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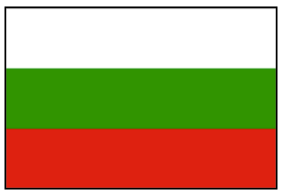


Municipal Infrastructure Development Project

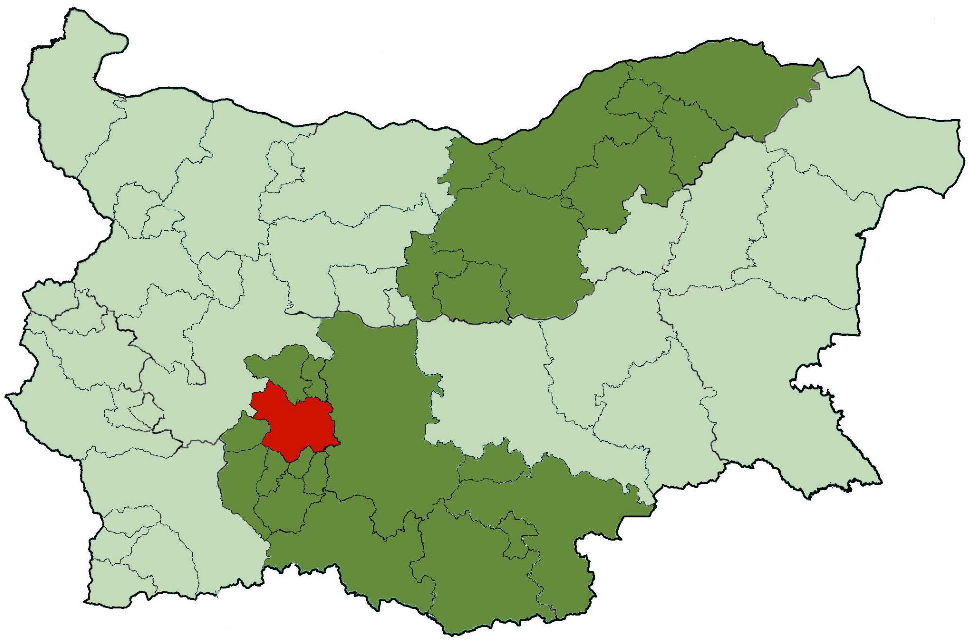
Loan No. 7834 - BG

MIDP-MP-QCBS2

PREPARATION OF REGIONAL WATER AND WASTE WATER MASTER PLANS FOR

CENTRAL REGION

OF REPUBLIC OF BULGARIA



REGIONAL FINAL MASTER PLAN
for the designated territory of
ViK EOOD – PAZARDZHIK

REPORT, APPENDICES, MAPS

January, 2014

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REPORT CONTROL SHEET

CLIENT:	MINISTRY OF REGIONAL DEVELOPMENT AND PUBLIC WORKS (MRDPW)		
PROJECT:	PREPARATION OF REGIONAL WATER AND WASTE WATER MASTER PLANS FOR THE **CENTRAL REGION** OF THE REPUBLIC OF BULGARIA	Loan No	7834 - BG
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REPORT TITLE:	Regional Final Master Plan for the designated territory of ViK EOOD - Pazardzhik		

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ADVICE

This MP has been prepared on the basis of best available data. Data has not always been forthcoming and all obtained data is included in the Annex in digital form. As a result of this, the assessment and investment measures (incl. option analysis) proposed in this MP will need to be revised and possibly significantly amended in subsequent pre-investment studies (e.g. Pre-Feasibility Study, Feasibility Study). A full revision of the MP shall be undertaken no later than 2018.

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LIST OF ABBREVIATIONS

AC	Asbestos-Cement
BA	Biodiversity Act
BDBSR	Basin Directorate – Black sea Region
BDWMDR	Basin Directorate for Water Management in Danube Region
BGN	Bulgarian Leva
BOD_5	*Biochemical Oxygen Demand – 5 days*
BP	Business Plan
BPS	Bunker pumping station
CBA	Cost Benefit analysis
CC	*Collection Chamber*
CCTV	Closed Circuit Television
CM	Constant Monitoring
COD	*Chemical Oxygen Demand*
CSG	Community Strategic Guidelines
DB	Deep Borehole
DBP	Disinfection by product
DC/DS	Distribution Chamber/Distribution Shaft
DNHWL	District Non-hazardous Waste Landfill
DWD	Drinking Water Directive
DWTP	Drinking Water Treatment Plant
EA	Environmental Assessment
EBRD	European Bank for Reconstruction and Development
EMAPA	Enterprise for Management of Environmental Protection Activities
EIA	Environmental impact assessment
EIB	European Investment Bank
EOP	Environment Operational Programme
EPA	Environmental Protection Act
EU	European Union
€	€uro
GAC	Granulated Activated Carbon
GDP	Gross Domestic Product
GIS	Geographic Information System
GVA	Gross Value Added
GWI	Ground Water Infiltration
HMS	Hydrometric stations
IFIs	International Financing Institutions
IS	Irrigation system
IURDP	Integrated Urban Recovery and Development Planning
IWA	International Water Association
IWSN	Internal Water Supply Network
l/c/d	Liter per capita per day
MA	Managing Authority
MEET	Ministry of Economy, Energy and Tourism
MoEW	Ministry of Environment and Water

MRDPW	Ministry of Regional Development and Public Works
N	Nitrogen
NDP	National Development Plan
NES	National Environmental Strategy
NL	Natural landmarks
NP	Natural park
NPV	Net Present Value
NRW	Non Revenue Water
NSMDW	National Strategy for Management and Development of the Water Sector
NSRF	National Strategic Reference Framework
NRW	Non-Revenue Water
NUTS	Nomenclature of Units for Territorial Statistics
NWMP	National Waste Management Programme
OP	Operational Programme
P	Phosphorus
PA	Protected areas
PE	Population Equivalent
PM	Periodical Monitoring
PR	Pressure reservoir
PS	Pumping Station
PU	Pump unit
RMP	Regional Master Plan
Q	Flow
RIEW	Regional Inspectorate of Environment and Water
RIPCPH	Regional Inspectorate of Protection and Control Public Health
RR	Relieve Reservoir
RWC	Regional Water Companies
RWSSSA	Regulation of Water Supply and Sewerage Services Act
SC	Spring Catchment
SCF	Structural and Cohesion Funds
SEWRC	State Energy and Water Regulatory Commission
SPZ	Sanitary Protection Zone
SS	Suspended solids
SW	Shaft Well
TR	Transitional Reservoir
TW	Tube Well
UCDB	Unit Cost Data Base
US	Urban sewerage
UWWTD	Urban Waste Water Treatment Directive
WA	Water Act
WA	Water Associations
WB	World Bank
WB	Water Body
WC	Water Cycle
WFD	Water Framework Directive
WSS	Water supply and sewerage
WSSC	Water Supply and Sewerage Companies (ViKs)

WWTP	Waste Water Treatment Plant

0. SUMMARY

0.1. OBJECTIVES AND SCOPE OF THE REGIONAL MASTER PLAN

This section relates to chapter 1 of the main report.

The Government of Bulgaria has received a loan from the World Bank to implement a Municipal Infrastructure Development Project. Its strategic aims are to (a) improve the reliability and quality of water provision to the communities in selected settlements in the project area and (b) assist municipalities to improve investment-planning capacity. The SEURECA, SCE, Arcadia Engineering and Hidroproekt Joint-Venture has been engaged through the Bulgarian Ministry of Regional Development and Public Works (MRDPW) to provide consultancy services for the Preparation of the Regional Water Supply and Sewerage Master Plans in Central Region of Bulgaria.

The objective of the project is to improve the water supply and sewerage systems on the considered region in compliance with the European Directives and the National Environmental Strategy of Bulgaria, which main objective is to "*provide good quality and sufficient quantity of water for different purposes"*. This will be done by defining the necessary assets, asset improvements and non-investment measures allowing meeting the needs of the population and the financial plan to be applied for such an achievement. The Regional Master Plan implementation period is 2014-2038.

The Regional Master Plan will be supporting the Water and Sewage Infrastructure development policy and the corresponding financing plan. It will serve as basis for the further stages of development: feasibility studies, Application Forms, Tender Documentation, design and construction.

The present report is exposing the outcomes of the Study conducted on the territory of the ViK EOOD – Pazardzhik in liquidation within the framework of the Regional Water and Wastewater Master Plans in Central Region of the Republic of Bulgaria.

0.2. CURRENT SITUATION AND DEFICIENCIES

This section relates to chapters 2 and 3 of the main report.

0.2.1. GENERAL CHARACTERISTICS

0.2.1.1. *Project area*

The region operated by ViK EOOD – Pazardzhik corresponds to the territory of the Municipalities of Pazardzhik, Septemvri and Lesichovo, which are located in Pazardzhik District. The figure below shows the location of the territory served by ViK EOOD Pazardzhik on the map of the Republic of Bulgaria.

The general situation of the territory of ViK EOOD – Pazardzhik is presented in map N°1.

Figure 0-1 Map of the location of the study area

0.2.1.2. Natural features

Geographical features.

Pazardzhik District covers an area of 636.8 km² and includes 32 settlements with a population of 114,817 inhabitants, the town of Pazardzhik – municipal centre (71,979 inhabitants). Septemvri Municipality occupies an area of 361.3 km² with 15 settlements and the town of Septemvri as a municipal centre. Lesichovo Municipality has an area of 208.9 km², encompassing 7 settlements with municipal centre in Lesichovo.

Geographical location – The designated territory of ViK Pazardzhik EOOD in liquidation is located in the central part of South Bulagria in the western part of Upper Thracian Lowland. The region is rich in water resources. Fertile fields are situated along both banks of Maritsa River and its tributaries (Topolnitsa and Luda Yana).

The area is comprised of primarily flat terrain. Pazardzhik has an altitude ranging from 190 to 370 m, with 205m in the town of Pazardzhik. The lowest part of the plain is situated east of Pazardzhik with an altitude of less than 200m. Septemvri Municipality has partially semi-mountainous and mountainous relief along the slopes of the surrounding mountains. Lesichovo Municipality – in the north and west, the municipal area is occupied by parts of Ihtiman and Central Sredna Gora Mountain and in the south and southeast it is taken up by branches of the Upper Thracian Lowland. The highest point in the municipality is Benkovski peak (1,186m).

Climate is of moderate-transitional and continental-Mediterranean type. The annual precipitation at Pazardzhik station amounts to 548 mm.

The main water arteries in the designated territory are Maritsa River and its larger tributaries – the rivers of Topolnitsa, Luda Yana and Chepinska, which in turn take up the water of numerous small tributaries. The catchment basins of several smaller and shallower rivers, tributaries of the rivers of Maritsa, Topolnitsa and Chepinska, are also entirely or partially located within the boundaries of the designated territory. All of them fall within the catchment basin of Maritsa River from the East Aegean Sea Region for water management. More detailed information is given in Chapter 2.

Hydrogeological conditions

Hydrogeological conditions on the territory operated by ViK EOOD- Pazardzhik in liquidation , are characterised by karst, fissure and pore groundwater

Karst groundwater is found mainly in the marble bodies of the Dobrostan formation and partially in other Precambrian formations, as well as in Palaeogene-Neogene carbonate sediments. The following groundwater bodies or parts of them belong to the territory „Karst water – Central Rhodope massif" under code BG3G00000Pt041 and „Karst water – Malko Belovo'" under code BG3G00000Pt037. Karst water is mainly drained through springs with variable flow rates and water abstraction facilities

Pore groundwater is accumulated in the gravelly-sandy Neogene sediments and the Quaternary alluvial and deluvial formations. The following groundwater bodies are formed within them: „Quaternary pore water– Upper Thracian Lowland" under code BG3G000000Q013 and „Neogene- Quaternary pore water – Pazardzhik-Plovdiv region" under code BG3G00000NQ018.

Apart from the abovementioned water bodies, the territory of Septemvri Municipality is occupied by mineral water field of Varvara-Septemvri Municipality, which is exclusive state property.

Geological conditions and soils

In terms of its structure, the territory served by ViK EOOD-Pazardzhik in liquidation from north to south falls within Sredna Gora zone, Panagyurishte volcanogenic strip, Ihtiman block, Upper Thracian depression, Maritsa fault zone, and the northern part of the Rila-Rhodope massif. The lithologo-stratigraphic structure of these tectonic units is very diverse and includes numerous rock complexes of Precambrian to Quaternary age.

Pursuant to Ordinance No RD-02-20-2/27.01.2012 for the design of buildings and facilities in seismic areas the building and facilities in the Municipalities of Pazardzhik, Septemvri and Lesichovo, are secured for IX-th degree with seismic coefficient of Cs= 0.27.

As regards the conditions for performance of construction works (excavations, enbankments, foundation of facilities, etc.), the lithological varieties, forming the geological environment, are classified as earth soils, which are possible to dig up by using excavators and as rocky soils, which are possible to dig up by means of explosives and/or high capacity excavators.

The estimated volume of excavation works in earth and rocky soils is as follows:

- Sredna Gora zone, Panagyrishte volcanogenic strip, Ihtiman block and Rila-Rhodope massif – for sewerage networks – earth soils about 20%, rocky soils – about 80% and for water supply networks – earth soils about 30%, rocky soils – 70%.

- Upper Thracian depression and Ihtiman graben - for sewerage networks – earth soils about 80%, rocky soils – about 20% and for water supply networks – earth soils about 70%, rocky soils – 30%.

Ecological and environmental features

Ecological and environmental features may be summarised as follows:

- The ambient air in the designated territory is characterised by relatively high purity except for the winter periods when fog occurs caused by domestic heating. Potential air pollutants in Pazardzhik Municipality are the large industrial enterprises, however if strict control and effective management are conducted, the harmful emissions can be reduced in order to meet the necessary requirements of the current legislation.
- Analysis results of the conducted monitoring indicate that for the period between 2011 and 2012, all surface water bodies are of good chemical status.
- Regarding the ecological status of the water bodies, the main parameters, for which exceedances are observed are phosphates, total phosphorus, ammonium nitrogen, nitrite nitrogen, nitrate nitrogen, total nitrogen, BOD. This is due to discharge of untreated and industrial wastewater from the settlements with partially built or missing sewerage systems. Only the town of Pazardzhik has an operating WWTP.
- The wastewater with high content of organic substances, nutrients (nitrogen and phosphorus compounds), detergents etc. is directly discharged. The oxygen content and the self-purification capacity of the water bodies are reduced. Conditions for health risk for the population in the area are created.
- Groundwater is vulnerable to pollution in areas with intensive agriculture and urbanization, which exist within the boundaries of the designated territory. The large-scale cutting down of forests within the water supply areas or immediately around the water sources contribute to the observed negative trends;
- Agricultural areas within the designated territory amount to about 65%, a major part of them being arable (the agricultural lands in Pazardzhik Municipality are over 70% of the total territory, in Septemvri Municipality – over 57%, while in Lesichovo Municipality they are over 60%). This is a precondition for the development of agriculture, animal breeding and food industry, with priority for the development of viticulture, wine production and vegetable-growing.
- The municipalities of Septemvri and Lesichovo, located within the designated territory of Pazardzhik, have developed Waste management programmes agreed with the competent authorities; ‘Regional waste management in Pazardzhik region’ is to be implemented by the from the Municipalities of Pazardzhik, Peshtera, Belovo, Lesichovo, Bratsigovo, Septemvri, Rakitovo, Batak and Velingrad. The site of the Regional non-hazardous waste landfill (RNWL) is envisaged to occupy a total area of 349 decares, of which 123 decares are located within the existing landfill on the lands belonging to the village of Aleko Konstantinovo.

- The territory operated by the Water Operator comprises the following protected areas – protected sites (13) and 10 protected zones of NATURA 2000 (Appendix 2-2). The implementation of the investment programmes included in the Regional Master Plan is not expected to exert any adverse effect on these areas.

According to Order № RD – 970 от 28.07.2003 of the Minister of Environment and Water, the water body of Chepinska River and its tributaries after the town of Velingrad until it flows into Maritsa River is classified as ‘sensitive area’ and pursuant to the Report for Implementation of Directive 97/271/EEC, a special management system is required in order to prevent and/or reduce the entry of nutrients into the water bodies, followed by deterioration in the ecological status of the surface water bodies. Pazardzhik WWTP is to be equipped with facilities for high degree of reduction of nitrogen and phosphorus compounds in the wastewater of Pazardzhik Agglomeration. As regards the WWTP in the town of Septemvri, reduction of nutrients is also envisaged.

More detailed information is presented in Chapter 2.

0.2.1.3. Socio-economic features

As of 2011, the population in the service territory runs to approximately 146,019 people, which is about 2% of the total national population. For the 10 year period between the last two censuses (2001-2011), the population in the service area has lost 18,404 people – a decline of 11.2%, which is similar to the average decline of 11.3% for Pazardzhik District and exceeds the average national decrease of 7.2%. According to statistical data, the decline is due not only to the negative natural growth and population ageing, which is similar to national tendencies, but also to increased levels of out-migration.

Table 0-1 Population in the service territory

Population	2001*	2011**	Change
Pazardzhik Municipality	127,918	114,817	-10.2%
Septemvri Municipality	29,872	25794	-13.7%
Lesichovo Municipality	6,633	5,408	-18.5%
Service territory	164,423	146,019	-11.2%
Pazardzhik District	310,741	275,548	-11.3%
Bulgaria	7,932,984	7,364,570	-7.2%

**2001 Census as of 01.03.2001: http://www.nsi.bg/Census/PopObsht.htm*

***2011 Census as of 01.02.2011: http://censusresults.nsi.bg/Census*

The share of urban population in the service territory has been stable over the period 2001-2011 at around 56% of the population.. Natural growth has been negative, reaching -4.2‰ in 2010. Population age distribution is similar to the national and district average, however, there is a continuous process of ageing with 17.2% of the population being over 65 years old and only 14.5% of the population in the service territory being below 15 years of age.Population density in Pazardzhik Municipality is very high – 189.1 people per square km – considerably above the average for

Pazardzhik district and the country. This is due to the fact that the district centre is located there – the town of Pazardzhik. Population density in Septemvri Municipality is 77.5 people per square km, and that in Lesichovo Municipality – 27.2 people per square km. The low density in Lesichovo Municipality is due to the large rural areas, which are usually more sparsely populated

Economic development in the region is mainly concentrated in vegetable and fruit growing. These are extremely important and traditional sub-branches in the region, with average yields in Pazardzhik Municipality being several times higher than the average yields in the country. Another major part of the regional economy is concentrated in the transportation, commercial and industrial activities. More information is provided in section 2.3.

0.2.1.4. *Water and Wastewater Services*

ViK EOOD Pazardzhik is a water operator and carries out regulated activities under the Water Supply and Sewerage Services Regulation Act, promulgated in SG. No. 18 of 25.02.2005, in force since 20.01.2005. In terms of legal status, it is a single-member limited liability company, administered by Manager (Liquidator).

Based on the profit and loss account for the year 2011, the total amount of the operating revenue is BGN 7,292,000 against a total amount of costs equal to BGN 6,675,000, therefore the financial result indicates a profit of BGN 617,000, and after taxation the net revenue for the year 2011 comes up to BGN 561,000.

The water company has a total of 248 employees, as follows:

Table 0-2 Total number of employees

Type of Employees	Total number
MANAGER (LIQUIDATOR)	4
PRODUCTION AND TECHNICAL DEPARTMENT	7
FINANCIAL AND ECONOMIC DEPARTMENT	10
OTHER	3
SERVICE REGIONS	210
AUXILIARY UNITS	14

Water price on the territory of ViK EOOD – Pazardzhik in liquidation for the year 2011 is:

Type of Service		Price (EUR/m3 excl. VAT)	Price (BGN/m3 excl. VAT)
Water supply, high pressure		0.425	0.85
Domestic and industrial wastewater collection		0.05	0.10
Domestic wastewater treatment		0.175	0.35
Industrial wastewater treatment	Degree of pollution 1	0.215	0.43
	Degree of pollution 1	0.265	0.53

0.2.2. CURRENT SITUATION FOR WATER SUPPLY AND SEWERAGE

The synthesis of the current situation and the compliance with EU directives regarding water supply and sewerage, settlement by settlement, is presented in chapter 0.10.

100% of the settlements have access to drinking water.

0.2.2.1. Water sources

0.2.2.1.1. General

ViK EOOD-Pazardzhik relies only on groundwater resources for drinking water supply. The available groundwater resources are fully sufficient to meet drinking and other needs of the settlements served. They are difficult to use and operating costs are high as water is mainly abstracted by submersible pump units installed in tube and shaft wells. The major water sources in Pazardzhik designated territory are located in the terrace of Maritsa River and its tributaries. 112 water abstraction facilities are currently used for water supply.

Water sources are distributed as follows:

- 17 spring catchments
- 81 tube wells
- 7 shaft wells
- 7 shaft – tube wells

The major part of abstracted water (82 %) is of very good quality. Raw water quality monitoring (constant and periodical) is conducted in conformity with Ordinance 9 of 16.02.2001 on the quality of water intended for drinking purposes. According to the records provided by Pazardzhik RHI (**Chapter 2.11)**, water sources of the settlements from Ivaylo water supply system contain nitrates, calcium, sulphates and total hardness above the permissible standards. There are no water supply restrictions in the territory served by ViK EOOD- Pazardzhik in liquidation.

Another problem is the lack of renewed water use permits for 50% of the water sources /14 renewed permits, 6 application filed in East Aegean Sea Region Basin Directorate-Plovdiv, 4 prepared, but not filed applications and for the remaining water sources - 6 applications are being drawn up/.

All water sources have been provided with Sanitary protection zones, which are not compliant with the requirements of Ordinance №3/16.10.2000.

Each water abstraction facility is endowed with a water meter.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
21,296,758	16,714,161	6,209,724

25 water supply zones[1] (WSZ) are established to provide water to the settlements. 18 of them function on the territory of Pazardzhik Municipality and another 7 systems operate on the territory of the Municipalities of Septemvri and Lesichovo.

There are ten main water supply zones. The largest ones are Vetren /encompassing 9 settlements with a population of 9,012 inhabitants, of which 1 having more than 2,000 inhabitants/ and Pazardzhik /including 8 settlements with a population of 83,679 inhabitants, of which 3 having more than 2,000 inhabitants/.

The external water supply zones are presented in drawings No 2, 3 and 4.

0.2.2.1.2. *Pazardzhik Water Supply Zone*

Pazardzhik, Ivaylo and Glavinitsa as well as the neighbouring villages /5 settlements/ use groundwater sources of three water yielding zones for their drinking water supply.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
11,951,538	9,041,560	3,700,835

0.2.2.1.3. *Vetren Water Supply Zone*

Vetren and 8 villages in three municipalities use groundwater for drinking water supply.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
1,558,850	1,672,627	364,536

0.2.2.1.4. *Malo Konare Water Supply Zone*

Malo Konare and the neighbouring village of Pishtigovo use groundwater for drinking water supply.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
450,000	331,630	182,379

0.2.2.1.5. *Chernogorovo Water Supply Zone*

Chernogorovo and the neighbouring village of Krali Marko use groundwater for drinking water supply.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
430,000	245,930	84,181

[1] A water supply zone is a group of settlements interconnected by external water mains, which use the same water sources. A settlement, receiving water from one or more water sources, which do not deliver water to other settlemetns, is a separate zone.

0.2.2.1.6. *Lyahovo-Bratanitsa Water Supply Zone*

The villages of Lyahovo and Bratanitsa use groundwater for drinking water supply.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
234,000	231,705	74,983

0.2.2.1.7. *Aleko Konstantinovo Water Supply Zone*

The village of Aleko Konstantinovo uses groundwater for drinking water supply.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
250,000	192,776	80,917

0.2.2.1.8. *Ognyanovo Water Supply Zone*

The village of Ognyanovo uses groundwater for drinking water supply.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
350,000	300,653	150,331

0.2.2.1.9. *Septemvri Water Supply Zone*

The town of Septemvri and the neighbouring village of Zlokuchene use groundwater for drinking water supply.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
1,500,000	865,350	345,084

0.2.2.1.10. *Lozen-Kovachevo Water Supply Zone*

The villages of Lozen and Kovachevo use groundwater for drinking water supply.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
270,000	208,870	113,721

0.2.2.1.11. *Varvara-Vetren Dol Water Supply Zone*

The villages of Varvara and Vetren Dol use groundwater for drinking water supply.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
828,000	779,678	120,902

0.2.2.1.12. *Other water supply zones*

The remaining 23 settlements use groundwater for potable water supply.

Water quantity according to the water intake permit in 2011	Produced water quantity in 2011 [m^3]	Invoiced water quantity in 2011 [m^3]
3,474,370	2,843,382	991,855

0.2.2.1.13. *Other settlements*

The village of Dolno Varshilo in Septemvri Municipality is supplied with water from old catchment systems and reservoirs with a small capacity and the water supply system is not served by a Water Operator. According to NSI data, the number of inhabitants in 2011 is 5. The village is used as a summer house area. The local water source covers the needs of the local consumers from the village but not of the temporary residents in the summer house area.

0.2.2.2. *Water pollution*

The monitoring performed by RHI and the water operator in 2011 in the water supply networks of some of the settlements served by the water operator has identified discrepancies in some indicators required by Ordinance № 9/16.03.2001 on the quality of water intended for drinking purposes.

The discrepancies have been identified as follows:

By microbiological indicators:

- Accidental contamination by microbiological indicators in the distribution networks of the villages Ovchepoltsi and Govedare.

  It has been found that this is mainly due to improper manipulations during repair and restoration works on the networks and the disinfection afterwards.

By physico-chemical indicators:

- Individual samples with higher content of residual chlorine in the networks of the villages Rosen, Tsrancha, Lyahovo and Dragor.

  This is due to an ineffective chlorination and lack of systems for support of the residual chlorine in the specified range.

- Increased levels of calcium, sulfates and nitrates in the networks of: city of Pazardzhik (northern part), and the villages Dragor, Saraya, Ivaylo and Dobrovitsa.

  This is due to the water from the water sources (tube wells) near the village of Ivaylo, which is supplied directly into the distribution networks of the above mentioned settlements. The water in the wells is contaminated by diffusion because of the lack of sewerage in the village of Ivaylo (the wells are in close proximity to the village) and the agricultural activities in the area.

For more details, see section 2.3.11 and section 3.2.

0.2.2.3. *Current water consumption*

The water consumption in ViK EOOD – Pazardzhik in liquidation for 2011 is summarised in the table below. More details are given in section 3.3.

Table 0-3 Water consumption for 2011

Water Supply Zones*	Total Water Consumption (including NRW)	Total Water Consumption excluding NRW	Domestic Water Consumption	Non-Domestic water Consumption	Specific Domestic Demand	NRW percentage
	m3/year	m3/year	m3/year	m3/year	l/c/d	%
Pazardzhik	9 041 560	3 700 835	2 868 269	832 566	94	59
Vetren	1 672 627	364 536	314 169	50 367	94	78
Malo Konare	331 630	182 379	169 962	12 417	86	45
Chernogorovo	245 930	84 181	77 682	6 499	89	66
Lyahovo-Bratanitsa	231 705	74 983	71 654	3 329	79	68
Aleko Konstantinovo	192 776	80 917	72 065	248	73	58
Ognyanovo	300 653	150 331	88 526	61 805	103	50
Septemvri	865 350	345 084	299 507	45 577	94	60
Lozen-Kovachevo	208 870	113 721	105 578	8 143	85	46
Vervara – Vetren Dol	779 678	120 902	110 081	10 821	86	84
Other	2 843 382	991 855	880 152	120 307	101	65
Total for Water Operator	**16 714 161**	**6,209,724**	**5,057,645**	**1,152,079**	**94**	**63**

More detailed data is available in Appendix 3-7.

0.2.2.4. *Current water supply zones*

There are 25 water supply systems, of which 10 include settlements above 2,000 inhabitants:

- Pazardzhik (total population – 83,679)
- Vetren (total population – 9,012)
- Malo Konare (total population – 5,390)
- Chernogorovo (total population - 2,393)
- Lyahovo- Bratanitsa (total population – 2,484)
- Aleko Konstantinovo (population 2,714)
- Ognyanovo (population 2,353)
- Septemvri (total population 8,729)
- Lozen-Kovachevo (total population 3,421)
- Varvara – Vetren Dol (total population 3,513)

The remaining 15 small water supply zones have a population of 22,751 inhabitants.

The village of Dolno Varshilo (total population of 5 – it is not served by a Water Operator) forms a separate 26th water supply zone.

There is no DWTP on the territory of ViK EOOD-Pazardzhik in liquidation. Disinfection facilities use gas chlorine and sodium hypochlorite.

The sections below describe the current water supply zones, taking into account "on-going" projects. For more information and detailed description (materials, diameters, age etc.), see section 3.4 and Appendices 3-7 to 3-15.

0.2.2.4.1. *Pazardzhik water supply zone*

Pazardzhik water supply zone encompasses the water supply of the town of Pazardzhik, the villages of Ivaylo and Glavinitsa (over 2,000 inhabitants) and 5 neighbouring villages with a total population of 83,679 inhabitants. The external water supply network is formed by 3 water yielding zones. There is also Glavinitsa water yielding zone, which is not currently in use.

Assets can be summarised as follows:

Asset	Measure	Quantity	Notes
External Water Supply			
DWTP	number	0	None
Water Sources	number	29 in total, 28 operating	Mokrishte water yielding zone – 24, 24 operating Ivaylo water yielding zone -3 TWs, 3 operating Garata water yielding zone – 1 TW, 1 operating Glavinitsa water yielding zone -1 TW, standby
Disinfection			Mokrishte water yielding zone – Disinfection with chlorine gas in Mokrishte pumping station Ivaylo water yielding zone – Disinfection with chlorine gas in Ivaylo pumping station Garata water yielding zone – Disinfection with sodium hypochlorite by means of dozing pump
Pumping Stations	number	31 in total, 29 operating	Mokrishte water yielding zone – 25 /1 PS and 24 BPSs/, 25 operating Ivaylo water yielding zone – 4 /1 PS and 3 submersible pumps/, 3 operating Garata water yielding zone – 2/1 PS and 1 submersible pump/, 1 operating
Water Mains	km	34.048	17.46 km of asbestos cement pipes; 7.815 km of steel pipes; 2.596 km of Mannesmann pipes; 3.036 km of HDPE pipes;
Reservoirs	number	1	Mokrishte water yielding zone - 1 reservoir /3x12,000 m3/ Ivaylo water yielding zone -none Garata water yielding zone -none
Distribution network			
Network	km	252.45	Pazardzhik - 123.170 km of AC; 19.940 km of PE; 1.960 km of cast iron; 25.330 km of steel; 2.420 km Manesmann; 0.100 km PVC; 0.90km galvanized pipes Ivaylo- 13.715km of AC; 5.590km of PE; 1.315 km of steel; Glavinitsa - 13.676km of AC; 1.035km of steel; 0.900km

Asset	Measure	Quantity	Notes
			of PVC; Settlements with less than 2,000 inhabitants – AC, Manesmann, PVC, PE.

The existing water supply networks of Pazardzhik, Ivaylo and Glavinitsa are depicted in drawings No 8, 12 and 18, respectively.

For the distribution network of the city of Pazardzhik there is an ongoing project[2] that envisages the rehabilitation of 15.74 km distribution branches. The water supply branches to be rehabilitated under this project are shown in drawing No.9.

0.2.2.4.2. *Vetren water supply Zone*

Vetren water supply system provides water to 9 settlements, of which 4 are located on the territory of Septemvri Municipality, 4 on the territory of Lesichovo Municipality and the village of Akandzhievo in Belovo Municipality, with a total population of 9,012 inhabitants.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes
External Water Supply			
DWTP	number	0	None
Water Sources	number	7	7 shaft tube wells
Disinfection			Disinfection with chlorine gas in chlorination facility at Vetren PS – second lift and with sodium hypochlorite in Lesichevo PR, Vetren PR-high zone at Slavovitsa PS.
Pumping Stations	number	11	4 pumping stations, 7 pumps in shaft wells
Water Mains	km	42.131	7.736 km of asbestos cement pipes; 28.322 km of steel pipes; 1.2 km of HDPE pipes; 4.873 km of PVC pipe;
Reservoirs	number	17	17 reservoirs with a capacity of 4,905 m^3
Distribution network			
Pumping Stations	number	0	None
Distribution Network	km	97.72	Vetren – 20.765 km of AC; 2.004 km of steel; Settlements with less than 2,000 inhabitants – AC, Manesmann, galvanized, PVC, PE.

The existing water supply network of Vetren is presented in drawing No 26.

0.2.2.4.3. *Malo Konare water supply Zone*

The water supply system provides water only to two villages – Malo Konare and Peshtigovo, which have a population of 5,390 inhabitants.

[2] On-going projects are projects that have been already approved and financed. To be included in the current situation, they must have been approved and financed before the 15th July 2012.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes
External Water Supply			
DWTP	number	0	None
Water Sources	number	3 in total, 2 operating	2 tube wells
Disinfection		-	Disinfection with sodium hypochlorite in the pressure pipelines
Pumping Stations	number	3 in total, 2 operating	1 pumping station is out of operation and 2 pumps in TW
Water Mains	km	4.4	1.542 km of asbestos cement pipes; 2.857 km of PVC pipes;
Reservoirs	number		None
Distribution			
Pumping Stations	number	0	None
Distribution Network	km	70.72	Malo Konare – 51.208 km of AC; 2.630 km of PVC; Settlements with less than 2,000 inhabitants – AC, PVC, PE.

The existing water supply network of Malo Konare is presented in drawing No 10.

0.2.2.4.4. *Chernogorovo water supply zone*

Chernogorovo water supply system provides water to the village of Chernogorovo and the neighbouring village of Krali Marko with a total population of 2,390 inhabitants.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes
External Water Supply			
DWTP	number	0	None
Water Sources	number	2	2 tube wells
Disinfection		-	Disinfection with sodium hypochlorite in PS – second lift
Pumping Stations	number	3	1 pumping station and 2 pumps in TW
Water Mains	km	3.365	1.542 km of asbestos cement pipes; 1.823 km of steel pipes;
Reservoirs	number	1	1 reservoir with a capacity of 50 m^3 – suction tank
Distribution network			
Pumping Stations	number	0	None
Distribution Network	km	27.34	Chernogorovo – 25.800 km of AC; 0.995 km of steel; 0.210 km PE; 0.335 km galvanized Settlements with less than 2,000 inhabitants – AC, Manesmann, PE.

The existing water supply network of Chernogorovo is presented in drawing No 20.

0.2.2.4.5. *Lyahovo-Bratanitsa water supply zone*

The water supply system provides water to the village of Lyahovo and Bratanitsa with a population of 2,484 inhabitants.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes
External Water Supply			
DWTP	number	0	None
Water Sources	number	2 in total, 1 operating	2 tube wells
Disinfection		-	Disinfection with sodium hypochlorite in the pressure pipelines
Pumping Stations	number	1	1 pumping station
Water Mains	km	1.15	Asbestos cement pipes
Reservoirs	number		None
Distribution			
Pumping Stations	number	0	None
Network	km	22.74	Bratanitsa – 14.005 km of AC; 1.645 km of PE; Settlements with less than 2,000 inhabitants – AC and PE.

The existing water supply network of Bratanitsa is presented in drawing No 22.

0.2.2.4.6. *Aleko Konstantinovo water supply zone*

The water supply system encompasses only Aleko Konstantinovo with a population of 2,714 inhabitants.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes
External Water Supply			
DWTP	number	0	None
Water Sources	number	2 in total, 1 operating	2 tube wells
Disinfection		-	Disinfection with sodium hypochlorite in PS – second lift
Pumping Stations	number	1	1 pumping station
Water Mains	km	1.1	Asbestos cement pipes
Reservoirs	number		None
Distribution network			
Pumping Stations	number	0	None
Distribution Network	km	18.10	Aleko Konstantinovo – 16.956 km of AC; 0.173 km of steel; 0.971 km of PVC;

The existing water supply network of Aleko Konstantinovo is presented in drawing No 14.

0.2.2.4.7. *Ognyanovo water supply zone*

The water supply system provides water only to the village of Ognyanovo with a population of 2,353 inhabitants. The water yielding zone is located within the boundaries of the village.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes

Asset	Measure	Quantity	Notes
External Water Supply			
DWTP	number	0	None
Water Sources	number	2	2 tube wells
Disinfection		-	Disinfection with sodium hypochlorite at BPS
Pumping Stations	number	1	1 BPS
Water Mains	km		
Reservoirs	number	1	1 reservoir with a capacity of 250 m^3- tower
Distribution network			
Pumping Stations	number	0	None
Network	km	21.45	Ognyanovo – 16.612 km of AC; 1.194 km of PE; 3.324 km of Mannesmann; 0.318 km of galvanized pipes.

The existing water supply network of Ognyanovo is presented in drawing No 16.

0.2.2.4.8. *Septemvri water supply zone*

The water supply system provides water to the town of Septemvri and the village of Zlokuchene with a population of 8,729 inhabitants.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes
External Water Supply			
DWTP	number	0	None
Water Sources	number	5	5 tube wells
Disinfection		-	Disinfection with sodium hypochlorite in PS –second lift
Pumping Stations	number	6 in total, 5 operating	1 pumping station is put of operation and 5 BPSs
Water Mains	km	4.53	2.955 km of asbestos cement pipes; 1.57 km of steel pipes;
Reservoirs	number	2 in total, 1 operating	2 reservoirs with a capacity of 4,250 m^3
Distribution network			
Pumping Stations	number	0	None
Distribution Network	km	52.60	Septemvri – 46.775 km of AC; 0.247 km of PE; 0.204 km of steel; 0.658 km of galvanized pipes. Settlements with less than 2,000 inhabitants – AC, PVC, PE.

The existing water supply network of Septemvri is presented in drawing No 24.

0.2.2.4.9. *Lozen - Kovachevo water supply zone*

The water supply system provides water to the villages of Lozen and Kovachevo with a population of 3,421 inhabitants.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes
External Water Supply			
DWTP	number	0	None
Water Sources	number	3 in total, 1 operating	3 tube wells
Disinfection		-	Disinfection with sodium hypochlorite in PS.
Pumping Stations	number	1	1 pumping station
Water Mains	km	5.3	Asbestos cement pipes
Reservoirs	number	1	1 reservoir with a capacity of 500 m^3
Distribution network			
Pumping Stations	number	0	None
Distribution Network	km	24.83	Kovachevo – 15.158 km of AC; Settlements with less than 2,000 inhabitants – AC.

The existing water supply network of Kovachevo is presented in drawing No 28.

0.2.2.4.10. *Varvara - Vetren Dol water supply zone*

The water supply system provides water to the villages of Varvara and Vetren Dol with a population of 3,513 inhabitants.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes
External Water Supply			
DWTP	number	0	None
Water Sources	number	3	3 tube wells
Disinfection		-	Disinfection with sodium hypochlorite in PS and PR of the village of Vetren Dol
Pumping Stations	number	4	1 pumping station and 3 pumps in TW
Water Mains	km	4.4	Steel pipes
Reservoirs	number	5	5 reservoirs with a total capacity of 820 m^3
Distribution network			
Pumping Stations	number	0	None
Distribution Network	km	37.24	Varvara – 18.059 km of AC; 0.154 km of PE; 2.107 km of steel; Settlements with less than 2,000 inhabitants – AC and PE.

The existing water supply network of Varvara is presented in drawing No 30

0.2.2.4.11. *Other settlements*

The remaining water supply systems encompass 23 settlements with a total population of 23,216 inhabitants

Assets in the remaining 15 “small” water supply systems may be summarised as follows:

Asset	Measure	Quantity	Notes
External Water Supply			
DWTP	number	0	None
Water Sources	number	53	26 tube wells, 6 shaft well and 21 spring catchments
Pumping Stations	number	27	12 pumping stations and 15 submersible pumps
Water Mains	km	136.92	Asbestos cement, steel, PVC
Reservoirs	number	34	34 reservoirs with a total capacity of 5,470 m^3
Distribution network			
Pumping Stations	number	0	None
Distribution Network	km	696	-

Dolno Varshilo forms a separate water supply system, which is not served by a Water Operator.

0.2.2.4.12. *Description of main deficiencies*

The deficiencies of the external water supply systems are as follows:

- Disinfection facilities using chlorine gas are old and not rendered safe for the service personnel and the surrounding area. The disinfectant is not added in proportion to the passing water flow and its quantity is not adjusted in accordance with the amount of residual chlorine in water.
- In some cases, where the pumping stations are located in or close to the settlement, the disinfectant is added in the pressure pipe of the pumps and water is sent directly to the distribution network. The contact time for interaction between disinfectant and water is not secured. Therefore, it is necessary to build reservoirs with a capacity providing 30-minute residence of water during the maximum hourly consumption period , where water will be disinfected and then treated water will be supplied to the distribution network.
- All reservoirs are in satisfactory structural condition but the pipes and equipment are old and obsolete.
- Lack of ground reservoirs or towers of 12 settlements in the following eight WSSs – Aleko Konstantinovo, Ivaylo, Govedare, Hadzhievo, Malo Konare, Bratanitsa-Lyahovo, Zvanichevo and Yunatsite.
- The horizontal pump units commissioned between 1970 and 1985 have low efficiency and relatively high energy consumption and are generally characterised as low efficient.
- The external water mains with a total length of 644 km were built in the period 1929-1986. The transmission mains are in poor structural condition.
- - the long service period of the asbestos cement pipes results in worn-out gaskets, broken or damaged couplings and pipes, frequent breakdowns, high losses and interruption of water supply to consumers;
- - steel water mains have cathodic protection but need replacement since the ones built in the 1970's were laid without being insulated.

- - the facilities on these water mains are in poor condition and need overall renovation.
- Nitrate concentration over the maximum permissibe levels up to 2011 was found in the settlements which are supplied from Ivaylo WSZ /Ivaylo, Dragor, Saraya, Dobrovnitsa and the northern part of Pazardzhik/.
- Water supply continuity of Septemvri-Zlokuchene WSS is not guaranteed due to the reduction of the design /permitted/ capacity of the wells, covering the consumption of the system /clogging or reduction of static and therefore dynamic levels in the wells/.

The main deficiencies of the water distribution networks are as follows:

- The networks are built of about 70% asbestos cement pipes, 20% steel and galvanized pipes and are obsolete. Water losses are high, ranging from 40 to 92%, and the failure rate for the year 2011 is 0.705 failures/km.
- Water supply service connections (over 41,000) are mainly built of galvanized pipes and are already obsolete.
- About 90% of all water meters are more than 10 years old and need to be replaced.

For more details about the main system deficiencies, see section 3.4

0.2.2.5. *Current wastewater systems*

ViK EOOD- Pazardzhik in liquidation provides sewerage services on the territory of the Municipalities of Pazardzhik, Septemvri and Lesichovo. Pazardzhik, Septemvri and Ivaylo have sewerage networks. Pazardzhik and Ivaylo are connected to Pazardzhik WWTP and there is an on-going for construction of a WWTP in the town of Septemvri.

Currently, the sludge produced by the wastewater treatment plants on the territory of ViK EOOD- Pazardzhik in liquidation is disposed of to the landfill at the village of Aleko Konstantinovo.

According to the report on the implementation of the requirements of Directive 91/271/EEC concerning the urban wastewater treatment, ***the designated agglomerations on the territory of ViK EOOD – Pazardzhik in liquidation***, are

- ***In Pazardzhik Municipality:***
  - Pazardzhik Agglomeration with 85,058 PE.;
  - Aleko Konstantinovo Agglomeration with 2,628 PE;
  - Bratanitsa Agglomeration with 2,034 PE;
  - Chernogorovo Agglomeration with 2,189 PE;
  - Glavinitsa Agglomeration with 2,282 PE;
  - Ivaylo Agglomeration with 2,841 PE;
  - Malo Konare Agglomeration with 4,353 PE;
  - Ognyanovo Agglomeration with 2,353 PE;
- ***In Septemvri Municipality:***
  - Septemvri Agglomeration with 7,869 PE;

- Vetren Agglomeration with 3,221 PE;
- Kovachevo Agglomeration with 2,402 PE;
- Varvara Agglomeration with 2,061 PE.

At the Water Operator level, assets may be summarized as follows:

Asset	Measure	Quantity
WWTP	number	2
Pumping Stations	number	7
Sewerage Network	km	192.533

0.2.2.5.1. *Pazardzhik*

The existing sewerage network of Pazardzhik is presented in map N°32.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes
Wastewater			
WWTP	number	1	Capacity for 150,000 PE. Commissioned in 2008. On-going project for extension of WWTP to remove the nutrients nitrogen and phosphorus.
Pumping Stations	number	5	On-going project, it is expected that Maritsa wastewater pumping station will be taken out of service after its implementation
Sewerage network	km	95	Combined system. Receiving water body – Maritsa River. Connection rate of 95%.

Industrial wastewater, which has the same characteristics as domestic wastewater, is discharged directly into the sewerage network. To ensure good performance of the future treatment plant, it is necessary that all industrial companies, as specified in the contracts for connection to urban sewerage system, should make their wastewater compliant with the requirements of the connection contract and the statutory provisions. If this is not explicitly stated in the connection contract, we recommend that the Water Operator renegotiate the terms for connection to the sewerage network.

The enterprises on the territory of the town of Pazardzhik, which are not discharging wastewater in Pazardzhik WWTP are *Kauchuk AD, Elhim – Iskra AD*, have their own local WWTP. Local treatment complies with the requirements of the Basin Directorate for Water Management in East Aegean Sea Region.

0.2.2.5.2. *Ivaylo*

The existing sewerage network of Ivaylo is presented in map N°34.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes
Wastewater			
WWTP	number	-	Pazardzhik WWTP
Pumping Stations	number	1	Capacity of 25 l/s, built in 2008.
Sewerage network	km	6.425	Combined system. Connection rate of 35%.

