on the slab of the concrete pool for safely discharging the leakages.	Construction Contractor	Construction site, Camp	Part of construction cost
Impact on Flora and Fauna	Avoid tree cutting In unavoidable cases, plant two trees of same species for each tree that is cut for construction The trench shall not be kept open in the night/after working hours. This will avoid any safety risk to people, domesticated, stray or wild animals. The Contractor shall ensure that the work site be kept clean, tidy and free of rubbish that would attract animals.	Construction Contractor	Construction site	Part of construction cost
Impact on Traffic	Inform all residents and businesses about the nature and duration of any work well in advance so that they can make necessary preparations if necessary; Provide wooden walkways/planks across trenches for pedestrians and metal sheets where vehicle access is required Increasing workforce to complete the work in minimum time in these stretches Initial situation of private properties has to be re-established after construction	Construction Contractor	Construction site, Access Roads	Part of construction cost
Hazardous Materials	Comply with all national, regional and local legislation with regard to the storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials. 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	Construction Contractor	Construction site, waste storage area, camp site	Part of construction cost

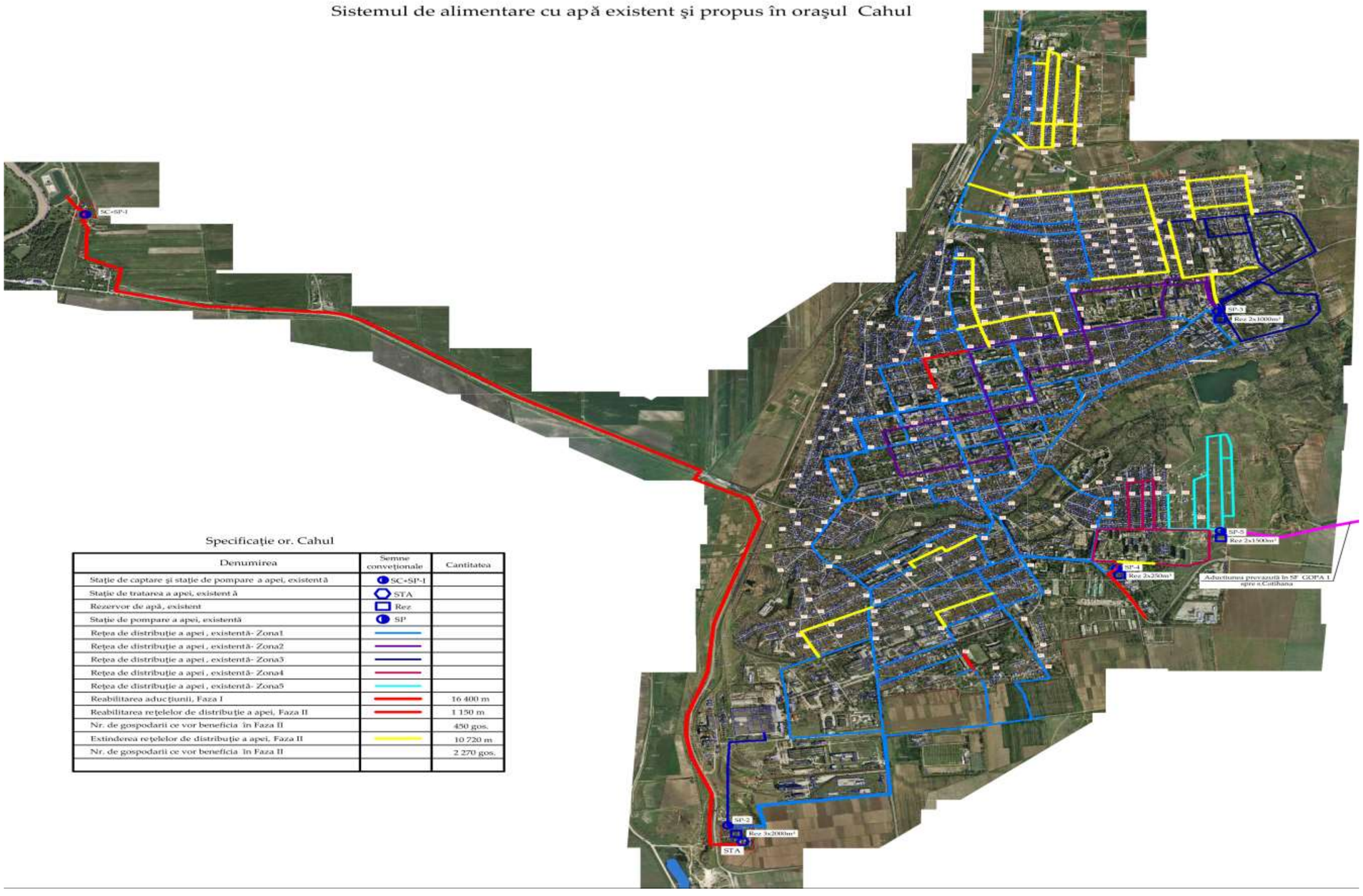
Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
	structures. Waste has to be immediately removed from the working sites. Waste has to be placed in secondary protective basins. Waste may only be transferred to a certified contractor. The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in: Waste handling Waste treatment; and Waste storage.			
Loss of top soil	Top soil of about 1 ft depth (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 Contractor	Construction sites and access roads	Part of construction cost
Socio-economic benefits from employing local people in construction work	To the extent possible labour force should be drawn from the local community	Construction Contractor	All construction sites	Part of construction cost
Safety risk – public and worker	Follow standard and safe procedures for all activities – such as provision of shoring up deep trenches (>2 m) Exclude public from the site – enclose construction area, provide warning and sign boards, 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	Construction Contractor	All construction sites	Part of construction cost