0.2.2.5.3. Septemvri

The existing sewerage network of Septemvri is presented in map N°36.

Assets may be summarised as follows:

Asset	Measure	Quantity	Notes
Wastewater			
WWTP	number	1	On-going project, capacity for 14,000 PE
Pumping Stations	number	1	On-going project. Capacity of 5 l/s
Sewerage network	km	43.77	Combined system. Receiving water body – Kaliman Dere Connection rate of 87%.

Industrial wastewater has the same characteristics as domestic wastewater To ensure good performance of the future treatment plant, it is necessary that all industrial companies, as specified in the contracts for connection to urban sewerage system, should make their wastewater compliant with the requirements of the connection contract and the statutory provisions. If this is not explicitly stated in the connection contract, we recommend that the Water Operator renegotiate the terms for connection to the sewerage network.

0.2.2.5.4. Summary of Main Deficiencies

The main deficiencies of the sewerage system are as follows:

Pazardzhik

- ✓ All wastewater systems have minimum or below the permissible gradient, in many places it is zero or even negative;
- ✓ High groundwater level on the territory of the entire town, varying between 1.0-1.5 m near the river and 3.0 – maximum 4.0 m in the central, northern part of the town, even in dry weather
- ✓ Wastewater network of the town is made of concrete and reinforced concrete pipes – over 98% and is reaching the end of its service life (100% of the pipes are more than 35 years old). There is infiltration in the street sewers caused by both obsolete water supply network and the high groundwater level;
- ✓ Part of the sewers and the inspection manholes are filled with deposits and pieces of stones and concrete, causing obstruction of the free wastewater flow and during rain the adjacent terrains and houses are flooded. The larger part of the pipes have additionally decreased capacity. There are also separate areas where the sewer profile is clogged to 40 and 60%.
- ✓ Lower capacity of the wastewater network, backwater formation and pressure movements in rainy weather, the major problems occur in the main collectors that are 8 to 30 times overloaded in some places.
- ✓ Insufficient number of stormwater overflows for unloading the sewerage network;
- ✓ Part of the industrial zone has no sewerage system;

- ✓ The construction of the wastewater network has started from the centre of the town to the periphery quarters, but this is not taken in account for the design of the collectors in the central part of the town. Part of the streets have two wastewater systems – an older one with small diameter and a newer one with larger diameter.
- ✓ The minimum gradients of the entire wastewater network cause accumulation of deposits in dry weather. Water mixed with decaying deposits, is directed during rain, directly to WWTP or the rivers, which is confirmed by the samples taken during rains at the inlet of the WWTP. The decaying deposits in the wastewater network are one of the reasons for the relatively high biologic load in the northern zone of the town, serving over 100,000 P.E., where actually live approximately 70,000 inhabitants and there is no industry at all /especially polluted wastewater/.

Septemvri

- ✓ In some places the gradients of the wastewater network are reverse or below the minimum allowed.
- ✓ There are neither as-built drawings nor information concerning wastewater network levelling.
- ✓ Lack of stormwater overflows for unloading of the network;
- ✓ The wastewater system of the town is reaching the end of its service life (100% of the pipes are more than 35 years old), made of concrete pipes, sealed with cement grout. The pipe connections cause infiltration and exfiltration from and in the collectors. There are displacements and collapses in some locations. There is infiltration in the street sewers due to obsolete water supply network and high groundwater level during rain and snowmelt;
- ✓ Part of the sewers and the inspection manholes are filled with deposits and pieces of stone and concrete, causing obstruction of the free wastewater flow.

Ivaylo

- ✓ Domestic wastewater is discharged via the correction of the drainage sewer crossing the settlement;
- ✓ Wastewater network has 35% coverage.

Aleko Konstantinovo, Glavinitsa

- ✓ *No wastewater network, future treatment in Pazardzhik WWTP.*

Chernogorovo, Bratanitsa, Malo Konare, Ognyanovo, Vetren, Kovachevo

- ✓ *No wastewater network and WWTP.*

Varvara

- ✓ *No wastewater network, future treatment in Septemvri WWTP.*

0.2.2.6. *On-going and pending projects*

Pazardzhik Municipality successfully conducts a targeted policy in the field of environment. Municipal priorities correspond to the national ones, defined in the

National Regional Development Strategy (NRDS) and include the implementation of measures for achieving specific objectives covering planned construction, rehabilitation and renewal of municipal infrastructures:

- Planned coverage of urbanised areas;
- Maintenance and development of transport infrastructure;
- Rehabilitation and modernisation of technical infrastructure;
- Environmental infrastructure improvement;
- Development and improvement of living environment.

The goals are directly related to the specific objectives of the second and fourth priorities of the *National Regional Development Strategy* and represent a natural continuation of the aim to improve the technical infrastructure in the region as well as the state of environment. Fulfillment of these targets will lead to modernisation of the elements of municipal technical infrastructures, renewal of urbanised area and improvement of the state of environmental components

For achieving those goals, municipalities apply under the following project funding schemes:

- Priority axis 1 of OP Environment 2007-2013: “Improvement and development of water and wastewater infrastructure in agglomerations of between 2,000 and 10,000 PE“ under Procedure Reference: BG161PO005/11/1.12/02/25, for financing from the Cohesion Fund 2007-2013.
- Priority axis 1 of OP Environment 2007-2013: “Improvement and development of water and wastewater infrastructure in agglomerations with over 10,000 PE“ under Procedure Reference №: BG161PO005/10/1.11/02/16, for financing from the Cohesion Fund 2007-2013.

Pazardzhik Municipality carries out the following project:

1. *Project: „Extension of WWTP for nutrient removal (nitrogen and phosphorus), rehabilitation and extension of WSS network of the town of Pazardzhik“.* Pazardzik Municipality has received funding under Priority Axis 1 of Operational Programme Environment 2007-2013 (OPE), under procedure BG161PO005/10/1.11/03/19 „Preparation and implementation of projects for improvement and development of water and wastewater infrastructure in agglomerations with over 10,000 PE”, with ***No DIR-51011119-C010,*** signed on 14.09.2011, in the amount of BGN 49,822,725.
    - Project main objectives:
    - Fulfiling the requirements of Directive 91/271/EEC on urban wastewater treatment in settlements with a population of over 10,000PE;
    - Ensuring environmentally sound collection, discharge and treatment of domestic wastewater;
    - Increasing the percentage of the population using improved quality of WSS services in the project area;

- Increasing the scope of domestic wastewater treatment services on the territory of the town of Pazardzhik as a result of WWTP completion;

- Expected results:
  - Completion, rehabilitation and reconstruction of sewerage network and associated water supply network;
  - Completion of full tertiary treatment for nitrogen and phosphorus removal in WWTP.

2. *Project: „Technical assistance for preparation of integrated investment project in the water sector of the villages of Aleko Konstantinovo and Glavinitsa, Pazardzhik Municipality* – no approved funding, under consideration by MoEW.

Septemvri Municipality carries out the following project:

3. *Project: „Water cycle improvement in the town of Septemvri".* Septemvri Municipality has received funding under Priority axis 1 of Operational Programmed Environment 2007-2013 (OPE) under procedure BG161PO005/10/1.11/02/16 „Improvement and development of water and wastewater infrastructure in agglomerations with over 10,000 PE", with ***No DIR-51011116-C055,*** signed on 20.11.2012.

- Project main objectives:
  - Fulfiling the requirements of Directive 91/271/EEC on urban wastewater treatment in settlements with a population of over 10,000PE;
  - Ensuring environmentally sound collection, discharge and treatment of domestic wastewater;
  - Increasing the percentage of the population using improved quality of WSS services in the project area;
  - Increasing the scope of domestic wastewater treatment services on the territory of the town of Pazardzhik as a result of WWTP completion;
- Expected results:
  - Completion, rehabilitation and reconstruction of sewerage network and associated water supply network;3,819m of sewerage network and 2,400m of water supply network;
  - Construction of WWPS for the Romany quarter;
  - Construction of Septemvri WWTP, intended to receive and treat wastewater discharged by the following settlements i.e. the town of Septemvri and the villages of Varvara and Vetren Dol.

0.3. PROJECTIONS

This section relates to chapter 5 of the main report.

The technical options defined to adapt water and wastewater systems to the oncoming needs of the population are established according to the expected demographic development of the population and its impact on water demand and wastewater generation

0.3.1. POPULATION EVOLUTION

56% of the population is urban (concentrated in the town of Pazardzhik - 49%, the town of Septemvri - 5% and the town of Vetren -2%) and 44% is rural. The main tendencies in the demographic processes are similar to the national ones, with a significant decrease expected in the coming decades.

Table 0-4 Population evolution in the period 2011-2038 for settlements with over 2,000 PE on the territory of ViK EOOD-Pazardzhik

Settlement Name	Population 2011 (Census)	Population 2016	Population 2021	Population 2028	Population 2038
Aleko Konstantinovo	2,714	2,640	2,576	2,492	2,394
Bratanitsa	2,093	2,035	1,983	1,918	1,842
Chernogorovo	2,203	2,142	2,087	2,019	1,939
Glavinitsa	2,282	2,219	2,162	2,091	2,009
Ivaylo	2,841	2,762	2,691	2,603	2,501
Malo Konare	4,353	4,233	4,124	3,989	3,832
Ognyanovo	2,353	2,288	2,229	2,156	2,071
Pazardzhik	71,979	69,987	68,185	65,952	63,358
Kovachevo	2,402	2,298	2,212	2,084	1,912
Septemvri	7,869	7,527	7,246	6,828	6,264
Varvara	2,061	1,972	1,898	1,788	1,641
Vetren	3,221	3,081	2,966	2,795	2,564

Source: http://www.nsi.bg/ORPDOCS/Pop_6.1.1_Pop_DR.xls

The remaining settlements on the territory operated by ViK EOOD-Pazardzhik in liquidation are presented in Chapter 4, Appendix 4-8

0.3.2. WATER DEMAND

Water demand forecast has been obtained on the basis of population evolution with the main hypothesis that the individual domestic water demand in 2038 will become close to the standard value of 120 l/c/d.

The table below indicates water demand including physical and commercial losses, having an impact on the quantity of water produced from the water sources. The overall efficiency[3] of the networks for the year 2011 is also described below (Source: ViK EOOD – Pazardzhik in liquidation).

- Aleko Konstantinovo 42%
- Bratanitsa 32%
- Chernogorovo 34%
- Glavinitsa 41%
- Ivaylo 41%
- Malo Konare 55%
- Ognyanovo 50%
- Pazardzhik 41%
- Kovachevo 54%
- Septemvri 40%
- Varvara 16%
- Vetren 22%
- Others 32%
- **Total** **37%**

The objectives for the year 2038 are 80% for new networks and 75% for old networks.

Table 0-5 Water demand projections including physical and commercial losses (Annual volume in m3)

Settlements	Water demand 2011	Water demand 2016	Water demand 2021	Water demand 2028	Water demand 2038
Aleko Konstantinovo	192,776	164,366	145,663	150,965	154,209
Bratanitsa	188,567	134,833	107,817	110,932	112,355
Chernogorovo	224,720	161,158	127,522	126,664	123,222
Glavinitsa	368,307	298,189	252,790	249,476	241,870
Ivaylo	263,045	207,659	172,718	168,274	159,997
Malo Konare	267,522	255,820	245,546	244,887	239,454
Ognyanovo	300,653	268,190	242,406	234,417	221,483
Pazardzhik	7,862,238	6,257,829	5,236,680	5,121,250	4,898,373
Kovachevo	132,477	127,053	122,496	122,111	117,543
Septemvri	814,367	622,269	505,821	479,616	436,231
Varvara	508,407	197,552	123,695	117,863	107,800
Vetren	553,794	282,397	191,832	184,207	169,981
Others	**5,037,288**	**3,244,089**	**2,533,122**	**2,460,227**	**2,309,200**
Total	**16,714,160**	**12,221,403**	**10,008,109**	**9,770,889**	**9,291,718**

The second table below shows the projected water demand.

[3] The efficiency is the percentage of supplied water that generates revenue.

Table 0-6 Water demand projections including domestic and non-domestic consumption (Annual volume in m^3)

Settlements	Water demand 2011	Water demand 2016	Water demand 2021	Water demand 2028	Water demand 2038
Aleko Konstantinovo	80,917	87,915	94,681	103,411	115,657
Bratanitsa	61,023	65,638	70,081	75,989	84,266
Chernogorovo	76,921	79,958	82,889	86,765	92,417
Glavinitsa	150,753	157,938	164,314	170,891	181,402
Ivaylo	107,668	109,988	112,267	115,268	119,998
Malo Konare	147,123	153,485	159,605	167,747	179,590
Ognyanovo	150,331	154,211	157,564	160,576	166,112
Pazardzhik	3,218,122	3,314,502	3,403,842	3,508,056	3,673,780
Kovachevo	72,128	75,880	79,622	83,646	88,157
Septemvri	324,753	326,312	328,783	328,537	327,173
Varvara	78,837	79,521	80,402	80,736	80,850
Vetren	120,695	122,552	124,691	126,182	127,486
Others	1,620,453	1,648,280	1,674,700	1,705,273	1,736,202
Total	6,209,724	6,376,180	6,533,442	6,713,077	6,973,091

For more details, see section 5.2.

0.3.3. WASTEWATER GENERATION

Wastewater flows are estimated on the basis of water consumption, sewerage coverage rate and infiltration.

The table below does not include infiltration.

The Water Operator has no available data on infiltration rates for 2011 as well as for the previous years, therefore, they have been calculated by using the methodology specified in Chapter 4.1

- Velingrad: 48 %
- Draginovo: 52 %
- Sarnitsa: 56 %
- The remaining agglomerations with over 2,000 PE have no sewerage network.

The network efficiency[4] objectives for the year 2038, including infiltration levels, are 15% for new networks and 20% for old ones.

[4] Efficiency is the percentage of wastewater, generating revenue.

Table 0-7 Wastewater flow projections (Annual volumes in m3)

Wastewater collection zones	Wastewater 2011	Wastewater 2016	Wastewater 2021	Wastewater 2028	Wastewater 2038
Aleko Konstantinovo	0	0	76,692	93,070	104,091
Bratanitsa	0	0	56,765	68,390	75,840
Chernogorovo	0	0	67,140	78,088	83,175
Glavinitsa	0	0	133,094	153,802	163,262
Ivaylo	33,915	34,646	90,936	98,554	107,998
Malo Konare	0	0	129,280	150,973	161,631
Ognyanovo	0	0	127,627	144,518	149,501
Pazardzhik	2,751,495	2,923,391	3,063,458	3,157,251	3,306,402
Kovachevo	0	0	64,494	75,281	79,341
Septemvri	254,282	293,681	295,905	295,683	294,456
Varvara	0	0	65,126	72,662	72,765
Vetren	0	0	100,999	113,564	114,737
Settlements below 2,000 PE	52,416	52,591	862,498	747,556	1,562,582
Total	**3,092,108**	**3,304,308**	**5,134,016**	**5,249,392**	**6,275,782**

For more details on wastewater flow projections, see section 5.3.

0.4. NATIONAL OBJECTIVES AND REGIONAL TARGETS

This section relates to chapter 1 of the main report.

As a member of the European Union since 2007, Bulgaria is committed to improve environmental quality in order to achieve compliance with the EU Acquis Communautaire as stated in Chapter 22 – Environmental Protection. Bulgaria has therefore harmonised its legislation in the fields of environment, water and sanitation with the one of the EU, and compliance with this legislation is part of the national objectives.

On the basis of the analysis of the current situation, the Operational Programme Environment 2007-2013 (managed by the Ministry of Water and Environment) sets the country priority areas for the environmental sector to be implemented and financed by the EU through the Cohesion Fund and the European Regional Development Fund. The first priorities are given to:

- Compliance with the Water Framework Directive 200/60/EC and Directive 98/83/EC: 100% of the population should be sufficiently supplied with drinking water of good quality
- Compliance with the Urban Wastewater Directive 91/271/EC: every agglomeration counting over 2,000 PE must treat wastewater in a WWTP, and the ones counting over 10,000 PE should include nutrients removal.

During the negotiations under Chapter 22, two transitional periods have been negotiated with regard to the implementation of UWWD 91/271/EC: until 31 December 2010 for all agglomerations over 10,000 PE and until 31 December 2014 for all agglomerations between 2,000 and 10,000 PE.

0.5. OPTION ANALYSIS AND REGIONAL STRATEGY

This section relates to chapter 4 of the main report.

0.5.1. WATER SUPPLY

The Consultant has examined all possible options for the territory serviced by ViK EOOD Pazardzhik in liquidation in terms of their advantages and disadvantages. The results are presented in the tables below. For more detailed information, see section 4.2.

The investments related to external water supply systems at Water Company level are presented in layouts No 4, 5, and 6.

The strategy of the non-revenue water reduction programme is described in section 4.2.1. It is consistent with the specific conditions in Bulgaria as well as on the territory of ViK EOOD-Pazardzhik.

To settle the main problem related to nitrate content in the water sources of Ivaylo water supply system, three settlements are excluded from Pazardzhik water supply system i.e. the villages of Ivaylo, Dragor and Saraya. The system will use Mokrishte water supply zone to cover its consumption as water sources will ensure water quantity and quality. As regards the separated three settlements, Option 1 is preferred (Water supply of the settlements from Ivaylo water supply system – the villages of Ivaylo, Dragor and Saraya with treated water from Luda Yana Dam.) instead of keeping the current scheme of treating water of the water source i.e. 1 TW, due to the better water supply security and lower investment costs of this option. See section 4.2.1.2.

Due to the risk of disturbing the continuity of water supply to Septemvri - Zlokuchene water supply system because of 5 damaged tube wells situated in the terrace of the right bank of Maritsa River, the preferred alternative covers the consumption of the settlements from the system including 4 TWs in the terrace of the left bank of Maritsa River based on the lower investment costs. See section 4.2.1.3.

Luda Yana Dam, located on the territory of Panagyurishte Municipality, is in the process of implementation. Based on the decreased consumption of the settlements within Panagyurishte Municipality and Strelcha Municipality, it is obvious that part of the treated water from Luda Yana Dam can be supplied by gravity to the territory of the service area of ViK EOOD – Pazardzhik in liquidation.

It is suggested that the dam cover the water demand of 24 settlements /7 from Lesichovo Municipality, 14 from Pazardzhik Municipality and 3 settlements from Septemvri Municipality/ located on the territory of the operator. See section 4.2.1.1.

Water supply scheme of the remaining settlements using the existing water sources (catchments, shaft and tube wells) is retained. It is envisaged that the future activities associated with them are fully focused on rehabilitation of water sources, SPZs, chlorination stations and chlorination systems, rehabilitation of water pipelines (external and distribution) and facilities such as pumping stations and pressure pipelines.

0.5.1.1. *Pazardzhik water supply system*

Investments concerning the water supply network of Pazardzhik and Glavinitsa are presented in drawings N°9 and 19 respectively. See section 4.2 for more details.

Short-term investments:

- Disinfection with chlorine gas–rehabilitation (civil works and equipment)–1 set;
- Reconstruction of external water mains – 5.971 km of pressure pipeline from Mokrishte PS to PR of the town of Pazardzhik.
- Reconstruction of 15.640 km of internal water supply network of the town of Pazardzhik;
- Reconstruction of 13.054 km of internal water supply network of the village of Glavinitsa;

Medium-term investments:

- Reconstruction of 3.345 km of external water mains.
- Rehabilitation of pressure reservoir – replacement of fittings and pipe systems;
- Rehabilitation of Mokrishte PS – building, pumps, pipe systems and fittings.
- Reconstruction of 28.56 km of internal water supply network of the town of Pazardzhik;
- Reconstruction of 1.657 km of internal water supply network of the village of Glavinitsa;

Long- term investments:

- Reconstruction of external water mains – 5.109 km of pressure pipelines;
- Reconstruction of 30.56 km of internal water supply network of the town of Pazardzhik.

0.5.1.2. *Aleko Konstantinovo water supply system*

Investments concerning the water supply network of Aleko Konstantinovo are presented in drawing N°15. See section 4.2 for more details.

Short-term investments:

- Disinfection with sodium hypochlorite – rehabilitation (civil works and equipment) – 1 set;
- Reconstruction of 15.223 km of internal water supply network of the village of Aleko Konstantinovo.

Medium-term investments:

- Reconstruction of 1.906 km of internal water supply network of the village of Aleko Konstantinovo.

Long-term investments:

- Reconstruction of external water mains – 1.908 km of pressure pipelines
- Rehabilitation of Aleko Konstantinovo PS – buildings, pumps, pipe systems and fittings.
- Construction of reservoir with a capacity of 450m^3.

0.5.1.3. *Malo Konare water supply system*

Investments concerning the water supply network of Malo Konare are presented in drawing N°11. See section 4.2 for more details.

Short-term investments:

- Disinfection with sodium hypochlorite – rehabilitation (civil works and equipment) – 1 set;
- Reconstruction of 45.219 km of internal water supply network of the village of Malo Konare.

Medium-term investments:

- Reconstruction of 5.379 km of internal water supply network of the village of Malo Konare.
- Rehabilitation of Malo Konare PS - buildings, pumps, pipe systems and fittings.

Long-term investments:

- Reconstruction of external water mains- 1.542 km of pressure pipeline;

0.5.1.4. *Ognyanovo water supply system*

Investments concerning the water supply network of Ognyanovo are presented in drawing N°17. See section 4.2 for more details.

Short-term investments:

- Disinfection with sodium hypochlorite – rehabilitation (civil works and equipment) – 1 set;

- Reconstruction of 18.146 km of internal water supply network of the village of Ognyanovo.

Medium-term investments:

- Reconstruction of 2.106 km of internal water supply network of the village of Ognyanovo.
- Rehabilitation of water tower – hydro-insulation, pipe systems and fittings.

Long-term investments:

- Rehabilitation of Ognyanovo PS - pumps, pipe systems and fittings.

0.5.1.5. *Lyahovo – Bratanitsa water supply system*

Investments concerning the water supply network of Bratanitsa are presented in drawing N°23. See section 4.2 for more details.

Short-term investments:

- Disinfection with sodium hypochlorite – rehabilitation (civil works and equipment) – 1 set;
- Reconstruction of external water mains- 917 m of pressure piepline;
- Doubling and providing equipment to Tube Well – 1;
- Reconstruction of 12.432 km of internal water supply network of the village of Bratanitsa.

Medium-term investments:

- Reconstruction of 1.573 km of internal water supply network of the village of Bratanitsa.

Long-term investments:

- Rehabilitation of Bratanitsa PS (pumps, pipe systems and fittings).
- Rehabilitation of tower and reservoir (pipe systems and fittings).

0.5.1.6. *Septemvri water supply system*

Investments concerning the water supply network of Septemvri are presented in drawing N°25. See section 4.2 for more details.

Short-term investments:

- No measures are envisaged;

Medium-term investments:

- Disinfection with chlorine gas – rehabilitation (equipment) – 1 set;
- Rehabilitation of 2.25km of external water main;

- Reconstruction of 18.596 km of internal water supply network of the town of Septemvri.

Long-term investments:

- Rehabilitation of 1.845 km of external water main;
- Rehabilitation of Septemvri PS - pumps, pipe systems and fittings.
- Rehabilitation of reservoir of 4,000m^3 and tower - pipe systems and fittings.
- Reconstruction of 26.085 km of internal water supply network of the town of Septemvri.

0.5.1.7. *Vetren water supply system*

Investments concerning the water supply network of Vetren are presented in drawing N°27. See section 4.2 for more details.

Short-term investments:

- Disinfection with chlorine gas – rehabilitation (equipment) – 1 set;
- Rehabilitation of external water main- 4.140 km of pressure pipeline;
- Reconstruction of 20.630 km of internal water supply network of the town of Vetren;
- Rehabilitation of Vetren PS, second and third lift - pumps, pipe systems and fittings.
- Rehabilitation of 3 reservoirs – pipe and fittings.

Medium-term investments:

- Rehabilitation of external water main – 2.781 km of pressure pipeline;
- Reconstruction of 2.222 km of internal water supply network of the town of Vetren.
- Rehabilitation of external water main - 3.011 km of pressure pipeline;

Long-term investments:

- Rehabilitation of external water main – 1.440m of pressure pipeline;

0.5.1.8. *Varvara-Vetren Dol water supply system*

Investments concerning the water supply network of Varvara are presented in drawing N°31. See section 4.2 for more details.

Short-term investments:

- Disinfection with sodium hypochlorite – rehabilitation (equipment) – 1 set;
- Reconstruction of 17.665 km of internal water supply network of the village of Varvara.

Medium-term investments:

- Reconstruction of 1.845 km of internal water supply network of the village of Varvara.
- Replacement of pump units in 3 tube wells;

Long-term investments:

- Rehabilitation of external water main –5.3 km of pressure pipeline;
- Rehabilitation of Varvara PS – pumps, pipe systems and fittings.

0.5.1.9. *Lozen-Kovachevo water supply system*

Investments concerning the water supply network of Kovachevo are presented in drawing N°29. See section 4.2 for more details.

Short-term investments:

- Disinfection with sodium hypochlorite – rehabilitation (equipment) – 1 set;
- Reconstruction of 13.565 km of internal water supply network of the village of Kovachevo;

Medium-term investments:

- Rehabilitation of external water main – 5.877 km of pressure pipeline;
- Reconstruction of 1.593 km of internal water supply network of the village of Kovachevo.
- Rehabilitation of external water main – 3.011 km of pressure pipelines;
- Rehabilitation of PS - pumps, pipe systems and fittings.
- Replacement of pump units in 2 tube wells;

Long-term investments:

- No measures are envisaged.

0.5.1.10. *Settlements supplied from Luda Yana dam*

Investments concerning the water supply network of Chernogorovo and Ivaylo are presented in maps N°21 and 13 repectively. See sect ion 4.2 for more details.

Short-term investments:

- Chlorination- civil works, equipment and power supply.
- 22.150 km of new gravity-fed water pipelines;
- Rehabilitation of external water main - 4.89 km of pressure pipeline;
- Rehabilitation of 3.44 km of external water main;
- Pressure reduction;

- New reservoir of 1000m^3 ;
- Major repair of pressure reservoir – civil works and installation works
- Rehabilitation of Borimechkovo PS – the two lifts - pumps, pipe systems and fittings.
- Rehabilitation of 3 reservoirs – pipes and fittings.
- Reconstruction of 12.555 km of internal water supply network of the village of Ivaylo;
- Reconstruction of 24.362 km of internal water supply network of the village of Chernogorovo;

Medium-term investments:

- 34.374 km of new external water mains;
- Pressure reduction;
- New reservoirs with a total capacity of 700m^3 -2;
- Major repair of pressure reservoir (civil works and installation works) – 3.
- Reconstruction of 1.185 km of internal water supply network of the village of Ivaylo;
- Reconstruction of 2.768 km of internal water supply network of the village of Chernogorovo;

Long-term investments:

- 30,588 m of new external water mains;
- Pressure reduction;
- New reservoirs with a total capacity of 450m^3 (4);
- Rehabilitation of pressure reservoir (pipes and fittings);

0.5.1.11. *Settlements with a population below 2,000 inhabitants*

0.5.1.11.1. *Pazardzhik Municipality*

Short-term investments:

- Disinfection with sodium hypochlorite – rehabilitation (equipment) – 14 sets;
- Rehabilitation of external water main - 1,85 km of pressure pipeline and 3.209 km of gravity-fed pipeline.
- Major repair of pressure reservoir (civil works and installation works)
- New reservoirs with a total capacity of 650 m^3 (2)
- Replacement of pump units in 3 tube wells;

- Reconstruction of 168.719 km of internal water supply network of settlements with less than 2,000 inhabitants.
- Rehabilitation of 3 catchment systems and establishment of SPZs around them.
- Rehabilitation of 4 PSs - pumps, pipe systems and fittings.

Medium-term investments:

- Doubling and providing equipment to 1 TW;
- Rehabilitation of 9 pressure reservoirs (pipes and fittings)
- Rehabilitation of PS - pumps, pipe systems and fittings
- Reconstruction of 8.638 km of internal water supply network of settlements with less than 2,000 inhabitants.

Long-term investments:

- Setting up of SCADA system for management and control.
- Rehabilitation of external water main – 4.651 km of pressure pipeline.
- Rehabilitation of 9 PSs - pumps, pipe systems and fittings
- Rehabilitation of 13 pressure reservoirs (pipes and fittings)
- Replacement of pump units in 5 tube wells
- Reconstruction of 32.453 km of internal water supply network of settlements with less than 2,000 inhabitants.

0.5.1.11.2. *Septemvri Municipality*

Short-term investments:

- Disinfection with sodium hypochlorite – rehabilitation (equipment) – 8 sets.
- Rehabilitation of external water main – 3.24 km of pressure pipeline and 4.798 km of gravity fed pipeline.
- Reconstruction of 97.512 km of internal water supply network of settlements with less than 2,000 inhabitants.

Medium-term investments:

- Reconstruction of 1.103 km of internal water supply network of settlements with less than 2,000 inhabitants.

Long-term investments:

- Setting up of SCADA system for management and control.
- Rehabilitation of external water main – 4.031 km of pressure pipeline.
- Rehabilitation of 13 pressure reservoirs (pipes and fittings)
- Replacement of pump units in tube well
- Rehabilitation of 7 PSs - pumps, pipe systems and fittings
- Reconstruction of 12.568 km of internal water supply network of settlements with less than 2,000 inhabitants.

0.5.1.11.3. *Lesichovo Municipality*

Short-term investments:

- Disinfection with sodium hypochlorite – rehabilitation (equipment) – 3 sets.
- Reconstruction of 66.534 km of internal water supply network of settlements with less than 2,000 inhabitants.

Medium-term investments:

- Reconstruction of 9.315 km of internal water supply network of settlements with less than 2,000 inhabitants.

Long-term investments:

- Setting up of SCADA system for management and control.
- Rehabilitation of 8 pressure reservoirs (pipes and fittings)
- Reconstruction of 14.638 km of internal water supply network of settlements with less than 2,000 inhabitants.

0.5.2. SEWERAGE

The main activities related to wastewater collection and treatment on the territory of ViK EOOD – Pazardzhik in liquidation are listed below. For more detailed information, see section 4.3

Strategic Options:

The following agglomerations/wastewater clusters, shown in the table below, have been established.

Table 0-8 List of agglomerations and clusters over 2,000 inhabitants

N°	Name of Agglomeration/Cluster	Preferred option
1	Pazardzhik	Joint WWTP (Glavinitsa, Aleko Konstantinovo, Ognyanovo, Golemanovo, Saraya, Dragor, Mokrishte, Dobrovnitsa, Miryantsi, Sinitievo, Hadzhievo, Ivaylo)
2	Malo Konare	Joint WWTP (Malo Konare, Chernogorovo, Pishtingovo and Krali Marko)
3	Patalenitsa	Joint WWTP (Patalenitsa, Tsrancha, Debrashtitsa)
4	Bratanitsa	Joint WWTP (Bratanitsa, Lyahovo and Zvanichevo)
5	Yunatsite	Joint WWTP (Yunatsite and Velichkovo)
6	Septemvri	Joint WWTP (Septemvri, Varvara, Vetren Dol, Semchinovo and Simeonovets)
7	Kovachevo	Joint WWTP (Kovachevo, Lozen and Zlokuchene)
8	Vinogradets	Joint WWTP (Vinogradets, Karabunar and Boshulya)

A detailed analysis is made in Chapter 4.3. The main elements used to determine the above-said agglomerations are as follows:

- Lower operation and maintenance costs;

- Technical possibility for implementation of external routes between the settlement and the relevant WWTP;
- Lower NPV;
- Treatment in a larger WWTP will be more effective.

The receiving bodies of the respective future WWTPs are identified as “sensitive” areas. The quality of treated wastewater should comply with the legal requirements. Pursuant to Directive 91 EEC 271 concerning urban wastewater treatment in agglomerations of between 2,000 and 10,000 PE, nitrogen and phosphorus should not be removed in the treatment of their wastewater.

Non-investment measure: we recommend a sound sludge management programme, including reuse for land reclamation, fertilization and a social programme facilitating its application by local farmers.

0.5.2.1. *Pazardzhik*

Investments concerning the sewerage network of Pazardzhik are presented in drawing N°33. See section 4.3 for more details on this opti on analysis.

Combined sewerage network with 95% coverage (142km). Due to the high coverage rate and the landscape features, there is an on-going project in which the preferred option for future development of the sewerage network is to implement a combined system. The approach adopted by the Consultant is to have a combined type of sewage system.

Short-term investments:

The scope of envisaged measures comprises 23.2 km of sewerage network, including

- Reconstruction and construction of 17,394 m of main sewer collectors;
- Construction of 5,777m of stormwater sewer collectors.

Medium-term investments:

- Reconstruction and construction of 13,168 m of main sewer collectors;
- Reconstruction and construction of 17,667 m of secondary sewerage network;
- Construction of Spartak WWPS – 2;
- Construction of 100m of pressure pipeline.

Long-term investments:

- Reconstruction and construction of 30,327 m of of secondary sewerage network;

0.5.2.2. *Septemvri*

Investments concerning the sewerage network of Septemvri are presented in drawing N°37. See section 4.3 for more details on this opti on analysis.

Combined sewerage network with 100% coverage (43.8km). Due to the high coverage rate and the landscape features, there is an on-going project in which the preferred option for future development of the sewerage network is to implement a combined system. The approach adopted by the Consultant is to have a combined type of sewage system.

Short-term investments:

- No measures are envisaged.

Medium-term investments:

- Reconstruction and construction of 8,165m of main sewer collectors;
- 960 m of discharge sewers;
- Reconstruction and construction of 6,983 m of secondary sewerage network.

Long-term investments:

- Reconstruction and construction of 324m of main sewer collectors;
- Reconstruction and construction of 17,790 m of secondary sewerage network.

0.5.2.3. *Ivaylo*

Investments concerning the sewerage network of Ivaylo are presented in drawing N°35. See section 4.3 for more details on this opti on analysis.

The sewerage network has 35% coverage and functions as a combined one. Part of the wastewater is discharged in the correction of the gully running through the settlement and the rest is pumped in the sewerage network of the town of Pazardzhik. The sewerage network may be switched to a separate one and:

- The sewers having small diameters ranging from 300 to 400 of the existing network will be kept for domestic wastewater, stormwater runoff will be removed from them and parallel stowmwater sewers will be built, where necessary;
- The existing sewers with larger diameters of 600 to 800 will receive only stormwater. For this purpose, domestic sewers will be constructed in parallel.

Short-term investments:

- Construction of new 11,450 m of sewerage network (domestic);

Medium-term investments:

- No measures are envisaged.

Long-term investments:

- No measures are envisaged.

0.5.2.4. *Aleko Konstantinovo*

Short-term investments:

The scope of envisaged measures is compliant with the Directive requiring 90% sewerage coverage. The settlement has no wastewater network

- Construction of new 13,822 m of sewerage network (domestic);
- Aleko Konstantinovo WWPS and pressure pipeline 300.

Medium-term investments:

- Construction of new 1,536 m of sewerage network (domestic);

Long-term investments:

- No measures are envisaged.

0.5.2.5. *Glavinitsa*

Short-term investments:

The scope of envisaged measures is compliant with the Directive requiring 90% sewerage coverage. The settlement has no wastewater network.

- Construction of new 13,662 m of sewerage network (domestic);

Medium-term investments:

- Construction of new 1,518 m of sewerage network (domestic);

Long-term investments:

- No measures are envisaged.

0.5.2.6. *Ognyanovo*

Short-term investments:

The scope of envisaged measures is compliant with the Directive requiring 90% sewerage coverage. The settlement has no wastewater network.

- Construction of new 16,659 m of sewerage network (domestic);
- Ognyanovo WWPS and 4,630 m of pressure pipeline.

Medium-term investments:

- Construction of new 1,851 m of sewerage network (domestic);

Long-term investments:

- No measures are envisaged.

0.5.2.7. *Malo Konare*

Short-term investments:

The scope of envisaged measures is compliant with the Directive requiring 90% sewerage coverage. The settlement has no wastewater network.

- Malo Konare WWTP (Malo Konare; Chernogorovo; Pishtigovo and Krali Marko, with a capacity of 7,783 PE, receiving body-Luda Yana);
- Construction of new 42,706 m of sewerage network (domestic);
- 2,300m of intercepting collector.

Medium-term investments:

- Construction of new 4,745 m of sewerage network (domestic);

Long-term investments:

- No measures are envisaged.

0.5.2.8. *Chernogorovo*

Short-term investments:

The scope of envisaged measures is compliant with the Directive requiring 90% sewerage coverage. The settlement has no wastewater network.

- Construction of new 20,470 m of sewerage network (domestic);
- 2,000 m of intercepting collector

Medium-term investments:

- Construction of new 2,274 m of sewerage network (domestic);

Long-term investments:

- No measures are envisaged.

0.5.2.9. *Bratanitsa*

Short-term investments:

The scope of envisaged measures is compliant with the Directive requiring 90% sewerage coverage. The settlement has no wastewater network.

- Construction of new 1,098 m of sewerage network (domestic);
- 2,100m of intercepting collector.

Medium-term investments:

- Construction of new 1,233 m of sewerage network (domestic);

Long-term investments:

- No measures are envisaged.

0.5.2.10. *Varvara*

Short-term investments:

The scope of envisaged measures is compliant with the Directive requiring 90% sewerage coverage. The settlement has no wastewater network.

- Construction of new 17,604 m of sewerage network (domestic);
- 4,809 m of intercepting collector

Medium-term investments:

- Construction of new 1,233 m of sewerage network (domestic);

Long-term investments:

- No measures are envisaged.

0.5.2.11. *Vetren*

Short-term investments:

The scope of envisaged measures is compliant with the Directive requiring 90% sewerage coverage. The settlement has no wastewater network.

- Vetren WWTP (3,221 PE, receiving body is the gully of the village);
- Construction of new 17,780 m of sewerage network (domestic);
- 1,000 m of intercepting collector

Medium-term investments:

- Construction of new 1,975 m of sewerage network (domestic);

Long-term investments:

- No measures are envisaged.

0.5.2.12. *Settlements forming agglomerations of over 2,000 PE with a population of less than 2,000 inhabitants*

The established Agglomerations (Wastewater Clusters) are described in detail in Chapter 4.3. and specified in the section above. Agglomerations are established on the basis of the methodology presented in Chapter 4.1.

The measured envisaged in the investment programme are presented in the table below:

№	Name	Diameter	Length [m]		
		[mm]	Short-term	Medium-term	Long-term
I	**Pazardzhik Cluster (V25 - WW - 1)**				
1	Golemanovo				
	Sewerage network	300	7,182		798
	External collector	400	1,800		
2	**Saraya**				
	Sewerage network	300	8,294		922
	External collector	400	1,300		
3	**Dragor**				
	Sewerage network	300	5,756		640
	External collector	400	2,800		

№	Name	Diameter	Length [m]		
		[mm]	Short-term	Medium-term	Long-term
4	**Mokrishte**				
	Sewerage network	300	7,452		828
	Mokrishte WWPS – 1 pc.				
	Pressure pipeline	DN120	1,640		
5	**Dobrovnitsa**				
	Sewerage network	300	13,392		1,488
	Dobrovnitsa WWPS – 1 pc.				
	Pressure pipeline	DN120	3,400		
6	**Miryantsi**				
	Sewerage network	300	6,024		828
	Miryantsi WWPS – 1 pc.				
	Pressure pipeline	DN180	1,700		
7	**Sinitievo**				
	Sewerage network	300	10,568		1,296
	Sinitievo WWPS – 1 pc.				
	Pressure pipeline	DN140	2,100		
8	**Hadzhievo**				
	Sewerage network	300	9,828		1,092
	Hadzhievo WWPS – 1 pc.				
	Pressure pipeline	DN110	2,100		
II	**Malo Konare Cluster (V25 - WW - 2)**				
9	**Pishtingovo**				
	Sewerage network	300	15,120		1,680
	External collector	400	3,500		
10	**Krali Marko**				
	Sewerage network	300	4,061		451
	External collector	400	1,000		
III	**Patalenitsa Cluster (V25 - WW - 3)**				
11	**Patalenitsa**				
	Sewerage network	300	16,263		1,807
	External collector	400	6,200		
12	**Tsrancha**				
	Sewerage network	300	11,016		1,224
	External collector	400	500		
13	**Debrashtitsa**				
	Sewerage network	300	8,748		972
	External collector	400	350		
	Patalenitsa WWTP – 4,049 PE				
IV	**Bratanitsa Cluster (V25 - WW - 4)**				
14	**Lyahovo**				
	Sewerage network	300	6,138		682
	External collector	400	750		
15	**Zvanichevo**				

№	Name	Diameter [mm]	Length [m] Short-term	Medium-term	Long-term
	Sewerage network	300	9,752		1,084
	External collector	400	1,800		
V	**Yunatsite Cluster (V25 - WW - 5)**				
16	**Yunatsite**				
	Sewerage network	300	12,420		1,380
	External collector	400	500		
17	**Velichkovo**				
	Sewerage network	300	6,650		1,472
	External collector	400	2,600		
	Yunatsite WWTP - 2,847 PE				
VI	**Septemvri Cluster (V25 - WW - 6)**				
18	**Semchinovo**				
	Sewerage network	300	9,828		1,092
	External collector	400	4,000		
19	**Simeonovets**				
	Sewerage network	300	8,307		923
	External collector	400	2,050		
20	**Vetren Dol**				
	Sewerage network	300	15,210		1,690
	Vetren Dol WWPS – 1pc.				
	Pressure pipeline	DN120	2,280		
VII	**Kovachevo Cluster (V25 - WW - 7)**				
21	**Lozen**				
	Sewerage network	300	11,466		1,274
	External collector	400	2,100		
22	**Zlokuchene**				
	Sewerage network	300	3,861		429
	Zlokuchene WWPS – 1pc.				
	Pressure pipeline	DN120	2,280		
VIII	**Vinogradets Cluster (V25 - WW - 8)**				
23	**Vinogradets**				
	Sewerage network	300	22,113		2,457
	External collector	400	3,000		
24	**Karabunar**				
	Sewerage network	300	19,922		2,213
	External collector	400	1,300		
25	**Boshulya**				
	Sewerage network	300	8,640		960
	External collector	400	2,000		
	Vinogradets WWTP - 3,646 PE				

0.5.2.13. *Settlements not forming agglomerations with over 2,000 PE*

Short-term investments:

- Sewerage zoning studies at Water Company level. Those studies will define best options among collective sanitation, small collective sanitation, autonomous sanitation, and rainwater purification systems zones for the studied settlements

Medium-term investments:

- Implementation of the conclusions and recommendations of the sewerage zoning studies.

Long-term investments:

- Implementation of the conclusions and recommendations of the sewerage zoning studies.

0.6. INVESTMENT PROGRAMMES

The necessary investments have been identified and planned in three periods corresponding to each investment programme

- Short Term (2014-2020)
- Medium Term (2021-2028)
- Long Term (2029-2038)

Besides the investment programme described below, the Consultant recommends that a set of institutional studies (analysis of services in terms of human resources management and analysis of the effectiveness of territorial services) are conducted after the publication of the new Water Act, which is currently being prepared. These studies are not included in the investment programme and cannot be quantified at this stage.