Activity / Impacts	Mitigation measures	Responsibility	Location	Cost
	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..			
Operation Phase				
Influx of insects, rodents	Regular waste and sludge disposal	Regional office of Ministry of Water	WWTP	Part of operation costs
Risk of delivery of unsafe water to consumers	Conduct regular water quality monitoring; Develop & implement water quality monitoring program for distribution system Establish a water quality laboratory as part of the project, with adequate building, equipment and trained personnel	Regional office of Ministry of Water	Water intake, transmission main, distribution network	Part of operation cost

Annex 11

Conceptual drawings

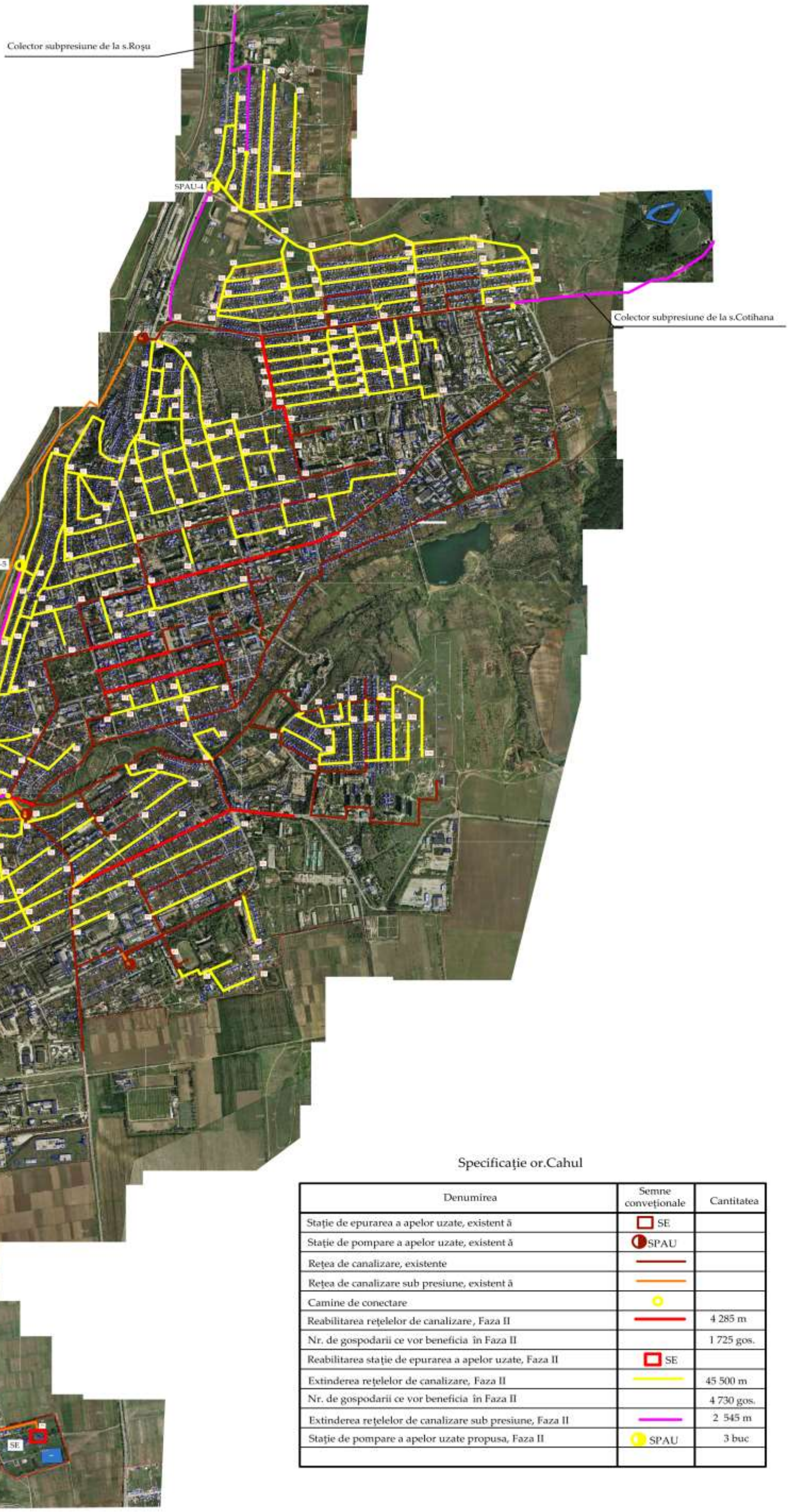
Annex 11: Conceptual drawings



Specificaţie or. Cahul

Denumirea	Semne convenţionale	Cantitatea
Staţie de captare şi staţie de pompare a apei, existentă	SC+SP-1	
Staţie de tratarea a apei, existentă	STA	
Rezervor de apă, existent	Rez	
Staţie de pompare a apei, existentă	SP	
Reţea de distribuţie a apei, existentă- Zona1		
Reţea de distribuţie a apei, existentă- Zona2		
Reţea de distribuţie a apei, existentă- Zona3		
Reţea de distribuţie a apei, existentă- Zona4		
Reţea de distribuţie a apei, existentă- Zona5		
Reabilitarea aducţiunii, Faza I		16 400 m
Reabilitarea reţelelor de distribuţie a apei, Faza II		1 150 m
Nr. de gospodarii ce vor beneficia în Faza II		450 gos.
Extinderea reţelelor de distribuţie a apei, Faza II		10 720 m
Nr. de gospodarii ce vor beneficia în Faza II		2 270 gos.