0.6.1. SHORT-TERM PROGRAMME

Table 0-9 Overall short-term investments for water supply

Code	Category of work	Total Cost
WS_1	Water abstraction	80,500 €
WS_2	DWTP	908,700 €
WS_3	External water mains	8,823,400 €
WS_4_1	Distribution networks	90,516,100 €
WS_4_2	Reservoirs	1,034,800 €
WS_4_3	Pumping stations	492,400 €
WS_5	Miscellaneous	32,800 €
WS System Construction Cost		101,888,700 €

Feasibility studies	1%
Design	4%
Construction supervision	5%
Project management	3%
Studies and supervision cost	13,245,500 €

Contingencies	10%
Contingency cost	10,188,900 €

Total investment costs	125,323,100 €

Table 0-10 Overall short-term investments for wastewater

Code	Category of work	Total cost
WW_1	WWTP	16 518 700 €
WW_2	Main collectors	52 298 400 €
WW_3_1	Sewerage network	140 731 900 €
WW_3_2	Wastewater pumping station	444 100 €
WW_4	Miscellaneous	312 100 €
WW Construction Cost		210 305 200 €

Feasibility studies	1%
Design	4%
Construction supervision	5%
Project management	3%
Studies and supervision cost	27 339 700 €

Contingencies	10%
Contingency cost	21 030 500€

Total investment costs	258 675 400 €

Table 0-11 Prioritization of short-term investment programme

Ranking**	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
1	10	Pazardzhik WS system	Chlorination facilities–disinfection of the water of WS Pazardzhik	52,800	78,060
2	9	Pazardzhik WS system	Replacement of a pressure pipeline from PS to PR, town of Pazardzhik 5,971 m	3,593,543	76,201
3	49	Pazardzhik	Reconstruction and construction of sewerage network 23,171 m	37,361,200	71,979
4	83	From Luda Yana dam, section from DC to Golemenovo	Chlorination in the direction of Gelemenovo, Ivaylo, Saraya, Dragor, Sbor, Apriltsi	51,800	21,149
5	17	From Luda Yana dam, section from DC to Golemenovo	Reduction of pressure /PRV/	12,800	7,089
6	1	From Luda Yana dam, section from DC to Golemenovo	Gravity water main from DC 4 to PR Sbor, PR Gelemenovo and PR Ivaylo 15,810 m	2,355,145	7,089
7	33	Pazardzhik Municipality	Reconstruction of water supply network for settlements with a population below 2,000 P.E.-168,917 m	31,613,700	23,999
8	13	From Luda Yana dam, section from DC to Golemenovo	New pressure reservoir of Ivaylo	359,671	5,619
9	2	From Luda Yana dam, section from DC to Golemenovo	Gravity water main from PR to the villages of Dragor, Saraya and Ivaylo 6,340 m	1,144,751	5,619
10	50	Aleko Konstantinovo	Construction of internal sewerage network – 13,822 m, WWPS, pressure pipeline with a length of 300 m	1,125,800	2,714
11	51	ViK Pazardzhik (Lesichovo)	Feasibility studies	91,000	5,408

Ranking**	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
12	52	Bratanitsa	Construction of internal sewerage network 11 m intercepting collector 2,100 m, WWTP	7,001,200	2,093
13	53	Ivaylo	Construction of internal sewerage network – 11,450 m	4,078,700	2,841
14	25	Pazardzhik	Reconstruction of water supply network -15,640 m	3,712,700	71,979
15	54	ViK Pazardzhik (Pazardzhik)	Feasibility studies	109,800	5,826
16	55	Glavinitsa	Construction of internal sewerage network 13,662m	4,867,900	2,282
17	56	Malo Konare	Construction of internal sewerage network 42,706 m, intercepting collector 2,300m, WWTP	19,044,000	4,353
18	57	Vetren	Construction of internal sewerage network 17,780m, intercepting collector 1,000m, WWTP	10,228,900	3,221
19	58	Miryantsi (WW-1 Pazardzhik)	Construction of internal sewerage network 4 860m, WWPS, pressure pipeline 1,700 m	2,044,100	568
20	59	Ognyanovo	Construction of internal sewerage network 18,338м, WWPS, pressure pipeline 4,630 m	7,224,900	2,353
21	60	Pishtingovo (WW-2 Malo Konare)	Construction of internal sewerage network 15,120m, intercepting collector 3,500m	6,484,200	1,037
22	61	Varvara	Construction of internal sewerage network 17,604m, intercepting collector 4,809m	6,271,300	2,061
23	62	Chernogorovo	Construction of internal sewerage network 20,470m , intercepting collector 2 000m	7,920,200	2,203

Ranking**	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
24	4	From Luda Yana dam to Borimechkovo	Replacement of a pressure pipeline to PR Borimechkovo 4,890 m.	523,474	569
25	63	ViK Pazardzhik (Septemvri)	Feasibility studies	35,300	1,019
26	11	Pazardzhik Municipality	Chlorination	518,451	42,838
27	64	Mokrishte (WW-1 Pazardzhik)	Construction of internal sewerage network 7,452m, WW, pressure pipeline 1,640m	2,827,300	1,851
28	65	WW-8 Vinogradets (Vinogradets, Karabunar, Boshulya)	Construction of internal sewerage network 47,934m, intercepting collector 6,300m	15,146,500	3,646
29	66	Kovachevo	Construction of internal sewerage network 14,694m, intercepting collector 1,700m, WWTP	3,595,900	2,402
30	67	Lozen (WW-7 Kovachevo)	Construction of internal sewerage network 9,636m, intercepting collector 2,100m	1,383,600	1,019
31	39	Vetren WS sysem	Chlorination – water disinfection , Vetren WS sysem	52,800	12,368
32	68	Sinitievo (WW-1 Pazardzhik)	Construction of internal sewerage network 10,568m, WWPS, 2,100m pressure pipeline	4,008,100	1,950
33	69	Semchinovo (WW-6 Septemvri)	Construction of internal sewerage network 8,388m, intercepting collector 4,000m	4,305,600	1,943
34	70	Dragor (WW-1 Pazardzhik)	Construction of internal sewerage network 5,756m, intercepting collector 2,800m	2,929,000	1,422
35	71	Zlokuchene (WW-7 Kovachevo)	Construction of internal sewerage network 3,861m, WWPS, pressure pipeline 2,280m	1,692,100	860

Ranking**	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
36	72	Saraya (WW-1 Pazardzhik)	Construction of internal sewerage network 8,294m, intercepting collector 1,300m	3,363,600	1,356
37	75	Dobrovnitsa (WW-1 Pazardzhik)	Construction of internal sewerage network 13,392m, WWPS, pressure pipeline 3,400m	5,099,000	1,380
38	76	Vetren dol (WW-6 Septemvri)	Construction of internal sewerage network 15,210m, WWPS, pressure pipeline 2,280m	5,735,700	1,452
39	77	Hadzhievo (WW-1 Pazardzhik)	Construction of internal sewerage network 9,828m, WWPS, pressure pipeline 1,700m	3,774,200	1,027
40	78	Simionovets (WW-6 Septemvri)	Construction of internal sewerage network 8,307m, intercepting collector 2,050m	3,602,900	898
41	79	Golemanovo (WW-1 Pazardzhik)	Construction of internal sewerage network 7,987m, intercepting collector 1,800m	3,375,500	695
42	80	Lyahovo (WW-4 Bratanitsa)	Construction of internal sewerage network 6,138m, intercepting collector 750m	2,422,800	391
43	81	Krali Marko (WW-2 Malo Konare)	Construction of internal sewerage network 4,061m, intercepting collector 1,000m	1,761,200	190
44	41	Vetren WS system	Replacement of pumps in PS II,III	193,591	3,639
45	5	Vetren WS system	Replacement of pressure pipeline from PS III to PR I.z. and from PS to PR Gorno Varshilo 4,140 m.	480,015	3,639
46	43	WS Semchinovo - Simeonovets	Re-captation of catchments	9,900	2,841
47	3	Semchinovo – Simeonovets WS system	Replacement of gravity water main from the catchments to PR of the villages	68,170	2,841

Ranking**	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
48	24	Patalenitsa Tsrancha WS system	Re-captation of catchments	5,400	2,335
49	21	Sinitovo WS system	Replacement of pumps in PS.	20,004	1,950
50	14	Sinitovo WS system	New suction reservoir	154,656	1,950
51	20	Zvanichevo WS system	Replacement of pumps in PS	20,004	1,899
52	15	Zvanichevo WS system	New suction reservoir	172,305	1,899
53	19	Govedare WS system	Replacement of pumps in TW	35,736	1,634
54	16	Yunatsite WS system	Rehabilitation of PS II, new pumps and replacement of pumps in TW	119,702	1,522
55	18	Hadzhievo WS system	Replacement of pumps in TW and PS	35,736	1,027
56	23	Debarshtitsa WS system	Re-captation of catchments	5,170	910
57	45	From Luda Yana dam to Borimechkovo	Replacement of pumps in PS I and II Borimechkovo	132,290	569
58	8	Debrashtitsa WS system	Replacement of gravity water main from catchments to PR Debrashtitsa 3,209 m	396,721	910
59	82	Zvanichevo (WW-4 Bratanitsa)	Construction of internal sewerage network 10,645m, intercepting collector 1,800m	4,318,100	1,899
60	85	Septemvri Municipality	Chlorination	154,240	13,426
61	37	Septemvri Municipality	Reconstruction of water supply network for settlement with a population below 2,000 P.E. -97,512 m	18,119,100	10,236
62	36	Vetren	Reconstruction of water supply network -20,683m	4,012,000	3,221
63	40	WS Vetren	Rehabilitation of PR G. Varshilo, Varvara, Vinogradets and Vetren l.z.	103,206	6,805
64	86	Lesichovo Municipality	Chlorination	71,840	5,408

Ranking**	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
65	35	Varvara	Reconstruction of water supply network -17,665м	3,430,700	2,061
66	12	From Luda Yana dam, section from DC to Gelemenovo	Overall repair of PR Ovchepoltsi	97,120	2,992
67	22	Lyahovo-Bratanitsa WS system	Doubling and equipment of TW	60,000	2,484
68	6	Lyahovo-Bratanitsa WS system	Replacement of a pressure pipeline from PS II to PR 917m	126,215	2,484
69	7	Patalenitsa Tsrancha WS system	Replacement of a pressure pipeline from PS II to PR 1,250m	162,477	2,335
70	84	Sinitovo WS system	Overall repair of KV Sinitovo	16,219	1,950
71	44	From Luda Yana dam to Borimechkovo	Rehabilitation of PR Lesichovo and Borimechkovo	46,748	1,397
72	42	Dolno Varshilo	Research and study works for the water supply of the villages	20,000	250
73	73	WW-3 Patalenitsa (Patalenitsa, Debarshtitsa, Tsrancha)	Construction of internal sewerage network 36,027m, intercepting collector 7,050m, WWTP	17,351,400	3,245
74	74	WW-5 Yunatsite (Velichkovo, Yunatsite)	Construction of internal sewerage network 12,420m, intercepting collector 3,100m,WWTP	9,724,200	2,542
75	26	Ivaylo	Reconstruction of water supply network - 12,255	2,355,900	2,841
76	28	Al. Konstantinovo	Reconstruction of water supply network -15,223м	2,865,700	2,714
77	27	Glavinitsa	Reconstruction of water supply network -13,054м	2,576,300	2,282
78	29	Bratanitsa	Reconstruction of water supply network -12,432м	2,350,200	2,093
79	34	Kovachevo	Reconstruction of water supply network -13,565м	2,819,400	2,402

Ranking**	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
80	32	Chernogorovo	Reconstruction of water supply network -24,362m	4,636,600	2,203
81	30	Malo Konare	Reconstruction of water supply network -45,219m	8,509,800	4,353
82	31	Ognyanovo	Reconstruction of water supply network-18,146m	3,513,900	2,353

** Population in 2011 according to NSI data.*

Category
Water Supply
Waste water

0.6.2. MEDIUM-TERM PROGRAMME

Table 0-12 Overall medium-term investments for water supply

Code	Category of work	Total Cost
WS_1	Water abstraction	60,000 €
WS_2	DWTP	- €
WS_3	Water mains	12 456 300 €
WS_4_1	Distribution networks	21,132,300 €
WS_4_2	Reservoirs	769,200 €
WS_4_3	Pumping stations	405,100 €
WS_5	Miscellaneous	19,200 €
WS System Construction Cost		34 842 100 €

Feasibility studies	1%
Design	4%
Construction supervision	5%
Project management	3%
Studies and supervision cost	4 529 500 €

Contingencies	10%
Contingency cost	3 484 200 €

Total investment costs	42 855 800 €

Table 0-13 Overall medium-term investments for wastewater

Code	Category of work	Total cost
WW_1	WWTP	- €
WW_2	Main collectors	23 627 200 €
WW_3_1	Sewerage network	18 436 800 €
WW_3_2	Wastewater pumping station	171 600 €
WW_4	Miscellaneous	8 391 400 €
WW Construction Cost		50 627 000 €

Feasibility studies	1%
Design	4%
Construction supervision	5%
Project management	3%
Studies and supervision cost	6 581 500 €

Contingencies	10%
Contingency cost	5 062 700 €

Total investment costs	62 271 200 €

Table 0-14 Prioritization of medium-term investment programme

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
1	42	Pazardzhik	Reconstruction and construction of sewerage network 30,385 m; WWPS Spartak -2, Rehabilitation of CPS	21,709,200	71,979
2	20	Pazardzhik WS system	Replacement of pumping units PS Mokrishte	156,938	77,590
3	19	From Luda Yana dam section from DC to Chernogorovo	Reduction of pressure /PRV/	12,800	5,467
4	3	From Luda Yana dam section from DC to Chernogorovo	Gravity water pipe from DC Svoboda to PR Ovchepoltsi, PS Tsar Assen and PR Rosen – 12,635 m	2,001,442	5,467

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
5	5	From Luda Yana dam section from DC to Chernogorovo	Gravity water pipeline from PR to Chernogorovo and Krali Marko and Pishtigovo – 8,340 m	1,174,195	3,430
6	4	From Luda Yana dam section from DC to Chernogorovo	Gravity water pipeline from DC Rosen to PR Topoli dol and PR Chernogorovo – 13 420 m	1,710,301	3,698
7	38	From Luda Yana dam section from DC to Borimechkovo	Reduction of pressure /RV/	6,400	3,646
8	43	Septemvri	Construction of internal sewerage network 16 008m	14,772,200	7,869
9	22	Pazardzhik	Reconstruction of water supply network - 28,560m	7,530,400	71,979
10	44	ViK Pazardzhik (Lesichovo)	Increasing the connection rate of the population to the sewerage network	3,237,000	5,408
11	45	ViK Pazardzhik (Pazardzhik)	Increasing the connection rate of the population to the sewerage network	3,587,400	5,826
12	46	ViK Pazardzhik (Septemvri)	Increasing the connection rate of the population to the sewerage network	1,055,000	1,019
13	47	Aleko Konstantinovo	Construction of internal sewerage network – 1,536 m	547,200	2,714
14	48	Varvara	Construction of internal sewerage network 1,956m	696,700	2,061
15	14	Simeonovets WS system	Replacement of pressure pipeline from TW to PS II 2,781 m.	389,014	12,368

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
16	35	Septemvri Municipality	Reconstruction of water supply network – settlements below 2,000 inhabitants-1,103m	217,000	10,236
17	1	Septemvri WS system	Gravity water pipeline from ST to the town 2,250 m.	426,564	8,729
18	30	Pazardzhik Municipality	Reconstruction of water supply network for settlements with population below 2,000 inhabitants-8,638m	2,912,300	23,999
19	36	Lesichovo Municipality	Reconstruction of water supply network for settlements with population below 2,000 inhabitants-9,315 m	1,767,900	5,408
20	2	Vetren WS system	Replacement of pressure piepline from PS II to PS III 4,230 m.	680,743	3,639
21	40	Vetren – Vetren Dol WS system	Replacement of pump units in TW	34,542	3,513
22	16	From Luda Yana dam section from DC to Chernogorovo	New pressure reservoirs Chernogorovo, Apriltsi	309,968	3,430
23	39	Lozen – Kovachevo WS system	Replacement of pump units PS Lozen and TW	144,856	3,421
24	34	Vetren	Reconstruction of water supply network-2,222m	424,400	3,221
25	56	Hadzhievo WS system	Doubling TW Hadzievo	60,000	1,207
26	21	Patalenitsa Tsrancha WS system	Replacement of pump units PS	68,787	2,335
27	33	Varvara	Reconstruction of water supply network - 1,845m	361,300	2,061

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
28	13	From Luda Yana dam section from DC to Bormiechkovo	Gravity water pipeline from DC Karabunar to PR 1,720 m.	300,855	1,349
29	12	From Luda Yana dam section from DC to Bormiechkovo	Gravity water pipeline from DC Boshulia 1,720 m.	184,126	816
30	31	Septemvri	Reconstruction of water supply network - 18,596m	4,227,900	7,869
31	10	Patalenitsa Tsrancha WS system	Replacement of gravity water pipeline from catchment to PR and pressure pipeline from TW to PS II 8,038 m	975,171	2,335
32	8	From Luda Yana dam section to Bormiechkovo	Gravity water pipeline from DC Velichkovo to PR Velichkovo and Pamidovo 4,370 m.	665,565	1,398
33	49	Vetren	Construction of internal sewerage network-1,975m	703,300	3,221
34	50	Ivaylo	Rehabilitation of WWPS Ivaylo	15,300	2,841
35	51	Kovachevo	Construction of internal sewerage network 1,633 m	101,300	2,402
36	52	Ognyanovo	Construction of internal sewerage network 2,038m	717,400	2,353
37	53	Glavinitsa	Construction of internal sewerage network 1,518m	540,900	2,282
38	54	Bratanitsa	Construction of internal sewerage network 1,233m	441,300	2,093
39	55	Malo Konare	Construction of internal sewerage network 4,745 m	1,692,800	4,353
40	6	From Luda Yana dam section to Bormiechkovo	Gravity water pipeline from transitional reservoir to DC Velichkovo 8,393 m	2,031,015	10,074

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
41	56	Chernogorovo	Construction of internal sewerage network 2,274 m	810,000	2,203
42	18	Pazardzhik Municipality	Rehabilitation of 1 WT, 2 ST and 7 PR	62,849	9,040
43	17	Pazardzhik WS system	Rehabilitation of PR 36,000m3	250,879	5,739
44	37	From Luda Yana dam section to Bormiechkovo	Overall repair of PR Boshulia and PR Karabunar	48,208	2,165
45	27	Malo Konare	Reconstruction of water supply network - 5,379m	973,100	4,353
46	11	WS Lozen - Kovachevo	Replacement of pressure pipeline from TW to PR 5,877 m.	958,680	3,421
47	23	Ivaylo	Reconstruction of water supply network - 1,185m	214,400	2,841
48	25	Al. Konstantinovo	Reconstruction of water supply network - 1,906m	750,000	2,714
49	32	Kovachevo	Reconstruction of water supply network - 1,593m	288,200	2,402
50	28	Ognyanovo	Reconstruction of water supply network - 2,108 m	381,400	2,353
51	24	Glavinitsa	Reconstruction of water supply network - 1,657m	298,600	2,282
52	29	Chernogorovo	Reconstruction of water supply network - 2,768m	500,800	2,203
53	26	Bratanitsa	Reconstruction of water supply network - 1,573m	284,600	2,093
54	7	From Luda Yana dam section to Bormiechkovo	Gravity water pipeline from DC to PR Shtarkovo and Dinkata 4,221 m.	550,970	1,558
55	57	Semchinovo – Simeonovets WS systen	Overall repair of w PR Semchinovo	70,143	1,943

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
56	9	Pazardzhik WS systen	Replacement of gravity water pipeline from the town of Pazardzhik to the village of Miriantsi 3,345 m.	434,789	568

** Population in 2011 according to NSI data.*

Category
Water Supply
Waste water

0.6.3. LONG-TERM PROGRAMME

Table 0-15 Overall long-term investments for water supply

Code	Category of work	Code
WS_1	Water abstraction	- €
WS_2	DWTP	- €
WS_3	Water mains	9,725,200 €
WS_4_1	Distribution networks	20,838,300 €
WS_4_2	Reservoirs	897,000 €
WS_4_3	Pumping stations	1,182,900 €
WS_5	Miscellaneous	509,600 €
WS System Construction Cost		33,153,000 €

Feasibility studies	1%
Design	4%
Construction supervision	5%
Project management	3%
Studies and supervision cost	4,309,900 €

Contingencies	10%
Contingency cost	3,315,300 €

Total investment costs	40,778,200 €

Table 0-16 Overall long-term investments for wastewater

Code	Category of work	Total cost
WW_1	WWTP	- €
WW_2	Main collectors	108 700 €
WW_3_1	Sewerage network	33 914 600 €
WW_3_2	Wastewater pumping station	- €
WW_4	Miscellaneous	8 170 400 €
WW Construction Cost		42 193 700 €

Feasibility studies	1%
Design	4%
Construction supervision	5%
Project management	3%
Studies and supervision cost	5 485 200 €

Contingencies	10%
Contingency cost	4 219 400 €

Total investment costs	51 898 300 €

Table 0-17 Prioritization of long-term investment programme

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
1	40	Pazarzhik	Reconstruction and construction of sewerage network – 30,327m	16,397,500	71,979
2	17	Pazarzhik WS system	Replacement of pump units in BPS Mokrishte	282,738	77,590
3	16	ViK	Implementation of SCADA system	500,000	146,439
4	1	Pazarzhik WS system	Replacement of pressure pipelines from PS to the village of Mokrishte and from TW to ST 5,109 m	1,325,098	77,590
5	27	Pazarzhik	Reconstruction of the water supply network-30,560	4,439,100	71,979
6	10	From Luda Yana dam to Borimechkovo	Gravity water pipeline from DC Kalugerovo to PR Tserovo 12,270 m	1,935,170	2,308
7	42	Zvanichevo (WW-4 Bratanitsa)	Construction of internal sewerage network -1,183m	418,700	1,899
8	65	Septemvri Municipality	Reconstruction of water supply network for settlements with a population below 2,000 inhabitants -12,568m	2,321,300	10,236
9	43	WW-8 Vinogradets (Vinogradets, Karabunar, Boshulia)	Construction of internal sewerage network -5,326m	1,912,900	3,646
10	6	Vetren WS system	Replacement of gravity pipeline from PR Slavovotsa – 5,423m	658,838	418

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
11	35	Pazarzhik Municipality	Reconstruction of water supply network for settlements with a population below 2,000 inhabitants -32,453m	5,986,000	23,999
12	5	Vetren WS system	Replacement of pressure pipelines from PS III to PR h.z. 1,440 m	201,431	3,221
13	46	From Luda Yana dam to Borimechkovo	Reduction of pressure /PRV/	9,600	5,408
14	18	Malo Konare WS system	Replacement of pump units in PS	29,319	4,353
15	14	Varvara – Vetren Dol WS system	Replacement of pressure pipeline from TW to PR - 5,300m	673,168	3,513
16	42	Varvara – Vetren Dol WS system	Replacement of pump units in PS.	68,787	3,513
17	13	Simeonovets - Semchinovo WS system	Replacement of pressure pipeline from TW to PR- 1,250 m	563,867	2,841
18	43	Semchinovo - Simeonovets WS system	Replacement of pump units in TW Hancheto	39,445	2,841
19	21	Al. Konstantinovo WS system	Replacement of pump units in PS	27,577	2,714
20	41	Septemvri	Construction of internal sewerage network – 18,114m	8,149,800	7,869
21	22	Liahovo - Bratanitsa WS system	Replacement of pump units in PS	64,187	2,484
22	19	Ognianovo WS system	Replacement pump units in PS	27,578	2,353
23	11	Patalenitsa - Tsrancha WS system	Replacement of pressure pipeline from TW to PR – 3,330m	465,809	2,335

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
24	23	Patalenitsa - Tsrancha WS system	Replacement of pump units in TW	259,523	2,335
25	20	Hadzhievo WS system	Replacement of pump units in PS	16,652	1,027
26	12	Septemvri WS system	Replacement of gravity water pipeline – Septemvri to Zlokuchene – 1,845m	226,620	860
27	44	Septemvri Municipality	Rehabilitation of PR	70,200	18,549
28	9	From Luda Yana dam to Borimechkovo	Gravity water pipeline from IS Lesichovo to PR Kalugerovo 9,288 m	1,387,665	3,472
29	44	Simionovets (WW 6 – Septemvri)	Construction of internal sewerage network -923m	329,000	898
30	45	Hadzhievo (WW-1 Pazarzhik)	Construction of internal sewerage network -1,092m	390,300	1,027
31	66	Lesichovo Municipality	Reconstruction of water supply network for settlements with a population below 2,000 inhabitants -14,638m	2,691,000	5,408
32	46	Vetren Dol (WW-6 Septemvri)	Construction of internal sewerage network -1,690m	602,300	1,452
33	67	From Luda Yana dam to Borimechkovo	New pressure reservoirs – Pamidovo, Shtarkovo	337,643	772
34	8	From Luda Yana dam to Borimechkovo	Gravity water pipeline from DC Velichkovo o PR Vinogradets – 9,030 m	1,845,947	3,646

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
35	36	Septemvri	Reconstruction of water supply network -26,085m	5,400,800	7,869
36	47	Golemanovo (WW-1 Pazarzhik)	Construction of internal sewerage network -887m	312,200	695
37	48	Pishtingovo (WW-2 Malo Konare)	Construction of internal sewerage network -1,680m	598,500	1,037
38	49	Sinitievo (WW-1 Pazarzhik)	Construction of internal sewerage network -1,296 m	461,000	1,950
39	50	Semchinovo (WW-6 Septemvri)	Construction of internal sewerage network -932 m	338,900	1,943
40	51	Mokrishte (WW-1 Pazarzhik)	Construction of internal sewerage network -828 m	295,200	1,851
41	25	Pazarzhik Municipality	Rehabilitation of PR	189,212	12,622
42	52	Dragor (WW-1 Pazarzhik)	Construction of internal sewerage network -640m	228,000	1,422
43	53	Saraya (WW-1 Pazarzhik)	Construction of internal sewerage network -922m	330,100	1,356
44	54	Lozen (WW-7 Kovachevo)	Construction of internal sewerage network	81,000	1,019
45	55	Zlokuchene (WW-7 Kovachevo)	Construction of internal sewerage network -429m	152,300	860
46	56	Liahovo (WW-4 Bratanitsa)	Construction of internal sewerage network -682m	242,500	391
47	57	WW-5 Yunatsite (Velichkovo, Yunatsite)	Construction of internal sewerage network – 2,852m	1,015,900	2,542
48	58	Dobrovnitsa (WW-1 Pazarzhik)	Construction of internal sewerage network -540m	531,500	1,380

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
49	59	WW-3 Patalenitsa (Patalenitsa, Debarshtitsa, Tsrancha)	Construction of internal sewerage network -4,003m	1,424,600	3,245
50	60	Krali Marko (WW-2 Malo Konare)	Construction of internal sewerage network -451m	161,900	190
51	62	ViK Pazarzhik (Septemvri)	Increasing population connected to the sewerage network.	1,004,900	1,019
52	63	ViK Pazarzhik (Lesichovo)	Increasing population connected to the sewerage network.	3,049,800	5,408
53	64	ViK Pazarzhik (Pazarzhik)	Increasing population connected to the sewerage network.	3,469,700	5,826
54	45	Septemvri WS system Vetren WS system	Rehabilitation of PS and tube wells	263,694	13,977
55	4	Malo Konare WS system	Replacement of pressure pipeline from PS to the village – 542 m	292,339	4,353
56	26	Pazarzhik Municipality	Rehabilitation of existing PS	60,240	4,189
57	47	Lesichovo Municipality	Rehabilitation of PR	43,200	4,011
58	61	Miriantsi (WW-1 Pazarzhik)	Construction of internal sewerage network – 540m	295,200	568
59	2	Al. Konstantinovo WS system	Replacement of pressure pipeline from TW to the village – 1,098 m	208,163	2,714
60	24	From Luda Yana dam to Borimechkovo	New pressure reservoirs – Boshulia, Vinogradets	143,197	2,297

Ranking	Number of investment on the maps	Name of WSZ / Agglomeration	Description of component	Investment costs	Population concerned*
61	15	Sinitievo WS system	Replacement of pressure pipeline from TW to the village – 700 m.	122,453	1,950
62	3	Zvanichevo WS system	Replacement of pressure pipeline from TW to the village – 214 m	34,439	1,899
63	7	Yunatsite WS system	Replacement of pressure pipeline from TW to the village – 407 m	65,499	1,522
64	68	Al. Konstantinovo WS system	New suction tank	205,498	2,714

** Population in 2011 according to NSI data.*

Category
Water Supply
Waste water

0.7. MACRO-AFFORDABILITY

This section relates to chapter 5.4 of the main report.

Macro-affordability assessment is required in order to determine the viability of proposed investments in water and wastewater systems and establish realistic limits on the maximum investment values. Macro-affordability is dependent on multiple variables – type and timing of investments, projected operation and maintenance costs, established and expected depreciation policies, financing sources of investments.

Bulgarian legislation sets an affordability threshold of 4% of the average household income with minimum water consumption of 2.8 m3 per household member. Other sources establish maximum limits of 2-2.5% of the average income. The maximum affordable tariffs at various affordability limits are presented in the table below:

Table 0-18 Affordability thresholds and maximum affordable prices

Indicators	2015	2020	2025	2030	2035	2038
Average household income, ViK EOOD - Pazardzhik, EUR (constant 2011 prices)	4,465	5,252	6,177	7,266	8,547	9,421
Maximum affordable price per m3 (4% of the average income for the poorest three decile groups), EUR	0.94	1.05	1.16	1.29	1.48	1.63

The affordability analysis has been made with assumptions for covering all operation costs and partial depreciation costs considering the financing sources.

Investment components proposed within the **short-term investment programme** is affordable when using tariffs equal to 4% of the lowest income households or the first three decile groups. 18.4% of the depreciation costs for new assets are covered in the period of the short-term programme. To cover operation, maintenance and depreciation costs resulting from the investments made, tariffs will reach levels within the range of 1.07 EUR/m3 in 2021 at present value of 0.83 EUR/m3. Given that under Bulgarian law, this tariff is determined based on 4% of the average income of the population, while affordable tariffs for the projection period are defined based on 4% of the income of the first three decile groups, this difference is not substantial. There is no need to take special measures to ensure targeted financial support to the lowest income population.

Investment components proposed within the **medium-term investment programme** are affordable at tariffs set to 4% of the lowest income households and the first three groups. 19% of the depreciation costs for new assets are covered in the period of the medium-term programme. To cover operation, maintenance and depreciation costs resulting from the investments made, tariffs will reach levels within the range of 1.23 EUR/m3 in 2028. There is no need to take special measures to ensure targeted financial support to the lowest income population.

Similar to the two previous programmes, the **long-term programme** can be fully implemented with the limitation of including depreciations of new assets. Investment components proposed within the long-term investment programme are affordable at tariffs set to 4% of the lowest income households or the first three decile groups. 25.3% of the depreciation costs for new assets are covered in the period of the long-term programme. To cover operation, maintenance and depreciation costs resulting from the investments made, tariffs will reach levels within the range of 1.63 EUR/m3 in 2038. Again, there is no need to take special measures to ensure targeted financial support to low income population.

0.8. PRIORITIZATION OF INFRASTRUCTURE INVESTMENTS

This section relates to chapter 6 of the main report.

Infrastructure investments have been designed to address the deficiencies identified in the current situation analysis and forecasted needs (see summary tables 0-19 and 0-20 for summarized data on the current situation for water supply and sewerage and the compliance with EU directives). All infrastructure projects identified in the investment programmes have been prioritized.

The prioritization consists in calculating an amount of points[5] for each investment, based on the following factors:

- The size (population / population equivalent) of the settlement / agglomeration
- The economic efficiency (cost per inhabitants / cost per equivalent inhabitant)
- The current service coverage

[5] Note: the scoring system has been harmonized for the preparation of Master Plan in the western, central and eastern regions of Bulgaria.

- The investment readiness to date
- The importance of the investment implementation according to the Water Framework Directive / Urban Wastewater Directive

The details of the methodology for prioritization are given in Appendix 4-7.

The implementation of this prioritization results in one list of prioritized investments for each investment programme period. They can be seen in:

- Table 6-6 for the short-term investment programme
- Table 6-11 for the medium-term investment programme
- Table 6-16 for the long-term investment programme

0.9. Public Consultations

This section relates to chapter 8 of the main report.

The Draft Regional Water and Wastewater Master Plan of the designated territory of ViK EOOD - Pazardzhik was first submitted to the Ministry of Regional Development on 11th July, 2013 and for public consultation on 30th August, 2013.

Following a discussion, the District Development Council endorsed the Master Plan on 2nd October , 2013

Following a discussion the members of the Water Association approved the Master plan on 31st October, 2013.

0.10. Overview of the territory of ViK EOOD - Pazardzhik

The schemes and tables presented below show the general information for all the settlements in the considered territory with respect to water supply and sanitation.

In particular, issues of water quality, water scarcity and direct discharge of wastewater into the environment are highlighted

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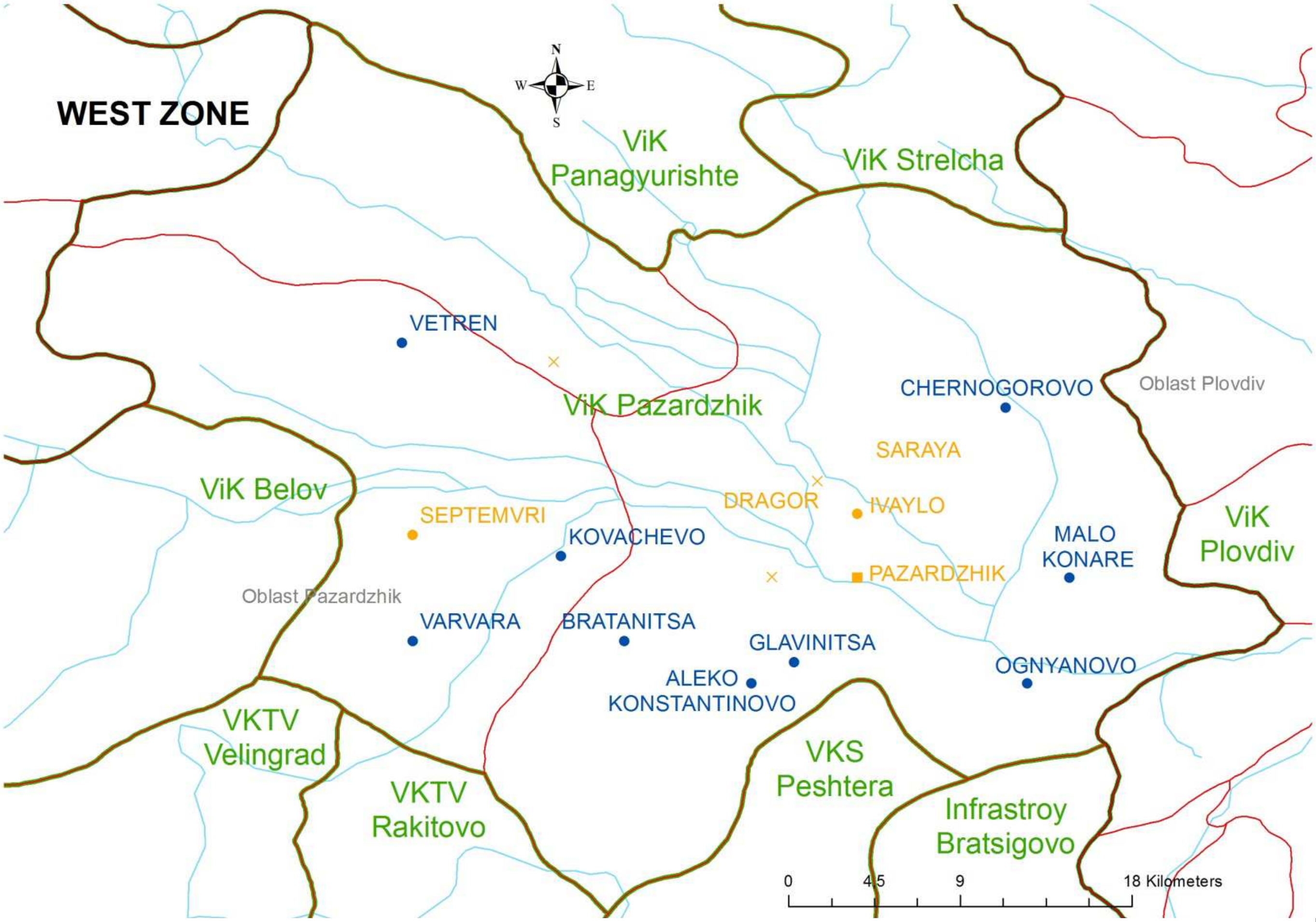
Water Supply: General Situation

VIK EOOD - Pazardzhik



CAPTION :

General information		Compliance with the Water Framework Directive 2000/60/EC		
(green line)	WSS Company borders	NOVO SELO (blue)	■ ●	Settlement compliant
(black line)	District borders	NOVO SELO (yellow)	■ ● ×	Settlement NOT compliant for water quality reasons
(red line)	Municipality borders	NOVO SELO (red)	■ ● ×	Settlement NOT compliant for water quantity reasons
(blue line)	Surface water bodies	NOVO SELO (brown)	■ ● ×	Settlement NOT compliant for water quality and quantity reasons
Settlements		**Drinking water treatment plants**		
■ NOVO SELO	Settlement with population over 10,000 inhabitants	(blue ellipse)	Existing DWTP	
● NOVO SELO	Settlement with population between 2,000 and 10,000 inhabitants	(green ellipse)	On-going construction of DWTP	
×	Settlement with a population under 2,000 inhabitants	(yellow ellipse)	DWTP to be constructed during the implementation of the Master Plan	

Figure 0-2 General situation for water supply

Table 0-19 Summary table for water supply systems

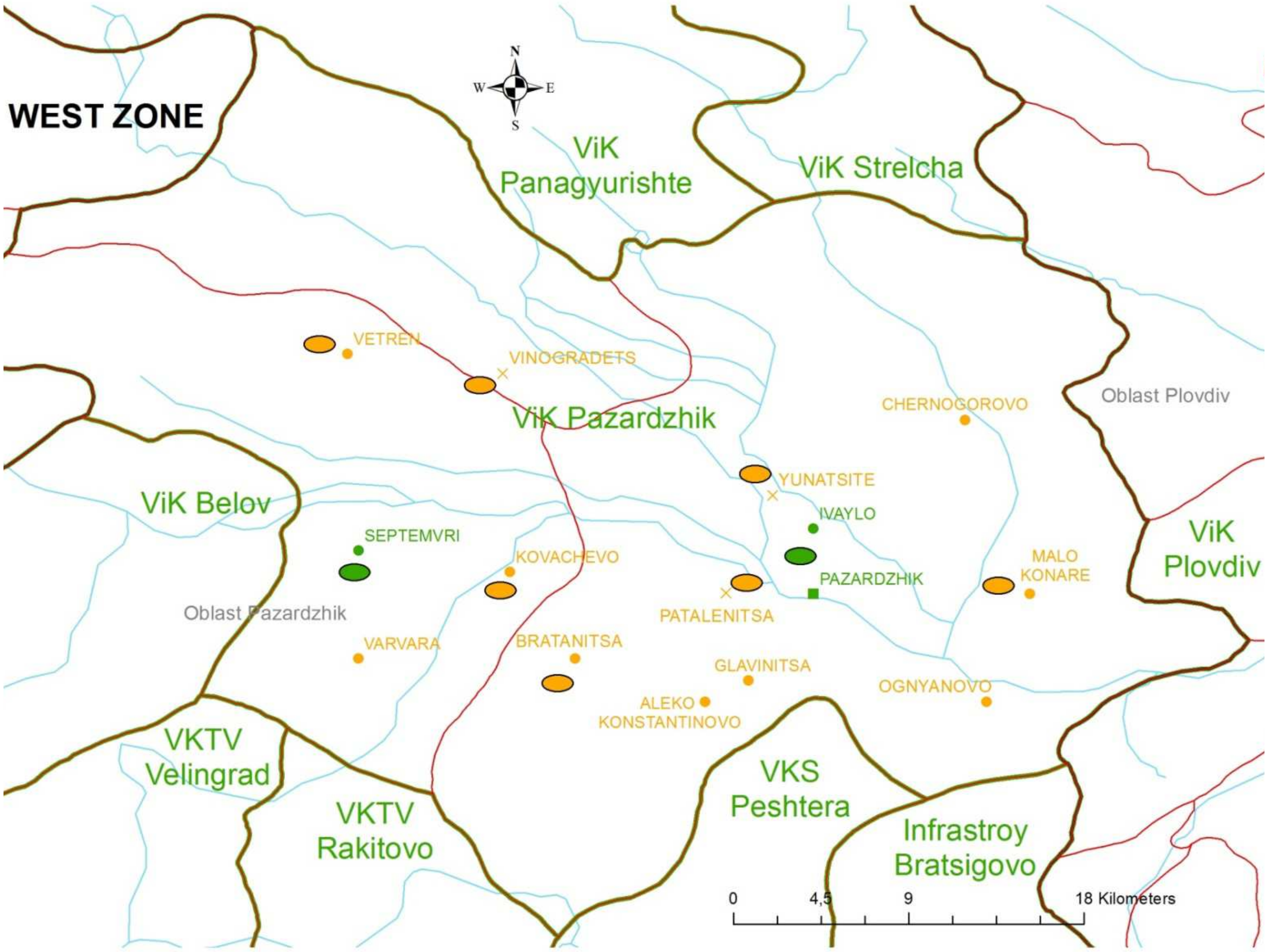
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ID	Municipality	Settlement	Water supply & sewerage operator	Population	Total number of the population and the temporary residents.	WS Zone Code	Length of the water distribution network	Domestic Water Demand	Specific Domestic consumption	Non-Domestic Water Demand	Total Water Demand (excl. NRW)	Total Water Demand incl. NRW	NRW percen-tage	Water Supply Connection rate	Water quantity compliance	Water quality compliance	Comments (major deficiencies (if different columns 14, 15 & 16),
-	Name	Name	Name	Number	Number	-	km	m³ / year	l/c/d	m³ / year	m³ / year	m³ / year	% of 13	% of total	Yes/No	Yes/No (1)	-
05459	Lesichovo	Borimechkovo	ViK EOOD - Pazardzhik	569	569	V25_WS_401	3,652	13,494	65	312	13,806	63,347	78%	100%	Yes	Yes	
21172	Lesichovo	Dinkata	ViK EOOD - Pazardzhik	1,164	1,164	V25_WS_403	10,059	26,134	62	1,367	27,501	91,093	70%	100%	Yes	Yes	
35571	Lesichovo	Kalugerovo	ViK EOOD - Pazardzhik	1,164	1,164	V25_WS_401	12,838	40,382	95	4,380	44,762	205,385	78%	100%	Yes	Yes	
43369	Lesichovo	Lesichovo	ViK EOOD - Pazardzhik	828	839	V25_WS_401	13,161	36,757	120	5,944	42,701	195,928	78%	100%	Yes	Yes	
55275	Lesichovo	Pamidovo	ViK EOOD - Pazardzhik	378	378	V25_WS_403	5,126	11,749	85	978	12,727	42,156	70%	100%	Yes	Yes	
84067	Lesichovo	Shtarkovo	ViK EOOD - Pazardzhik	394	394	V25_WS_403	9,966	12,079	84	2,550	14,629	48,456	70%	100%	Yes	Yes	
78478	Lesichovo	Tserovo	ViK EOOD - Pazardzhik	911	911	V25_WS_401	11,732	30,033	90	2,989	33,022	151,517	78%	100%	Yes	Yes	
00254	Pazardzhik	Aleko Konstantinovo	ViK EOOD - Pazardzhik	2,714	2,714	V25_WS_113	18,100	72,065	73	8,852	80,917	192,776	58%	100%	Yes	Yes	
00571	Pazardzhik	Apriltsi	ViK EOOD - Pazardzhik	526	526	V25_WS_106	5,673	14,857	77	248	15,105	34,534	56%	100%	Yes	Yes	
06149	Pazardzhik	Bratanitsa	ViK EOOD - Pazardzhik	2,093	2,093	V25_WS_111	15,650	58,083	76	2,940	61,023	188,567	68%	100%	Yes	Yes	
81089	Pazardzhik	Chernogorovo	ViK EOOD - Pazardzhik	2,203	2,203	V25_WS_103	27,340	70,783	88	6,138	76,921	224,720	66%	100%	Yes	Yes	
20362	Pazardzhik	Debrashtitsa	ViK EOOD - Pazardzhik	910	1,065	V25_WS_114	10,206	46,662	120	11,161	57,823	100,350	42%	100%	Yes	Yes	
21556	Pazardzhik	Dobrovnitsa	ViK EOOD - Pazardzhik	1,380	1,380	V25_WS_101	15,475	53,683	107	1,996	55,679	136,030	59%	100%	Yes	Yes	
23457	Pazardzhik	Dragor	ViK EOOD - Pazardzhik	1,422	1,422	V25_WS_101	6,652	37,859	73	734	38,593	94,287	59%	100%	Yes	No	There are nitrates in the water sources of Ivaylo - 3 tube wells
14619	Pazardzhik	Gelemenovo	ViK EOOD - Pazardzhik	695	695	V25_WS_107	9,341	28,236	111	18,693	46,929	74,870	37%	100%	Yes	Yes	
15028	Pazardzhik	Glavinitsa	ViK EOOD - Pazardzhik	2,282	2,282	V25_WS_101	15,611	74,189	89	76,564	150,753	368,307	59%	100%	Yes	Yes	
15271	Pazardzhik	Govedare	ViK EOOD - Pazardzhik	1,634	1,634	V25_WS_118	11,126	58,476	98	4,088	62,564	82,901	25%	100%	Yes	Yes	
77061	Pazardzhik	Hadzhievo	ViK EOOD - Pazardzhik	1,027	1,027	V25_WS_117	11,357	35,079	94	2,193	37,272	141,114	74%	100%	Yes	Yes	
32010	Pazardzhik	Ivaylo	ViK EOOD - Pazardzhik	2,841	2,841	V25_WS_101	20,620	99,099	96	8,569	107,668	263,045	59%	100%	Yes	No	There are nitrates in the water sources of Ivaylo - 3 tube wells
39428	Pazardzhik	Krali Marko	ViK EOOD - Pazardzhik	190	190	V25_WS_103	4,692	6,899	99	361	7,260	21,210	66%	100%	Yes	Yes	
44879	Pazardzhik	Lyahovo	ViK EOOD - Pazardzhik	391	391	V25_WS_111	7,093	13,571	95	389	13,960	43,138	68%	100%	Yes	Yes	
46749	Pazardzhik	Malo Konare	ViK EOOD - Pazardzhik	4,353	4,353	V25_WS_102	53,838	137,493	87	9,630	147,123	267,522	45%	100%	Yes	Yes	
48444	Pazardzhik	Miryantsi	ViK EOOD - Pazardzhik	568	587	V25_WS_101	5,685	25,695	120	3,941	29,636	72,404	59%	100%	Yes	Yes	
48876	Pazardzhik	Mokrishte	ViK EOOD - Pazardzhik	1,851	1,851	V25_WS_101	8,610	63,212	94	2,230	65,442	159,882	59%	100%	Yes	Yes	
53335	Pazardzhik	Ognyanovo	ViK EOOD - Pazardzhik	2,353	2,353	V25_WS_116	21,448	88,526	103	61,805	150,331	300,653	50%	100%	Yes	Yes	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ID	Municipality	Settlement	Water supply & sewerage operator	Population	Total number of the population and the temporary residents.	WS Zone Code	Length of the water distribution network	Domestic Water Demand	Specific Domestic consumption	Non-Domestic Water Demand	Total Water Demand (excl. NRW)	Total Water Demand incl. NRW	NRW percen-tage	Water Supply Connection rate	Water quantity compliance	Water quality compliance	Comments (major deficiencies (if different columns 14, 15 & 16),
-	Name	Name	Name	Number	Number	-	km	m³ / year	l/c/d	m³ / year	m³ / year	m³ / year	% of 13	% of total	Yes/No	Yes/No (1)	-
53285	Pazardzhik	Ovchepoltsi	ViK EOOD - Pazardzhik	972	972	V25_WS_104	16,719	40,201	113	3,106	43,307	121,333	64%	100%	Yes	Yes	
55556	Pazardzhik	Patalenitsa	ViK EOOD - Pazardzhik	1,228	1,670	V25_WS_112	18,793	73,158	120	6,429	79,587	306,552	74%	100%	Yes	Yes	
55155	Pazardzhik	Pazardzhik	ViK EOOD - Pazardzhik	71,979	71,979	V25_WS_101	172,980	2,481,483	94	736,639	3,218,122	7,862,238	59%	100%	Yes	No	There are nitrates in the water sources of Ivaylo - 3 tube wells - the water source covers 20% of the consumption of the town
56561	Pazardzhik	Pishtigovo	ViK EOOD - Pazardzhik	1037	1,037	V25_WS_102	17,640	32,469	86	2,787	35,256	64,108	45%	100%	Yes	Yes	
63032	Pazardzhik	Rosen	ViK EOOD - Pazardzhik	516	516	V25_WS_105	6,004	22,289	118	351	22,640	73,575	69%	100%	Yes	Yes	
65437	Pazardzhik	Saraya	ViK EOOD - Pazardzhik	1356	1,356	V25_WS_101	9,585	33,049	67	1,893	34,942	85,367	59%	100%	Yes	No	There are nitrates in the water sources of Ivaylo - 3 tube wells
65468	Pazardzhik	Sbor	ViK EOOD - Pazardzhik	249	357	V25_WS_106	7,852	15,634	120	361	15,995	36,568	56%	100%	Yes	Yes	
66559	Pazardzhik	Sinitovo	ViK EOOD - Pazardzhik	1950	1,950	V25_WS_115	11,864	72,154	101	3,524	75,678	108,860	30%	100%	Yes	Yes	
72713	Pazardzhik	Topoli Dol	ViK EOOD - Pazardzhik	268	268	V25_WS_104	7,934	11,202	115	1,158	12,360	34,629	64%	100%	Yes	Yes	
78056	Pazardzhik	Tsar Asen	ViK EOOD - Pazardzhik	281	360	V25_WS_105	6,387	15,785	120	645	16,430	53,394	69%	100%	Yes	Yes	
78570	Pazardzhik	Tsrancha	ViK EOOD - Pazardzhik	1107	1,314	V25_WS_112	12,730	57,540	120	5,600	63,140	243,202	74%	100%	Yes	Yes	
10505	Pazardzhik	Velichkovo	ViK EOOD - Pazardzhik	1020	1,115	V25_WS_108	12,270	48,850	120	25,612	74,462	224,759	67%	100%	Yes	Yes	
86074	Pazardzhik	Yunatsite	ViK EOOD - Pazardzhik	1522	1,522	V25_WS_109	14,352	55,361	100	8,315	63,676	79,517	20%	100%	Yes	Yes	
30572	Pazardzhik	Zvanichevo	ViK EOOD - Pazardzhik	1899	1,899	V25_WS_110	12,451	64,149	93	2,299	66,448	160,584	59%	100%	Yes	Yes	
05949	Septemvri	Boshulya	ViK EOOD - Pazardzhik	816	816	V25_WS_503	9,984	28,259	95	960	29,219	113,330	74%	100%	Yes	Yes	
22592	Septemvri	Dolno Varshilo		5	5			No data	No data	No data	No data	No data		100%	Yes	Yes	
16732	Septemvri	Gorno Varshilo	ViK EOOD - Pazardzhik	42	69	V25_WS_501	2,493	3,004	119	206	3,210	14,729	78%	100%	Yes	Yes	
36172	Septemvri	Karabunar	ViK EOOD - Pazardzhik	1349	1,349	V25_WS_503	19,854	49,026	100	3,036	52,062	201,930	74%	100%	Yes	Yes	
37491	Septemvri	Kovachevo	ViK EOOD - Pazardzhik	2402	2,402	V25_WS_504	15,158	68,512	78	3,616	72,128	132,477	46%	100%	Yes	Yes	
44053	Septemvri	Lozen	ViK EOOD - Pazardzhik	1019	1,019	V25_WS_504	11,270	37,066	100	4,527	41,593	76,393	46%	100%	Yes	Yes	
66202	Septemvri	Semchinovo	ViK EOOD - Pazardzhik	1943	1,943	V25_WS_506	9,693	56,746	80	4,756	61,502	282,362	78%	100%	Yes	Yes	
66264	Septemvri	Septemvri	ViK EOOD - Pazardzhik	7869	7,869	V25_WS_502	47,884	281,466	98	43,287	324,753	814,367	60%	100%	Yes	Yes	
66439	Septemvri	Simeonovets	ViK EOOD - Pazardzhik	898	898	V25_WS_506	9,692	36,526	111	4,273	40,799	187,313	78%	100%	Yes	Yes	
67009	Septemvri	Slavovitsa	ViK EOOD - Pazardzhik	376	458	V25_WS_501	5,385	20,070	120	7,718	27,788	127,502	78%	100%	Yes	Yes	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ID	Municipality	Settlement	Water supply & sewerage operator	Population	Total number of the population and the temporary residents.	WS Zone Code	Length of the water distribution network	Domestic Water Demand	Specific Domestic consumption	Non-Domestic Water Demand	Total Water Demand (excl. NRW)	Total Water Demand incl. NRW	NRW percen-tage	Water Supply Connection rate	Water quantity compliance	Water quality compliance	Comments (major deficiencies (if different columns 14, 15 & 16),
-	Name	Name	Name	Number	Number	-	km	m^3 / year	l/c/d	m^3 / year	m^3 / year	m^3 / year	% of 13	% of total	Yes/No	Yes/No (1)	-
10104	Septemvri	Varvara	ViK EOOD - Pazardzhik	2061	2,061	V25_WS_505	20,320	71,481	95	7,356	78,837	508,407	84%	100%	Yes	Yes	
10820	Septemvri	Vetren	ViK EOOD - Pazardzhik	3221	3,221	V25_WS_501	22,905	108,250	92	12,445	120,695	553,794	78%	100%	Yes	Yes	
10851	Septemvri	Vetren Dol	ViK EOOD - Pazardzhik	1452	1,452	V25_WS_505	17,576	38,600	73	3,465	42,065	271,271	84%	100%	Yes	Yes	
11154	Septemvri	Vinogradets	ViK EOOD - Pazardzhik	1481	1,481	V25_WS_501	25,557	46,438	86	15,695	62,133	285,089	78%	100%	Yes	Yes	
31214	Septemvri	Zlokuchene	ViK EOOD - Pazardzhik	860	860	V25_WS_502	4,720	18,041	57	2,290	20,331	50,983	60%	100%	Yes	Yes	
00165	Belovo	Akandzhievo	ViK EOOD - Pazardzhik	420	420	V25_WS_501	6,623	15,741	103	678	16,419			100%	Yes	Yes	

(1) If "No", The parameter(s) non complying are indicated into brackets.

Sewage: General Situation
VIK EOOD - Pazardzhik



CAPTION :

General information		Coverage rate of sewerage for agglomeration	
(green line)	WSS Company borders	NOVO SELO (blue)	≥ 90%
(black line)	District borders	NOVO SELO (green)	< 90%
(red line)	Municipality borders	NOVO SELO (yellow)	0%
(blue line)	Surface water bodies	Waste water treatment plants	
Agglomeration		(purple ellipse)	Existing WWTP
■ NOVO SELO	Agglomeration with population over 10,000 inhabitants	(green ellipse)	On-going construction of WWTP
● NOVO SELO	Agglomeration with population between 2,000 and 10,000 inhabitants	(yellow ellipse)	WWTP to be constructed during the implementation of the Master Plan
×	Agglomeration with a population under 2,000 inhabitants	★	Other issue concerning wastewater

Figure 0-3 General situation for sewerage

Table 0-20 Summary table for wastewater systems

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ID	Municipality	Settlement	Water supply & sewerage operator	Population	Total number of the population and the temporary residents.	Population equivalent	WW Zone Code[1]	Length of the sewerage network	Total waste-water generated	Actual pollution load collected	Sensitive Area	Wastewater connection rate	Connection to a WWTP	Compliance with UWWD	Comments (major deficiencies (if different columns 12 & 13), …)
-	Name	Name	Name	Number	Number	Number	Number	km	m3/year	PE60	Yes/No ([2])	% of total	Yes/No/ Partial/ On-going (2)	Yes/No	-
05459	Lesichovo	Borimechkovo	ViK EOOD - Pazardzhik	569	569	569	10	0	0	0	Yes	0	No	No	
21172	Lesichovo	Dinkata	ViK EOOD - Pazardzhik	1,164	1 164	1,164	11	0	0	0	Yes	0	No	No	
35571	Lesichovo	Kalugerovo	ViK EOOD - Pazardzhik	1,164	1,164	1,164	12	0	0	0	Yes	0	No	No	
43369	Lesichovo	Lesichovo	ViK EOOD - Pazardzhik	828	839	839	13	0	0	0	Yes	0	No	No	
55275	Lesichovo	Pamidovo	ViK EOOD - Pazardzhik	378	378	378	14	0	0	0	Yes	0	No	No	
84067	Lesichovo	Shtarkovo	ViK EOOD - Pazardzhik	394	394	394	15	0	0	0	Yes	0	No	No	
78478	Lesichovo	Tserovo	ViK EOOD - Pazardzhik	911	911	911	16	0	0	0	Yes	0	No	No	
00254	Pazardzhik	Aleko Konstantinovo	ViK EOOD - Pazardzhik	2,714	2,714	2,783	1	0	0	0	Yes	0	No	No	
00571	Pazardzhik	Apriltsi	ViK EOOD - Pazardzhik	526	526	526	17	0	0	0	Yes	0	No	No	
06149	Pazardzhik	Bratanitsa	ViK EOOD - Pazardzhik	2,093	2,093	2,116	4	0	0	0	Yes	0	No	No	
81089	Pazardzhik	Chernogorovo	ViK EOOD - Pazardzhik	2,203	2,203	2,251	2	0	0	0	Yes	0	No	No	
20362	Pazardzhik	Debrashtitsa	ViK EOOD - Pazardzhik	910	1,065	1,065	3	0	0	0	Yes	0	No	No	
21556	Pazardzhik	Dobrovnitsa	ViK EOOD - Pazardzhik	1,380	1,380	1,380	1	0	0	0	Yes	0	No	No	
23457	Pazardzhik	Dragor	ViK EOOD - Pazardzhik	1,422	1,422	1,422	1	0	0	0	Yes	0	No	No	
14619	Pazardzhik	Gelemenovo	ViK EOOD - Pazardzhik	695	695	695	1	0	0	0	Yes	0	No	No	
15028	Pazardzhik	Glavinitsa	ViK EOOD - Pazardzhik	2,282	2,282	2,880	18	0	0	0	Yes	0	No	No	
15271	Pazardzhik	Govedare	ViK EOOD - Pazardzhik	1,634	1,634	1,634	19	0	0	0	Yes	0	No	No	
77061	Pazardzhik	Hadzhievo	ViK EOOD - Pazardzhik	1,027	1,027	1,027	1	0	0	0	Yes	0	No	No	
32010	Pazardzhik	Ivaylo	ViK EOOD - Pazardzhik	2,841	2,841	2,908	1	6,425	77,081	1,628	Yes	56%	Yes	No	On-going project
39428	Pazardzhik	Krali Marko	ViK EOOD - Pazardzhik	190	190	190	2	0	0	0	Yes	0	No	No	
44879	Pazardzhik	Lyahovo	ViK EOOD - Pazardzhik	391	391	391	4	0	0	0	Yes	0	No	No	
46749	Pazardzhik	Malo Konare	ViK EOOD - Pazardzhik	4,353	4,353	4,428	2	0	0	0	Yes	0	No	No	
48444	Pazardzhik	Miryantsi	ViK EOOD - Pazardzhik	568	587	592	1	1,428	7,409	93	Yes	46%	No	No	
48876	Pazardzhik	Mokrishte	ViK EOOD - Pazardzhik	1,851	1,851	1,851	1	0	0	0	Yes	0	No	No	
53335	Pazardzhik	Ognyanovo	ViK EOOD - Pazardzhik	2,353	2,353	2,836	1	0	0	0	Yes	0	No	No	
53285	Pazardzhik	Ovchepoltsi	ViK EOOD - Pazardzhik	972	972	972	20	0	0	0	Yes	0	No	No	
55556	Pazardzhik	Patalenitsa	ViK EOOD - Pazardzhik	1,228	1,670	1,670	3	0	0	0	Yes	0	No	No	
55155	Pazardzhik	Pazardzhik	ViK EOOD - Pazardzhik	71,979	71,979	77,731	1	142,331	5,291,336	37,311	Yes	48%	Yes	No	On-going project
56561	Pazardzhik	Pishtigovo	ViK EOOD - Pazardzhik	1,037	1,037	1,037	2	0	0	0	Yes	0	No	No	
63032	Pazardzhik	Rosen	ViK EOOD - Pazardzhik	516	516	516	21	0	0	0	Yes	0	No	No	
65437	Pazardzhik	Saraya	ViK EOOD - Pazardzhik	1,356	1,356	1,356	1	0	0	0	Yes	0	No	No	
65468	Pazardzhik	Sbor	ViK EOOD - Pazardzhik	249	357	357	22	0	0	0	Yes	0	No	No	
66559	Pazardzhik	Sinitovo	ViK EOOD - Pazardzhik	1,950	1,950	1,954	1	1,096	20,032	297	Yes	49%	No	No	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ID	Municipality	Settlement	Water supply & sewerage operator	Population	Total number of the population and the temporary residents.	Population equivalent	WW Zone Code[1]	Length of the sewerage network	Total waste-water generated	Actual pollution load collected	Sensitive Area	Wastewater connection rate	Connection to a WWTP	Compliance with UWWD	Comments (major deficiencies (if different columns 12 & 13), …)
-	Name	Name	Name	Number	Number	Number	Number	km	m3/year	PE60	Yes/No ([2])	% of total	Yes/No/ Partial/ On-going (2)	Yes/No	-
72713	Pazardzhik	Topoli Dol	ViK EOOD - Pazardzhik	268	268	268	23	0	0	0	Yes	0	No	No	
78056	Pazardzhik	Tsar Asen	ViK EOOD - Pazardzhik	281	360	360	24	0	0	0	Yes	0	No	No	
78570	Pazardzhik	Tsrancha	ViK EOOD - Pazardzhik	1,107	1,314	1,314	3	0	0	0	Yes	0	No	No	
10505	Pazardzhik	Velichkovo	ViK EOOD - Pazardzhik	1,020	1,115	1,235	5	6,6	77,957	756	Yes	51%	No	No	
86074	Pazardzhik	Yunatsite	ViK EOOD - Pazardzhik	1,522	1,522	1,522	5	0	0	0	Yes	0	No	No	
30572	Pazardzhik	Zvanichevo	ViK EOOD - Pazardzhik	1,899	1,899	1,899	4	0	0	0	Yes	0	No	No	
05949	Septemvri	Boshulya	ViK EOOD - Pazardzhik	816	816	816	8	0	0	0	Yes	0	No	No	
22592	Septemvri	Dolno Varshilo		5	5	5	25	0	0	0	Yes	0	No	No	
16732	Septemvri	Gorno Varshilo	ViK EOOD - Pazardzhik	42	69	69	26	0	0	0	Yes	0	No	No	
36172	Septemvri	Karabunar	ViK EOOD - Pazardzhik	1,349	1,349	1,349	8	0	0	0	Yes	0	No	No	
37491	Septemvri	Kovachevo	ViK EOOD - Pazardzhik	2,402	2,402	2,430	7	0	0	0	Yes	0	No	No	
44053	Septemvri	Lozen	ViK EOOD - Pazardzhik	1,019	1,019	1,019	7	0	0	0	Yes	0	No	No	
66202	Septemvri	Semchinovo	ViK EOOD - Pazardzhik	1,943	1,943	1,943	6	0	0	0	Yes	0	No	No	
66264	Septemvri	Septemvri	ViK EOOD - Pazardzhik	7,869	7,869	8,179	6	43,777	529,753	4,253	Yes	52%	Yes	No	On-going project
66439	Septemvri	Simeonovets	ViK EOOD - Pazardzhik	898	898	898	6	0	0	0	Yes	0	No	No	
67009	Septemvri	Slavovitsa	ViK EOOD - Pazardzhik	376	458	458	27	0	0	0	Yes	0	No	No	
10104	Septemvri	Varvara	ViK EOOD - Pazardzhik	2,061	2,061	2,118	6	0	0	0	Yes	0	No	No	
10820	Septemvri	Vetren	ViK EOOD - Pazardzhik	3,221	3,221	3,318	9	0	0	0	Yes	0	No	No	
10851	Septemvri	Vetren Dol	ViK EOOD - Pazardzhik	1,452	1,452	1,452	6	0	0	0	Yes	0	No	No	
11154	Septemvri	Vinogradets	ViK EOOD - Pazardzhik	1,481	1,481	1,481	8	0	0	0	Yes	0	No	No	
31214	Septemvri	Zlokuchene	ViK EOOD - Pazardzhik	860	860	860	7	0	0	0	Yes	0	No	No	

(1) "0", means that there is no wastewater collection for the settlements (1)
(2) "Yes" means there is a connection to an operational WWTP. "No" means that currently there is no connection to a WWTP and no project on-going for a connection in the future. "Partial" means that only parts of the sewerage network are connected. "On-going" means that a project has been "approved and financed" before the 15.07.2012 so the settlement is connected in the future

1. INTRODUCTION

1.1. PROJECT FRAMEWORK

1.1.1. GENERAL FRAMEWORK AND POLICY CONTEXT

Bulgaria, as member of the European Union (EU), is committed to improve environmental quality in order to achieve compliance with the EU Acquis Communautaire. In this respect, Bulgaria has adopted most of the Acquis in the field of environmental protection. The fulfilment of the commitments made by Bulgaria in the negotiation process for Chapter 22 – Environmental Protection, involves the implementation of major investment projects in environmental infrastructure.

Before Bulgaria's accession to EU, part of the funds needed for environmental investments were available through different European programmes (i.e. PHARE, ISPA, SAPARD) or through projects financed by International Financing Institutions (IFIs) (like: EBRD, EIB, WB, etc.). After 1st of January 2007, Bulgaria has continued to receive EU financial support from the Structural and Cohesion Funds (SCF).

In order to ensure an efficient absorption and use of EU funds, the Bulgarian Ministry of Environment and Water (MoEW), as Managing Authority for the Operational Programme (OP) "Environment", prepared a strategic document for the programming period 2007 – 2013 developed in line with the Community Strategic Guidelines (CSG); the National Development Plan (NDP); the National Environmental Strategy 2005-2014; the National Strategic Reference Framework (NSRF); the National Waste Management Programme 2009-2013; the National Strategy for Management and Development of the Water Sector 2004 – 2015; and the programmes for the implementation of the requirements of different "heavy" directives, elaborated in 2003, such as 91/271/EEC concerning urban waste water treatment. On the basis of the analysis of the current situation, the OP "Environment 2007-2013" sets the country priority areas for the environmental sector to be implemented and financed by the European Union through the Cohesion Fund and the European Regional Development Fund. Priority axis 1 concerns the improvement and development of water and wastewater infrastructure in settlements with over 2,000 population equivalent (PE) and in settlements below 2,000 PE within urban agglomeration areas. The priority axis is based on the purpose of Council Directive 2000/60/EC laying down the framework for community activities related to water - Water Framework Directive (WFD) as well as the purposes of Council Directive 91/271/EEC for urban waste water treatment.

During the negotiations under Chapter 22, two transitional periods have been negotiated with regard to the implementation of the requirements of Directive 91/271/EEC, which are as follows:

- Till 31 December 2010 – for settlements over 10,000 PE (85 no in total);
- Till 31 December 2014 – for settlements between 2,000 and 10,000 PE (273 no in total).

This requires measures that include:

- Water supply: extension, reconstruction, modernization, NRW reduction programmes as well as construction of Drinking Water Treatment Plants (DWTP), reservoirs…
- Sewerage: extension, reconstruction and modernization, as well as construction of new sewerage systems including urban Waste Water Treatment Plants (WWTP), sceptic tanks, soakaways…

According to the Report for Implementation of Directive 91/271/EEC by the end of 2010 issued by the MoEW, there is a delay in the fulfilment of the Directive requirements for agglomerations above 10,000 PE. This imposes to give first priority to the design and construction of sewerage networks and urban WWTP for agglomerations over 10,000 PE.

Joining the EU in 2007, Bulgaria was urged to reform the water sector and adopt stricter regulations and environmental standards. The European Commission requested from Bulgarian an urgent action plan for reform in the water infrastructure sector. As a result, the Ministry of Environment and Water prepared a strategy and completed a map for the water supply and sewage sector development, in coordination with other ministries, regional authorities, municipalities and ViK operators –for most effective planning, management and operation of the water infrastructure.

At present, the operators providing water supply and sewerage services in the country are state, municipal or joint commercial companies that are facing the challenges of the reform launched in the water sector, triggered by the need to resolve the fragmented ownership of water assets. According to the reforms in the water sector the ownership of water infrastructure will be public state and public municipal and the management of water systems will be carried out by the water supply an sewerage associations.

This Regional Master Plan (RMP) is the first important step giving the framework for the development strategy of the municipalities in the water supply and sewerage sector for the period 2014-2038. An identification of necessary investment measures to achieve full compliance with relevant EU Directives and other objectives defined in the Terms of Reference is given in the present document, as well as a prioritisation and phasing of these measures in short, medium and long term. Special attention is paid to the preparation of the short term investment programme intended to be financed by the next Operational Programme "Environment 2014-2020".

1.1.2. PROJECT OBJECTIVES AND SCOPE OF WORK

The project objectives and scope of work below have been defined in accordance with the Terms of Reference of the "Regional water and wastewater Master Plans for the central region".

The Government of Bulgaria has received a loan from the World Bank to implement a Municipal Infrastructure Development Project. Its strategic aims are to (a) improve the reliability and quality of water provision to the communities in selected settlements in the project area and (b) assist municipalities to improve investment-planning capacity. These objectives are in line with Bulgaria's National Strategy on Environment (2005-

2014), which pursues the following goal: “To provide good quality and sufficient quantity of water for different purposes”.

There are three project components:

- Component 1: Project Implementation Support;
- Component 2: Technical assistance for Regional and Municipal Infrastructure Development;
- Component 3: Completion and Rehabilitation of Dams.

This assignment covers Component 2 under which the project will support the Strategy for Water Supply and Sewerage Management and Development in the Republic of Bulgaria through the preparation of 24 Regional Master Plans for water supply and sewerage systems for the designated territories in the Central region with a planning horizon of 2038. According to a first assessment based on 2011 population census and in compliance with the Terms of Reference for the project, the Regional Master Plans should focus on 143 settlements above 2,000 PE. Small settlements will be taken into account at general level within the activity of the Water Supply and Sewerage Companies (WSSCs) and the situation assessment. The plans will be the first step for identification of priority investments for rehabilitation of existing facilities and construction of new facilities for water supply and wastewater collection and treatment needed to cover the requirements of the EU Directives concerning the environment.

The present report aims to prepare a Regional Master Plan for the water supply and sewerage systems of the designated territory of the Water Operator i.e ViK EOOD – Pazardzhik , serving the Municipalities of Pazardzhik, Septemvri and Lesichovo. The borders of the territory are determined by the area of ViK EOOD – Sofia District, ViK-P EOOD Panagyurishte, ViK EOOD - Strelcha, ViK EOOD - Plovdidv, Infrastroi EOOD-Bratsigovo, VKP EOOD – Peshtera, VKTV EOOD – Rakitovo, VKTV EOOD – Velingrad and ViK EOOD - Batak.

The territory operated by ViK EOOD – Pazardzhik comprises 54 settlements (Pazardzhik Municipality - 32; Septemvri Municipality - 14, Lesichovo Municipality – 7 and Belovo Municipality - 1), out of which 1 settlement has a population of over 10,000 inhabitants and 11 settlements with a population of between 2,000 and 10,000 inhabitants. The table below presents the agglomerations with more than 2,000 inhabitants in the subject territory, according to the “Report on the Implementation of the Requirements of EU Directive 91/271/EEC” issued by the MoEW.

Table 1-1 Settlements with over 2,000 inhabitants served by ViK EOOD – Pazardzhik

EKATTE (Unified Classifier of Administrative-Territorial and Territorial Units)	Agglomeration	Scope	PE	Population as of 2011
55155	Pazardzhik	The town of Pazardzhik	85,058	71,979
00254	Aleko Konstantinovo	The village of Aleko Konstantinovo	2,628	2,714

EKATTE (Unified Classifier of Administrative-Territorial and Territorial Units)	Agglomeration	Scope	PE	Population as of 2011
06149	Bratanitsa	The village of Bratanitsa	2,034	2,093
81089	Chernogorovo	The village of Chernogorovo	2,189	2,203
15028	Glavinitsa	The village of Glavinitsa	2,248	2,282
32010	Ivaylo	The village of Ivaylo	2,799	2,841
46749	Malo Konare	The village of Malo Konare	4,278	4,353
53335	Ognyanovo	The village of Ognyanovo	2,309	2,353
37491	Kovachevo	The village of Kovachevo	2,337	2,402
66264	Septemvri	The town of Septemvri	7,780	7,869
10104	Varvara	The village of Varvara	2,056	2,061
10820	Vetren	The town of Vetren	3,197	3,221

Source: NSI

The Regional Master Plan has the following objectives:

- Assess the current state of water and wastewater systems;
- Enable the preparation of feasibility studies for individual investment projects;
- Ensure compliance with the Environmental Acquis and all relevant EU directives, in particular the DWD and the UWWTD, within the committed deadlines;
- Ensure efficient use of water resources;
- Facilitate co-financing from EU grants (Cohesion Fund);
- Build capacity for project preparation at regional/local level;
- Define short (2014-2020), medium (15 years horizon) and long term (25 years) investment programmes;
- Serve as a basis for environmentally sound water projects.

In particular, regarding the water supply sector, the Regional Master Plan aims:

- To supply the population with drinking water of good quality, in sufficient quantity;
- To reduce water losses in water supply systems;
- To increase equipment energy efficiency;
- To increase the population connected to the water supply network;
- To decrease operation and maintenance costs;

Regarding the sewerage sector, the Regional Master Plan aims:

- To reduce the direct discharge of untreated wastewater through the construction of WWTP covering the requirements of Directive 91/271/EEC and Bulgarian legislation;
- To optimize the operation of WWTP through infiltration reduction in sewerage networks and other improvements;
- To increase the population served by sewerage networks;
- To increase the proportion of the population for which waste water undergoes complete purification.
- To provide efficient sludge management;
- To decrease operation and maintenance costs;

The project has the following scope of the services:

1) Data collection and review, including:
   - General, socio-economic and technical indicators for the last three years from official publications;
   - Establishment of a unit costs database from previous projects and available sources (e.g.: MoEW) to assess the costs of proposed investment projects;
2) Assessment of existing situation and needs of the water supply and sewerage system, with detailed evaluation for:
   - Water resources, including all surface and ground water resources for potable water supply, water catchment areas and the main characteristics of rivers and dams;
   - Water pollution, including all major polluters, volume of wastewaters discharged, pollution loads and evaluation of the impact on surface and ground water;
   - Condition of existing main water supply systems including water intakes, water treatment plants, transmission mains, raw and treated water reservoirs, pumping stations;
   - Condition of existing water distribution network including the networks of settlements with more than 2000 inhabitants and areas with disturbed water supply, based on existing data including age, pipe material and diameters, records of leak detection and repairs and existing studies;
   - Condition of existing sewerage network with focus on structural condition, hydraulic capacity and energy efficiency, based on existing data and studies for the drainage area and visual inspections of pumping stations, storm water overflows and other assets.
   - Condition of existing wastewater treatment in terms of capacity, structural condition, energy efficiency and compliance with the conditions set in the discharge consents, based on existing data and studies, and visual inspections, as well as, assessment of sludge handling and disposal.
   - Condition of industrial wastewaters describing present industries discharging effluents.
3) Priorities for water and sewerage system development to achieve compliance with the EU Directives and Environmental Acquis including:
   - Proposed Basic Design Criteria based on data analysis, Bulgarian regulations requirements and best European practices.

- Options for water supply and sewerage system development such as rehabilitation of existing facilities, system rationalization, construction of new facilities.

4) Socioeconomic forecast including macroeconomic prospective, demographic forecast, household income forecast and economic activities forecast with a planning horizon of 2035. Three scenarios will be developed: optimistic, pessimistic and balanced.
5) Macro-affordability assessment and financing capacity for different scopes of the investment programmes, under different amounts and investment phasing and other related costs within the planning period.
6) Short-term (2014-2020), medium-term (2021-2028), and long-term (2029-2038) investment programmes including priority measures, a timeframe for their implementation and indicative investment costs.
7) Environmental Assessment including environmental screening for proposed investment impacts and, if necessary, a full Environmental Impact Assessment report.
8) Public Consultation, assisting the client in organizing and carrying out consultations with the stakeholders, the public, interested institutions and other persons that might be affected by the Regional Master Plan during the different stages of preparation.
9) Review of all the settlement in the territory of the WSSC with general water supply and sewerage data for each of them.

1.1.3. PROJECT LEGAL BACKGROUND

The Managing Authority for the project is the Ministry of Regional Development and Public Works (MRDPW). It has contracted the Consortium consisting of the international consultancy companies Seureca (part of Veolia Environment), SCE, Hidroproekt - Sofia and Arcadia Engineering to prepare the Regional Master Plans for Central region of Bulgaria. The contract agreement was signed on 8th December 2011. The project commenced on 27th December 2011 and will be implemented over a period of 18 months. The project is funded through a loan from the World Bank No.7834-BG, Ref. MIDP-MP-QCBS2.

1.1.4. OTHER RELEVANT PROGRAMMES AND PROJECTS

Pazardzhik Municipality carries out a successful policy in the field of environment at the local level according to Municipal Programmes for Environmental Protection, approved in 2009. The strategic goal set out in the programme is “sustainable use of water resources through rehabilitation of the existing infrastructure and construction of new one in order to reduce water losses and to ensure reasonable water use and protection. For achieving this objective, the municipality applies under the following project funding schemes:

- Priority axis 1 of OP Environment 2007-2013: „Improvement and development of water and wastewater infrastructure” under Procedure Reference №: BG161PO005/08/1.10/02, for financing from the Cohesion Fund 2007-2013.

- Priority axis 1 of OP Environment 2007-2013: "Improvement and development of water and wastewater infrastructure in agglomerations with over 10,000 PE" under Procedure Reference №: BG161PO005/10/1.11/02/16, for financing from the Cohesion Fund 2007-2013.
- Priority axis 1 of OP Environment 2007-2013: „Preparation and implementation of projects for improvement and development of water and wastewater infrastructure in agglomerations with over 10,000 PE "under Procedure Reference №: BG161PO005/10/1.11/03/19, for financing from the Cohesion Fund 2007-2013.
- Rural areas development programme 2007-2013. Measure 321 – Basic services for the population and economy in the rural areas.

Pazardhik Municipality carried out the following project:

For more details about on-going projects in the territory of VIK EOOD – Pazardzhik, see section 3.8.

1) Project: „*Extension of WWTP for nutrient removal (nitrogen and phosphorus), rehabilitation and extension of WSS network of the town of Pazardzhik".* Pazardzik Municipality has received funding under Priority Axis 1 of Operational Programme Environment 2007-2013 (OPE), under procedure BG161PO005/10/1.11/03/19 „Preparation and implementation of projects for improvement and development of water and wastewater infrastructure in agglomerations with over 10,000 PE", with ***No DIR-51011119-C010,*** signed on 14.09.2011 to the amount of BGN 49,822,725.
   - Project main objectives:
     - To meet the requirements of Directive 91/271/EC concerning treatment of wastewater for settlements with a population over 10,000 PE;
     - To ensure environmentally sound collection, discharge and treatment of domestic wastewater
     - To increase the percentage of population using improved quality of WSS services in the project area;
     - To increase the scope of domestic wastewater treatment services on the territory of the town of Pazardzhik as a result of WWTP completion;
   - Expected results:
     - Completion, rehabilitation and reconstruction of sewerage network and associated water supply network;
     - Completion of full tertiary treatment, removal of nitrogen and phosphorus in WWTP.
2) Project*: „Technical assistance for preparation of integrated investment project in the water sector of the villages of Aleko Konstantinovo and Glavinitsa,*

Pazardzhik Municipality – no approved funding, under consideration by MoEW.

Septemvri Municipality carries out the following project:

3) Project: *„Water cycle improvement in the town of Septemvri“.* Septemvri Municipality has obtained funding under funding under Priority Axis 1 of Operational Programme Environment 2007-2013 (OPE), under procedure BG161PO005/10/1.11/02/16 „Improvement and development of water and wastewater infrastructure in agglomerations with over 10,000 PE", with ***No DIR-51011116-C055,*** signed on 20.11.2012.

- Project main objectives:
  - To meet the requirements of Directive 91/271/EC concerning treatment of wastewater for settlements with a population over 10,000 PE;
  - To ensure environmentally sound collection, discharge and treatment of domestic wastewater
  - To increase the percentage of population using improved quality of WSS services in the project area;
  - To increase the scope of domestic wastewater treatment services on the territory of the town of Pazardzhik as a result of WWTP completion;

    - Expected results:
  - Completion, rehabilitation and reconstruction of sewerage network and associated water supply network; 3,819m of sewerage network and 2,400m of water supply network;
  - Construction of wastewater pumping station in the Romany quarter;
  - Construction of Septemvri WWTP, intended to collect and treat wastewater of the town of Septemvri and the villages of Varvara and Vetren Dol.

1.1.5. REPORT STRUCTURE

The Regional Master Plan provides an overview of the existing situation, such as the socio-economic and institutional framework as well as the current service levels of existing water and wastewater facilities. Investigations, measurements and analysis were made for the identification of future water demand and wastewater flows and characteristics in order to define the realistic needs of the population in the water sector.

The Regional Master Plan structure is as follows:

0) Executive Summary
1) Introduction (presentation of the general scope of study, project framework , policy context, goals and general objectives, legal background, other relevant projects,

report structure, institutional and regulatory framework, stakeholders, legal aspects of funding opportunities etc.)
2) Data Collection and Review (description of project area, natural features, socio-economic features, water and wastewater services).
3) Assessment of the existing situation and needs for water supply and sewerage (water resources, water consumption, water sources pollution, existing water and wastewater infrastructure facilities and current performances in towns and rural areas, sufficiency of data and conclusions regarding current deficiencies and database definition for projection)
4) Priorities for water and wastewater infrastructure development to achieve compliance with EU Directives and Environmental Acquis (methodologies and assumptions, options for water supply and sewerage systems development), based on the analysis carried out in chapter 3 and the projections made in chapter 5.
5) Socio-economic forecasts and macro-affordability assessment (socio-economic projections, water demand forecasts, projected wastewater flow and assessment of the investment programmes (detailed in chapter 6) macro-affordability
6) Short, medium and long term Investment programmes to meet water and wastewater development targets (key performance indicators, list of priority investment measures, timeframe for their implementation and indicative investment costs), based on the methodology and option analysis made in chapter 4)
7) Environmental Assessment
8) Public consultations
9) Settlement review (general summary of the information on each settlement)

Annexes (general and specific annexes for the individual chapters) including maps and drawings.

1.2. INSTITUTIONAL AND REGULATORY FRAMEWORK

1.2.1. GENERAL ADMINISTRATIVE FRAMEWORK

The main responsibilities for water management and water supply and sewerage are shared among the following institutions:

The **Ministry of Regional Development and Public Works** is responsible for the overall policy related to the design, construction and operation of water supply and sewerage systems in the country. The Minister represents the state in water supply and sewerage companies with over 50% state share. The Ministry also coordinates water association activities and provides methodological guidance on the preparation of the water supply and sewerage Regional Master Plans.

The **Ministry of Environment and Water (MoEW)** is responsible for the management and the distribution of water resources at the national level. The Minister issues the permits for water-taking of mineral water – exclusive state property. The MoEW is also responsible for environmental protection and the implementation of the Operational Programme Environment, under which water and wastewater infrastructure is funded.

The **Council of Ministers** defines the state policy in the water supply and sewerage sector as part of the country's water policy and the National strategy for development and management of the water sector in Bulgaria. The Council of Ministers approves a Strategy for development and management of the water supply and sewerage sector in Bulgaria for a period of at least 10 years. The strategy defines the main objectives, priorities, stages and necessary resources and sources of funding for the construction and development of water supply and sewerage systems and for improvement of water supply and sewerage service quality. The policy in the water sector is implemented by: 1. The Minister of Regional Development and Public Works, 2. Municipal councils and mayors of municipalities.

The **Ministry of Health** is responsible for the control on the quality of water intended for drinking and household needs, the quality of mineral water intended for drinking or used for prophylactic, therapeutic and hygienic purposes, including bottled mineral water in the commercial network and the quality of water intended for bathing.

Basin Directorates undertake water management at the basin level. There are four basin directorates: (i) Danube Basin Directorate – Pleven, (ii) Black Sea Basin Directorate – Varna, (iii) West Aegean Basin Directorate – Blagoevgrad and (iv) East Aegean Basin Directorate – Plovdiv. Directorates develop River Basin Management Plans and Flood Risks Management Plans. They are also responsible for issuing permits for water use and abstraction, for controlling the compliance with the parameters set in these permits, for controlling the activities in river beds, and for water quantity and quality monitoring. Their management of water is based on basin principles.

Water Associations are non-profit legal entities. They manage water supply and sewerage systems within the boundaries of a designated territory in the cases where water supply and sewerage system ownership is divided either between the state and one or more municipalities or among several municipalities. If the WSSC system, which falls within the specified territory, is the property of a single municipality, the management is performed by the municipal council.

The governing bodies of a Water Association include a General Assembly, which consists of representatives of the state (District Governor), and the municipality(ies), with the district governor being the chairman. In the cases where the state and more than one municipality participate in the Water Association, the state is entitled to 35 per cent of the votes, and the other 65 per cent of the votes are allocated among all municipalities in proportion to their population. The funds necessary for the Water Associations operation are provided by the state and municipalities according to the proportion of their voices.

Regarding the Water Act, Water Associations are responsible for the preparation of the regional Master Plans and the investment programmes attached to the plans. Assignment and approval of these specific Master Plans is made by the MRDPW. The regional Master Plans are accepted and approved by the MRDPW only after they are endorsed by the respective Water Association or Municipal Council.

Water supply and sewerage companies (WSSC) (referred to as ViK, VKS, VKTV or INFRASTROI in the Central Region) are responsible for the operation, management and maintenance of water supply and sewerage facilities in the settlements as well as the provision of water supply and sewerage services to consumers. A WSSC is a commercial, state or municipal company – a legal entity, which has signed a contract with the chairman of the corresponding Water Association or with the mayor of the respective municipality. The term of the contract with a WSSC, signed in accordance with the Water Act, cannot be longer than 10 years, provided that it does not include an obligation for the WSSC to build new water and sewerage infrastructure; or 15 years, if it obliges the WSSC to undertake construction of new infrastructure. In all other cases, the procedure and selection of a water operator as well as the signature of the contract is carried out in accordance with the Concession Act.

Municipalities are direct beneficiaries of the OP "Environment". The **mayor** of a municipality develops and implements the policies related to planning, management, construction, reconstruction and modernization of water supply and sewerage networks and facilities that are municipal property.

Municipal councils control the municipal participation in water supply and sewerage companies (in those companies, in which the municipalities have shares). They also approve municipal development plans and mayor's statements regarding the business plans developed by WSSCs.

The **State Energy and Water Regulatory Commission (SEWRC)** is responsible for regulating the tariffs, affordability and quality of water supply and sewerage services under the Water Supply and Sewerage Services Regulation Act.

The **Environmental Executive Agency** under the Minister of Environment and Water guides the National environmental monitoring system.

1.2.2. REGULATORY FRAMEWORK

1.2.2.1. *Regulatory framework in Bulgaria*

The regulatory framework in Bulgaria includes the following acts, laws and policies (see Appendix 1-1 for more details):

- **The Water Act (WA):** The WA (SG 67/27.07.1999; last proposal for amendment April 2012) is the main legal act in Bulgaria that sets out the relations in the management of water as a nation-wide natural resource.
- **New Draft Water Law:** *Draft Law on amendment and supplements to the Water Act,* which has been prepared in April 2012.
- **Draft National strategy on management and development of the water sector**: It has been elaborated according to the requirements of art. 151 of the WA.
- **Environmental Protection Act (EPA):** The EPA (SG 91/25.09.2002) is the basic act concerning all environmental components – air, water, soils, ground, landscape, natural sites, biodiversity and their interrelation.

Other relevant policies and regulations are:

- **State policy for protection of the environment**
- **Water Supply and Sewerage Services Regulation Act (WSSSRA)**

1.2.2.2. *Regulatory framework in the European Community*

The main Directives of the European Union concerning the water and wastewater sector are listed below:

- The Water Framework Directive 2000/60/EC establishing a legal framework to protect and restore clean water across Europe and ensuring its long-term and sustainable use.
- Directive 91/271/EEC on the urban wastewater treatment.
- Directive 75/440/EEC concerning the surface water used or intended for abstraction of drinking water.
- Directive 2006/118/EC on the protection of groundwater against pollution and deterioration.
- Directive 2006/7/EC concerning the bathing water quality.
- Directive 1975/EC concerning the bathing waters quality
- Directive 98/83/ EC concerning the quality of water intended for human consumption.
- Directive 2006/44/EC on the quality of fresh waters needing protection or improvement in order to support fish life and Directive 2006/113/EC on the quality required of shellfish waters.
- Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources**.**
- Directive 80/68/EEC on the protection of groundwater against pollution caused by dangerous substances.
- Directive 2006/11/EC on the pollution caused by certain substances discharged into the aquatic environment of the Community and seven daughter Directives.
- Directive 85/337/EEC on the Environmental Impact Assessment.
- Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damages.
- Directive 90/313/EEC, repealed by Directive 2003/4/EC on the public access to environmental information.
- Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment.
- Directive 80/777/EC on the approximation of the laws of the Member States relating to the exploitation and marketing of natural mineral waters.
- Directive 2003/40/EC establishing the list, concentration limits and labeling requirements for the constituents of natural mineral waters and the conditions for using ozone-enriched air for the treatment of natutal mineral waters and spring waters.
- Directive 2008/56/EC establishing a framework for community action in the field of marine environmental policy.

- Directive 2007/60/EC on the assessment and management of flood risks.
- Directive 92/43/EEC on conservation of natural habitats and of wild flora and fauna.
- Directive 2009/90/EC on the determination according to Directive 2000/60 of technical specifications for chemical analysis and monitoring of water status.
- Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture.
- IPPC Directive 2008/1/EC ("Integrated Pollution Prevention and Control") aims to achieve a high level of protection of the environment through prevention and reduction of integrated pollution from a wide range of industrial and agricultural activities. It is the codified version of Directive 96/61/EC of 24 September 1996. The IPPC Directive will gradually be replaced by Directive 2010/75/EU on industrial emissions directive called IED. This new directive brings together in a single text seven separate directives on industrial emissions. IED Directive came into force January 6, 2011 and must be transposed by January 7, 2013.
- Directive 2008/98/EC of 19 November 2008 on waste and repealing certain Directives is the relevant Solid Waste Directive mentioned thereafter.

1.2.2.3. *International agreements and conventions*

The international agreements and conventions in the field of water management and those with water reference in the field of environment protection are:

- Convention on the Cooperation for Protection and Sustainable Use of Danube River, ratified in 1999 (SG, No 30 of 1999), enforced on 6.04.1999.
- Convention on the Protection of the Black Sea against Pollution, ratified in 1992 (SG, No 99 of 1992), enforced on 15.01.1994.
- Convention on the Protection and Use of Transboundary Watercourses and International Lakes, ratified in 2003 (SG, No 86 of 2003), enforced on 26.01.2004.
- Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention), ratified in 1974, enforced on 24.01.1976.
- Convention on environmental impact assessment in a transboundary context, ratified in 1995 (SG, No 28 of 1995), enforced on 10.09.1997.
- Agreement between the European Community and the Republic of Bulgaria concerning the participation of the Republic of Bulgaria in the European Environment Agency and the European Environment Information and Observation Network, ratified in 2000.