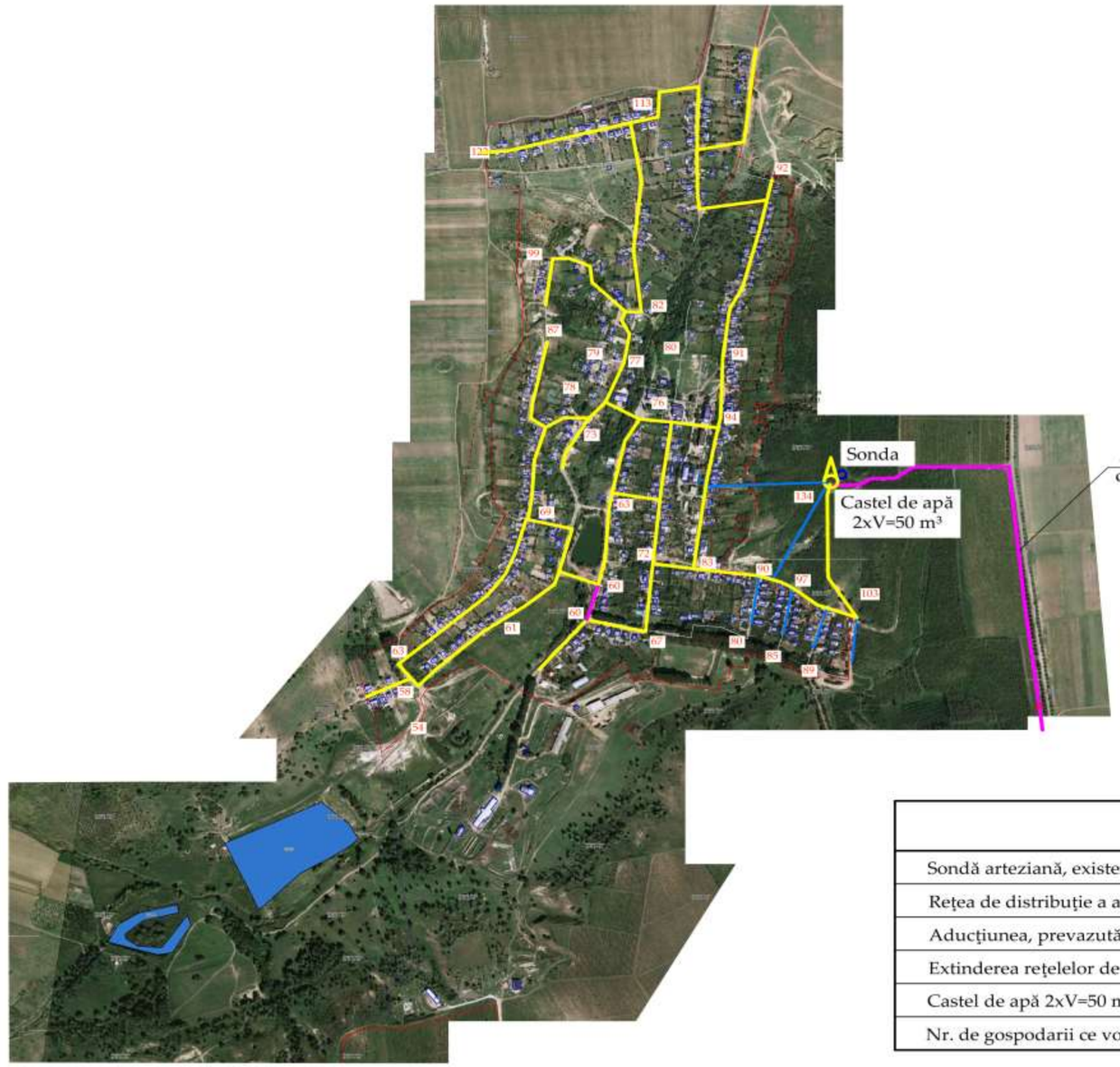
Sistemul de canalizare existent şi propus în oraşul Cahul



Specificaţie or.Cahul

Denumirea	Semne convenţionale	Cantitatea
Staţie de epurarea a apelor uzate, existent ă	SE	
Staţie de pompare a apelor uzate, existent ă	SPAU	
Reţea de canalizare, existente		
Reţea de canalizare sub presiune, existent ă		
Camine de conectare		
Reabilitarea reţelelor de canalizare, Faza II		4 285 m
Nr. de gospodarii ce vor beneficia în Faza II		1 725 gos.
Reabilitarea staţie de epurarea a apelor uzate, Faza II	SE	
Extinderea reţelelor de canalizare, Faza II		45 500 m
Nr. de gospodarii ce vor beneficia în Faza II		4 730 gos.
Extinderea reţelelor de canalizare sub presiune, Faza II		2 545 m
Staţie de pompare a apelor uzate propusa, Faza II	SPAU	3 buc