1.2.3. STAKEHOLDERS

The main stakeholders and their role in the project are summarized in the following table:

Table 1-2 Main stakeholders involved in preparation of the Regional Master Plans

Stakeholder	Role
Ministry of Regional Development and Public Works (MRDPW)	MRDPW drives the preparation of the Regional Water Supply and Sewerage Master Plans and approves them. It is also responsible for coordinating the management of water supply and sewerage systems at national level. The ministry functions as the principal in the 100% state-owned and the jointly owned WSSCs. It also coordinates the activities of water associations and provides methodological guidance on the preparation of the water supply and sewerage Regional Master Plans. Changes in the new Strategy: • MRDPW shall prepare and maintain a National Register of water infrastructure, including owners and operators of facilities; • MRDPW elaborates an Integrated Plan for Water Infrastructure • MRDPW manages facilities – state property in the water sector
Ministry of Environment and Water (MoEW):	The MoEW is responsible for environmental protection and the implementation of the Operational Programme "Environment", under which water and wastewater infrastructure, included in the investment programme projects, will be funded. MoEW is involved in the approval of the Regional Master Plans.
Ministry of Economy, Energy and Tourism (MEET)	Changes in the new Strategy: • Management of all dams, used for drinking water and hydro-energy purposes • Control of the technical condition of dams and micro dams by “Dams and cascades” enterprise
Ministry of Agriculture and Foods	Changes in the new Strategy: • Management of all dams in public state ownership not managed by the Ministry of Economy, Energy and Tourism, signing contract for maintenance and monitoring with the operator for irrigation systems
Ministry of Health	Responsible for monitoring drinking water quality. Gets information on problems related to water quality.
Ministry of Labour and Social Policy	Changes in the new Strategy: • Creation of a new programme “Water Assistance” which aims at helping the population with low revenues to pay the water service fees.
ViK EOOD-Pazardzhik	Provides water supply and sewerage services within the designated territories of the Municipalities of Pazardzhik, Septemvri and Lesichovo. Operates and maintains water supply systems and facilities. Supplies data concerning the project. Involved in the preparation of Business Plans, including tariffs. It is also the project beneficiary.
The Municipalities of Pazardzhik, Septemvri and Lesichovo	Formulate and implement the water sector policy at local level. Responsible for the investments in the WSS sector on the territory of the Municipality. They are direct beneficiary of OPE. They are involved in the preparation of Municipal Development Plans and in the approval of the project Master Plans.
Water Association	Non-profit legal entity, which plays the role of a union of the owners of water supply and sewerage systems. Management of water supply and

Stakeholder	Role
	sewerage systems within the designated territory. Responsible for the preparation of the regional Master Plans and the investment programmes related to the plans. Approval of Regional Master Plans. The Municipalities of Pazardzhik, Septemvri and Lesichovo are members of Pazardzhik Water Association.
State Energy and Water Regulatory Commission (SEWRC)	Responsible for the regulation of water tariffs, affordability and the quality of water supply and sewerage services under the Water Supply and Sewerage Services Regulation Act. It also approves the Business Plans of the WSSCs. Changes in the new Strategy: • Prices regulation not only in the water sector but also in the "Hydro-energy" and "Hydro-melioration" sectors. Defining the price level, taking into account the necessity for implementation of priority investments by the owners of the facilities.
Basin Directorate for East Aegean Sea Region – Plovdiv	Responsible for the management of surface water, groundwater and other water resources, which are state property. Provides database with maps, GIS data, water quality and quantity. Conducts water monitoring. Grants permits for discharge and water intakes.
Regional Inspectorate of Environment and Water (RIEW) – Pazardzhik	Responsible for Environmental Impact Assessments. Advices on Environmental Impact Assessments. Approval of EIA screening report.
European Commission	Approval of the Regional Master Plans. Financing of projects included in the investment programmes through EU funds.
World Bank	Financing projects and Regional Master Plans.
Pazardzhik Regional Health Inspectorate	Pazardzhik RHI is an administrative structure of the Ministry of Health, which is responsible for the organisation and implementation of the state health policy on the territory of Pazardzhik District. RHI develops and participates in the implementation of regional programmes and projects in the field of health control; collects and summarizes information about the quality of drinking water in the region.

1.2.4. REGULATION OF WATER SUPPLY AND SEWERAGE SERVICES PROVISION

The service performance of water companies is managed at national level, basin level, regional, and municipal level. The regulation at each level is performed by the authorities as described in the table below:

Table 1-3 Regulation of Water Supply and Sewerage Services Provision

Level of Regulation	Authorities involved	Role of Regulating Authorities
National level	The Ministry of Regional Development and Public Works	Implements the state policy pertinent to operation, construction, rehabilitation and modernization of water systems and facilities
Basin level	Basin Directorates	Develop river basin development plans, and programmes for measures related to improvement,

Level of Regulation	Authorities involved	Role of Regulating Authorities
		protection and maintenance of the state of waters
Regional level	Regional Environmental and Water Inspectorates Regional governors	Environmental and water protection
Municipal level	Mayor	Implements the policies pertinent to activities involving operation, construction, rehabilitation and modernization of water systems and facilities – municipal property
	Municipal councils	Implement the rights of the sole-owner in the RWSSCs, solely owned by the municipalities or the rights of the shareholder in the RWSSCs, jointly owned by the state and the municipalities.

The service provision regulation is performed at two levels – external and internal. The external regulation is performed by the State Energy and Water Regulatory Commission (SEWRC). The regulation principles are set in the Ordinance on the long-term levels, the conditions and the order for the annual target levels of the indicators of water supply and sewerage services quality. The internal regulation is performed by the company shareholders through the general principles set in the Commercial Act, the Regulations on the Order for Execution of the Rights of the State in the Commercial Companies with State Share in the Capital, the company's Articles of Association and the contract for management assignment.

The **Water Supply and Sewerage Services Regulation Act** establishes the legal framework for the regulation of prices, accessibility and quality of water supply and sewerage services provided by the water companies.

The prices and quality of water supply and sewerage services are regulated by the **State Energy and Water Regulatory Commission**, regardless of the forms of ownership and management of water supply and sewerage systems. The Commission is guided by the following principles:

1) Ensuring conditions for provision of universal access and social affordability of water supply and sewerage services;
2) Prevention of abuse of dominant position;
3) Protection of consumer interests;
4) Economic justification of water supply and sewerage services prices;
5) Taking into consideration the needs of consumers placed at a disadvantage for geographic, ground or other reasons;
6) Creation of conditions for water and sewerage operators to operate and maintain the system and to make investments upon reduction of operating costs;
7) Encouragement of expedient and effective planning of investments in time;
8) Speed and procedural economy of proceedings before the Commission;
9) Encouragement of reduction of water losses, efficient and economic use by consumers of the water quantities delivered;
10) Environmental protection;

11) Creation of conditions for attraction of resources for investment and participation of the private sector in the provision of water-supply and sewerage services;
12) Encouragement of introduction of modern technical methods and achievements in the provision of water-supply and sewerage services.

SEWRC measures and assesses the quality of water supply and sewerage services by means of the following quality indicators:

1) Coverage rate of water supply services;
2) Drinking water quality;
3) Non-interruption of water supply (uninterrupted water delivery and duration of disruptions);
4) Total water losses in the water-supply systems and time limits for the reduction thereof;
5) Water supply system breakdowns;
6) Water supply system pressure;
7) Sewerage service coverage rate;
8) Raw wastewater and treated wastewater quality;
9) Sewerage system breakdowns;
10) Flooding of third party corporeal immovable caused by the sewerage system;
11) Operational indicators of efficiency;
12) Financial indicators of efficiency;
13) Time limit for reaction to written complaints by consumers;
14) Time limit for connecting new consumers with the water supply and sewerage systems;
15) Staff size in proportion to the number of consumers serviced.

The Commission regulates prices by setting an upper limit for prices or for revenues and a rate of return. Price regulation methods, pricing rules reflecting the structure of costs, the procedure for price proposal submission and for the endorsement thereof, as well as the procedure for disclosure of information, are determined by an ordinance adopted by the Council of Ministers on a motion by the Commission. WSSCs submit the prices formed according to this ordinance to the Commission for endorsement. The prices proposed by the WSSCs may not be higher than the prices endorsed by the Commission. The tariff is proposed for each planning period. The application must be submitted not later than four months before expiration of the old price period or the coming into force of the proposed approval or change of the approved price.

1.2.5. LEGAL ASPECTS OF FUNDING OPPORTUNITIES

After amendments were made to the Water Act in 2009, it was decided that the ownership of the former state and municipal water companies would be removed from their assets and become public state and public municipal property to be managed by water associations. The purpose of the change was to enourage the utilization of funds under Operational Program "Environment" and to use EU funds for renovation of the water infrastructure. The upgrade and construction of water and wastewater treatment infrastructure is set as Priority 1 of OP "Environment". 71.3 % of the total financial package or nearly EUR 1.3 billion has been allocated to this priority for the period 2007-2013. 80 % of this amount, i.e. EUR 1.03 billion is provided by the Cohesion Fund of the EU and the remaining amount – by the national budget. Funding for the water sector is also provided under the National Plan for Rural Development (EUR 600 million), the Regional Development Operational Programme (EUR 150 million), the pre-accession programme ISPA (unallocated funding for 2007-2010 to the amount of EUR 300 million), the World Bank (over EUR 100 million). The projected investments from the private sector are expected to amount to EUR 2 billion.

When one or more municipalities apply for European Union funds for reconstruction and modernization of water supply and sewerage facilities - public state property, they make a request to the Minister of Regional Development and Public Works for a change of the facility ownership, indicating the programme, the name of the procedure by which proposals will be submitted and the deadline for their submission, if such is defined. The Minister of Regional Development and Public Works, within one-month period from the submission of the request, submits a draft decision to the Council of Ministers for a change of the facility ownership from public state to public municipal. By decision of the Council of Ministers the ownership of the facility is granted to the municipalities, provided that it is reconstructed or modernized in whole or in part with funds received under programmes financed by European Union funds.

The municipal budget is the main financial plan of a municipality for a fiscal year and its framework must be robust and adaptable, allowing the municipality to accumulate substantial resources in support of its municipal priorities and initiatives. Since 2003, municipal budgets are drawn up and implemented under the conditions of fiscal decentralization. The division of expenditure responsibilities between the state and municipalities increased the responsibilities of the municipalities for determining their own revenue, which is the main source of funding of municipal activities. Municipal budgets are developed in accordance with Art. 11 of the Municipal Budgets Act, the State Budget Act of the Republic of Bulgaria, Decision № 937/08.12.2009 of the Council of Ministers, and the local regulations in force, adopted by decisions of the Municipal Council.

The strategic development plan of a municipality is the main document determining the strategic objectives and priorities of the municipal policy, developed in accordance with the requirements of the Law on Regional Development and the National Strategy for Regional Development of the Republic of Bulgaria for the period 2005-2015. The plan is the starting point for directing the efforts of the municipal management and all interested parties in the municipality to reach the objectives of that development and turn the strategic planning into a main instrument for the development of the municipality.

1.2.6. CONCLUSIONS AND RECOMMENDATIONS

As a member of the European Union, Bulgaria has harmonised its environmental and water legislation with the one of the EU. The European legislation in the field of water management is transposed to the Bulgarian legislation by means of the Water Act and the regulations for its implementation.

The effective policy in the water supply and sewerage sector is the most important commitment of Bulgaria joining the EU. The main investment and management tool of the Government in this area is the OP "Environment", by means of which the sector can be financially supported by EU funds. Municipalities were defined as the sole beneficiary of this funding.

For the purposes of effective management, planning and construction of water supply and sewage systems and the provision of water supply and sewerage services, the territory of the country has been divided into 51 designated territories. Their limits and coverage are essential for the formation of the water associations, which provide integrated management of water systems consisting of two main groups of ownership of the water assets - public state and public municipal property.

The planning of the development of the water supply and sewerage systems is done by means of Regional Master Plans and Long-term investment programs. These plans and programs consider all the settlements in the studied area and, in accordance with the Terms of Reference, more in depth analysis are given for settlements with population over 2,000 inhabitants for the water supply part and agglomerations with over 2,000 equivalent inhabitants for the wastewater part. The Regional Master Plans are prepared for a period of 25 years. The scope of work for the plans and programmes includes performing a comprehensive analysis of the conditions of the water supply and sewerage systems and facilities, setting objectives and priorities for the development of water supply and sewerage systems and the development of short and long-term investment programmes. One of the main requirements for the plans is that they contribute towards meeting the requirements of the European Directives for the use and treatment of water, and to ensure the effectiveness of public investment in the water infrastructure.

Numerous stakeholders are involved at the national, regional and local levels. Ministries play a significant role at the national level: The Ministry of Environment and Water is responsible for the management and distribution of water resources, while at national level the Ministry of Regional Development and Public Works is in charge of the overall policy related to the design, construction and operation of water supply and sewerage systems. At the regional level, the management is carried out by the waters supply and sewerage association, which includes the state and one or more municipalities – in the case where the ownership of the water systems within a specified area is divided between the state and municipalities, or among several municipalities. If the specified area includes several water systems owned only one municipality, the management of water systems is carried out by the Municipal Council. The District Development Councils and the Basin Directorates participate in the coordination of the regional master plans.The Water Supply and Sewerage Companies are commercial, state or municipal companies that operate and maintain water supply and sewerage facilities. They are contracted by municipalities or by Water Associations. According to the Water Act, Art 198c, the water supply and sewerage associations are also responsible for the preparation and approval of the short-term and long-term investment programs of the Regional Master Plans for water supply and sewerage. The regulation of water tariffs, affordability and quality of water supply and sewerage services is undertaken by the State Energy and Water Regulatory Commission.

The regulatory framework is based on a few texts. The main legal act is the Water Act (1999) which sets out the relations in the management of water as a nation-wide resource and regulates the state policy for the operation, construction, reconstruction and modernization of water supply and sewerage infrastructure. The scope of the Water Act spans interdisciplinary fields: It regulates for example water body statuses, issuance of permits for water uses and water intakes, land easements, water protection, financial and economic organization in water management, administrative and citizen responsibilities etc. It is supported by 14 ordinances that specify terms and conditions or requirements for specific activities related to water. This Water Act is to be amended and supplemented in the future as a Draft Law has already been prepared in April 2012. Those new components of the Water Act come mainly from the transposition of European Union Directives. Along with the Water Act, two laws complement this regulatory framework: The Environment Protection Law (2002) for questions related to environmental components (including air, water, soils, ground, landscape, and biodiversity) and the Regulation of Water Supply and Sewerage Services Act for prices, accessibility and water supply and sewerage services quality.

2. DATA COLLECTION AND REVIEW

2.1. PROJECT AREA

2.1.1. REGIONAL MASTER PLAN STUDY AREA

The designated territory of Vodosnabdyavane i Kanalizatsiya EOOD Pazardzhik encompasses the following municipalities: Pazardzhik, Septemvri and Lesichovo, located in Pazardzhik District, South Central Planning region. The territory occupies an area of 1,207 km².

Figure 2-1 Map of the location of the study area

The designated territory borders the following municipalities: Strelcha, Panagyurishte, Belovo, Velingrad, Rakitovo, Peshtera and Bratsigovo, located within Pazardhik District; and Saedinenie, Stamboliyski, Maritsa and Rodopi, located in Plovdiv District, as well as Ihtiman Municipality.

Table 2-1 Designated territory of ViK EOOD Pazardhik by municipalities

№	Municipality	Mayoralty	Settlements	Area km²	Inhabitants	
					Municipality	Municipal centre
1	Pazardzhik	31	32	636.8	114,817	71,979
2	Septemvri	12	15	361.3	25,794	7,869
3	Lesichovo	6	7	208.9	5,408	828
	Total	49	54*	1,207	146,019	80,676

Note* The settlements served by ViK Pazardzhik are 54. The village of Dolno Varshilo with a population of 5 inhabitants in Septemvri Municipality, is not operated by ViK Pazardzhik, while the village of Akandzhievo in Belovo Municipality is served by ViK Pazardzhik. More detailed clarification is given in Chapter 3 and depicted in Layout № № 1,2 and 3.

The territorial and percentage proportion of the area of the Municipalities of Pazardzhik, Septemvri and Lesichovo to the area of Pazardzhik District and the Republic of Bulgaria is detailed in **Appendix 2-1.**

2.1.2. ADMINISTRATIVE DIVISION

The Regional Master Plan study area for the Regional Master plan of the designated territory of Vodosnabdyvane i Kanalizatsiya EOOD Pazardzhik (ViK Pazardzhik) encompasses Pazardzhik Municipality (with municipal centre the town of Pazardzhik), Septemvri Municipality (with municipal; centre the town of Septemvri)and Lesichovo Municipality (with municipal centre the town of Lesichovo).

Pazardzhik District covers an area of 636.8 km² and includes 32 settlements in 31 mayoralties with a total population of 120,894 inhabitants (01.02.2011), the town of Pazardzhik – municipal centre (74,850 inhabitants). Septemvri Municipality occupies an area of 361.3 km² with 15 settlements in 12 mayoralties and the town of Septemvri as a municipal centre. Lesichovo Municipality has an area of 208.9 km², encompassing 7 settlements in 6 mayoralties with municipal centre Lesichovo.

Figure 2-2 Location of Pazardzhik Municipality, Septemvri Municipality and Lesichovo Municipality in Pazardzhik District

2.1.3. RIVER BASINS

The main water arteries in the designated territory are Maritsa River and its larger tributaries – the rivers Topolnitsa, Luda Yana and Chepinska, which in turn take up the water of numerous small tributaries. The catchment areas of several smaller and shallower rivers, tributaries of the river Maritsa, Topolnitsa and Chepinska, are also entirely or partially located within the boundaries of the designated territory. All of them fall within the catchment area of Maritsa River from the East Aegean Region Basin Directorate for water management.

The catchment areas of the rivers of Maritsa, Topolnitsa, Luda Yana, Chepinska and their tributaries are located on the southern slopes of Sredna Gora Mountain, the Thracian valley, the northern slopes of Rila-Rhodope massif and the Sub-Balkan fields. Their characteristics are determined by the climate features mainly of the transitional-continental climate subzone to which they belong.

Maritsa River is the largest and high water river in Bulgaria. It originates from Rila Mountain, from the two Marichini lakes under Mancho Peak (2,378 m). Its catchment area to the border between Bulgaria and Greece is 21,992 km^3, which is 62.2% of the area of the East Aegean Region. The length of the river within the territory of Bulgaria is 321 km.

Maritsa River has around 100 more significant tributaries, which are located symmetrically about the main river, i.e. the number of the left and the right tributaries is almost equal. The largest among them are Topolnitsa River, Luda Yana River and Chepinska River, whose lower reaches are located within the designated territory of Pazardzhik.

Topolnitsa River is a left tributary of Maritsa River. It springs from Sredna Gora Mountain – north from Bogdan Peak, in the foothill of Bich Peak (1,496 m). Its length is 129 km, and its total catchment area is 1,889 km^2. The river has about 12 tributaries, the larger ones being Medetka River, Pirdopska River, Selska Reka River, Smolska River, Bunovska River, Mati Vir River etc., located outside the designated territory of Pazardzhik. After passing the village of Lesichovo the river enters the Upper Thracian Valley. It flows into Maritsa River at about 2 km west from the town of Pazardzhik.

Luda Yana River springs south from Bich Peak (1,146 m) in Sredna Gora Mountain and is a left tributary of Maritsa River. Its length is 74 km, and its total catchment area is 685.3 km^2. It is formed from the confluence of its tributaries – Strelchenska Luda Yana, Panagyurska Luda Yana and Banska Luda Yana. It enters the designated territory of Pazardzhik near the villages of Sbor and Tsar Asen. Then it takes up the water from its the right tributaries Domuzdere and Kishladere, heads toward south and flows into Maritsa River near the village of Sinitevo.

The upper course of Potoka River is located in the designated territory of Pazardzhik. The river is a left tributary of Maritsa River. It is formed through the confluence of numerous small tributaries and gullies, which spring on the southern slopes of Sredna Gora Mountain (one of the higher peaks are Pogledets Peak – 486.8 m, Bakadzhik Peak – 486.1 m, etc.) and form a dense river network within the region. Among the larger tributaries of the river within the designated territory are Tarnevo Dere (right tributary) and Kabayuk (left tributary). The river flows in southeast direction, passes through the village of Topoli Dol and then exits the designated territory. It runs through the town of Saedinenie and flows into Maritsa River near the village of Orizare. Its total length is 55.7 km and its catchment area is 422.9 km^2.

Other larger left tributaries of Maritsa River whose catchment areas are located in the designated territory of Pazardzhik (within the boundaries of Septemvri Municipality) are the following rivers: Sidovsko Dere (Sidovets), Golemoto Dere, Bataliysko Dere, Kashla Dere etc.

Chepinska River is a right tributary of Maritsa. It originates from the area south of Malka Syutka Peak (2,078 m), from several gullies located in the southwest parts of the Rila-Rhodope massif. The river has 8 larger tributaries, the largest being Matnitsa River, where Batak Dam is constructed. Other larger tributaries whose catchment areas are located outside the designated territory are the following rivers: Sofan (left tributary), Grancharitsa (left), Ablanitsa (left), Hremshtitsa (right tributary), Lukovitsa (left) etc. The river enters the designated territory after the confluence of Leshtaritsa River. In the Upper Thracian Valley, it is divided into numerous branches. After it passes the village of Varvara, Sol Dol River and Sveti Petka River, along with other small tributaries flow into Chepinska River. Its total length is 82.7 km, while its total catchment area is 899.6 km².

Other right tributaries of Maritsa River within the designated territory Pazardzhik are the following rivers: Selska Reka, Byala etc. Selska Reka River originates from the northern slopes of the Western Rhodope Mountains and collects the water of several tributaries, the major of which are Selashka Reka, Deyanovo Dere, Ermenska Reka etc. It is discharged in Maritsa River near the village of Mokrishte, in the area opposite to the mouth of Topolnitsa River. Among the larger tributaries of Byala River are Demeshki Dol (left tributary), Gergevsko Dere (right tributary), Turska Glava, Pishmeka etc.

There are numerous small dams constructed within the designated territory and used for irrigation and fish stocking.

2.2. NATURAL FEATURES

2.2.1. GEOGRAPHICAL FEATURES

The designated territory of ViK Pazardzhik OOD is located in Pazardzhik District, situated in the central part of South Bulgaria included in the Western part of the South Central Region. The designated territory encompasses the area of the three municipalities in Pazardzhik Disrtict – Pazardzhik, Septemvri and Lesichovo. It is located in the western part of the Upper Thracian Valley. The region is rich in water resources. Fertile fields are situated along the both banks of Maritsa River and its tributaries (Topolnitsa and Luda Yana). The beautiful scenery, along with the presence of numerous rivers, dams and mineral springs, contribute to the development of the mountain, rural and eco-tourism in the region. Pazardzhik District is abundant in cultural and historical sites. The remains of the Thracian settlement Besapara, the fortress Tsepina, medieval settlements etc. have been restored.

2.2.2. CLIMATE CHARACTERISTICS

The climate in the territory served by ViK Pazardzhik EOOD is transitional between moderate continental and continental Mediterranean. In addition to the latitude and the proximity of the Mediterranean Sea, the terrain and the river basin of Maritsa River are also of great significance for the climate features of the region. The climate characteristic is prepared based on the data obtained from the Pazardzhik hydro meteorological station (205 m). Meteorological factors such as precipitation, temperature, relative humidity of the air etc. exert a powerful impact on the formation of the flow of the surface water. The amount of precipitation is one of the preconditions for ensuring the water supply for the population in the designated territory with natural groundwater and surface water.

2.2.3. ENVIRONMENTAL AND ECOLOGICAL FEATURES

2.2.3.1. *Ecological characteristics*

The air, water, and soil pollution of a certain area is mainly caused by the development of economics, agriculture, forestry, animal husbandry, energy source utilization; by the waste treatment activities status and the condition of the water supply and sewerage networks and their adjacent facilities, as well as by the lack of highly efficient treatment facilities for industrial and household wastewater of the population, etc. The industrial production is concentrated mainly in the municipal centres – the town of Pazardzhik, the town of Septemvri and Lesichovo, however some enterprises perform their activity outside these areas.

2.2.3.2. *Ambient air*

The ambient air in Lesichovo Municipality and the settlements in the designated territory excluding towns with industrial enterprises (Pazardzhik and Septemvri) are characterized by relatively high air purity except for the winter periods when fog occurs caused by domestic heating.

Potential air pollutants in Pazardzhik Municipality are the large industrial enterprises, however if strict control and effective management are exerted, the harmful emissions can be reduced in order to meet the necessary requirements of the current legislation (Durapak Trakia Papir, Kauchuk AD Pazardzhik, Varnitsi Ognyanovo etc.). Most of the enterprises are concentrated in the Industrial zone of the town of Pazardzhik. 28 industrial enterprises are included in the gas transmission network. The most significant among them are accumulator factory Elhim Iskra EOOD, Kauchuk AD, Bulgartabak –Holding AD, Vinprom AD, Lakrima AD, Mebel Luks. Pazardzhik Municipality is included in the list of regions in which the levels of one or several pollutants exceed the established standards – non-toxic dust and SO_2. In Pazardzhik Municipality there is one fixed ambient air monitoring station for manual sampling, which is included in the National Environmental Monitoring System (NEMS) and located in the Vasil Levski square in the town of Pazardzhik. The town of Pazardzhik has geographical and climatic conditions favorable for the formation of temperature inversions during the spring and winter months, which contributes to the retention of pollutants in the surface layer of the air. This fact determines the poor quality of the ambient air. Sources of air pollutants are also the functioning unregulated landfills, the Regional waste landfill (RWL) and WWTP, however the pollution caused by them is local. The air is also partially and locally polluted by the vehicles passing through the settlements, as well as the combustion of wood, coal, oil etc. (mostly during the winter season from the domestic heating of private and public facilities). The air pollution around construction sites during execution of certain construction works is increased. The good operation of the air treatment facilities in the pollution emitting enterprises and the increase in the rate of gasification of the facilities in the settlements within the designated territory contribute to the protection of the air in the area.

2.2.3.3. *Water*

The water resources in the designated territory are formed by surface and groundwater sources. The main water artery is Maritsa River with its tributaries (Chepinska River, Topolnitsa River and Luda Yana River).

- Surface water

Analysis results of the conducted monitoring indicate that for the period between 2011 and 2012, all surface water bodies are of good chemical status. Regarding the ecological status of the water bodies, the main parameters, for which exceedances are observed are phosphates, total phosphorus, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, total nitrogen, BOD. Only the town of Pazardzhik has an operating UWWTP within the designated territory, however not all of the wastewater generated by the industrial enterprises and the population of the town is included in the treatment plant. It is envisaged that the urban WWTP may treat the wastewater from several settlements - the village of Ivaylovo (partially constructed sewerage), the village of Aleko Konstantinovo, the village of Glavinitsa, the village of Ognyanovo and the village of Hadzhievo, for which investment projects under OPE have been prepared, as well as the possibility for future transfer of the domestic wastewater from the villages of Saraya, Dragor, Mokrishte, Sinitevo, Dobrovnitsa and Miryantsi to the treatment plant.

The untreated domestic and industrial wastewater from the settlements with partially constructed or missing sewerage, exert a negative impact on the aquatic ecosystem.

Many industrial enterprises have inefficient local treatment facilities or none at all. The wastewater with increased content of organic substances, biogenic elements (nitrogen and phosphorus compounds), detergents etc. is directly discharged. The oxygen content and the self-cleaning capacity of the water bodies are reduced. Conditions for health risk for the population in the area are created.

- Groundwater

Groundwater is vulnerable to pollution in areas with intensive agriculture and urbanization, which exist within the boundaries of the designated territory. The large-scale cutting down of forests within the water supply areas or immediately around the water sources has its contribution to the observed negative trends.

* More detailed data on the condition of the water and its pollution from the population and industrial sources are presented in Chapter 3, section 3.1 and 3.2.

2.2.3.4. *Land and soils*

Soil and agricultural lands are the main natural resource for the development of agricultural activity (development of agriculture, animal husbandry and food industry enterprises, which use the produced raw materials). Agricultural areas within the designated territory amount to 65%, a major part of them being arable (the agricultural lands in Pazardzhik Municipality are over 70% of the total territory, in Septemvri Municipality – over 57%, while in Lesichovo Municipality – over 60%). This is a perquisite for the development of agriculture, animal husbandry and food industry, with priority for the development of viticulture, production of wine and vegetables. The introduction into agriculture of good agricultural practice, controlled fertilization, prevention of unauthorized accumulation of manure masses from livestock farms, municipal solid waste, etc. guarantee the protection of soils and water in the area. Potential soil pollution sources within the designated territory are transport, plant protection activity (PPA), landfills, industry and damages from past contaminations. The data from the soil pollution monitoring in Pazardzhik Municipality is presented in an appendix.

There are plenty of small livestock farms and unregulated storage of manure and its subsequent use within the designated territory, which is a perquisite for diffuse pollution of the surface and groundwater. Livestock farms need to comply with the rules of good agricultural practice for the protection of water and soils from pollution caused by nitrates from agricultural sources. During the recent years, the trend for reducing land and soil pollution is becoming stronger. The sparing use of pesticides and fertilizers in agriculture, the ecological agriculture and animal husbandry programmes, the introduced control for limitation of the emission pollution in terms of air, water and waste management, the technological innovation in the production processes are among the activities which reduce the degradation of land and soils. Currently no risk of pollution of water sources for drinking water supply, animal drinking pools, water bodies and sensitive ecosystems has been identified. There is a possible risk of soil pollution from illegal landfills within the territory served by ViK Pazardzhik EOOD.

2.2.3.5. *Waste management*

The municipalities of Septemvri and Lesichovo, located within the designated territory Pazardzhik, have developed Waste management programmes coordinated with the competent authorities. The existing waste landfills for the settlements in the municipalities are to be closed down and recultivated. The municipal solid waste landfills of the settlements will be closed down. There is an upcoming implementation of the 'Regional waste management in Pazardzhik region' from the following municipalities: Pazardzhik, Peshtera, Belovo, Lesichovo, Bratsigovo, Septemvri, Rakitovo, Batak and Velingrad, which consists of regional landfill, waste separation installation, composting facilities, regional recycling centre, facilities for construction waste and transfer station (Velingrad/Rakitovo), including pre-treatment facilities and composting site. The site of the Regional non-hazardous waste landfill (RNWL) is envisaged to occupy a total area of 349 decares, from which 123 decares are located within the existing landfill in the lands of the village of Aleko Konstantinovo (it is envisaged that its recultivation will be included in the total area of the RNWL).

Industrial waste – Part of the generated industrial waste is transmitted for treatment by companies, located on the territory of ViK. For example, the company Duropak-Trakia Papir AD uses as a raw material a major part of the paper waste generated within the enterprise and the region. Waste from ferrous and non-ferrous metal shavings and cuttings are used by Metalkomers OOD. Waste from processing and washing of ores and minerals, waste from calcination and hydration of lime are used by Ognyanovo-K AD etc. The rest of the waste is disposed of in the existing landfill.

2.2.3.6. Hazardous waste

Among the hazardous waste generated by the enterprises are waste oil, lead accumulator batteries, waste from physical and chemical concentration of metal ores and minerals containing hazardous substances ("Yonteh OOD) etc. Medical facilities within the territory of Pazardzhik Municipality transfer their hospital waste for disposal at the incinerator of Aleksanrovska Hospital, Sofia. At the landfill of the village of Aleko Konstantinovo, the plant protection products past expiration date that are unfit for use are stored in ‘B-B cube’ container for hazardous waste.

Waste management programmes have been prepared for the sludge from the UWWTP Pazardzhik and WWTP of the settlements included in the investment programmes, which need to be periodically updated and the possibilities for sludge utilization will be further specified.

Regarding the structure of the landscape in the designated territory, it can be generalized that due to many years of anthropogenization of the area and the adjustments to the landscape, some of the environment components are altered, limited or destroyed. The natural landscape is replaced by new categories of landscape such as settlement infrastructures, communication routes and anthropogenic accumulations.

2.2.3.7. Noise pollution

The transport noise takes up a part of the acoustic mode of the town of Pazardzhik, the town of Septemvri and the settlements located near road sections with heavy traffic. The noise load is increases during construction works.

2.2.3.8. Radiation control

According to the data provided by RIEW – Pazardzhik, within the municipalities included in the designated territory there are no manufacturing or other types of activities, which are sources of radiation pollution. No radiation contamination has been reported. There are no values exceeding the regulatory requirements.

2.2.3.9. Population and human health

The discharge of untreated wastewater in the water bodies creates perquisites for health risk for the population of the region. The implementation of the projects envisaged in the investment programme will prevent situations that pose a health risk for the natural and work environment.

Regarding the structure of the landscape in the designated territory, it can be generalized that due to many years of anthropogenization of the area and the adjustments to the landscape, some of the environment components are altered, limited or destroyed. The natural landscape are replaced by new categories of landscape such as settlement infrastructures, communication routes and anthropogenic accumulations

2.2.3.10. *Biodiversity, protected territories and areas*

The region of the designated territory of Vodosnabdyavane i Kanalizatsiya EOOD Pazardzhik is characterized by relatively rich biodiversity, which is confirmed by the high density of protected territories and areas. The protected natural territories within the territorial scope of the designated territory within the boundaries of the lands of Pazardzhik Municipality, Septemvri Municipality and Lesichovo Municipality, Pazardzhik District, are the Protected territories and Protected zones on the territory controlled by RIEW Pazardzhik.

Protected territories (PT) are: *Protected areas (PA)* – *PA* Bilyov Rat (area of 99.6 ha, located within the lands of Lesichovo Municipality and Septemvri Municipality); *PA* Vodinicharska Koriya (area of 2.2 ha, Pazardzhik Municipality), *PA* Dabravata (area of 12.0 ha, within the lands of Lesichovo Municipality), *PA* Ezeroto (area of 5.8 ha, within the lands of Septemvri Municipality), *PA* Zlatni Dol (area of 8.3 ha, within the lands of Septemvri Municipality), *PA* Yordanovi Polyani (area of 71.9 ha, within the lands of Lesichovo Municipality), *PA* Konsko Dere (area of 8.0 ha), *PA* Koritata (area of 10.9 ha) and *PA* Marina (area of 1.5 ha, within the lands of Septemvri Municipality), *PA* Milevi Skali (area of 115.1 ha, within the lands of Septemvri Municipality and velingrad Municipality), *PA* Novakovets and Benkovska Polyana (area of 35.33 ha, within the lands of Lesichovo Municipality), *PA* Ognyanovo – Sinitevski Rid (area of 146.24 ha, within the lands of Pazardzhik Municipality) and *PA* Sveti Georgi (area of 5.7 ha, within the lands of Septemvri Municipality). A

Protected zones (PZ):

PZ under the Birds Directive – *for the conservation of wild birds:* BG0002057 PZ Besaparski Ridove, part of the lands of Pazardzhik Municipality falls within its boundaries, PZ Ribarnitsi Zvanichevo BG0002069 part of the lands of Pazardzhik Municipality and Septemvri Municipality falls within its boundaries, PZ Maritsa-Plovdiv BG0002087, within its boundaries fall parts of the lands of Pazardzhik Municipality.

PZ under the Directive on the conservation of natural habitats and wild flora and fauna: *PZ Besaparski Vazvisheniya BG0000254*, within its boundaries fall parts of the lands of Pazardzhik Municipality. *PZ BG0000578 Maritsa River*, within its boundaries fall parts of the lands of Pazardzhik Municipality and Septemvri Municipality. *PZ Golak BG0000304,* within its boundaries fall parts of the lands of Septemvri Municipality. *PZ Ovchi Halmove BG0000365,* within its boundaries fall parts of the lands of Pazardzhik Municipality. *PZ Luda Yana River BG0000426*, within its boundaries fall parts of the lands of Pazardzhik Municipality. *PZ Popintsi BG0001039*, within its boundaries fall parts of the lands of Lesichovo Municipality. *PZ Yadenitsa BG0001386,* within its boundaries fall parts of the lands of Septemvri Municipality.

The proposed measures for implementation of modern infrastructure investment projects in the short, middle and long term within the designated territory are not expected to exert negative impact on the object and purposes of the Protected zones under Natura 2000, the protected territories and sites.

Regarding the partially concerned PZ for the protection of biological species, an important factor is the maintenance of water in good condition, which determines the significant positive impact on the object and purposes of the conservation of the areas.

According to Order № RD – 970 от 28.07.2003 of the Minister of Environment and Water, the water body of Chepinska River and its tributaries after the town of Velingrad until it flows into Maritsa River is classified as 'sensitive area' and pursuant to the Report for Implementation of Directive 97/271/EEC, a special management regime is required within the designated territory in order to prevent and/or reduce the entry of biogenic elements into the water bodies, followed by deterioration in the ecological status of the surface water bodies. An implementation of facilities in the UWWTP for increased degree of reduction of nitrogen and phosphorus compounds in the wastewater of Pazardzhik Agglomeration is imminent. Regarding the UWWTP in the town of Septemvri, reduction of the biogenic elements is also envisaged.

2.2.3.11. *Conclusion*

The implementation of the project will solve numerous ecological problems in the region, which currently are a perquisite for the creation of conditions for health risk for the population in the area:

- Ensuring high quality of life and natural environment. Prevention of situations that may create conditions for health risks for the population in the designated territory and risk to the aquatic ecosystem will be guaranteed;
- Providing sufficient quantity of good quality water for the population. Reducing water losses in the water supply network.
- Reducing the discharge of untreated industrial and domestic wastewater of the municipalities in the designated territory. The missing sewerage of some areas in the settlements within the municipalities will be constructed.

2.2.4. GEOLOGICAL AND HYDROGEOLOGICAL CONDITIONS

2.2.4.1. *Geological-lithological Structure and engineering geological conditions*

In terms of its structure, the territory served by Vodosnabdyavane i Kanalizatsiya EOOD-Pazardzhik from north to south falls within the following zones: Sredna Gora zone, Panagyurishte volcanogenic strip, Ihtiman block, Upper Thracian depression, Maritsa fault zone, and the northern part of the Rila-Rhodope massif. The lithologo-stratigraphic structure of these tectonic structures is very diverse and includes numerous rock complexes of Precambrian to Quaternary age.

The Sredna Gora zone is characterized as a volcanogenic structural zone built of Upper Cretaceous volcanogenic rocks. Gabbrodiorite granites and gabbro-monzonite-syenite intrusive massifs breaking apart the volcanogenic deposits are embedded in the deep faults.

Panagyrishte volcanogenic strip includes Upper Cretaceous tuffs and tuffites with layers of marl, argilites and clayey limestones, layered bodies and lava flows of andesites, Quaternary alluvial clays, sands and gravels of the river bed and the floodplains of Topolnitsa River, Luda Yana River and their tributaries as well as delluvial formations of large and small rock masses with sandy-clayey impurities.

Ihtiman block is built of Precambrian metamorphites – gneisses, granite gneisses, gneiss schists, amphibolites with small-scale sporadic coating of Quaternary deluvial formations.

Rila-Rhodope massif is a complex tectonic structure built of severely dislocated Precambrian metamorphites, in which intrusive bodies such as the Rila-Western Rhodopes batholith are embedded. On this background, there are several structural depressions filled with Palaeogene and Palaeogene-Neogene sediments and volcanogenic rocks, as well as with Quaternary formations.

Maritsa fault zone is built of Precambrian, Palaeozoic and Upper Cretaceous rocks, Neogene sediments and Quaternary formations. It is characterised by fault disorders of strike-slip nature, located on the border between Sredna Gora zone and Rila-Rhodope Massif.

The Upper Thracian depression is filled with Palaeogene braccia-conglomerates, sandstones and limestones, Neogene clays, conglomerates, sands, gravels, and Quaternary alluvial, proluvial and deluvial clayey-sandy formations.

The engineering-geological conditions in the territory serviced by ViK EOOD-Pazardzhik are determined by the following natural assets – topography, geological structure, lithological composition and physico-mechanical properties of the rocks, conditions of occurrence, groundwater in rock massifs, physical and geological processes and phenomena.

The weathering, erosion-accumulation and karst processes and phenomena have a significant development within the considered territory.

The current geomorphological appearance of the region, the Quaternary alluvial and deluvial formations etc. are a result of the weathering and erosion-accumulation processes and phenomena.

Karst processes and phenomena are manifested mainly in the carbonate sediments of the Dobrostan formation in the Precambrian. Various surface and underground karst forms such as funnels, whirlpools, hollows, channels, passages and caves were formed as a result of these processes.

Pursuant to Ordinance No RD-02-20-2/27.01.2012 for the design of buildings and facilities in seismic areas the building and facilities in Pazardzhik Municipality, Septemvri Municipality and Lesichovo Municipality, are secured for IX-th degree with seismic coefficient of Cs= 0.27.

Regarding the conditions for execution of the building works (excavations, embankments, foundations of facilities, etc.) the lithological varieties constituting the geological environment are classified as *earth soils* the digging of which is carried out by means of an excavator and as *rocky soils* the digging of which is carried out by means of explosives and/or heavyweight excavators.

The approximate size of the excavation works of earth and rocky soils is estimated as follows:

- Sredna Gora zone, Panagyrishte volcanogenic strip, Ihtiman block and Rila-Rhodope massif – for sewerage networks – earth soils about 20%, rocky soils – about 80% and for water supply networks – earth soils about 30%, rocky soils – 70%.
- Upper Thracian depression and Ihtiman graben - for sewerage networks – earth soils about 80%, rocky soils – about 20% and for water supply networks – earth soils about 70%, rocky soils – 30%.

2.2.4.2. Hydrogeological conditions

The hydrogeological conditions on the service area of Vodosnabdyavane i Kanalizatsiya EOOD Pazardzhik are characterized by karst, fissure and pore groundwater.

Karst groundwater is found mainly in the marble bodies of the Dobrostan formation and partially in other Precambrian formations, as well as in Palaeogene-Neogene carbonate sediments. The recharge of the karst waters is carried out by precipitations and surface water from the river-ravine network. The following groundwater bodies or parts of them belong to the designated territory: ‘Karst groundwater – Central Rhodope massif’ with code BG3G00000Pt041 and ‘Karst groundwater – Malko Belovo’ with code BG3G00000Pt037. The drainage of the karst groundwater is carried out mainly through springs with variable flow rates and water abstraction facilities. Karst water is mainly hydrocabonated-calcium with mineralization within the range between 200÷500 mg/l. According to the River Basin Management Plan for East Aegean Sea Region, the groundwater bodies BG3G00000Pt041 and BG3G00000Pt037 are of ‘good’ chemical condition.

Fissure groundwater is formed in the Precambrian, Paleozoic and Palaeogene-Neogene rocks. The groundwater is free flowing, with a shallow circulation in the hypergenic fissured, and weathered zone. The recharge of fissure water is mainly by precipitation. It is drained in the hydrographic network through springs of variable flow rates. The fissure water on the territory of Pazardzhik Municipality, Lesichovo Municipality and Septemvri Municipality is located within the following groundwater bodies: ‘Fissure groundwater – Western Rhodope complex’ with code BG3G0000Pt047, ‘Fissure groundwater – Western and Central Balkan massif’ with code BG3G0000Pt044 and ‘Fissure groundwater Peshtera-Dospat’ with code BG3G0000PgN020. In terms of its chemical content, the water is hydrocarbonated-chloride-calcium-sodium with mineralization up to 400 mg/l in the Palaeogene volcanogenic sedimentary rocks, hydrocarbonated-calcium-magnesium with mineralization 100÷600 mg/l in the Precambrian metamorphites. According to the River Basin Management Plan for East Aegean Sea Region, the groundwater bodies BG3G0000Pt044 and BG3G0000PgN020 are of 'good' chemical condition, while groundwater body with code BG3G0000Pt047 is of 'bad' chemical condition.

Pore groundwater is accumulated in the gravelly-sandy Neogene sediments and the Quaternary alluvial and deluvial formations. The following groundwater bodies are formed within them: 'Pore groundwater in the Quaternary – Upper Thracian Valley; with code BG3G000000Q013 and 'Pore groundwater in the Neogene-Quaternary – Pazardzhik-Plovdiv region' with code BG3G00000NQ018. The pore groundwater is recharged by precipitation and fissure and karst water. It is drained in the river-ravine network through water abstraction facilities. Pore groundwater is mainly hydrocarbonated-sulphate-calcium to hydrocarbonated-calcium with mineralization between 400÷900 mg/l. The chemical condition of groundwater bodies BG3G000000Q013 and BG3G00000NQ018 is 'bad'.

Except for the abovementioned water bodies, within the territory of Septemvri Municipality is located the mineral water deposit 'Varvara'-Septemvri Municipalit', which is exclusive property of the state.

2.2.5. HYDROLOGICAL CONDITIONS

The hydrological conditions in the region of the designated territory of Pazardzhik are good. Surface water within the territory is formed by a relatively dense river network, suggesting seamless capture and transfer of surface flow. The network consists of numerous rivers, springs and gullies, encompassing almost the entire designated territory. The river flow is formed mainly by precipitation, which falls on the catchment area of the rivers.

The variations in the water abundance of Maritsa River and its major tributaries in their catchment areas within the designated territory of Pazardzhik depend on the combination and distribution of precipitation, the snow cover in the higher parts of their currents, the air temperature and other characteristics of the climatic subzones to which they belong. The flow modules, which give an average idea of the intensity of the flow formation in the catchment areas, vary within a broad range. There is a pronounced dependence of the variability of the average annual flow on the altitude and the influence of the climate. The current of the river is characterized by significant anthropogenic activity, which greatly changes the characteristics of the natural water resources and redistributes them in time and space.

Within the designated territory, Maritsa River and its tributaries fall within several climate zones, the main one being the transitional continental zone with predominating autumn-winter precipitation maximum. As a result, the flow regime of Maritsa River is very variable and intermittent, usually dependent on its tributaries and mainly on Topolnitsa River and Chepinska River.

Maritsa River, before and after the town of Pazardzhik, forms a summer minimum of low water in September (3-4%). The beginning of the high water period is from March to February, and its end is in June, with decrease to about 10%. The high water maximum is from April and is about 14.5-15%.

The percentage distribution of the tributaries depends on the physico-geographic conditions. The left tributaries, which come from Sredna Gora Mountain, have high water maximum in March – April and minimum in August-September. The right tributaries have a high water maximum in April – May, while the minimum is in September.

Topolnitsa River has a highly disrupted natural flow in its lower reaches due to the constructed dams – Topolnitsa Dam and Dushantsi Dam. The rest of the dams within the river valley of Topolnitsa, a total of 30 small and larger dams, are located on its tributaries above the main current of the river and outside the designated territory of Pazardzhik.

The natural flow of Luda Yana River is also disrupted due to the 26 micro-dams constructed along its course, with a total storage capacity of 4.86 million m³ and intended for irrigation.

Along the course of Chepinska River is located one of the largest dams within the catchment area of Maritsa River – Batak Dam, which has been a compensating basin for the entire Batak hydropower system for many years. Batak Dam is constructed on Matnitsa River, a right tributary of Cheinska River whose basin is situated outside the designated territory of Pazardzhik.

The internal annual flow distribution within the river network of the designated territory is determined mainly by the climate features of the transitional continental climate zone.

The surface flow of the rivers within the designated territory of Pazardzhik is used for the water economy subsectors of energy, irrigation and industrial water supply. There are no water catchment facilities constructed along the river network for the drinking and household water supply of the population, which is carried out by the operator ViK EOOD Pazardzhik (100% municipal property). The water catchment areas in the terraces of Maritsa River and its tributaries are used for this purpose. As an additional source of water are used the regulated surface waters (the town of Pazardzhik) of the Cascade "Belmeken - Sestrimo - Chaira."

2.3. SOCIO-ECONOMIC FEATURES

2.3.1. DEMOGRAPHIC DEVELOPMENT

The territory served by ViK EOOD, town of Pazardzhik (RWC Pazardzhik), includes the municipalities Pazardzhik, Lesichovo and Septemvri.

As of 2011 the population in the service territory amounts to 146,019 persons – approximately 2% of the total national population. For the 10-year period between the last two Censuses (2001-2011), the service territory has lost 18,404 people – a decline of 11.2%, which is similar to the average decrease of 11.3% for Pazardzhik Disctirct and is above the average national decrease of 7.2%. According to statistical data, the decline is due not only to the negative natural growth and ageing of the population, which is similar to national tendencies, but also to increased levels of out-migration.

Table 2-2 Population in the service territory

Population	2001*	2011**	Change
Pazardzhik Municipality	127,918	114,817	-10.2%
Septemvri Municipality	29,872	25,794	-13.7%
Lesichovo Municipality	6,633	5,408	-18.5%
Serviced area	164,423	146,019	-11,2%
Pazardzhik District	310,741	275,548	-11.3%
Bulgaria	7,932,984	7,364,570	-7.2%

** Census 2001 as of 01.03.2001, Source: http://www.nsi.bg/Census/PopObsht.htm*

*** Census 2011 as of 01.02.2011, Source: http://censusresults.nsi.bg/Census*

The share of urban population in the service territory has kept stable over the period 2001-2011 at around 56% of the population. This share is below the national average of 72% and below the average for Pazardzhik District (62%). As a share of the total district, the population of the service territory has remained steadily around 53% during the last years. Natural growth has been negative, reaching -4.2‰ in 2010. Net migration has also been negative during the last years.

*Table 2-3 Population dynamics in the service territory**

	2004	2005	2006	2007	2008	2009	2010	2011
Service Territory								
Population - total	159,415	158,161	157,351	156,173	155,429	154,479	153,171	145,199
- urban population %	55.8%	55.9%	56.1%	56.1%	56.3%	56.5%	56.6%	56.8%
- rural population %	44.2%	44.1%	43.9%	43.9%	43.7%	43.5%	43.4%	43.2%
Births	1,522	1,512	1,531	1,496	1,581	1,650	1,577	1,434
Deaths	2,131	2,131	2,131	2,131	2,131	2,131	2,131	2,131
Natural growth	-609	-661	-592	-649	-567	-389	-446	-610
Migration	-636	-593	-218	-529	-177	-561	-862	-328
Pazardzhik Municipality								
Population - total	124,564	123,769	123,324	122,421	122,064	121,366	120,422	114,091
- urban population %	61.5%	61.5%	61.7%	61.7%	62.0%	62.1%	62.2%	62.6%
- rural population %	38.5%	38.5%	38.3%	38.3%	38.0%	37.9%	37.8%	37.4%
Births	1,189	1,162	1,195	1,143	1,244	1,268	1,237	1,125
Deaths	1,501	1,551	1,528	1,587	1,564	1,522	1,474	1,502
Natural growth	-312	-389	-333	-444	-320	-254	-237	-377
Migration	-289	-406	-112	-459	-37	-444	-707	-470
Septemvri Municipality								
Population -	28,516	28,175	27,886	27,671	27,459	27,304	27,061	25,711

	2004	2005	2006	2007	2008	2009	2010	2011
total								
- urban population %	43.3%	43.3%	43.4%	43.4%	43.5%	43.6%	43.5%	43.0%
- rural population %	56.7%	56.7%	56.6%	56.6%	56.5%	56.4%	56.5%	57.0%
Births	277	292	287	295	295	323	291	257
Deaths	476	443	450	424	413	396	407	419
Natural growth	-199	-151	-163	-129	-118	-73	-116	-162
Migration	-282	-190	-126	-86	-94	-82	-127	92
Lesichovo Municipality								
Population - total	6,335	6,217	6,141	6,081	5,906	5,809	5,688	5,397
- urban population %	100%	100%	100%	100%	100%	100%	100%	100%
- rural population %	56	58	49	58	42	59	49	52
Births	154	179	145	134	171	121	142	123
Deaths	-98	-121	-96	-76	-129	-62	-93	-71
Natural growth	-65	3	20	16	-46	-35	-28	50

*All data is as of 31.12 of the respective year in order to have comparable figures and be able to trace the dynamics over the period 2004-2011

Source: http://www.nsi.bg/ORPDOCS/Pop_6.1.1_Pop_DR.xls

Population age distribution is similar to the national and district average. The population is characterized with a continuous process of ageing with 17.2% of the population being over 65 years old and only 14.5% of the population in the service territory being below 15 years of age. The age dependency ratio (ratio of younger and older dependents - people younger than 15 and people older than 65 - to the working age population – those aged 15 - 64) is 46.4% - similar to the national and district average. Old age dependency ratio (ratio of older dependents - people older than 65 - to the working age population – those aged 15 – 64) is 25.2%, which is again similar to the national and district average. The coefficient of demographic replacement (people aged 15-19 years, entering active working age versus the people aged 60-64 years, leaving active working age) is 0.8, i.e. each 100 persons leaving the working age group in 2011 are replaced by only 80 persons entering the same group.

Table 2-4 Age structure of the population

Census (2011)	0-14	15-64	65 or more	Age dependency ratio	Old-age dependency ratio	Coefficient of demographic replacement
Pazardzhik Municipality	14.4%	69.0%	16.5%	44.9%	24.0%	0.7
Septemvri Municipality	14.8%	67.3%	17.9%	48.7%	26.7%	0.9
Lesichovo Municipality	14.0%	58.4%	27.6%	71.1%	47.2%	0.7
Service Territory	14.5%	68.3%	17.2%	46.4%	25.2%	0.8

Census (2011)	0-14	15-64	65 or more	Age dependency ratio	Old-age dependency ratio	Coefficient of demographic replacement
Pazardzhik District	14.4%	68.0%	17.6%	47.0%	25.9%	0.8
Bulgaria	13.2%	68.3%	18.5%	46.5%	27.1%	0.7

Source: http://www.nsi.bg/ORPDOCS/Census2011_1.pop_by_age.xls

The similarity of regional and national ratios and coefficients also defines the resemblance in future demographic development – it is very likely that the territory served by the RWC will continue to decrease its population in short- and medium term, although the decline might not be as rapid as current historical trends. The falling number of women in fertile age will continue to influence negatively birth levels, while the process of population ageing (decreasing relative share of the kids below 15 years and increasing share of the population over 65 years) will keep mortality at a constant degree. Outmigration will be mostly influenced by the likely economic development of the region, outlined in Section 5.

2.3.2. ECONOMIC INDICATORS

The Gross Domestic Product (GDP) of Bulgaria has reached values of BGN 75,265 million in current prices in 2011, which is BGN 4,754 million higher than the value in 2010. However, in constant 2005 prices, the 2011 GDP amounts to BGN 52,833 million, representing a real growth of only 1.67%. These results outline the slow economic recovery of the country following the first negative growth of GDP for the last 15 years in 2009. Despite some positive signals, Bulgaria is still struggling to achieve the average economic growth of over 6% from the pre-crisis period, which is unlikely to happen in near future. The industrial sector is practically the only one with substantial growth for 2011, with increase of 9.1% in Gross Value Added (GVA). The total real increase in GVA for 2011 stood at a low 1.81%. The following figure outlines the trend in GDP development for the last 11 years.

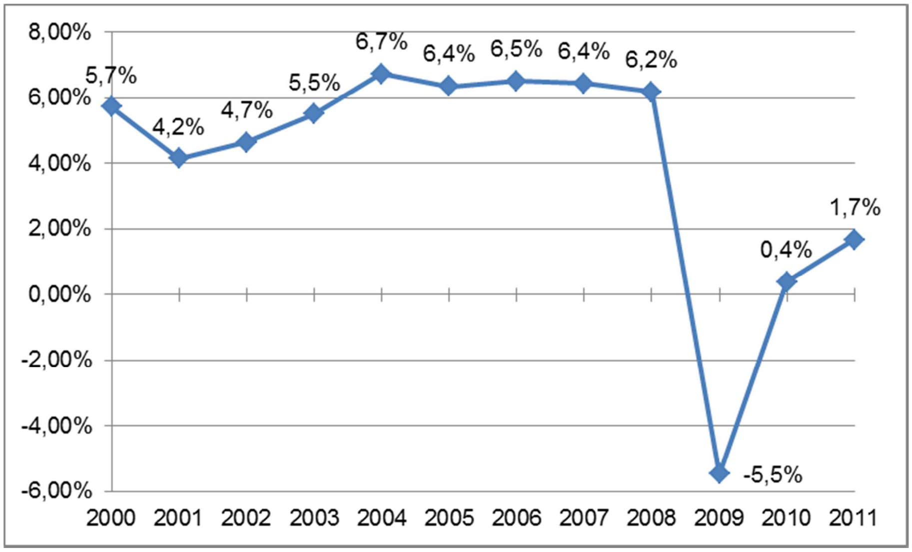


Figure 2-3 GDP growth rate (2005 constant prices)

Source: http://www.nsi.bg/ORPDOCS/GDP_1.1.1.xls

Exports of goods and services increased by 8.5 % in real terms during 2011, while imports fell by 12.0 %. On a chain basis gross fixed capital formation (investments)[6] increased in real terms by 0.9 %, but due to the considerable fall in inventories gross capital formation contracted by 3.7 % and had a negative contribution to GDP growth.

Regional GDP data is not available for recent years and for municipal or district levels because of the limitations of statistical data, collected for NUTS[7] 2 regions only. The service territory of Regional Water Company (RWC) Pazardzhik falls within the boundaries of South Central Region, which produces approximately 15% of the national GDP and has lower economic growth as compared to national tendencies. These differences are significant and growing with time (indicated by the gap between the trend lines on the following figure) and it can be assumed that while regional economic growth will follow national trends, it will increase at a lower rate.

[6]Gross fixed capital formation includes the acquired fixed assets owned by residential producers and households less disposal ones during the reporting period. Capital assets may be tangible and intangible assets, produced in the production process (or imported), which are used many times for more than one year.

[7]NUTS classification is the Nomenclature of territorial units for statistics.

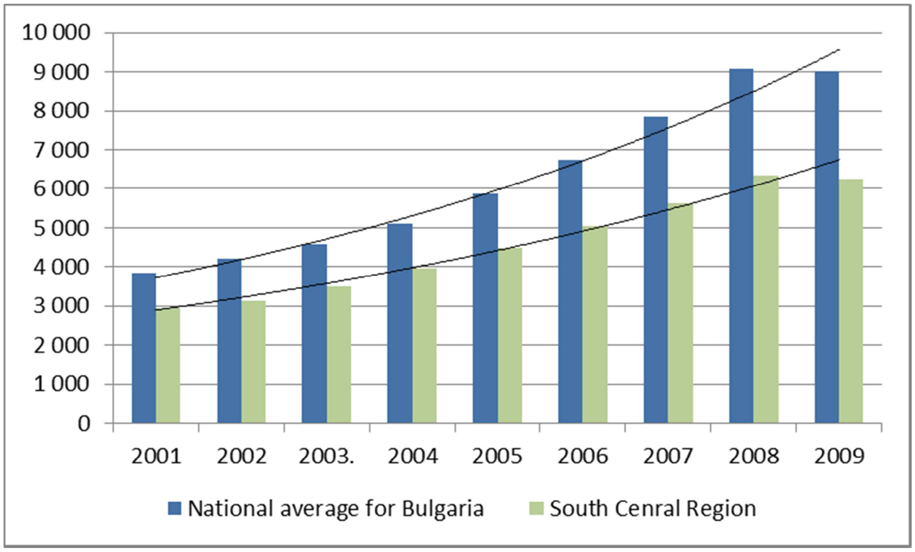


Figure 2-4 Comparison of regional and national per capita economic growth, BGN

Source: http://www.nsi.bg/ORPDOCS/GDP_1.1.4.xls

The annual inflation for 2011, measured by means of the consumer price index with respect to the average prices for the previous year, was 4.2% and the highest for the last 3 years, but also well below the average inflation in medium term. The increase is largely due to rapid growth of fuel prices because of the unstable international environment. The average inflation for the first half of 2012 is well below 2% and the expected all-year inflation is about 3.5-3%. This tendency is expected to be stable for the coming years and Bulgaria will be one of the countries in the EU with lowest increase in consumer prices.

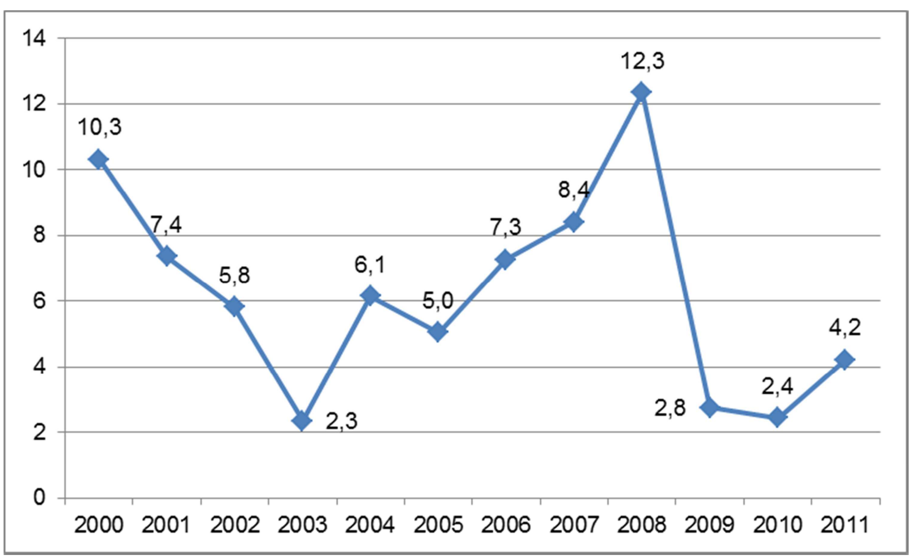


Figure 2-5 Figure: Inflation in Bulgaria, measured by Consumer price index (%)

Source: http://www.nsi.bg/otrasal.php?otr=14

Since the end of 1999 the exchange rate in Bulgaria is fixed at BGN 1.95583 per one euro. Data on real effective exchange rate (REER) for the total Bulgarian economy (based on nominal unit labour costs) and on REER for manufacturing (based on nominal unit wage costs in manufacturing) show that REER in Bulgaria appreciated compared to 1999 but not to the extent observed in other Member States, including those with floating exchange rate.

Real effective exchange rates in the new EU Member States over the last ten years have been on an upward trend. Empirical evidence shows that this is mainly due to fundamentals and to the successful nominal and real convergence attained through higher growth in labour productivity compared with the EU average (weighted by the volumes of trade realised by trading partners). The increase in REER needs to be viewed as an equilibrium development driven by fundamental factors rather than a loss of competitiveness.

In the medium term, REER in the new EU Member States is expected to continue appreciating as a result of and depending on maintaining a positive differential in labour productivity growth and real convergence speed relative to advanced EU countries. (Bulgarian National Bank, www.bnb.bg).

2.3.3. HOUSEHOLD CHARACTERISTICS

The number of households on a national level has increased despite the negative trend in population development in the last years. The 2001 Census has counted 2,921,887 households, while the 2011 Census indicates that there are 3,005,589 separate households in the country. This situation points out a rapid decline in the “people per household” indicator which falls to 2.4 people in 2011 from 2.7 people in 2001.

Table 2-5 Number of households and persons per household in Pazardzhik Dictrict

	2001			2011		
	households	persons in the households	average number of persons per household	households	persons in the households	average number of persons per household
Total for the country	2,921,887	7,848,395	2.7	3,005,589	7,296,459	2.4
Pazardzhik District	107,458	307,559	2.9	102,481	272,062	2.7

Source: http://www.nsi.bg/census2011/pagebg2.php?p2=175&sp2=192&SSPP2=194

The observed trends are similar on a regional level. The number of persons per household in Pazardzhik District, where the territory served by ViK Pazardzhik is located, decreased from 2.9 in 2001 to 2.7 in 2011. Still, the number is slightly higher than the national average. The larger number of people per household in the region is primarily due to the fact that there are a substantial number of households with 4 and more than 5 people, as indicated in the following table.

Table 2-6 Household characteristics, 2011 Census

Households	Total	1-person	2-persons	3-persons	4-persons	5-persons and more
Bulgaria	3,005,589	925,385 30.8%	853,735 28.4%	606,613 20.2%	401,517 13.4%	218,339 7.3%
Pazardzhik District	102,481	26,547 *25.9%*	28,254 *27.6%*	20,937 *20.4%*	15,782 *15.4%*	10,961 *10.7%*
- Urban	*64,492*	*16,571* *25.7%*	*17,938* *27.8%*	*14,185* *22.0%*	*9,817* *15.2%*	*5,981* *9.3%*
- Rural	*37,989*	*9,976* *26.3%*	*10,316* *27.2%*	*6,752* *17.8%*	*5,965* *15.7%*	*4,980* *13.1%*

Source: http://www.nsi.bg/census2011/pagebg2.php?p2=175&sp2=192&SSPP2=196

Household income on a national level has increased steadily in nominal terms for the last 10 years. 2010 is the first year with officially registered decrease of 1.2%. However, despite the observed nominal increase, real incomes have grown with much lower rates. Real household income for 2010 has declined with 3.6% compared to 2009, taking into account the influence of inflation. The 2010 income is also lower compared to the two previous years – 2007 and 2008.

Table 2-7 National household income by source (BGN)

	2001	2003	2005	2007	2009	2011
Total	**4,532**	**5,887**	**6,577**	**8,429**	**9,550**	**9,629**
Total income	4,307	5,584	6,158	7,818	9,122	9,251
Wages and salaries	*1,711*	*2,234*	*2,685*	*3,732*	*4,762*	*4,793*
Other earnings	*218*	*214*	*252*	*364*	*387*	*127*
Entrepreneurship	*179*	*234*	*277*	*428*	*434*	*590*
Property income	*30*	*32*	*46*	*76*	*59*	*61*
Unemployment benefits	*50*	*30*	*24*	*24*	*50*	*65*
Pensions	*1,022*	*1,152*	*1,366*	*1,724*	*2,519*	*2,789*
Family allowances	*29*	*32*	*47*	*42*	*84*	*78*
Other social benefits	*56*	*70*	*119*	*191*	*164*	*158*
Household plot	*644*	*1017*	*827*	*624*	*283*	*162*
Property sale	*19*	*37*	*36*	*126*	*12*	*10*
Miscellaneous	*349*	*532*	*479*	*487*	*368*	*419*
Interest income	128	140	221	321	276	277
Loans and credits	88	151	190	275	142	93
Loans repaid	9	12	8	15	11	8

Source: http://www.nsi.bg/ORPDOCS/HH_1.1.3_en.xls

Wages, salaries and pensions are the main income sources for Bulgarian households, but their relative shares have changed significantly over the years. The ageing of the population has dramatically increased the share of pension in the total household income, while salaries also continue their relative growth. Incomes from own agricultural production constantly lose their significance.

Salaries and wages account for 51.8% of the total household income in 2011, increasing from 39.7% in 2001. Pensions add up an additional 30.1% in 2011 compared to 21.4% in 2001. Household agricultural production income loses a lot of its potential and its share in the total income is reduced to 1.7% in 2011 from 15.0% in 2001.

The average nominal increase of salaries and pensions and social benefits is similar over the last 10 years – 11.1% for salaries and 10.8% for pensions and social benefits, so it is expected that all households will increase their income in a similar manner over the years. However, because of these similarities in development over time, the gap between richer and poorer households (unemployed, pensioners) will continue to open.

It is considered that household’s disposable income will grow as equal to real GDP growth. As a result, the current data collected, split by income deciles are projected using a growth rate equal to the GDP growth. Despite the fact that the income of the lower three deciles is likely to evolve at a lower pace than the average income, which is indexed fully to GDP growth, no such observations are justified by existing statistical data. To that extent, historical income averages during the last 5 years are used to determine the percentage of growth rate that can be attached to the average income and the income of the last three deciles. These values are further used in the affordability analysis.

Regional household income in Pazardzhik District has a similar structure to the national one, but the share of wages and salaries is lower than the national average. While the age structure of the population in the service territory is identical to the national averages, these differences can be explained by two major factors – lower level of salaries and higher unemployment rates.

Table 2-8 Comparison on household income structure on national and regional level

2010	Share of the income from wages and salaries	Share of the income from pensions
Bulgaria	51.1%	31.4%
Pazardzhik District	45.5%	31.7%

Source: http://www.nsi.bg/otrasalen.php?otr=44&a1=2241&a2=2242#cont

The above facts explain the differences between the household income in the service territory and the national average. In 2009 GDP per capita in Pazardzhik district was BGN 5,390 or only 60% of the national average value (Source: Local Statistical Bureau - Pazardzhik).

On the basis of the income distribution statistics we can group the households according to the indicator “total income per capita” into ten decile groups, with each group containing approximately equal number of persons. The average income for all decile groups is BGN 8,455, while the average income for the first three (or poorest) decile groups is BGN 4,472. These estimates are used to determine the affordability level in Section 5 as the poorest population in the first three decile groups needs special attention when setting the water tariffs.

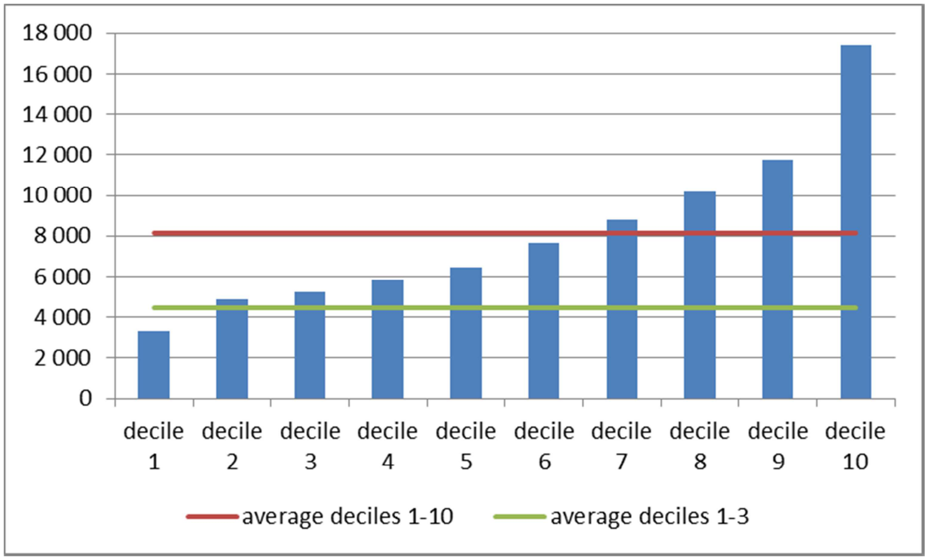


Figure 2-6 Figure: Income distribution across income deciles, 2010

Source: http://www.nsi.bg/publications/HBS2010.pdf

Household expenditure follows the tendency and dynamic changes of the income during the last 10 years. Consumer expenditure within the total household expenditure has not changed considerably within the observed period and is about 86%. The share of expenditures on housing, water, electritown and fuels has increased from 12.1% in 2001 to 14.1% in 2011. However, the increase of this expenditure is not bigger than the other cost categories.

Table 2-9 National household expenditures by cost categories (average per household, BGN)

Expenditure groups	2001	2003	2005	2007	2009	2011
Total	**4043**	**4861**	**5736**	**7776**	**9060**	**8981**
Total expenditure	3850	4585	5346	7195	8236	8547
Consumer total expenditure	3315	3970	4612	6121	7057	7177
Foods and non-alcoholic beverages	1727	1854	2063	2696	3004	3095
Alcoholic beverages and tobacco	142	186	226	333	387	380
Clothing and footwear	137	161	183	252	254	255
Housing, water, electritown, gas and fuels	465	644	748	899	1194	1206
Furnishing and maintenance of the house	110	150	177	272	303	236
Health	150	199	253	338	438	479
Transport	204	245	301	481	493	501
Communication	128	214	272	335	371	397
Recreation, culture and education	124	162	193	259	318	295
Miscellaneous goods and services	128	155	196	256	295	333
Taxes	120	142	151	210	266	446
Household plot	119	119	111	140	109	74
Other expenditure	296	354	472	724	805	849
Saving deposits	108	125	168	269	413	112
Purchase of currency and securities	1	5	0	1	1	0
Debt paid out and loan granted	84	146	222	311	410	322

Source: www.nsi.bg/ORPDOCS/HH_2.1.3.xls

The poverty line in Pazardzhik district is BGN 6,668 for 2009 or 90% of the national average (Source: http://www.nsi.bg/otrasal.php?otr=72&a1=2687&a2=2692&#cont). Keeping in mind the income sources and expenditure structure (large share of expenditures for food and similar products), these values can be explained by the presence of a share of self-subsistence agricultural production in the settlements.

2.3.4. Unemployment rate

National unemployment rate was 11.2% in 2011, which is the highest level for the last 5 years. Regional unemployment rate in Pazardzhik district was 17.2% in 2011, which is higher than the rate for the South Central Region (12.7%) and the national average (http://www.nsi.bg/otrasal.php?otr=26&a1=735&a2=741&a3=744#cont). These results are directly related to the existing problems with out-migration of economically active people as a driver for population decline.

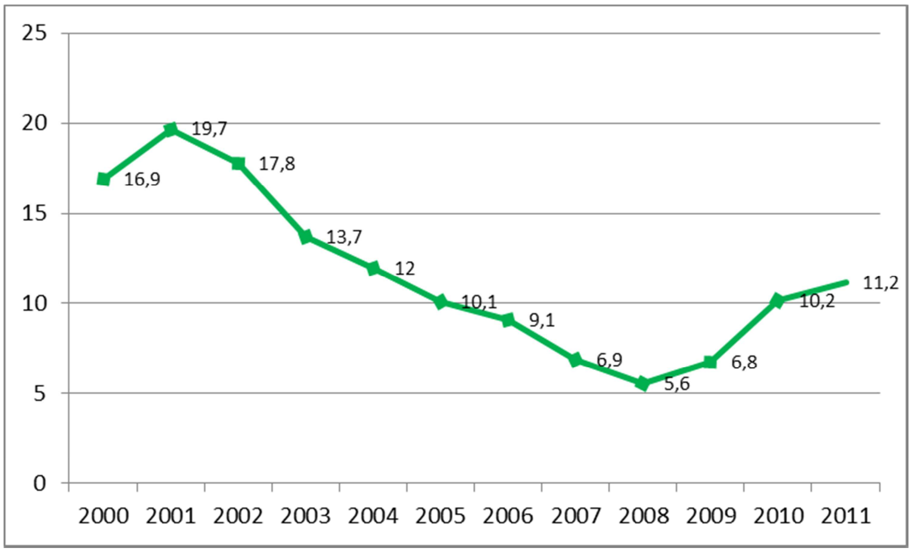


Figure 2-7 National unemployment rate, %

Source: http://www.nsi.bg/otrasal.php?otr=26&a1=735&a2=736&a3=739

As of December 31, 2011, the number of registered unemployed in the region served by Pazardzhik Bureau of Labor, i.e. Pazardzhik municipality and Lesichovo municipality, was 4,581 people (4,159 people for Pazardzhik and 422 for Lesichovo). Unemployment rate was 8.9%, for the served region, 8.4% for Pazardzhik municipality, and quite high - 27.1% for Lesichovo Municipality. Unemployment in Septemvri municipality was 20% as of December 2011 (according to data from the Employment Agency - Pazardzhik http://www.az.government.bg/eng/index_en.asp).

2.3.5. Density and type of housing

As of 2010, population density in Bulgaria is 67.6 people per square km. Population density in Pazardzhik Municipality is very high – 189.1 people per square km – considerably above the average for Pazardzhik district and the country. This is due to the fact that the district centre is located there – the town of Pazardzhik. Population density in Septemvri Municipality is 77.5 people per square km, and that in Lesichovo Municipality – 27.2 people per square km. The low density in Lesichovo Municipality is due to the large rural areas, which are usually more sparsely populated.

Table 2-10 Population density as of 31.12.2010

Settlement	Area – sq.km	Population density per sq.km
Pazardzhik District	**4456.9**	**64.6**
Batak	677.3	9.2
Belovo	346.4	26.2
Bratsigovo	229.4	43.9
Velingrad	803.1	51.5
Lesichovo	209.4	27.2
Pazardzhik	636.7	189.1
Panagyurishte	598.9	42.9
Peshtera	135.4	159.3
Rakitovo	246.4	62.6
Septemvri	349.4	77.5
Strelcha	224.5	23.6

Source: http://www.nsi.bg/publications/REGIONS_2010.pdf

2.3.6. Economic development in the area

Pazardzhik Municipality is a dynamically developing municipality, which aims at achieving an efficient and competitive economy. The geographical position of Pazardzhik municipality favors the development of road and transport communication, distribution and trade, as well as the activities related to the transfer of cargo, goods, information, people and services. The relief and water resources provide opportunities for the development of power generation by hydro power plants and cascades, and the average high mountain areas provide opportunities for the development of ecological farming. Modern agriculture is developed in the lowland areas. Vegetable growing is a traditional and extremely important sub-sector in the region, with average yields in Pazardzhik Municipality being several times higher than the average yields for the country. On the basis of its favorable geographical location, climatic and soil conditions, Pazardjik Municipality has good traditions and appropriate indicators for the development of horticulture, with priority importance of growing apples, cherries, morello and peaches.

2.3.7. Major employers in the area

The majority of the active population in Pazardzhik, Septemvri and Lesichovo municipalities is employed in agriculture. In all stages of development, agriculture has occupied a leading position in the local municipal economies, providing the main part of income for the population and the highest employment of active population. Another part of the active population is employed in companies engaged in transportation, commercial and industrial activities listed in section 2.3.8..

2.3.8. COMMERCIAL AND INDUSTRIAL ACTIVITIES

The main industrial activities and operations developed by the enterprises on the territory of Pazardjik Municipality with municipal, regional or national importance are the following branches:

- Food industry: production of fruit and vegetable cans, milk processing and production of dairy products, production of finished meat products for consumption, milling and rice industry, wine industry, tobacco industry.
- Manufacturing industries: manufacturing of conveyor belts, production of lathes, production of batteries, production of construction machines;
- Manufacture of paper, textile and apparel industry, furniture industry, construction and mining industries.

Most of the enterprises are concentrated in the industrial zone of the town of Pazardzhik. 28 industrial enterprises are included in the gas-transmission network. The most significant ones of them are the battery plant "Elhim Iskra" EOOD, "Kauchuk" AD, "Bulgartabac - Holding" AD. In the southern industrial zone of the town there are 11 manufacturing plants and about 150 retail outlets and small enterprises.

2.3.9. URBAN DEVELOPMENT PLANNING

Sustainable and integrated urban development is a subject of Priority axis 1 of the Operational Program "Regional Development" 2007-2013. It aims at a wide range of interventions to improve the competitiveness of cities and urban areas, and more specifically – to provide conditions for development of successful and sustainable urban areas, which are interconnected, and create opportunities for each other and their surrounding areas.

On 14.08.2012 Pazardzhik Municipality signed a contract with the Association "Sustainable Development for Pazardzhik" in its capatown of a contractor under a public procurement contract for preparation of an integrated plan for urban rehabilitation and development (IPURD) of Pazardzhik. The contract is worth BGN 285,000 without VAT, with initial estimated cost of the public procurement – BGN 358,000 without VAT.

The consulting services are financed under the project "Sustainable Integrated Development of Pazardzhik town - preparation of an integrated plan for urban rehabilitation and development", which is implemented with the financial support of Operational Program "Regional Development" (2007-2013), funded by the European Union through the European Regional Development Fund under Contract № BG161PO001/1.4-07/2010/036. The project is worth BGN 498,000, the amount of grant under the operational program is BGN 473,100 and the amount of co-financing by the Municipality of Pazardzhik is BGN 24,900.

It is envisaged that the IPURD of the town of Pazardzhik will be ready by July 2013. It is a prerequisite for utilization of the funds under the operational programs and the EU funds in the next planning period 2014 – 2020.

IPURD will outline the framework for sustainable development of Pazardzhik town with a time horizon 2014-2020, by preparing a set of projects for urban rehabilitation, improving the standard of living, the image of the town, its economic vitality, environmental sustainability and social activity in accordance with the current requirements for the development of the European cities.

2.3.10. LAND USE AND OWNERSHIP

The arable agricultural land on the territory of Pazardzhik Municipality occupies the largest share - 70% of the total area of the municipality, compared to the average 24% for the district and 42% for the country as a whole. The arable land on the territory of Pazardzhik Municipality is located mainly along the river valley of Maritsa River. About 80% of the arable land is irrigated, which is an extremely favorable conditions for the development of intense local crop growing and stock breeding.

Non-arable land covers about 30% of the territory of the municipality. Out of it, the largest share is taken by forests - 11.9%, common pastures - 8.5%. Uncultivated lands occupy about 7%, which is significantly higher than the average for the district - about 3.2%. Two-thirds of the uncultivated lands are in the forest fund, and the rest are in the agricultural fund.

2.3.11. WATER BORNE HEALTH PROBLEMS

In the Republic of Bulgaria, the competent authority in the field of drinking water is the Ministry of Health and its regional structures – 28 regional health inspectorates (RHI), according to the Water Act and the Health Act. The water supply organizations, in their capacity of structures, carrying out water supply activity for drinking-domestic purposes, are responsible for the fulfilment of the legislation requirements for drinking water, including drinking water quality monitoring in its full volume.

According to the effective legislation, state health control of drinking water is performed by the Ministry of Health, respectively RHI in the following major directions:

Drinking water quality monitoring in all settlements of the country is carried out by taking samples as well as by conducting laboratory analysis: of raw water from the water sources for drinking-domestic water supply, at the “end consumer”, of water at different stages of its treatment, of water delivery to the “end consumer”, water from independently supplied sites, water from “independently supplied sites”.

RHIs are obliged to carry out at least 50% of the full volume of investigations, which need to be executed by the WSSC.

RHI exercises control over the sanitary protection zone of the sites and facilities intended for central drinking-domestic water supply: water sources, water abstraction facilities, sanitary protection zones (SPZ), drinking water treatment plants (DWTP), disinfection installations – chlorination and other stations for water disinfection, reservoirs, independently supplied sites, bathing zones, etc.;

The RHIs approve project documentation for sanitary protection zones of water sources intended for drinking-domestic purposes and project documentation of water supply facilities and networks; participates in takeover commissions for such sites; undertake administrative-proceeding and other measures in case of discrepancies established in drinking water quality and violations of the sanitary hygienic requirements for water sources, supplied sites and facilities, sanitary-protection zones (prescriptions, acts, penalty decrees, suspension orders, property sanctions, removal from office, etc.).

The water supplied to the consumers is of quality suitable for drinking and household purposes. No infectious or other water borne diseases have been registered in recent years. Part of the problems is due to emergency repairs of the treatment facilities and sections of the water supply network, as well as issues with the water abstraction facilities etc.

The constant monitoring (CM), conducted during the period 2010-2012 (covering only part of the monitored parameters) and the periodical monitoring (PM), indicated discrepancies in the different parameters required by Ordinance №9 /16.03.2001 on the quality of water intended for drinking and household purposes.

The registered discrepancies need to be eliminated in the shortest possible time by envisaging the respective effective measures.

Microbiological parameters – registered in emergency breakdown situations and ineffective disinfection: Coliforms, enterococci Escherichia coli etc. (In Ovechepoltsi zone - : Coliforms and Escherichia coli; Govedare zone - colonies and microbial number);

Physical and chemical parameters

Deviations from the requirements of Ordinance No 9 /16.03.2001 have been registered.

Increased content of residual chlorine Overdose of chlorine used for the disinfection of water in conditions of poorly controlled operation of disinfection facilities and their management.(Dragor zone, Rosen zone, Zrancha zone, Lyahovo zone).

Increased content of nitrates in the water of Pazardzhik zone, Ivaylovo zone, Saraya zone, Dobrovnitsa zone in 2010 and 2011. The nitrate content parameters for the water of Ivaylovo zone registered in 2012 are within the statutory requirements. (Numerous measures for the reduction of the impact of different potential pollution sources have been undertaken in the region. For example, the wastewater from the sewerage network of the village of Ivaylovo is included in the sewerage of the town of Pazardzhik etc.).

Increased content of calcium in Pazardzhik zone (reasons related to water abstraction facilities) content of sulphates (reasons related to water abstraction facilities).

Part of the problems with the registered discrepancies from the requirements of Ordinance №9 is due to violations of the SPZ, emergency breakdowns of the treatment / disinfection facilities, and in many cases due to their insufficient efficiency and the rather poor management. As per data of the operator these facilities are with low reliability and need to be replaced with modern disinfection installations

All tested parameters except for the ones with the abovementioned deviations have been within the permissible limits.

Discrepancies from the requirements of Ordinance №9/16.03.2001 have been registered in protocols of the analysed samples in the period between 2010 and 2012 < 5 % of all of the tested samples.

Microbiological parameters discrepancies - The problem is of leading health importance (as per recommendations of the World Health Organization non-standard annual values of the health important microbiological parameters must not exceed 5%) and creates a direct risk to the consumers' health. It is expected to occur in emergency breakdown situations, in cases of insufficient disinfection, etc. Main reasons are: lack of treatment; obsolete, inefficient or not sufficiently efficient treatment facilities; not good disinfection; frequent breakdowns in the obsolete water supply networks; deposits in the old and amortised water supply networks including the service building connections. Other reasons are also the inappropriate technological design of the water supply including incorrect placement of disinfection installations or their insufficient number, the lack of water treatment, frequent breakdowns of old and obsolete WSS networks, subjective mistakes due to low qualifications or careless execution of work duties by WSS operators' employees.

Measures: construction of modern and effective water treatment and disinfection facilities for the treatment and disinfection of water, replacement of the old and obsolete water supply systems, increased fastidiousness and improvement of the qualifications of responsible employees. Increased control of the responsible institutions. It is necessary to start the reconstruction and rehabilitation of the water supply networks of the settlements. These indicators are of paramount significance for the safety of the water and direct health risk, which is created. Strict control for the compliance with requirements of the prohibitions within the area of protection of SPZ is needed.

Deviations in the nitrate levels - The problem is of importance to the human health. The excess level of nitrates in the water might cause the disease "water nitrate methemoglobinemia" in infants and young children. In iodine deficient areas it might lead to increase in the frequency of endemic goitre in the adolescent group. The problem is still widely spread in areas with developed farming and animal breeding as in this particular case of the water supply of Ivaylovo, Saraya, Dragor and Dobrovnitsa).The causes are related to the water abstraction facilities. The prohibition of activities, which pose a potential risk of water pollution, is violated within the SPZ. When effective measures are taken for the elimination of the causes, the increased nitrate parameters are also reduced and are within the limits of the statutory requirements. (In 2012, in Ivaylovo zone the registered nitrate content is within the limits of the statutory requirements i.e. below 50 mg/l. This parameter continues to be monitored).

Measures: Introduction of good agricultural practices for the fertilization of agricultural lands in the region. Prevention of unregulated accumulation and storage of manure masses. Prevention of violations of the SPZ (a strict control for the compliance with the requirements of the prohibitions in the area of protection is needed). It is necessary to prepare a Programme for staged implementation of alternative measures for reducing the nitrate content in drinking water and technical and economical motivation needs to be presented for the individual proposals so that the most rational technical solution can be selected. First, it is necessary to implement and specify the required measures for the reduction of the impact of all potential sources of pollution (lack of sewerage and wastewater treatment in the settlements, uncontrolled fertilization etc.) and to seek a possibility for replacement of the water source or dilution of the water with water from another water source with low content of nitrates. The treatment of water by means of ion exchange, sorption, membrane methods, etc. is a solution which is associated with significant investments and operation cost and its implementation in this case by preliminary assessment is considered to be the most irrational solution.

Other factors influencing adversely drinking water quality

The water supply is restricted and suspended after emergency breakdowns until the failure has been repaired. In such cases various problems with water quality occur which might increase the risk of health problems. The poor technical condition of part of the transmission mains and water supply systems of the settlements built and commissioned mainly during the 1970’s also causes problems. The share of asbestos cement water mains also remains very high. These factors lead not only to large water losses but also create a number of problems with water quality because of the potential for its secondary pollution especially in cases of water supply network failures. The lack of funds for the replacement of water mains, adversely affect the renovation and development of the water supply systems.

Other problems related to the quality of water and the monitoring performed

The epidemiological studies carried out so far have not established or proved any connection between the infectious diseases and the quality of water supplied for drinking and household purposes in the settlements supplied by VIK EOOD Pazardzhik. The maintenance of the SPZs, their updates and the compliance with the prohibitions and restrictions regime for certain activities in the sanitary protection zones are also of importance for the preservation of drinking water quality. Currently full monitoring of the water in designated territory is not conducted due to insufficient capacity of the laboratories of WSS operators. The volume and frequency of the monitoring does not comply with the European requirements and there are no complete data for the service territory and the country.

Recommendations for the improving drinking water quality

It is necessary to provide sufficient quantities of water with good drinking quality compliant with all regulatory requirements of the regulation in force and the existing problems to be solved.

The measures that need to be undertaken are legislative and financial

- Legislative measures for settling ownership issues and water networks and facilities management;

- Financial measures – providing means for reconstruction and modernisation of the water supply networks and facilities, the WSS operator and the municipality must actively seek sources of funding for obtaining EU grant funds.
- Construction of new facilities for water treatment and disinfection;
- Programme for staged implementation of alternative measures for reducing the nitrate content and other parameters exceeding the permissible levels in drinking water
- Seeking and discovering new water sources when necessary;
- Ensuring strict control and effective water management in the service territory of VIK EOOD Pazardzhik
- Updating the sanitary protection zones around the water sources and increased control on the compliance with the prohibitions and restrictions in them;
- Providing complete monitoring of water in pursuant to the European and national legislation.
- Preventing pollution of drinking water with nitrates and pesticides by increasing the control on the compliance with the rules of good agricultural practices and other measures

Recommendations are presented in section 3.7.

2.3.12. CONCLUSIONS

The service territory of ViK EOOD, town of Pazardzhik, can be characterized as mostly urban with approximately 56% of the population living in the urban areas. Population density in Pazardzhik municipality is significantly above the average levels for the country due to the location of the district center there – the town of Pazardzhik. Population density in Septemvri Municipality is similar to the average for the country, while that in Lesichovo Municipality is lower compared to the average levels for the country due to the large rural areas, which are usually more sparsely populated.

Decreasing natural growth, population ageing and net out-migration have triggered population decline of 11.2% over the last ten years, compared to an average decline of 11.3% for Pazardzhik District and 7,2% for the country. If this negative demographic development continues, it will exert significant influence on future investments in the water and wastewater networks.

The unemployment rate in Pazardzhik Municipality is below the national average, however that in Lesichovo and Setpemvri municipalities is quite high - 27.1% and 20% respectively as of December 2011. If this tendency continues, regional and national disparities will get bigger unless both national and local measures are taken.

The economic development in the region is concentrated mainly in vegetable and fruit growing. These are extremely important and traditional sub-branches in the region, with average yields in Pazardzhik Municipality being several times higher than the average yields in the country. Another major part of the regional economy is concentrated in the transportation, commercial and industrial activities.

Conclusions and recommendations – Above 99% of the water supplied to the consumers, is of good quality, fully suitable for drinking and household purposes. No infectious or other water borne diseases have been registered in recent years. The major part of the problems is due to emergency repairs of different sections of the old water supply network.

The surface water and soils are polluted mainly by the non-application of good agricultural practices, unregulated accumulation of waste and manure masses, however the impact of the discharge of wastewater from settlements without treatment is limiting, which creates a risk for contamination of surface and groundwater in the area of the designated territory. This is a perquisite for health risk for the population in the area. Therefore, wastewater treatment and providing adequate quality of drinking water remains the most important tool for preventing water borne diseases.

2.4. WATER SUPPLY AND SEWERAGE SERVICES

2.4.1. WATER SUPPLY AND SEWERAGE OPERATORS

The main activity of the company is operating, maintenance, construction, investments, and plumbing, sewage, and construction services.

ViK EOOD Pazardzhik in liquidation is a water operator and carries out regulated activities under the Water Supply and Sewerage Services Regulation Act, promulgated in SG. No. 18 of 25.02.2005, in force since 20.01.2005.

Pursuant to the provisions of Art. 21, paragraph 1, paragraph 4 and paragraph 54, Art. 23, paragraph 1 of Water Supply and Sewerage Services Regulation Act, the operator is subject to annual regulatory audit of the achieved levels of the quality indicators for the water and sewerage services, the implementation of price and comparative analysis of the reported and approved revenues and costs, as well as the implementation of the investment and repair programme.