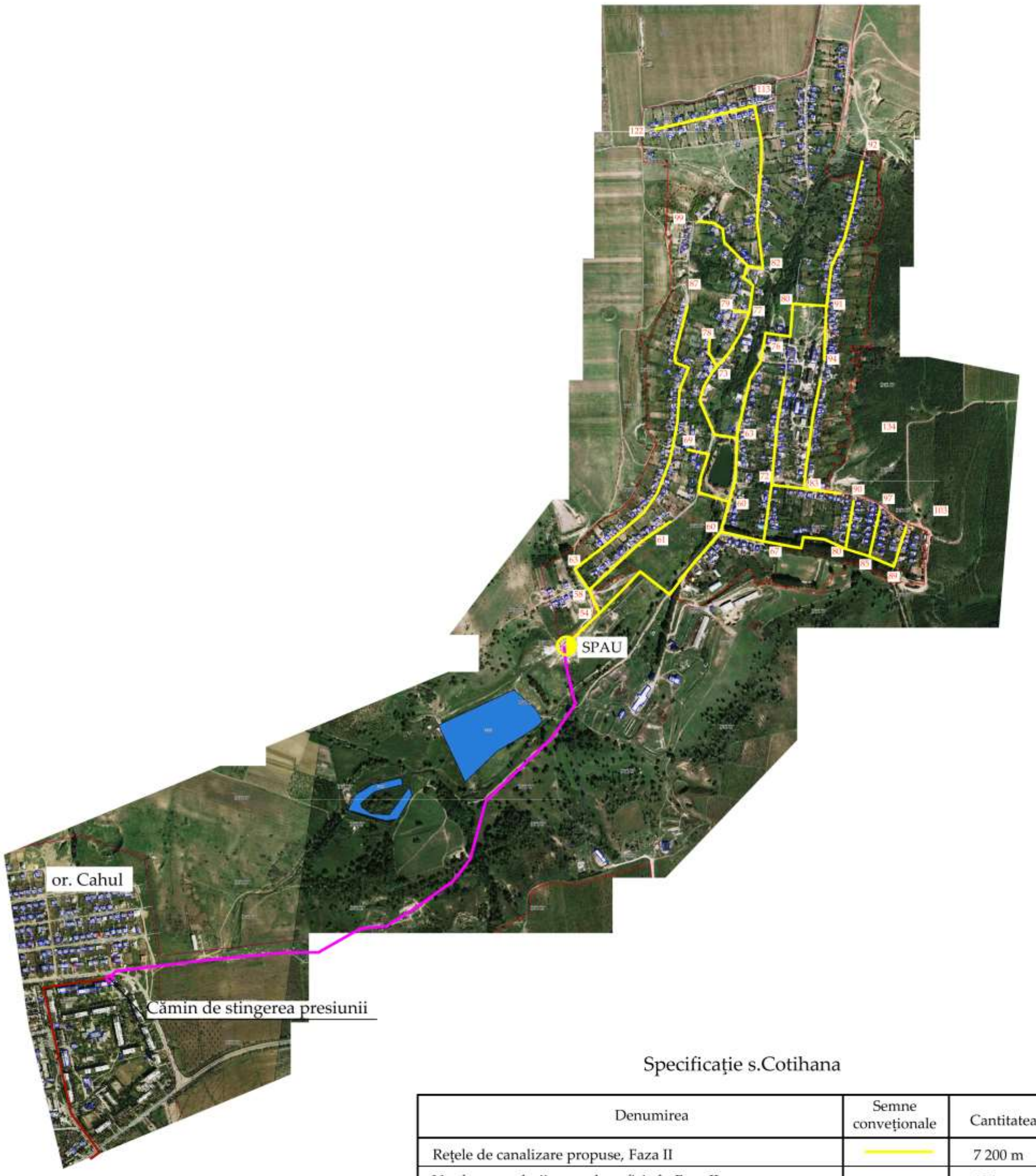
Sistemul de alimentare cu apă propus în satul Cotihana



Specificaţie s.Cotihana

Denumirea	Semne convenționale	Cantitatea
Sondă arteziană, existentă	Sonda	
Rețea de distribuție a apei, existentă		
Aducțiunea, prevazută în SF GOPA 1		
Extinderea rețelelor de distribuție a apei, Faza II		6 880 m
Castel de apă 2xV=50 m³, propus Faza II		2 buc
Nr. de gospodarii ce vor beneficia în Faza II		300 gos.