Table 2-11 Details on ViK EOOD –Pazardzhik

Name of the WSS operator	Vodosnabdyavane i Kanalizatsiya EOOD, the town of Pazardzhik (ViK EOOD - Pazardzhik)
Legal status	Single-member Limited Liability Company, managed by Manager (Liquidator)
Date of registration	Company file №3948/91 - Pazardzhik District Court
UIC (code under BULSTAT	822 106,665
Headquarters and address of management	The town of Pazardzhik, № 6 Vtori Yanuari Str.
Correspondence address	The town of Pazardzhik, № 6 Vtori Yanuari Str.

Subject of activity	Operation, maintenance, construction, investments, water supply, sewerage, and construction services on the territory of Pazardzhik Municipality, Septemvri Municipality and Lesichovo Municipality.

Based on the profit and loss account for the year 2011, the total amount of the operating revenue is BGN 7,292,000 against a total amount of costs equal to BGN 6,675,000, therefore the financial result indicates a profit of BGN 617,000, and after taxation the net revenue for the year 2011 comes to BGN 561,000.

Brief Company History

By Decree N 49 of the Council of Ministers of 1971, an economic Water Supply and Sewerage Directorate was established as a separate legal entity with headquarters in Sofia, 12 Uzundzhovska Street together with branches in the former counties with centres in the county towns, which undertook the maintenance and operation of water supply and sewerage systems in the respective counties (former Pazardjik County)

Over the course of time, the service regions of Velingrad, Batak, Rakitovo and Peshtera (from 1989 to 1990) were separated from the water operator followed by Belovo, Strelcha, Panagyurishte and Bratsigovo (1997). Those service regions became municipal water companies after the Council of Ministers issued a decision for transfer of the ownership. By Decree of the Council of Ministers the capital of ViK EOOD Pazardzhik was reduced and the right of ownership of the real properties was gratuitously transferred to the respective municipalities.

Pursuant to the Bulgarian Lev Denomination Act, the re-dominated capital was re-registered by Decision № 1012 of 21.03.2000 under company file № 3948/91. Currently, the registered capital of the company amounts to BGN 68,000, divided into 6,800 shares of BGN 10 each. The state is the sole capital owner.

By Decision № 635 of March 28, 2003, the Pazardzhik District Court has declared the liquidation of ViK EOOD Pazardzhik. The deadline for completion of the liquidation has been extended as follows:

- By Decision № 1586 / 11.09.2003 to 28.03.2004
- By Decision № 581 / 24.03.2004 to 31.12.2004
- By Decision № 2471 / 23.12.2004 to 31.12.2005
- By Decision № 2003 / 30.11.2005 to 31.12.2006
- By Decision № 2161 / 21.12.2006 to 30.06.2007
- By Decision № 1280 / 20.06.2007 to 31.12.2007
- By Decision № 2740 / 21.12.2007 to 30.06.2008
- With protocol № T3-48 / 30.06.2008 of the Minister of the MRDPW the deadline for completion of the liquidation has been extended to 31.12.2008.

Currently there is an on-going procedure for the reregistration of the Company in the Commercial Register.

The total staff of the ViK EOOD Pazardzhik is summarized in the following table:

Table 2-12 Total number of employees

Type of employees	Total number
MANAGER (LIQUIDATOR)	***4***
Technical Secretary	1
Marketing Specialist	1
Supplier	1
Chief Engineer	1
PRODUCTION AND TECHNICAL DEPARTMENT (PTD)	***7***
PTD Chief specialist	1
WSS Specialist"	1
WSS Technician	1
Power Engineer Specialist	1
Electronics and Automatics Specialist	1
Fitter of electronic equipment	1
Sales Specialist	1
FINANCIAL AND ECONOMIC DEPARTMENT (FED)	***10***
FED Chief Specialist	1
Accountant Specialist	3
Accountant/Cashier Specialist	1
Workforce Specialist	1
Informatics Specialist	2
Payroll Specialist	1
Records and Archive Specialist	1
OTHER	***3***
Shopkeeper-buffet attendant	1
Cleaner	2
TECHNICAL AREAS	***210***
Pazardhik Area	153
Septemvri-Lesichovo Area	57
SUPPORT SERVICE DEPARTMEN	***14***
Motor transport	8
Water meter workshop	6
AVERAGE NUMBER OF EMPLOYEES	**248**

2.4.2. WSS SERVICES AND TARIFF POLICY

The WSS operator has the right to determine the price level in compliance with the Water Supply and Sewerage Services Regulation Act, the Ordinance for the price formation of water supply and sewerage services as well as the Methodological guidelines for preparation of water operators business plans, published by the SEWRC.

The state regulation of the activities in the water supply and sewerage services is performed by the SEWRC. It is responsible for monitoring the implementation of the quality of the service provided by the water operators and used in their business plans.

The business plan of each water operator clearly describes all parameters required by the SEWRC for determining the prices using a specific methodology for assessing the expedience and legal compliance of the prices suggested by the operator.

A financial model is used for reporting and calculating:

- The operating and maintenance costs of the systems;
- The planned investments which will be realized with the own funds of the operator and will remain his property;
- The depreciation of assets owned by the operator;
- The expenses and effects of losses reduction;
- The required revenue for matching the allowed expenses;
- The social affordability of the suggested prices;

The business plans of the WSS operators do not include the projects that are financed by EU funds and those of which the beneficiaries are the Municipalities. When the municipality provides these assets for exploitation, the WSS operators do not have the right to include the amortization expense, including only the operation and maintenance expenses.

ViK EOOD Pazardzhik applies uniform tariffs for the services of provision of drinking water and differentiated tariffs for wastewater discharge and treatment services with regard to domestic and industrial consumers.

Currently the clients of ViK EOOD Pazardzhik pay for the services of water supply and wastewater discharge. After completion of the WWTP the tariff will include a component for wastewater treatment.

The tariff for the new service of wastewater treatment is calculated in accordance with the requirements of the National Guidelines for Cost-Benefit Analysis in the Water and Wastewater Sector, i.e. the projection of tariffs should cover fully the cost of operation and maintenance of WWTP and part of the depreciation within the limits of social affordability.

Table 2-13 Prices of water and wastewater services provided by ViK EOOD-Pazardzhik, approved by SEWRC (as of 31.01.2012)

Type of service	Prices suggested by the WSS operator as per latest submitted applications (BGN/m3 w/o VAT)	Approved price limits by the SEWRC for WSS services as of 30.09.2012 (BGN/m3 w/o VAT)
Water supply, high pressure	0.85	0.85
Household and industrial wastewater disposal	0.10	0.10
Treatment of household wastewater	0.35	0.35

Type of service		Prices suggested by the WSS operator as per latest submitted applications (BGN/m3 w/o VAT)	Approved price limits by the SEWRC for WSS services as of 30.09.2012 (BGN/m3 w/o VAT)
Treatment of industrial wastewater	1 degree of pollution	0.43	0.43
	2 degree of pollution	0.53	0.53

Source: SEWRC

2.4.3. CENTRALISED HEATING SERVICES SUPPLY

In the town of Pazardzhik, the natural gas distribution is carried out by Hebrosgas AD. The company is a joint venture with major shareholders OVERGAS Inc. AD and Pazardzhik Municipality.

OVERGAS Inc. AD finances the project for gasification of the town of Pazardzhik. Currently, the constructed distribution network on the territory of the municipality is with a total length of 74 km. Hebrosgas AD carries out the delivery of natural gas to its customers.

2.4.4. PRIVATE WSS SYSTEMS IN THE AREA

Currently there is no private WSS operator on the territory of the municipalities of Pazardzhik, Lesichovo and Septemvri. ViK EOOD-Pazardzhik serves this territory.

2.4.5. CONCLUSIONS AND RECOMMENDATIONS

The price of the water supplied by ViK EOOD Pazardhik (BGN 0.85 without VAT) is below the national average of 1.05 BGN/m³ (without VAT) but ecxceeds the average price of 0.73 BGN/m3. (without VAT) for region 7 in Pazardzhik District. In reality, the price for the water supply in Pazardzhik District varies from 0.45 BGN/m³ - without VAT, for VKTV EOOD – the town of Rakitovo, to 1.19 BGN/m³ for ViK-P EOOD – Panagyurishte. This price variability is even higher at national level: from 0.26 BGN/m³ for Vodosnabdyavane EOOD – the town of Breznik and 0.4 BGN/m³ for Barziyska Voda EOOD – the village of Barziya, to 1.98 BGN/m³ for Vodosnabdyavane-Dunav EOOD – the town of Razgrad, 2.05 BGN/m³ for ViK OOD – the town of Targovishte and 2.09 BGN/m³ for ViK OOD – the town of Isperih.

The prices of WSS services are determined by the State Energy and Water Regulation Commission. They reflect the network maintenance costs, the treatment and water supply costs as well as the investment costs. If the need for investments is big this will also affect the prices of WSS services. It is up to the municipality and the operator to determine the level of investments in order to ensure the reducing of losses and the quality of the services. Compared to other European countries the price of water in Bulgaria is lower. In Germany for example through the years large investments have been made in network renewal and as a result the percentage of losses in the network is very low, but at the same time the prices of water are very high. It is a matter of political decision and choice of policy. If Bulgaria decides to have a higher price this would allow for investing more in the network, reducing losses, treating more waste water, since in many cities in Bulgaria this is not done. But all this requires investments. They can come from the European Union too, but part of them must probably be provided from the price of WSS services.

3. ASSESSMENT OF THE EXISTING SITUATION AND NEEDS FOR WATER SUPPLY AND SEWERAGE SYSTEMS

3.1. WATER RESOURCES

3.1.1. GENERAL FEATURES

The designated territory of ViK Pazardzhik belongs to the water basin of the Maritsa River in the East Aegean Sea River Basin Directorate. It includes the territories of the municipalities of Pazardzhik, Septemvri and Lesichovo in Pazardzhik district.

The territory is rich in water resources which are formed from surface and groundwater water sources recharged mainly by precipitation falling not only on the territory but also on the basin area of the rivers outside it.

Surface water

Appendix 3-1 presents in detail water bodies, their codes, river and lake categories and irrigation canals in the designated territory. Surface water sources are not used for drinking water supply.

Groundwater

The settlements on the territory served by served by Water Supply and Sewerage EOOD-Pazardzhik use part of the groundwater resources in groundwater bodies: “Fracture water – West Rhodopes complex” with code BG3G0000Pt047, “Fracture water – west and central Balkan masiff” with code BG3G0000Pt044, “Fracture water Peshetra – Dospat” with code   BG3G0000PgN020, “Pore water in the Neogene – Quaternary Pazardzhik-Plovdiv region” with code BG3G00000NQ018 and “Pore water in Quaternary – Upper Thracian lowlands” with code BG3G000000Q013. The area, resource and permitted annual water abstraction volume from the above stated groundwater bodies in regional aspect are presented in the table below according to information of EASRBD Plovdiv:

Table 3-1 Regional resources and permitted groundwater abstraction by the EASRBD

Groundwater body code (GWB)	Size of the GWB km2	Regional resources, l/s		Permitted annual abstraction l/s	Available quantities l/s
		Natural	Available		
BG3G00000Pt047	748	1322	1322	168	1154
BG3G00000Pt044	3811	2286	2012	92	1920
BG3G0000PgN020	748	1322	1322	168	1154
BG3G000000Q013	2727	11180	3247	3071	176
BG3G00000NQ018	3957	18819	18819	3830	14989

Source: East Aegean Sea River Basin Directorate – River Basin management Plan for the East Aegean Sea Region

More detailed information on permits is given in item 3.1.3.

3.1.2. SURFACE WATER SOURCES

3.1.2.1. *General features*

The main water bodies in the designated territory of ViK EOOD – Pazardzhik are the Maritsa River and its bigger tributaries – the Topolnitsa, Luda Yana and Chepinska Rivers which also collect the water from a large number of smaller tributaries.

Within the territory are also situated entire or parts of the basins of some smaller and less abundant rivers which are tributaries of the Maritsa, the Topolnitsa and the Chepinska – the Elshishka, the Yavoritsa, the Golemoto dere, the Sidovets, the Potoka, the Sveta Petka, the Byala rivers, etc.

3.1.2.2. *Surface water quantity*

For measuring the quantity and quality of the surface water in the designated territory of Pazardzhik and its variations in monthly and annual aspect is used the established and working reference hydrometric network – on the Maritsa at Belovo (HMS No 71700), at Pazardzhik (HMS No 71800), on the Topolnitsa at Lesichevo village (HMS No 243, situated closest to the designated territory of Pazardzhik), on the Luda Yana (HMS No 71550, east of the Sbor village) and on the Chepinska river (HMS No 71420, at Narko Nikolovo). There are no other hydrometering stations including institutional ones on the designated territory.

The table below presents the available data for the surface water discharge in the designated territory of Pazardzhik.

Table 3-2 Surface water discharge quantity

No.	Location of hydro metering station	Size of the basin area [km^2]	Discharge module [$l/s.km^2$]	Average discharge quantity [m^3/s]	Minimum discharge quantity [m^3/s]	Maximum discharge quantity [m^3/s]
1	the Maritsa – Belovo	741	11.174	8.280	4.742	13.364
2	the Maritsa – Pazardzhik	4126	6.440	26.573	12.166	44.770
3.	the Chepinska at M. Nikolovo	881	7.493	6.601	3.208	11.818
4	the Chepinska at the mouth	899.6	7.447	6,7	3,256	11.995
5.	the Topolnitsa at Lesichevo village	1618	5.975	9.668	3.169	16.944
6.	the Topolnitsa at the mouth	1789	5.857	10.479	3,435	18.366
7.	The Luda Yana at Sbor villages	569.8	5.421	3.089	0.810	7.020
8.	The Luda Yana at	685.3	5.202	3.565	0,934	8,101
9.	The Potoka - mouth	422.9	2.719	1.150	0.406	2.475

Source: RBMP, 2009

In the designated territory of ViK Pazardzhik there are no surface water intakes for drinking and household water supply. The surface water of the rivers and dams in the designated territory is only used for irrigation, fishery and power generation. The quantities are presented in detail in the table of the surface water quantities permitted for intake by the EASRBD.

Surface water volume variations – monthly and yearly in 2011.

The variations of the discharge of the Maritsa and its main tributaries in their basins on the designated territory of Pazardzhik depend on the combinations and distribution of precipitation, snowfall in the high areas of the river courses and the air temperature and other climate specifics of the climate sub-areas to which the rivers belong. The discharge modules presenting the intensity of the discharge formation on an average in the basin areas vary in very wide ranges. A clear correlation between the variation of the average annual discharge and the altitude and climate impact is observed.

In the area of the designated territory along the Maritsa river before and after Pazardzhik is formed a summer low water minimum in September (3-4%). The high water starts from February – March and ends in June with decrease in the percentage to about 10%. The high water maximum starts in April and is about 14.5-15%.

The percentage distribution of the tributaries depends on the physical and geographical conditions. The left-side tributaries which flow from Sredna gora mountain have high water maximum in March – April and minimum in August – September. The right-side tributaries are have high water maximum in April – May and minimum in September.

The average annual discharge of the Maritsa within the designated territory of Pazardzhik varies from 8.28 m^3/sec at Belovo to 26.57 m^3/sec at Pazardzhik with respective annual discharge module of 11.17 and 6.44 l/sec.km^2. For the main tributaries – the Luda Yana (at Sbor) the average multiannual discharge is 3.09 m^3/sec, and the discharge module – 5,42 l/sec.km^2, the Chepinska (at Marko Nikolovo) – respectively 6.6 m^3/sec and 7.49 l/sec.km^2, the Potoka (mouth) – 1.15 m^3/sec and 2.72 l/sec.km^2 .

The discharge distribution within the river network throughout the year in the designated territory is determined by the climate specifics of the transitional continental climate sub-region.

The table below presents the percentage distribution of the annual discharge for each month at specific stations on the main rivers in the designated territory of Pazardzhik.

Table 3-3 Percentage distribution of the discharge in months in specific points on the main rivers in the designated territory ViK Pazardzhik

№	River, station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
	Main river													
1	the Maritsa - Belovo	2.9	3.2	4.6	10.2	27.6	19.7	9.3	6.2	4.3	4.2	4.4	3.5	100.0
2	the Maritsa - Pazardzhik	5.3	7.7	11.1	13.8	18.1	13.2	7.3	5.0	4.0	4.4	4.8	5.3	100.0
	Tributaries													
4	The Topolnitsa – Poibrene	6.0	9.0	12.8	16.0	14.5	12.0	6.8	3.8	3.6	4.6	4.8	5.9	100.0
5	The Luda Yana – Sbor	7.6	14.4	16.7	14.4	12.3	8.6	3.6	2.3	2.4	4.3	6.0	7.5	100.0
6	the Chepinska – M. Nikolovo	6.9	10.1	13.8	13.7	12.2	8.9	7.0	6.5	4.8	4.8	5.1	6.3	100.0

Source – RBMP, 2009

The discharge variations within the surveyed period (2009-2011) do not vary widely as a clear correlation between the variation of the average annual discharge and the altitude and climate impact of the area is observed.

3.1.2.3. *Surface water quality*

The surface water in the region of the designated territory of ViK Pazardzhik is not used for drinking water supply (currently there are no river catchments) but are used by the economic subsectors energy generated from hydro sources, irrigation and industrial water supply. And also for discharged domestic and industrial wastewater from the region.

The quality of the used surface water for certain purposes must comply with the regulatory requirements. The water in the water bodies receiving discharged wastewater must comply with the requirements for their design category. Water polluted above the permissible levels creates health risk conditions to the population in the region.

For assessment of the quality of the surface water bodies in the territory served by ViK Pazardzhik control and operational monitoring is carried out in various stations on the rivers Maritsa, Topolnitsa and Luda Yana. The NMS stations serve for assessing the water pollution in the region and the discharge of polluted wastewater as point-source pollution. Physical and chemical monitoring for determining the ecological and chemical status of the surface water is carried out at the control monitoring stations.

The water bodies' pollution does not affect the water used for DHWS.

Conditions for potential surface water pollution above the defined limits for the design category and limiting significance health risk are created by the direct discharge of untreated wastewater from the population and industrial companies in the settlements.

All surface water bodies on the territory of Water Supply and Sewerage EOOD – Pazardzhik have been categorised pursuant to РД 272/2001 of the MoEW for the categories of surface water bodies or parts of them, РД 970 /2003 of the MoEW for defining the “sensitive zones” and РД-930/25.10.2010 for the nitrate vulnerable zones.

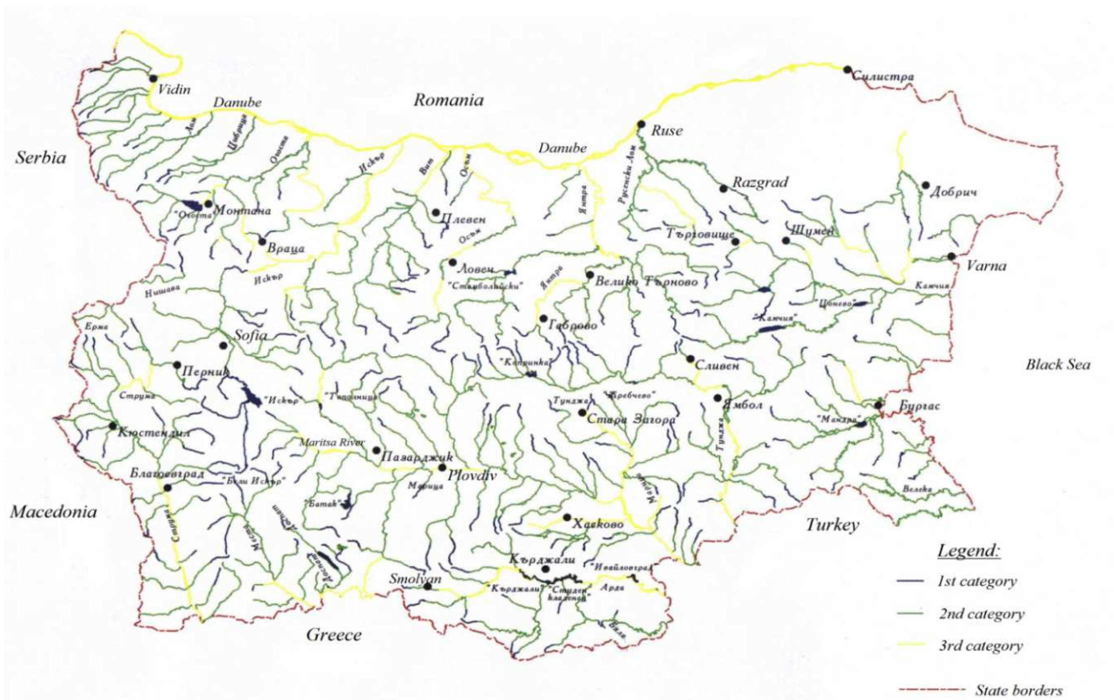


Figure 3-1 Categorization of surface water bodies in the Republic of Bulgaria

Categorisation of the rivers in Bulgaria:

- the Maritsa, after the mouth of the Chepinska to Pazardzhik- II category
- the Maritsa, after Pazardzhik to the mouth of the Vacha - III category
- the Maritsa, after the mouth of the Vacha to Plovdiv - II category
- Topolnitsa dam - III category „sensitive zone”;
- The Topolnitsa, after the mouth of the Pirdopska – III category„
- The Topolnitsa, after Topolnitsa dam up to the point of flowing into the Maritsa - **II** category
- The Elshishka – after the settlement to the point of flowing into the Topolnitsa - III category
- The Luda Yana, after an anthropogenic impact source to the point of flowing into the Maritsa - II category.
- The water in the irrigation canals take the category of the water body /or part of it/ from which it is abstracted. The water in the irrigation canals is of II category.

Appendix 3-2 presents a summary of the water bodies’ condition.

Physical and chemical monitoring for determining the ecological and chemical status of the surface water is carried out at the control monitoring stations.

On the territory of Pazardzhik municipality are situated two control monitoring stations:

- the Maritsa – Pazardzhik

the Topolnitsa – Pazardzhik, before the mouth.

Table 3-4 General condition of the surface water in the designated territoryserved by ViK Pazardzhik.

№	Water body	Ecological condition /potential			Chemical condition	General condition
		Biological elements	**Physical and chemical elements**	Ecological condition /potential – general		
1	The Maritsa from the Topolnitsa to the mouhth of the Vacha and ГОК-9 and ГОКII	average 3	average N total, NH4	average 3	Good	(average)
2	The Maritsa from Belovo to the Topolnitsa and ГОК-13 – К1(ГК1)	average 3	Good 4	average 3	Very good	average
	The Topolnitsa from Topolnitsa dam to the mouth of the Elshishka (Dragor village)	average 3	-	average 3	Good	(average)
3	The Topolnitsa from Dragor village to the mouth and Elshishka river	average 3	Bad Electrical conductivity, SO_4, Fe, Cu, Mn	Bad 1	Good	Very bad
4	The Luda Yana from the mouth of the Strelchanska Luda Yana to the mouth	3	PO_4, P- total, Mn, Cu, Fe	bad	Good	Very bad
6	The Chepinska from initial correction to the mouth and Grohocha river	average 3	Bad BOD5, N total, NH4, PO4, P total	Bad 1	Good	Very bad
7	The Selska river and its tributaries and ГОК Chakasha	average 3		average 3	Very good	average

Environmental condition report from RIEW – Pazardzhik for 2011.

The industrial wastewater is treated in local treatment plants and ad=fter that discharged in the urban sewerage system and further treated in the WWTP designed for 150,0000 PE for the period till 2025.

The industrialfacilities with own treatment plants in Pazardzhik municipality are the follwoinf: Elhim Iskra AD, Duropak Trakia AD, Kauchuk AD, Ognyanovo K AD, Informacionni nositeli AD, Garo OOD, Ognyanovo winery OOD as all of them dischreg their treated wastewater in a II category water body.

There is no treatment plant in the pig farm in Apriltsi village (Svikom AD, Pazardzhik), which has been fined under the Water Act for illegal discharge of untreated wastewater.

Pazardzhik with limited pollution load – the wastewater from the southern industrial zone is not included in the UWWTP Pazardzhik (subject to future reconstruction for impriving the treatment with Nt and Pt removal) and all the wastewater from the nearby villages: Ivaylovo (included only partially), Saraya and Dragor, Miryantsi (on the territory of which is situated UWWTP Pazardzhik).

In the region of Pazardzhik municipality potential water body polluters are the industrial companies. A lot of them have local WWTPs and the treated wastewater comply with the requirements set in the discharge permission.

mines (currently part of them are in liquidation) , mill tailing dams, etc. They are situated outside the designated territory but the pollution from them depending on its extent in many cases cause excess pollution of the water and rivers passing via the designated territory served by ViK Pazardzhik. Measures for limiting the pollution from the former mines to a minimum have been undertaken.

animal farms – Svikom pig farm, poultry farms, etc. When the control is poor situations involving excess pollution of the river water occur.

The rivers Elshishka and Topolnitsa between Panagyurishte and Pazardzhik are polluted in emergency breakdown situations by the potential polluters (in 2011 Eko Medet EOOD polluted the right-side tributary of the Elshishka with wastewater containing excess quantity of copper, iron, manganese, sulphates, etc. The cause for excess pollution with organic and biogenic elements in emergency breakdown situations are the Svikom pig farm, poultry farms, etc).

3.1.3. GROUNDWATER RESOURCES

3.1.3.1. *General features*

Water supply and sewerage EOOD-Pazardzhik manages 112 water abstraction facilities (tube and shaft wells, spring catchments). According to their type and municipality location the water abstraction facilities are summarized in the table below.

Table 3-5 Number and distribution of the operating groundwater abstraction facilities

Region of operation	Type of water abstraction facilities, number			Total number
	Tube wells	Shaft wells	Spring Catchments	
Pazardzhik	58	7	9	74
Lesichovo	6	-	-	6
Septemvri	17	-	8	32
Total	81	14	19	112

Water supply of settlements rely on water sources in the terrace of Maritsa River and its tributaries and on local water sources. There are only groundwater sources i.e. 81 tube wells (TW) with depth up to 100 m, 14 shaft wells (SW) with depth up to 20 m and 17 spring catchments.

3.1.3.2. Groundwater quantity

The company operates 62 water abstraction facilities based on 14 issued water abstraction permissions. For the remaining 50 water abstraction facilities: 6 applications are filed in East Aegean Sea Region Basin Directorate-Plovdiv, 4 applications are already prepared, but not filed. Currently, the applications for the remaining 6 water sources are being drawn up. The permitted water quantities pursuant to the abstraction permissions are presented in Appendix 33 which shows that the total quantity of the groundwater resources used by Water Supply and Sewerage EOOD-Pazardzhik amounts to 21.3*10^6 m^3/year (675.3 l/s). Its distribution for each groundwater body and operational region is presented in the table below.

Table 3-6 Distribution of groundwater resources as per groundwater body and municipality

Municipality	Average annual water quantity as per GWB, m^3/year				Total m^3/year.
	BG3G000000Pt047	BG3G000000Pt044	BG3G0000PgN020	BG3G00000NQ013 BG3G000000Q018	
Pazardzhik	131000	63070	267000	15595038	16 056 108
Lesichovo	-	-	-	300000	300000
Septemvri	313000	6300	-	4621350	4940650
Total	444000	69370	267000	20516388	21296758

**A total figure for water quantities is given for water bodies BG3G00000NQ013 and*

None of the sanitary protection zones is compliant with the provisions of Ordinance №3/16.10.2000.

3.1.3.3. Groundwater quality

Information for the performed monitoring of the chemical condition parameters of the groundwater used for drinking and household water supply is presented in Appendix 3-7. It shows that the concentrations of the examined parameters in almost all water abstraction facilities comply with Ordinance No 9/16.03.2001 on the quality of water intended for drinking and household purposes, with the Quality Standard in Ordinance No 1/10.10.2007 on the survey, use and preservation of groundwater and with Directive 98/86/EC /. An exception is the water from PS Ivaylo in which the nitrate contents up to and in 2011 has exceeded the regulatory limits 1.3 times. According to the last results from 2012 presented by the RIEW – Pazardzhik with letter with ref. No I-1935/28.02.2013 of Consortium Seureca, SCE, Arcadia, as a result of the partially built sewerage network of the village of Ivaylo, situated within the borders of the SPZ of the water sources, a gradual decrease of the nitrate concentrations in the drinking water is observed with a tendency to reach the admissible regulatory limits.

The protection of water quality is implemented by establishing sanitary protection zones in three areas the borders of which are determined under Ordinance No

3/16.10.2000 on the terms and conditions for the survey, design, approval and operation of sanitary protection zones around the water sources and facilities for drinking and household water supply and around the water sources of mineral water used for medical, preventive, drinking and hygiene purposes. This ordinance will be supplemented with the Ordinance for water protection zones pursuant to Art.135, para. 1, item 6 of the Water Act.

Table 3-7 Summary of the water quality

Water yielding zone /groundwater body/	Standards compliance	Problematic parameter
„Fracture water – western Rhodopes complex“ with code BG3G0000Pt047	Groundwater quality is compliant with Ordinance No 9/16.03.2001, Quality Standard in Ordinance No 1/10.10.2007 and Directive 98/86/EC/	No problematic parameters
„ Fracture water – western and central Balkan masiff” with code BG3G00000Pt044	Groundwater quality is compliant with Ordinance No 9/16.03.2001, Quality Standard in Ordinance No 1/10.10.2007 and Directive 98/86/EC/	No problematic parameters
„Karst water – Malko Belovo” with code BG3G00000Pt037	Groundwater quality is compliant with Ordinance No 9/16.03.2001, Quality Standard in Ordinance No 1/10.10.2007 and Directive 98/86/EC/	No problematic parameters
„Pore water in the Neogene - Quaternary – Pazardzhik-Plovdiv district” with code BG3G00000NQ018	Groundwater quality is compliant with Ordinance No 9/16.03.2001, Quality Standard in Ordinance No 1/10.10.2007 and Directive 98/86/EC/ with small exceptions	Groundwater from the tube wells of Ivaylo village had increased nitrate contents but the concentration decreased in 2012 under the standard limit. In the village of Pamidovo has been found increased manganese content.
„ Pore water in the Quaternary – Upper Thracian lowlands” with code BG3G000000Q013	Groundwater quality is compliant with Ordinance No 9/16.03.2001, Quality Standard in Ordinance No 1/10.10.2007 and Directive 98/86/EC/	No problematic parameters

3.1.4. WATER RIGHTS AND OVERALL UTILISATION OF RESOURCES

3.1.4.1. *Water rights*

A main principle with regard to ownership of natural resources on the territory of the Republic of Bulgaria is that they are public state property. This principle is also applicable to the property right of water and water bodies. Public state property is river water as well as water in reservoirs including water in dams and micro-dams, natural lakes and groundwater.

Public state property are also the mineral water resources under Appendix No 2 to Art.14, item. 2 of the Water Act.

In the designated territory of Pazardzhik there are no surface water abstraction facilities for the purposes of drinking and household water supply.

3.1.4.2. *Problematic zones with scarcity of water or conflicts among various consumers (domestic, industrial, agricultural and electricity generation)*

The surface water discharge of the rivers in the designated territory of ViK Pazardzhik is used by the economic sectors of energy generation, irrigation and industrial water supply. There are no surface water abstraction facilities for the purposes of drinking and household water supply built.

The main water consumers are:

Drinking and household water supply – in the designated territory of ViK Pazardzhik the supply of drinking water to the population is performed by the company “Water supply and sewerage” EOOD – Pazardzhik. There are no water catchments built on the river network.

The settlements in the designated territory are supplied from water yielding zones in the terrace of the Maritsa and its tributaries by wells (tube, shaft) and drainages.

There are no problems with the water supply in the region resulting in the disturbed water use of seasonal or permanent nature. Water from small rivers and tributaries is not envisaged to be used for energy generation and their use for irrigation during the recent years has seriously decreased. Due to this the available water resources in the region can be used for the purposes of water supply.

Existing water resources are sufficient to supply the settlements with drinking water / no water shortage /.

Industrial water supply - in the designated territory of Pazardzhik there are no large water consumers outside the administrative centres and settlement agglomerations.

The bigger part of the industrial water supply is based on groundwater use. 6,600 million m^3 of water are used for industrial purposes from the basin of the Luda Yana river (EASRBD).

Irrigation – the favourable topographic, climate and hydrological conditions and the fertile soil in the region of the designated territory of Pazardzhik have created conditions for intensive agriculture development, for significant hydromelioration construction and high degree of utilization of the available water resources. In the region are built some big irrigation systems which cover the plain and most fertile agricultural areas in the region. The irrigated areas are compact and form common plots which are naturally divided by the water source and topographic conditions. They cannot be separated for each municipality and istricts since some of the water sources are the same and are united in one irrigation system.

In the designated territory of Pazardzhik belong areas of the existing irrigation systems IS Karabunar, IS Topolnitsa, IS Aleko-Pazardzhik, IS Varvara and IS Aleko- Potoka".

The irrigation systems in the designated territory of Pazardzhik are operated by "Napoitelni sistemi"EAD – branch Topolnitsa at the MAF.

In the designated territory of Pazardzhik are built also many small dams – 16 in total. Part of them have lost their initial function to irrigate areas of various size and now have undefined purpose. They are used mainly for fish breeding and have no impact on the water balance of the territory.

Hydro energy generation – in the designated territory exist hydro energy facilities mainly small hydro power plants.

<u>Total balance of permitted water abstraction quantities</u>

The balance of the water quantities permitted to be abstracted by the EASRBD on the designated territory of ViK Pazardzhik is presented in the table below**.**

Table 3-8 Water quantity balance

Basin	Water abstraction point	GWB	Irrigation	Power generation	Fish breeding	Industrial purposes	Other purposes
Pazardzhik municipality							
the Maritsa	The Luda Yana					6 600	
	the Chepinska (Eli dere)			32 000 000			
Total for Pazardzhik municipality		0	0	32 000 000	0	6 600	0
Septemvri municipality							
the Maritsa	the Chepinska			102 720 000			
	Micro dam		2 987				
	the Maritsa						8 000
	the Chepinska			92 720 000			
Total for Septemvri municipality		0	2 987	195 440 000	0	0	8 000
Total for the designated territory of Pazardzhik		0	2 987	227 440 000	0	6 600	8 000

The table above shows that no surface water is used for drinking water consumption, there is no conflict and shortage of drinking water supply.

3.1.4.3. *Important limitations on the use of surface and/or groundwater for each agglomeration*

- ✓ **Territories determined for abstraction of water intended for human consumption pursuant to Art. 7 of the District Directorate of Interior**

Within the designated territory the surface water bodies are not used for DHWS. The protection of the water quality used for drinking and household purposes abstracted from groundwater sources is ensured by the establishing of sanitary protection zones.

- ✓ **Water protection zones for the conservation of natural habitats in which the maintenance or improvement of the water condition is an important factor for their conservation including the respective sites under Natura 2000 defined pursuant to Directive 92/43/EEC for the conservation of natural habitats and Directive 79/409/EEC on the conservation of wild birds**

Table 3-9 Zones with restricted use of surface and/or groundwater

No	Agglomeration	Water bodies	Natura 2000
1. Protected zones under the Habitats Directive 92/43/EEC.			
1.1.	Pazardzhik municipality	The Luda Yana in the section of the Strelachanska Luda Yana BG3MA700R149	PZ “The Luda Yana river” BG 0000426
1.2	Pazardzhik municipality and Septemvri municipality	The Maritsa with code BG3MA790R157- section from Belovo to the Topolnitsa and ГОК13-К1(ГК1) and code BG3MA700R143 the section from the Topolnitsa to the mouth of the Vacha	PZ “The Maritsa river” BG 0000578
1.3.	Septemvri municipality	The Chepinska from initial correction to the mouth and Grohcha river code BG3MA900R184	PZ “Yadenitsa” BG 0001386
2. Protected zones under the Birds Directive 79/409/EEC			
2.1	Pazardzhik and Septemvri municipality	The Maritsa with code BG3MA790R157- section from Belovo to the Topolnitsa and ГОК13-К1(ГК1) and code BG3MA700R143 the section from the Topolnitsa to the mouth of the Vacha. The Topolnitsa in the section from Dragor village to the mouth and Elshitsa water body with code BG3MA800R158	PZ “Zvanichevo fisheries” BG 0002069
2.2	Pazardzhik municipality (Govedare village)	The Maritsa with code BG3MA700R143 the section from the Topolnitsa to the mouth of the Vacha.	PZ “Maritsa Plovdiv” BG 0002087
2.3	Pazardzhik municipality	The Maritsa with code BG3MA700R143 the section from the Topolnitsa to the mouth of the Vacha. The Luda Yana in the section of the Strelachanska Luda Yana BG3MA700R149 The Selska river and tributaries and ГОК Chakasha with code BG3MA700R156	PZ “Besaparski ridove” BG 0002057

The stated zones defined as “sensitive for the conservation of natural habitats in which the maintenance or improvement of the water condition is an important factor for their conservation including the respective sites under Natura 2000 defined pursuant to Directive 92/43/EEC for the conservation of natural habitats and Directive 79/409/EEC on the conservation of wild birds. In order to guarantee the protection of the natural habitats and habitats of species the plans, programmes, projects and investment intentions are subjected to appropriate assessment with the subject and purposes of preservation of the respective protected zone. The terms and condition for carrying out the assessment are set in Ordinance under Art.31 of the Biodiversity Act.

⇒ **Sensitive areas - the zones sensitive to biogenic elements defined as sensitive pursuant to Directive 91/271/EEC and zones defined as vulnerable pursuant to Directive 91/676/EEC.**

- Groundwater body –“Pore water in the Neogene - Quaternary – Pazardzhik-Plovdiv region” with code BG3G00000NQ018 belongs to a vulnerable zone pursuant to Directive 91/676/EEC
- Surface water monitoring stations in connection to Directive 91/676/EEC as follows:
  - On the Chepinska river before it flows in the Maritsa at the village of Kovachevo
  - the Maritsa-Pazardzhik
- pursuant to Directive 91/271/EEC have been defined sensitive zones (РД 970 and the requirements for improved water body condition)
- The wastewater from all agglomerations in “sensitive zone” must be treated for removal of the biogenic elements nitrogen and phosphorus up to the increased requirements. In the designed WWTP for the settlements in the designated territory of Pazardzhik (the existing UWWTP of Pazardzhik will be reconstructed for increased reduction of biogenic elements Nt and Pt t), in the future UWWTP for Septemvri are envisaged facilities for increased reduction of biogenic elements Nt and Pt.

3.1.5. POTENTIAL POLLUTION THREATS

The potential pollution threats of water in the designated territory are problems having negative influence on surface water and groundwater quality.

No point source and diffuse pollution sources have been registered which pollute the water abstraction facilities used for drinking and household water supply of Pazardzhik municipality.

Table 3-10 Type of pressure used to determine water bodies in risk by different activities

	Type of Pressure	Significant sector/activity
1.	Diffuse pollution	- Urbanized territories without sewerage system and WWTP in many of the settlements within the designated territory served by ViK Pazardzhik Domestic water from population is collected in septic tanks and creates real risk for groundwater and people’s health. - industrial workshops and sites of industrial companies without efficient site sewerage systems are potential polluters of the soil and water. (petroleum product warehouses, residue oil plants with uncleaned old pollution sources,

	Type of Pressure	Significant sector/activity
		warehouses for chemical substances used as raw materials in the industry, etc.). Risk of excess pollution of soil and water is created. - Agriculture - Uncontrolled application of fertilizers, temporary storage of plant protection agents, non-performance of the good agricultural practice recommendations. - Stock-breeding - Accumulation of manure mass, water pollution when washing animal breeding premises, etc . There is a risk of water pollution above permissible levels with biogenic elements nitrogen compounds, phosphorus compounds, etc. - Waste landfills, unauthorised dump sites, uncontrolled accumulation of construction and domestic waste in the outskirts of the settlements - Car repair and transport activity - washing the transport vehicles at places having no sewerage, spill of oils and petroleum products, etc.
2	Point source pollution	- Urbanized territories, where settlements have sewerage systems but no WWTP : - the sewerage system of the southern zone is not connected to the existing UWWTP Pazardzhik (it will be connected as well as the nearby settlements: Ivaylovo, Aleko Konstantinovo, Glavinitsa, Hadzhievo, Ognyanovo, Dobrovnitsa, Dragor, gelemenovo, Saraya, Miryantsi, Mokrishte and Sinitovo . Additional treatment for Nt and Pt removal will also be carried out.) - The wastewater of Septemvri, Varvara and Vetrin dol (WWTP Septemvri will be built to treat the wastewater from the three settlements), - other settlements in the designated territory with partially built sewerage systems (suggested group treatment in separate WWTPs): settlements of the groups Malo Konare, Patalenitsa, Bratanitsa and Yunatsite. content of organic pollution in the receiving waters is increased, dissolved oxygen content is decreased, nutrient content is increased, which leads to eutrophication, conditions for negative impact on biodiversity and sustainable development of water ecosystem are formed, the self-cleaning capacity of the water body is reduced. Preconditions for health risk are created. – Industry - Enterprises discharging untreated or insufficiently treated waste water directly into the receiving body or sewerage systems of the settlements where the local WWTP is inefficient or there is no such. Potential polluters are many food processing companies in the designated territory (wineries, dairy processing and meat processing factories and others in the settlements in the municipalities of Lesichevo, Pazardzhik, Septemvri), transport companies, vehicle parks, car repair shops, etc. - animal farms where conditions for uncontrolled breakdown leaks of wastewater exist – pig farm in Apriltsi (Pazardzhik municipality) – owned by Svikom AD Pazardzhik, etc. - Enterprises discharging untreated or insufficiently treated waste water directly into sewerage systems of the settlements where the local WWTP is inefficient - This creates a risk of volley pollution of the total wastewater flow and can compromise the optimal treatment of wastewater in the future WWTPs. - the Luda Yana and the Topolnitsa rivers are under potential risk of pollution with metal ions from mining facilities situated outside the borders of the territory served by ViK Pazardzhik. If strict control and efficient water management is

	Type of Pressure	Significant sector/activity
		carried out in these regions the excess pollution of the water bodies' sections in the region of the designated territory is expected to be reduced. In the designated territory on the land of Tsar Asen village is situated Yonteh OOD – installation for cathode copper and zinc sulphate production (industrial water supply from the Luda Yana). If all conditions for complex prevention and pollution control are complied with the company does not cause any negative impact (it does not discharge wastewater), since the discharge of industrially polluted wastewater including water from security gutters under the waste heap and the cooling water in the Luda Yana is not permitted.
3.	Morphological alterations	Industry / extraction of sand and aggregates, etc. embankments and river corrections
4.	Other specific processes	Erosion, intrusion

3.1.6. CONCLUSIONS AND RECOMMENDATIONS

Water Supply and Sewerage EOOD - Pazardzhik has sufficient quantity of resources and groundwater sources to satisfy the drinking and household and other needs of the population in the served settlements.

There are no restrictions on the use of surface water and groundwater for drinking water supply and other purposes as their determined resources and water quality fully satisfy the requirements in the relevant legal and statutory documents i.e. Water Act, Ordinance № 1/10.10.2007 on groundwater exploration, use and protection, Ordinance № 2 concerning the protection of waters against pollution caused by nitrates from agricultural sources, Ordinance № 3/16.10.2000 on the terms and conditions for investigation, design, approval and operation of sanitary protection zones around water sources and facilities for drinking-domestic water supply as well as around mineral water sources used for medicinal, preventive, drinking and hygienic purposes, Ordinance № 9/16.03.2001 on the quality of water, intended for drinking purposes, Ordinance No 9/16.03.2001 on the quality of water intended for drinking and household purposes (subject to supplementation with Ordinance for water protection zones pursuant to Art. 135, para. 1, item 6 of the Water Act), Directive 98/86/EC/ concerning the quality of water intended for human consumption, etc.

The major part of the territory has sufficient groundwater of quality compliant with the drinking water standards located at a depth between 10-100 metres under the surface. Water use permissions of some local water sources have not been renewed and none of the sanitary protection zones is consistent with the provisions of Ordinance No3/16.10.2000.

The company operates 62 water abstraction facilities based on 14 issued water abstraction permissions. For the remaining 50 water abstraction facilities: 6 applications are filed in East Aegean Sea Region Basin Directorate-Plovdiv, 4 applications are already prepared, but not filed. Currently, the applications for the remaining 6 water sources are being drawn up.

3.2. WATER POLLUTION

3.2.1. MAJOR POLLUTION SOURCES

Water pollution sources are related to anthropogenic activities.

Point sources of surface water pollution:

Point sources are the main cause of excess pollution of water bodies and deterioration of their chemical and ecological condition. The main point source pollution sources are the population and industrial companies of the settlement. The population generates pollution load characterised by the organic contents measured with the equivalent parameters BOD_5 and COD, suspended solids and biogenic elements expresses in various nitrogen and phosphorus compounds.

Domestic and industrial wastewater is discharged without permission in rivers and gullies which pollutes the soil and water in the region. This results in health risk to human health as well as poor living conditions and polluted environment.

⇒ ***Discharges of untreated wastewater from urban sewer collectors***:

- Agglomerations with constructed sewerage network in Pazardzhik municipality are connected to WWTP Pazardzhik. There are occasional discharges of untreated wastewater in the nearby rivers as less than 5 times diluted wastewater during rains.
- Agglomeration Septemvri – current project for WWTP Septemvri 14,000 PE.
- Many of the settlements below 2,000 inhabitants have partially built sewerage networks (15-50%) and direct connections of untreated wastewater from separate facilities which creates health risks.

⇒ ***Wastewater discharged from certain facilities without local WWTPs or with local treatment plants which do not treat the wastewater up to the defined requirements for individual emission limits pursuant to the discharge permissions.***

- Facilities in which operation generates biodegradable industrial wastewater – dairy processing factories, fruit and vegetable processing factories, meat processing industry, wineries, etc. Almost all companies have treatment facilities for the wastewater but almost al of them have problems with the quality of treated wastewater and in many cases pollute the water bodies in which the wastewater is discharged.