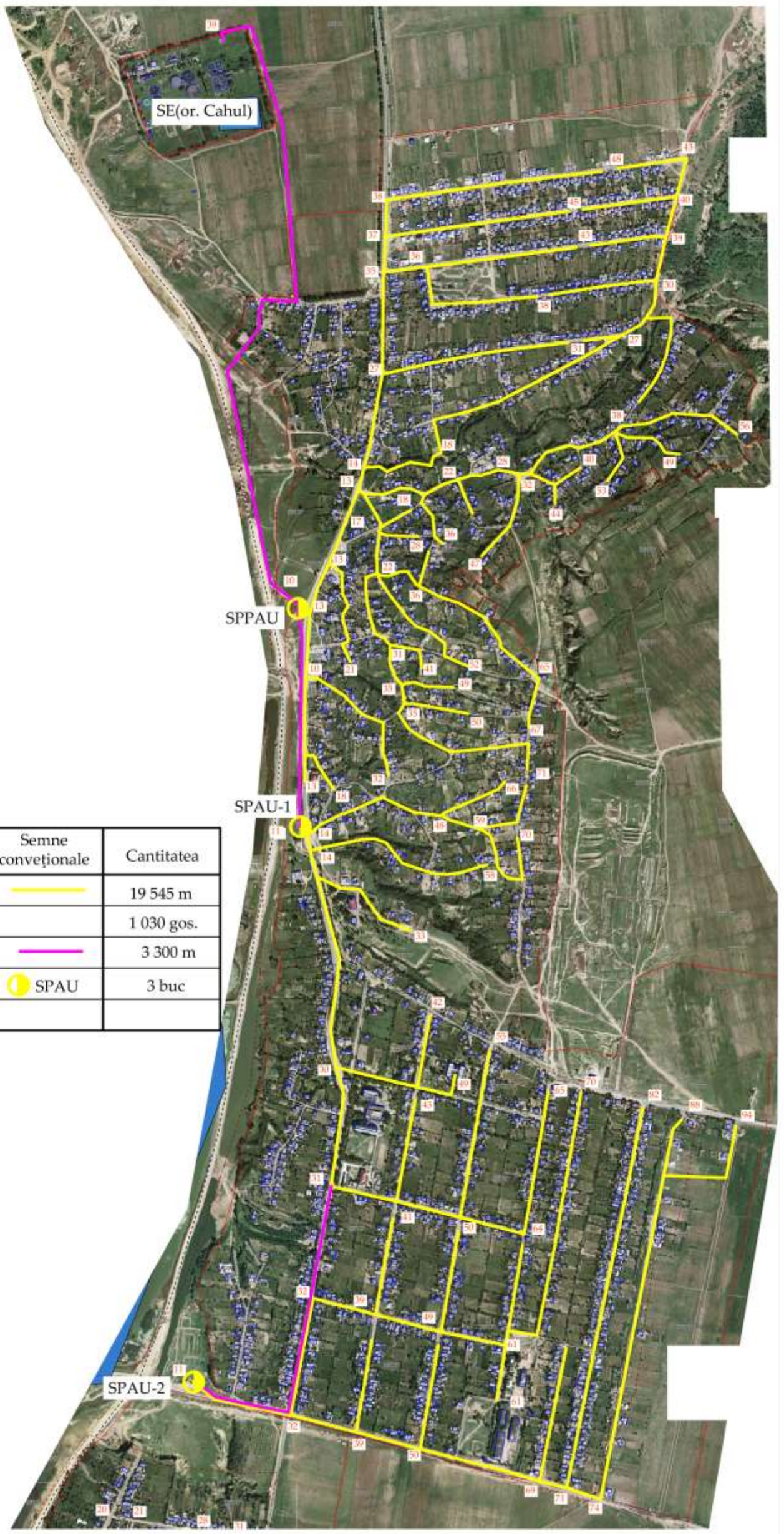
Sistemul de canalizare propus în satul Cotihana



Specificaţie s.Cotihana

Denumirea	Semne convenționale	Cantitatea
Rețele de canalizare propuse, Faza II		7 200 m
Nr. de gospodarii ce vor beneficia în Faza II		425 gos.
Rețele de canalizare sub presiune propuse, Faza II		1915 m
Stație de pompare a apelor uzate propusa, Faza II	SPAU	1 buc

Sistemul de canalizare propus în satul Crihana Veche



Specificație s.Crihana Veche

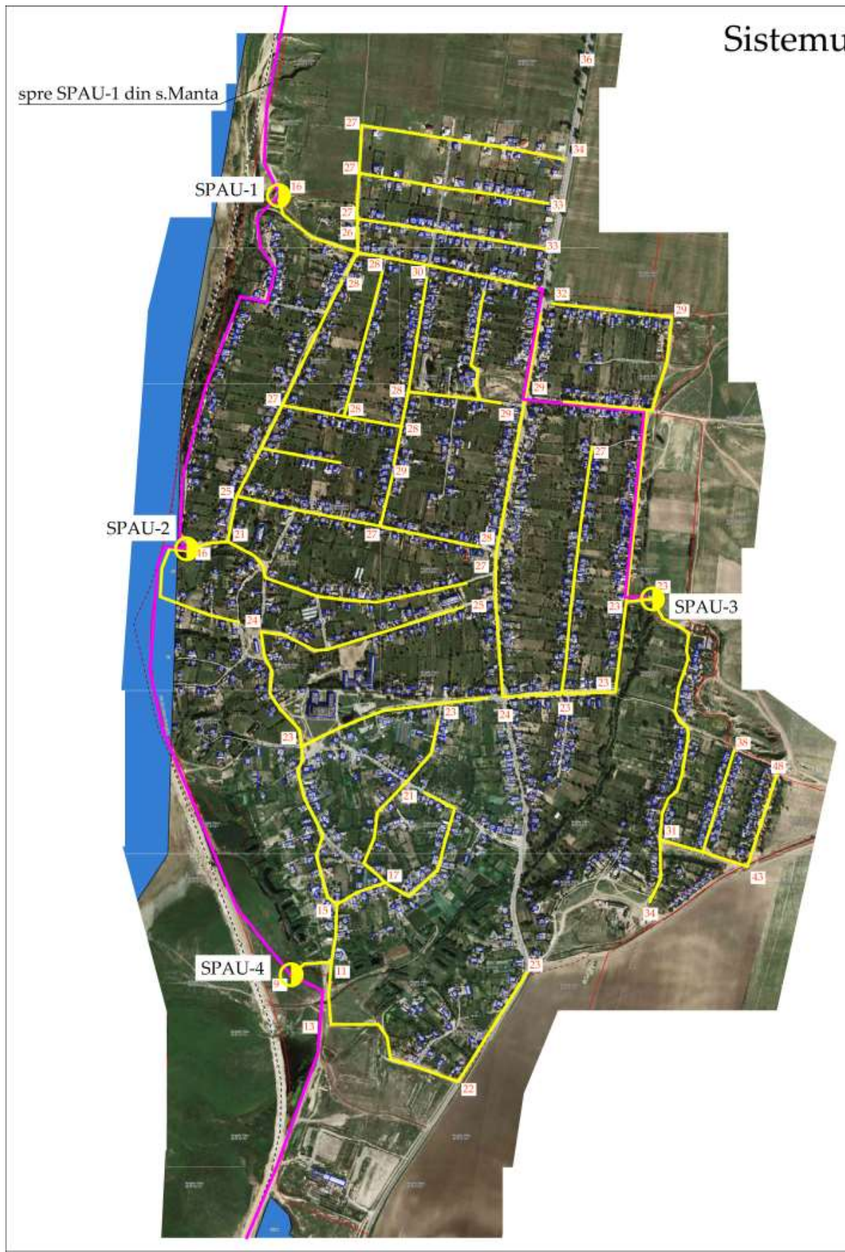
Denumirea	Semne conveționale	Cantitatea
Rețele de canalizare propuse, Faza II		19 545 m
Nr. de gospodarii ce vor beneficia în Faza II		1 030 gos.
Rețele de canalizare sub presiune propuse, Faza II		3 300 m
Stație de pompare a apelor uzate propusa, Faza II	SPAU	3 buc

Sistemul de canalizare propus în satul Manta

Specificaţie s. Manta

Denumirea	Semne convenționale	Cantitatea
Rețele de canalizare propuse, Faza II		14 315 m
Nr. de gospodarii ce vor beneficia în Faza II		682 gos.
Rețele de canalizare sub presiune propuse, Faza II		3 565 m
Stație de pompare a apelor uzate propusa, Faza II	SPAU	4 buc

Sistemul de canalizare propus în satul Manta



Specificaţie s. Manta

Denumirea	Semne convenţionale	Cantitatea
Reţele de canalizare propuse, Faza II		14 315 m
Nr. de gospodarii ce vor beneficia în Faza II		682 gos.
Reţele de canalizare sub presiune propuse, Faza II		3 565 m
Staţie de pompare a apelor uzate propusa, Faza II	SPAU	4 buc