▪ **Diffuse pollution sources:**

The main diffuse pollution sources are:

- Urbanized territories, settlements and facilities without sewerage system (using cess-pits, absorption wells, etc..). Large part of the wastewater is mostly discharged into the ground and create conditions for pollution of soils, groundwater and surface water and health risk in the region.
- Waste – illegal solid household waste landfills , uncontrolled disposal of waste.
- Animal breeding – uncontrolled storage of manure
- Automobile and railway transport as well as transport maintenance works;

- Industry – industrial sites, storage areas of plants, etc..

Industry as a source of wastewater pollution.

The industrial plants are situated mainly in the municipal centres as the limiting industrial companies are situated in the disctrict centre of Pazardzhik. On the territory served by ViK Pazardzhik operate industrial companies as most of them are connected to the sewerage systems of the settlements or discharge independently in the various water bodies. Among the connected companies are food processing companies (bread and baked goods production, pastry shops, non-liquor drinks production, dairy processing companies, meat processing factories, etc.), machine building companies, wood processing factories, textile companies, transport companies, etc. which generate wastewater with pollution which is relative to the overall load and will be included for treatment in the future WWTPs. The wastewater from the food processing industry is characterised with increased contents of organic substances, susupended solids, biogenic elements and oils from vegetable and animal origin. Almost all companies have local WWTPs built but many of them fo not treat the wastewater to the requirements for discharging into water bodies.

The wastewater from the wood processing and textile companies has domestic pollution nature. The wastewater from machine building contains no organic pollution. The wastewater from fuel stations, car repair shops and other transport companies has limited organic pollution and contain lubricants and petroleum products (if the sludge and grease trap operates effectively no excess pollution should be expected) .

Pazardzhik municipality: Indistrial wastewater is treated in local treatment plants and then discharged into the urban sewerage network and further treated in the UWWTP designed for population of 150,000 PE for the period till 2025.

The industrial facilities with treatment plants which are not connected to the *Pazardzhik* WWTP *and Septemvri WWTP* are:

- Elhim Iskra AD – accumulator batteries manifacturing – the wastewater contains metal ions of Pb, Cu, Fe, etc. The wastewater is treated in a local WWTP and discharged into *Pishmanka River*.
- Kauchuk AD – rubber products manufacturing – treatment facilities for industrial and domestic wastewater. The treated wastewater is discharged in the Pishmanka river *through* 3 collectors.
- Duropak Trakia AD on the *land belonging to* Glavinitsa – paper manufacturing. The industrial wastewater contains increased levels of suspended solids (mainly fiber) and organics. The treatment plant for domestic and industrial wastewater is currently under reconstruction and modernisation (WWTP for mechanical, physical and chemical and biological treatment). The treated wastewater is discharged in the Pishmanka river after the drainage *channel* of HPP Aleko.
- Ognyanovo K AD - the wastewater contains increased levels of suspended solids. There *ar*e treatment facilities built and operating. The treated wastewater is discharged in the Maritsa *River, which is a* III category *receiving* water body.

- Informacionni nositeli AD – hot plate coating, digital storage disks, etc. – treatment facilities for physical and chemical and biological treatment. The treated wastewater is discharged in the Topolnitsa - II category water body receiver.
- Garo OOD – meat production and processing - the wastewater contains organic substances, suspended soilds and oils of animal origin and biogenic elements - local WWTP for domestic and industrial wastewater. The treated wastewater is discharged in the Topolnitsa *River, which is a* II category *receiving* water body.
- Ognyanovo Winery OOD – wine and liquor production - the wastewater contains organic substances, suspended soilds. Local WWTP for mechanical and biological treatment. The treated wastewater is discharged in drainage *channel* No 000480- II category receiv*ing water body* .
- Septemvri municipality – Eko F AD – milk, dairy and ice cream production. The wastewater contains organic substances, suspended soilds and oils of animal origin and biogenic elements. After the local WWTP the treated wastewater is discharged in the Gerenska river /Karabunarsko dere/ - II category *receiving* water body.

Industrial facilities-polluters without treatment plants, discharging directly into the receiving water body:

- Kalufrukt *P*roduction OOD – Kalugerovo, Lesichovo municipality - plum concentrate production and pastry shop. *It w*orks seasonally. The wastewater is polluted with oganic substances and is dicharged in a municipal canal which flows into the Topolnitsa river.*It is necessary to study the the possibility of joint treatment of water from Kalufruct Production OOD together with water from the future WWTP of the agglomeration*.
- Animal breeding farms – small animal farms mostly pig farms. The main polluter is the pig farm in the village of Apriltsi (Svikom AD, Pazardzhik) operating without treatment plant ,which has been fined pursuant to the Water Act for illegal discharge of untreated wastewater. The pig farm in the village of Apriltsi has a treatment plant for industrial wastewater from the farm, but it is non-operational. This wastewater should not be mixed with the urban wastewater.

Table 3-11 Pollution sources and quantities discharged in the river water in the designated territory

River basin	Pollution source	Quantity of wastewater discharged in receiving body [million of m³/year]	Pollution load discharged in receiving body [kgBOD5/year]	Assessment according to the wastewater discharge permission, treatment level
The Maritsa	Pazardzhik	5,291,405	1,702,360	Treated in the existing WWTP Pazardzhik . ongoing project for expansion of WWTP for Nt, Pt removal.

River basin	Pollution source	Quantity of wastewater discharged in receiving body [million of m³/year]	Pollution load discharged in receiving body [kgBOD5/year]	Assessment according to the wastewater discharge permission, treatment level
Tributary of the Maritsa, the Maritsa	Septemvri	529,615	173,010	Ongoing project for WWTP Septemvri 14 000 ЕЖ
The Maritsa	Pazardzhik, Ivaylo municipality	135,050	62,780	Treated in the existing WWTP Pazardzhik . ongoing project for expansion of WWTP for Nt, Pt removal.
	Industry Septemvri municipality	254,282	No data	Wastewater of industrial companies on the territory of the town of Septemvri are envisaged to be treated in Septemvri WWTP.
the Maritsa	Industry Pazardzhik municipality	646,672	No data	Treated in the existing WWTP Pazardzhik . ongoing project for expansion of WWTP for Nt, Pt removal.
	Elhim Iskra AD	No data	No data	Existing WWTP - industrial
	Kauchuk AD	No data	No data	Existing WWTP- industrial
	Industry Pazardzhik municipality Industry Ognyanovo K AD	No data	No data	Existing WWTP- industrial
	Ognyanovo Winery OOD	No data	No data	Existing WWTP – industrial, drainage channel No 000480- II category receiving body
	Duropak Trakia AD on the territory of Glavinitsa	No data	No data	Existing WWTP– industrial in the Pishmanka river after the drainage channel of HPP Aleko
	Industry Informacionni nositeli AD Pazardzhik municipality	No data	No data	Existing WWTP– industrial
	Industry Garo OOD Pazardzhik municipality	No data	No data	Industry : Garo EOOD Pazardzhik municipality

Note: Wastewater of Elhim Iskra and Kauchuk AD is not connected to the urban wastewater treatment plant of Pazardzhik

3.2.2. IMPACT OF WASTEWATER DISCHARGE

3.2.2.1. *Impact on surface water*

Surface water quality monitoring is carried out by the subdivisions of MoEW on the basis of special programmes for surveillance and operational monitoring.

The main objective of surveillance monitoring programme is to provide comprehensive and detailed summaries of the ecological and chemical status of the various water bodies, by identifying the base line of their status and ensuring option for classification of the water sites in five categories according to the statutory definitions.

In general, the frequency of monitoring is consistent with the variability in parameters, obtained as a result of natural or anthropogenic conditions.

The surface water monitoring stations on the Maritsa, the Luda Yana and the Topolnitsa rivers in the designated territory are included in the Operational monitoring programme of the water bodies of category "river" in the Maritsa River basin.

Apart from the physical and chemical analysis of water an Assessment of the condition of water bodies by hydro biological control is also performed.

The biggest pressure comes from the point source pollution – untreated wastewater from the settlements.

In the service territory the water bodies which are at risk for achieving their ecological objectives pursuant to the RBMP are the Panagyurska Luda Yana River form Panagyurishte to the flowing in of Strelchanska Luda Yana 30 km, code BG3MA700R150; the Panova River at the village of Oborishte, DHWS 1,9 km, code BG3MA700R151 and the village of Bezimenna, Muley area, code BG3MA700R155 - 3,9 km. The necessary measures for minimizing the level of ecological risk have been undertaken.

3.2.2.2. *Impact on groundwater*

The main risks for groundwater pollution are as follows:

- Long-term pollution of terrains near water abstraction facilities caused by industrial, agricultural or domestic sources. (incompliance with the requirements for permitted activities in the SPZ. Unauthorized access of people and animals, etc.)
- Authorised and unauthorized waste landfills and dump sites in the settlements of the designated territory, which are not compliant with the statutory requirements, causing pollution of shallow aquifers and deep aquifers;
- Uncontrolled use of fertilizers and pesticides for agricultural purposes causing high concentrations of nitrate in shallow aquifers
- Exfiltration of sewerage from leaking sewerage networks might particularly constitute a pollution risk in areas with high soil porosity and high groundwater tables (i.e. Pazardzhik, Septemvri and Ivaylo village).

- Exfiltration of sewerage from on-site sanitation facilities (leaking septic tanks and latrines) might particularly constitute pollution risk in settlements below 2,000 P.E. located in areas with high soil porosity and high groundwater tables

3.2.3. SLUDGE MANAGEMENT AND DISPOSAL

Techniques of sludge treatment and end use options are described in detail in the chapter dedicated to the methodology (section 4.1.1.4.4 Technical Design Criteria, subsection Wastewater Sludge Treatment).

Throughout Bulgaria, the final destination of sludge in almost all situations is landfills. However, in some cases, sludge enhancement is carried out for land use (non-farming) after sludge digestion (usually vermiculture).

This situation stems from the fact that first, non-domestic discharges are not mastered by operators (risk of pollution of sludge) and second because prospective studies on sludge management for agricultural use have not been conducted.

These studies and actions are the responsibility of the feasibility and design studies (or specific studies), not included as part of this regional master plan. Therefore, the Consultant's investment programmes do not include such measures.

However, the consultant recommends to initiate this type of thinking in future feasibility and design studies but also to initiate a specific study on actions to conduct at the national level with several pilot sites.

This action study includes several components:

- Analysis and proposed regulatory changes regarding Bulgarian sludge management
- Assessment of the industrial situation on the pilot sites
- Assessment of the existing management of sludge on the pilot sites
- Determination of potential agricultural uses on the pilot sites
- Prospective actions with potential users
- Socio-economic actions and communications to educate the public concerned
- Design educational courses
- Assistance in the implementation of contracts between operators and end users of sanitation sludge

3.2.4. WATER QUALITY MONITORING

3.2.4.1. *Drinking water quality monitoring*

Monitoring on the quality of water intended for drinking and household purposes is performed by „Water supply and sewerage - EOOD Pazardzhik under a programme elaborated together with RHI – Pazardzhik in compliance with the provisions of

Ordinance No 9/ 16.03.2001 on the quality of water intended for drinking and household purposes.

The programme is updated annually according to the results from the previous year.

The monitoring is executed in each water supply zone. (pursuant to Ordinance No 9/ 16.03.2001 “water supply zone” is a geographically defined area within which water with approximately similar quality is abstracted or distributed from one or more water sources).

3.2.4.2. *Wastewater quality monitoring*

The wastewater of the settlement is usually the main polluter of the relevant basin. Water quality monitoring is carried out by Pazardzhik Regional Inspectorate for Environmental Protection /RIEW. The samples taken are processed in the regional laboratory of RIEW-Pazardzhik). With the building of WWTPs in the design stage has been developed a Plan for self-monitoring after the construction of the treatment plant. Such surveillance monitoring is periodically conducted by RIEW authorities. These control measurements normally take place every month. The following parameters characterise wastewater qualities and are compulsory to monitor: Suspended solids, BOD5, COD, Nt, Pt, ph. Water quantity is also determined. For controlling the operation of the separate facilities is performed also operational monitoring of the work and optimization of technological processes in the WWTP for certain parameters determined as per a schedule after commissioning the biological treatment and bringing it to stable operating mode. The condition of the sludge generated during the treatment process is also monitored in terms of their treatment (disposal or reuse).

Waste water from the individual enterprises, which is discharged or will be discharged into the sewerage system of the settlement, should be compliant with the requirements of Ordinance 7/2000 on the terms and conditions for discharge of industrial water into the sewerage systems of the settlements by building efficient local treatment facilities (where such are missing and their necessity has been proven) or rehabilitation and maintenance of the existing ones.

The monitoring, exercised by RIEW over the industrial companies, which do not discharge into the urban sewerage network is executed on the basis of a contract with each enterprise and may not occur at intervals longer than once per 4 months. The following parameters characterise wastewater qualities and are compulsory to monitor: Suspended solids, BOD5, COD, Dissolved Oxygen, NO3. If during the operation specific pollution is also established, these too will be included in the monitored parameters of wastewater.The enterprises Elhim Iskra AD, Kauchuk AD, Duropak Trakia AD Ognyanovo K AD, Informacionni Nositeli Ad, etc. that do not discharge into the urban sewage system and impose potential risk to the receiving body are subject to special monitoring .

3.2.5. CONCLUSIONS AND RECOMMENDATIONS

At present the main pollution source are the untreated wastewater coming from the town of Pazardzhik and other settlements on the territory of the municipality and discharged in the water body (the Luda Yana River and the Maritsa River. A Draft design for a wastewater treatment plant of the town of Pazardzhik has been elaborated and submitted to the Investor – including treatment of biogenic elements pursuant to the modified discharge permission and the category change of the Maritsa river from low sensitive to a sensitive zone. Along with this the connection of the south urban collector to the UWWTP is also expected. After the implementation of the planned works this pollution source is expected to be eliminated.

The nutrient removal stage is included in an on-going project. It is awarded by the Pazardzhik Municipality based on modified discharge permit due to reclassification of the Maritsa River - from a slightly sensitive area to a sensitive area

Some industrial polluters /Elhim Iskra AD, Kauchuk AD, Duropak Trakia AD, Ognyanovo AD, Informatsionni nositeli AD, etc./ are outside the area of operation of ViK Pazardzhik ООД. These companies have their own water sources and working wastewater treatment facilities.

The recommendation is to continue using the treatment facilities in compliance with the discharge permissions in the water body, as the companies Elhim Iskra AD and Kauchik AD do not discharge their wastewater in the urban treatment plant and in the future their sludge to be disposed of at the regional solid household waste landfill since in is not usable for other purposes.

The Consultant emphasizes that industrial wastewater of Elhim Iskra AD and Kauchuk AD should not be connected to the urban sewage system and from there to the urban treatment plant in order to prevent pollution that will make the generated sludge unsuitable for utilisation.

The Consultant notes that wastewater discharged by the pig farm in the village of Apriltsi should not be treated together with wastewater of the adjacent agglomeration due to the incompatibility of the treatment technology.

3.3. CURRENT WATER CONSUMPTION

3.3.1. CURRENT WATER CONSUMPTION BY CATEGORY OF WATER USERS

The table below presents the water balance results and its components for 2011.

Table 3-12 Summary of the produced water quantity, consumption and non-invoiced water in 2011

Settlement	Total supplied water quantity	Inhabitants	Temporary residents	Total population	Total invoiced water quantity in m3/year and rates								
					For the population	Rate	Industry and companies	Rate	Public consumers	Rate	Total quantity of water sold (invoiced)	**Total rate**	**Unbilled water (total losses)**
	m3/year	number	number	number	m3/year	l/c/d	m3/year	l/c/d	m3/year	l/c/d	m3/year	l/c/d	%
Pazardzhik	7,862,238	71,979		71,979	2,481,483	94	464,598	18	272,041	10	3,218,122	122	59
Aleko Konstantinovo	192,776	2,714		2,714	72,065	73	8,084	8	768	1	80,917	82	58
Bratanitsa	*188,567*	*2,093*		*2,093*	*58,083*	*76*	*1,899*	*2*	*1,041*	*1*	*61,023*	*80*	*68*
Varvara	508,407	2,061		2,061	71,481	95	6,680	9	676	1	78,837	105	84
Vetren	553,794	3,221		3,221	108,250	92	7,954	7	4,491	4	120,695	103	78
Glavinitsa	368,307	2,282		2,282	74,189	89	71,220	86	5,344	6	150,753	181	59
Ivaylo	263,045	2,841		2,841	99,099	96	7,519	7	1,050	1	107,668	104	59
Kovachevo	132,477	2,402		2,402	68,512	78	2,112	2	1,504	2	72,128	82	46
Malo konare	267,522	4,353		4,353	137,493	87	7,569	5	2,061	1	147,123	93	45
Ognyanovo	300,653	2,353		2,353	88,526	103	59,571	69	2,234	3	150,331	175	50
Septemvri	814,367	7,869		7,869	281,466	98	34,397	12	8,890	3	324,753	113	60
Chernogorovo	224,720	2,203		2,203	70,783	88	4,668	6	1,470	2	76,921	96	66
43 settlements below 2,000 inh.	5,037,288	40,063	1,225	41,294	1,446,215	96	134,445	11	39,793	3	1,620,453	110	67
Total	16,714,161	1476,434	1,225	147,665	5,057,645	94	810,716	15	341,363		6,209,724		63

Source:ViK EOOD Pazardzhik

Note: The number of population includes the number of permanent residents (2011 Census) and the number of temporary residents.

Information for water consumption as per user category and water balance is presented in **Appendix 3-5 and Appendix 3-6.**

3.3.2. WATER BALANCE AND NON-REVENUE WATER ASSESSMENT

Pursuant to the adopted methodology described in section 4.1. the water balance according to the IWA has been drawn. The main components of the water balance are: Total drinking water produced, billed (sold) water and unbilled water, which is the difference between total water produced and water sold. According to IWA, the unbilled water itself is divided into several components depending on the reasons why the relevant quantity has not been invoiced.

Table 3-13 IWA Water Balance for 2011 of ViK EOOD Pazardzhik

<table>
<tr><td rowspan="9">Total drinking water produced (system input) 16,714,161 m3/ year [Q]</td><td rowspan="4">Authorised consumption 6,215,974 m3/ year 37.19%</td><td rowspan="2">Billed authorised consumption 6,209,724 m^3/year 37.15%</td><td>Billed metered consumption 6 197,224 m3/year [A] 37.08%</td><td rowspan="2">Revenue water (billed) 6,209,724 m3/ year 37.15%</td></tr>
<tr><td>Billed unmetered consumption 12,500 m3/year [B] 0.07%</td></tr>
<tr><td rowspan="2">Unbilled authorised consumption 6,250 m3/ year 0.04%</td><td>Unbilled metered consumption 0 m3/ year [C]</td><td rowspan="7">Non-Revenue water (water losses) 10,504,437 m3/ year 62.85%</td></tr>
<tr><td>Unbilled unmetered consumption 6,250 m3/ year [D] 0.04%</td></tr>
<tr><td rowspan="5">Water Losses 10,498,187 m3/ year 62.81%</td><td rowspan="2">Apparent (Commercial) losses 2 100,887 m3/ year 12.57%</td><td>Theft 1,479,915 m3/ year [E] 8.85%</td></tr>
<tr><td>Metering inaccuracies 620,972 m3/ year [F] 3.72%</td></tr>
<tr><td rowspan="3">Real (Technical) losses 8,397,300 m3/ year 50.24%</td><td>Leakage on transmission and distribution lines 7,725,516 m3/ year [G] 46.22%</td></tr>
<tr><td>Leakage from overflow at storage tanks 0 m3/ year [H] 0.0%</td></tr>
<tr><td>Leakage on service connections 671,784 m3/r [I] 4.02%</td></tr>
</table>

Source: ViK EOOD Pazardzhik

Table 3-14 Assumption for Assessment of the Water Balance Components

Losses	Assumptions
Non-Revenue Water	Total non-revenue water is calculated as the difference between the total water quantity supplied to the water supply systems of the settlements (water produced) and the total quantity of water billed (sold). For unmetered water sources the quantity of the water has been estimated on the basis of their annual discharges. Data on water delivered and billed are provided by the Billing Department of the relevant WWS operator.
Unbilled metered consumption	There are no customers who have water meters, but are not billed, on the territory of ViK Pazardzhik.
Unbilled unmetered consumption	0.04 % of the total produced water quantity is for firefighting purposes, for periodical washing of water chambers of the pressure reservoirs and the water supply and sewerage networks
Unauthorised consumption	Based on information provided by the WSS operator, there are a certain number of illegal connections to the distribution networks of the settlements. Their exact number is difficult to establish, except when the street water distribution pipelines are replaced. It is assumed that 3.0% of delivered water is used as unauthorized consumption.
Metering Inaccuracies and handling data errors	Based on information provided by the WSS operator for the average age of the water meters, their frequent replacement and their accuracy, about 5.36% of the supplied water is lost from inaccuracies in metering of abstracted, supplied and billed water. All water meters are read monthly. The business programme of the operator includes scheduled annual inspections of the water meters /individual and common/.
Real Losses in the network	First real losses are calculated as a difference between non-revenue water (unbilled water) minus the above mentioned types of losses. Secondly, the performance indicators have been calculated (litres/connections/day) taking into account the system load, the network length, the number of connections and are interpreted according to the IWA matrix. Thirdly (the approach described above), real losses are calculated based in the metered water quantity during the night and data provided by the operator (average system load, number of damaged pipes, age and condition of the network, water balances, calculation of losses in pilot zones). The results of the above and below calculations are compared and the respective amendments of the balance components are made. The physical losses in the network result from invisible leakages, visible failures, reservoir overflow, drawdown of distribution networks for repair works or in case of breakdowns, etc. Real losses are calculated as a difference between non-revenue water (unbilled water) minus the above mentioned types of losses. Based on information provided by ViK EOOD Pazardzhik about 5.5% of the real losses in the network are formed due to failures and leakages at service connections. No water overflows have been registered at the reservoirs over the past years.

3.3.3. CONCLUSIONS AND RECOMMENDATIONS

The lost – unused water in the territory of ViK EOOD Pazardzhik is 63 % of the total quantity of supplied water. High losses are a precise indication for the condition of the existing water supply systems–transmission water mains and facilities, fixtures and equipment as well as the distribution networks – water mains, fixtures and service connections.

In settlements with significant terrain level differences (semi mountainous areas) the reservoirs have been construted at elevation providing the required pressure in the highest points – 2-3 atmospheres. For reducing the number of breakdowns additional pressure regulation is performed in 33 settlements. In the rest of the settlements with insignificant level differences (plain areas) the water quantity is supplied directly from the water sources (tube wells) to the distribution networks (without pressure reservoirs). The pumping units are equipped with electric frequency rotation regulation which also controls the discharge.

Considering the outdated equipment of the water supply systems with damaged seals on the pipes and fixtures – fire hydrants, stop valves, air chambers, small but permanent and hard to detect leaks often occur.

The abstracted water quantity is measured at the water sources. The supplied water quantity to each settlement is not measured.

The water metering system in the settlements' distribution networks is well organized – all consumers have water meters with seals. Some inaccuracies have been established due to faulty water meters and delays in the replacement of water meters after the statutory 5-year period of operation.

The measures proposed for reducing real/physical losses are as follows:

- Systematic detection, localization and repair of leakages (apply modern leak detection equipment /;
- Implementation of an advanced leakage monitoring system (i.e. installation of district metering areas or other strategies for water loss reduction /;
- Replacement of old water transmission (external) mains;
- Distribution network reconstruction – replacement of the asbestos cement pipes mostly used
- Replacement of the old service connections along with the network reconstruction.

The activities required for reducing apparent /commercial losses are as follows:

- Maintaining the good operation of all water meters at the water sources, replacement of old ones
- Installation of water meters where such are missing after all ground and tower reservoirs after the distribution chambers on the main branches in settlements with common reservoirs
- Continued implementation of the programme for verification and replacement of consumption water meters;
- Continued detection and legalization of unauthorized water connections.

3.4. WATER SUPPLY INFRASTRUCTURE

3.4.1. GENERAL FEATURES

According to the administrative division in the designated territory are included 53 settlements from three municipalities – Pazardzhik, Septemvri and Lesichovo and 1 settlement from Belovo municipality. The village of Dolno Varshilo from Septemvri municipality is not served by the WSS company. The village has never had centralised water supply managed by a WSS operator.

The water supply of the settlements is carried out from water sources in the terrace of the Maritsa river and its tributaries and from local water sources. All water sources are for groundwater – tube wells (TW) with depth up to 100 m – 81 in total, shaft wells (SW) with depth up to 20 m - 14 and spring catchments – 17. A total of 112 water sources, 33 PS, 17 BPS, many submersible pumps, 180 reservoirs and 971 km of water mains of which 237 km trunk mains and 734 km of distribution water mains provide drinking water to all 54 settlements in the territory served by ViK EOOD – Pazardzhik. WSS Vetren supplies water to the village of Akandzhievo / Belovo municipality / situated on the territory of ViK-Belovo.

About 70 % of the water mains are made of asbestos cement, the rest of steel, reinforced steel, PVC and polyethylene. The water mains have been used for over 30 years so they are near or past the end of their useful service life. The replaced water mains after1995 are of steel pipes and after 2000 of PVC and PE.

82% of the abstracted water has good quality parameters. Raw water quality is monitored (regularly and periodically) according to Ordinance №9/16.02.2001 on the quality of water intended for drinking and household purposes. In the water sources of WSS Ivaylo – 3 TW were found nitrate, calcium and sulphates above the permissible limits. In the territory served by ViK Pazardzhik EOOD there are no restrictions of the water supply.

25 water supply systems have been established for the water supply of the settlements. For better presentation the information for the components of the water supply infrastructure have been presented for each water supply system and summarized for each municipality following the manner of their organization and operation by ViK EOOD Pazardzhik.

Depending on the location and capacity of the water sources on the territory of Pazardzhik municipality there are 18 water supply systems functioning on the territory of Municipality 7 water supply systems Septemvri and Lesichovo municipalities.

3.4.2. EXTERNAL WATER SUPPLY SYSTEMS

3.4.2.1. *General features*

The existing external water supply systems on the territory of ViK EOOD Pazardzhik are presented on Maps No 2, 3 and 4.

In the present chapter are preseneted the water supply systems of settlements with population over 2,000 inhabitants on the territory of the operator. Water supply system Vetren includes the town of Vetren and 8 more settlements with population below 2,000. Detailed description o fthe other water supply systems /supplying groups of 2 settlements/, as well as of the independent systems is presented in Appendix 3-8.

3.4.2.2. *Main water supply systems*

3.4.2.2.1. *Water supply system "Vetren"*

Water supply system „Vetren" includes 9 settlements of which 4 on the territory of Septemvri municipality– the town of Vetren and the villages of Gorno Varshilo, Slavovitsa and Vinogradets , 4 on the territory of Lesichovo municipality - the villages of Lesichovo, Tserovo, Kalugerovo and Borimechkovo and Akandzhievo in Belovo municipality. The consumption is satisfied by 7 shaft-tube wells in the terrace of the Maritsa river on the territory of Vetren at about 4.2 km east of the town. The water supply system includes two main pumping stations – PS „Vetren" II-nd uplift, PS "Vetren" II-rd uplift.

The water from the wells is pumped to a PR with V= 100 m³ at PS „Vetren" II-nd uplift. The pimping station is equipped with two groups of pumps which pump the water in two directions:

- northeast to PR of Vinogradets village where by gravity it reaches the PR of Kalugerovo;

- northwest to SR with V= 50 m³ at PS „Vetren" II-rd uplift. From the suction reservoir by gravity the water is supplied to a PR of Akandzhievo and the pumping station II-nd uplift pumps the water along independent pressure mains with two groups of pumps to: PR low zone of Vetren and to PR of Vetren – high zone.

Due to the complex configuration of the terrain on the territory covered by WSS Vetren the water must be pumped to the village of Slavovitsa – by pumping station IV-th uplift, to Gorno varshilo – by PS V-th uplift, to Borimechkovo by two uplift pumping stations. The water reaches the villages of Akandzhievo, Tserovo and Lesichovo by gravity.

The built-up average annual minimum water quantities at the water sources exceed the required maximum 240hour consumption of the settlements of WSS „Vetren". Around the wells have been established SPZ and there is a Water use permission No31510236/02.06.2010 issued.

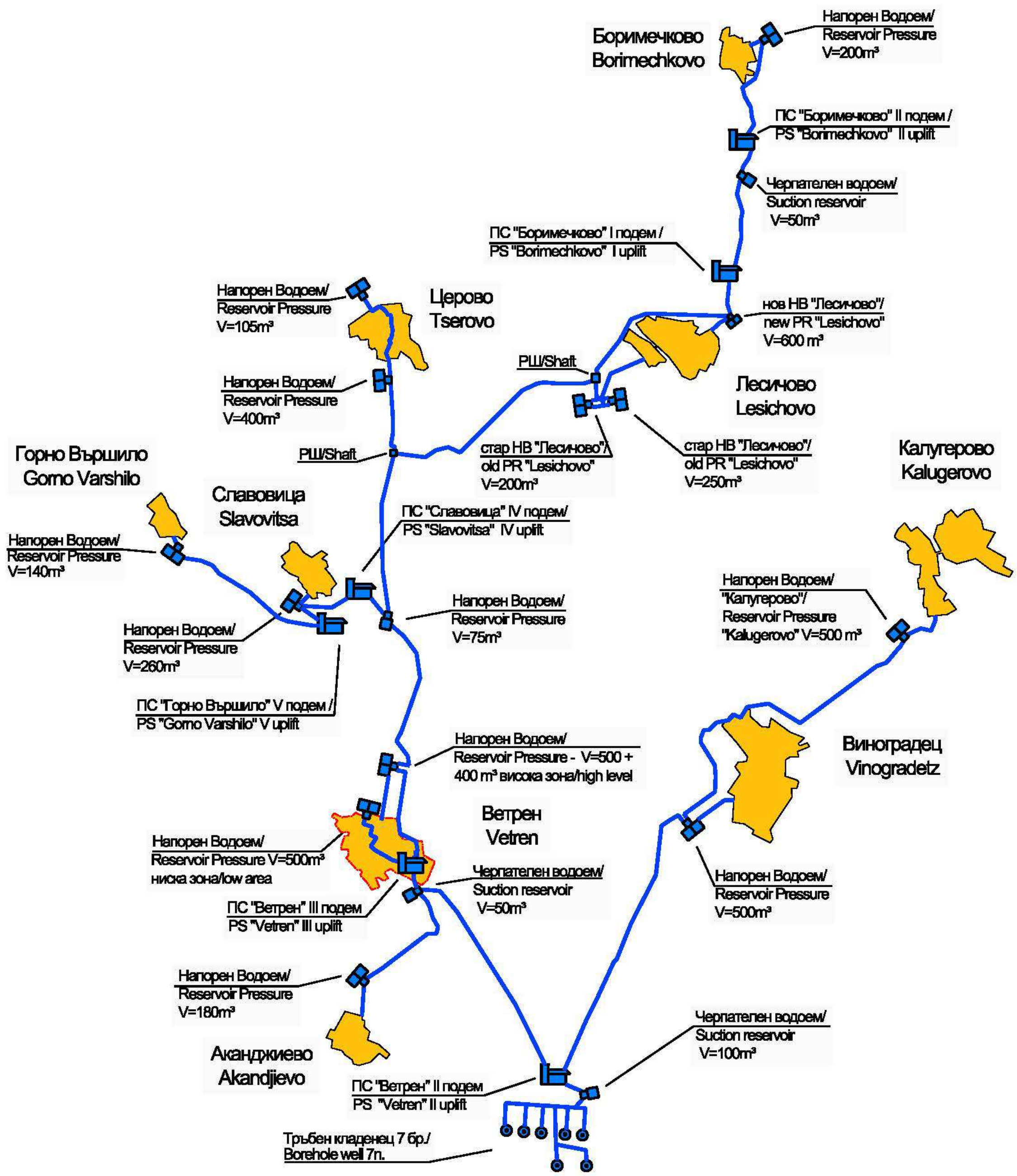


Figure 3-2 Layout of water supply system Vetren

Table 3-15 General features of water supply system Vetren

Component	Description
Water Sources	7 shaft-tube wells with total capacity of 49.4 to 196 l/s.
Treatment Facilities	2 chlorine installations for chlorination with chlorine gas at PS Vetren II-nd uplift and 3 PROMINENT dosing pumps for chlorination with sodium hypochlorite at: PR Lesichevo, PR „Vetren” high zone and at PS Slavovitsa
Water Storage	13 pressure reservoirs with total volume of 4,630 m³, and 4 SR with total volume of 275m³
Pumping Stations	4 pumping stations 7 submersible pumps
Transmission mains	42.131 km - 7.736 km of asbestos cemet pipes: 28.322 km of steel pipes; 1.2 km of HDPE pipes: 4.873 km of PVC pipes
Connected Settlements	9 settlements
Total Population in Service Area	9,012
Connected Population	9,012
% of connected population	100%

Table 3-16 Summary of the main deficiencies of water supply system Vetren (BCB)

№	Components	Main deficiency
1	Water abstraction	The existing sanitary protection zones are not established as according to Ordinance №3/16.10.2000
2	Treatment	- the quality of the supplied water complies with the standards and no treatment is necessary before the water is supplied for consumption. The water disinfection is carried out by: Introducing chlorine gas in the chlorination compartment in PS Vetren II-nd uplift. 0Introducing sodium hypochlorite with dosing pumps in PR „Lesichevo PR „Vetren” high zone PS Slavovitsa Manually in PR Tserovo. The disinfectant is supplied by dosing pumps but not proportionally to the flowing water quantity. No metering devices have been installed /water meters/ which can regulate the dosing pumps. As a whole the disinfectant does is not precisely measured in view of the quantity of residual chlorine in the water.
3	Storage	The reservoirs were built in 1956 for Vinogradets up to 2002 for the second reservoir of Tserovo. The volume for storing the maximum consumption reserve and fire-fighting purposes is not sufficient in the settlements Vinogradets, Shtarkovo, Dinkata and Pamidovo. Major repair works are required for the pressure reservoirs in Gorno varshilo, Borimechkovo and Lesichovo and the suction reservoir at PS Borimechkovo II-nd uplift.

№	Components	Main deficiency
		Amortised and technically outdated equipment– stop valves, float valves of all reservoirs, corroded pipe connections.
4	Pumping stations	The pumps installed at the PS of the system date back from 1987. The pumps in PS "Vetren" II-nd uplift and III-rd uplift are amortised and often break down. They are characterised as low efficient and highly energy consuming.
5	Transmission water mains	The main problem of the steel pipes is corrosion. Regardless of the cathodic anti-corrosion protection, the pipes on the territory of Septemvri municipality were laid in the 1980's and have no insulation. Breakdowns are 59 in 2011, 0.675 per km.

3.4.2.2.2. *External water supply systems on the territory of Pazardzhik municipality*

Water supply system „Pazardzhik" – this water supply system supplies water to Pazardzhik and 7 villages – Dragor, Dobrovnitsa, Glavinitsa, Miryantsi, Mokrishte, Ivaylo and Saraya. The system has groundwater supply:

- 24 tube wells in water yielding zone in the terrace of the Maritsa river of which 13 at Mokrishte village /Mokrishte east and Mokrishte west/ and 11 in Karaman tepe area;
- 3 tube wells in water yielding zone near Ivaylo village;
- 1 tube well in water yielding zone „Garata" on the territory of Pazardzhik.
- The water from 22 wells in water yielding zone in the terrace of the Maritsa river are puped into a suction reservoir with V= 300 m3 at PS „Mokrishte" from where it is pumped in tow directions – directly into the distribution network of the village of Mokrishte and to PR of Pazardzhik which functions as a conter-respervoir. From the other two wells the water is pumped directly into the network of Pazardzhik. Directly into the networks of the settlements in the system is pumped the water from WSZ Ivaylo – Pazardzhik and the villages of Ivaylo, Gabrovnitsa, Dragor and Saraya and WSZ "Garata" in the industrial zone of Pazardzhik and the village of Glavinitsa. The village of Miryantsi is supplied from the network of Pazardzhik.

Pumping station "Glavinitsa" and the water source serve as backup.

The permitted average annual discharge of 391.20 l/s of all water sources covers the consumption the settlements in the system for 2011 (282.30 l/s).

Figure 3-3 Layout of water supply system Pazardzhik

According to information provided by RHI Pazardzhik the drinking water supplied by WSZ Ivaylo to the settlements of the system is characterised with nitrate concentration above the permissible levels /monitoring from 2009-2010/.

Table 3-17 General features of water supply system Pazardzhik in Pazardzhik municipality

Component	Description
Water Sources	29 tube wells /1 backup/ with total capacity of 391.2 l/s.
Treatment Facilities	Disinfection is done with chlorine gas in the chlorination compartment at: PS „Mokrishte" and directly introduced in the network of Pazardzhik. PS „Ivaylo", chlorination with sodium hypochlorite at PS "Garata"
Water Storage	PR with volume of 36,000 m³ and SR with volume of 300m³
Pumping Stations	1 pumping station 28 submersible pumps in TW
Transmission mains	34.048 km - 17,46 km of asbestos cement pipes; 7.815 km of steel pipes; 2.596 km of Mannesmann pipes; 3.036 km of HDPE pipes
Connected Settlements	8 settlements
Total Population in Service Area	83,679
Connected Population	83,679
% of connected population	100%

Water supply system "Malo Konare" includes 2 villages – Pishtigovo and Malo Konare. The consumption is satisfied with groundwater from the territory of Malo Konare village – 3 tube wells in Doganovo area and PS "Malo Konare". TW 1 is not equipped and serves for backup.

The two TW are equipped with GRUNDFOS pumps. From TW1a the submersible pump pumps the water directly into the network of Pishtigovo. Water from TW 2 is pumped in the distribution network of Malo Konare. PS "Malo Konare" is not used. In the building are situated the disinfection facilities. The average hydrodynamic pressure does not exceed 1.5 atmospheres in the highest and most distant points from the regulated territories of the villages and is maintained by a frequency transformer.

The average annual permitted water quantity covers the maximum hourly consumption /the two settlements have no 24-hour equalizer/. With maximum permitted water quantity of 38.0 l/sec and maximum hourly consumption of 31l/sec the excess water is 7 l/sec.

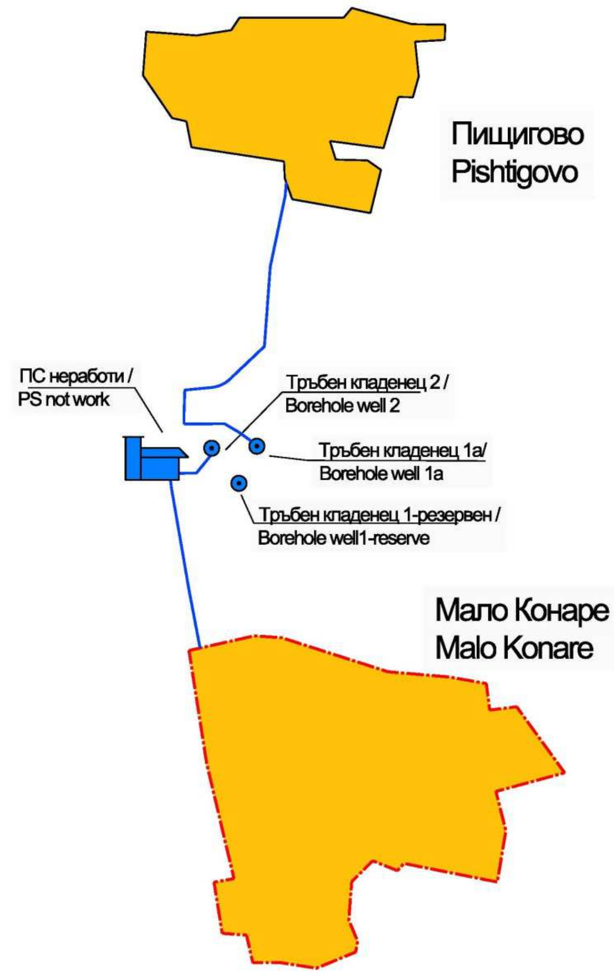


Figure 3-4 Layout of water supply system Malo Konare

Table 3-18 General features of water supply system Malo Konare in Pazardzhik municipality

Component	Description
Water Sources	2 tube wells with total capacity of 14.2 до 38 l/s./ 1 backup/
Treatment Facilities	Chlorination with sodium hypochlorite with 2 dosing pumps. Water from TW 1 is disinfected with sodium hypochlorite directly in the pressure main and the network of Pishtigovo. Water from TW 2 is disinfected with sodium hypochlorite directly in the network of Malo Konare.
Water Storage	No reservoirs
Pumping Stations	1 pumping station and 2 submersible pumps
Transmission mains	4.4 km of asbestos cement and PVC pipes
Connected Settlements	2 settlements
Total Population in Service Area	5,390
Connected Population	5,390

Component	Description
% of connected population	100%

Water supply system "Chernogorovo" is supplied from wells situated in the terrace of the Luda Yana river east of Krali Marko village and provides the water supply of the villages of Chernogorovo and Krali Marko. Out of the existing 4 wells – 3 TW and one shaft well, only 2 TWs are operating. The other two are sealed and can be used if necessary after their equipment is provided. Submersible pumps – GRUNDFOS SP60-3 in TW 2 and GRUNDFOS SP30-5 in TW 3a pump the water to SR V=50 m^3 at PS II-nd uplift. From the pumping station by horizontal pumps with frequency regulation which maintains a pressure between 1.5 – 3.5 atm. water is sent directly into the distribution network of Chernogorovo. The distribution network of Krali Marko is supplied from the network of Chernogorovo. A reducer is installed on the trunk water main for pressure regulation. The two settlements have no reservoirs built. The construction of PR V= 400$м^3$ of Chernogorovo has been suspended.

The consumption of the settlements from WSS Chernogorovo is secured with the average annual discharge of the water sources and the maximum hourly consumption.

Figure 3-5 Layout of water supply system Chernogorovo

Table 3-19 General features of water supply system Chernogorovo in Pazardzhik municipality

Component	Description
Water Sources	2 tube wells with total capacity of 13.7 to 23l/s.
Treatment Facilities	Disinfection of water in SR 50m3 at PS II uplift with sodium hypochlorite.
Water Storage	SR with volume of 50m³
Pumping Stations	1 pumping station, 2 submersible pumps

Component	Description
Transmission mains	3.365 km – 1.542 km of asbestos cement pipes; 1.823 km of steel pipes
Connected Settlements	2 settlements
Total Population in Service Area	2,393
Connected Population	2,393
% of connected population	100%

Water supply system "Lyahovo-Bratanitsa" uses water from 2 tube wells (one serving as backup) in the terrace between the two villages and covers the two settlements of the municipality – the villages Lyahovo and Bratanitsa.

The water from the wells enters directly the distribution networks of the two villages pumped by pumps type 25 E32 – operating and backup 12 E50 M and 6 E50M, installed at the PS. The horizontal pumps are equipped with a frequency regulator which maintains an average dynamic pressure of 2.2 atm. on the territory of the villages and not less than 1.5 atm. in the highest and most remote points of the street network. The settlements have no reservoirs built.

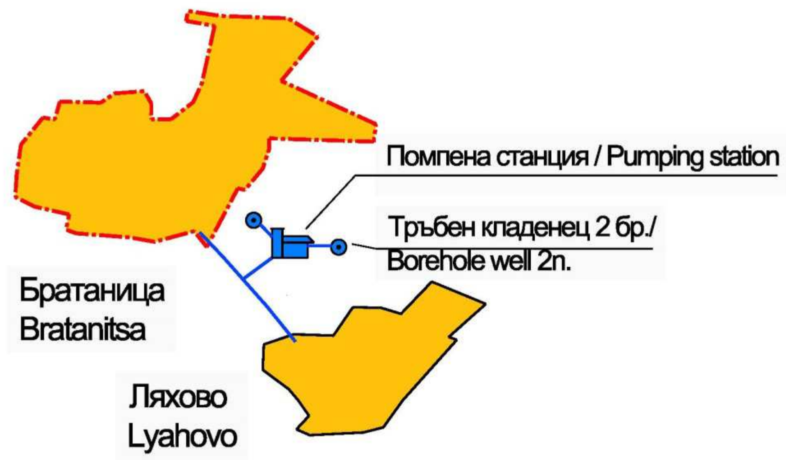


Figure 3-6 Layout of water supply system Lyahovo-Bratanitsa

Table 3-20 General features of water supply system Lyahovo-Bratanitsa in Pazardzhik municipality

Component	Description
Water Sources	1 tube well 1 backup well with capacity from 7.4 to 13 l/s.
Treatment Facilities	The disinfection is performed with sodium hypochlorite in the pressure pipe of the pumps. The disinfected water is supplied directly into the network of the settlements
Water Storage	None
Pumping Stations	1 pumping station
Transmission mains	1.15 km of asbestos cement pipes
Connected Settlements	2 settlements
Total Population in Service Area	2,484
Connected Population	2,484

% of connected population	100%

Water supply system "Aleko Konstantinovo" serves the village with independent supply from 1 tube well TW1[a], situated on its territory at about 1 km from the border of its regulated territory. The constructed second well TW2a is not equipped and serves as backup. TW1[a] is equipped with a horizontal pump 25E 32A with frequency regulator which sends the water directly into the distribution network of the village. The average 24-hour discharge of TW1[a] is 8.00 l/sec and covers the maximum 24-h consumption. With the lack of a reservoir the hourly irregularity and the fire-fighting reserve can be supplied directly from the well the maximum discharge of which is 23.00l/sec and can be used for 9 hours out of 24. The frequency regulation of the pumping station guarantees an average pressure on the territory of the village of about 2 atmospheres and minimum pressure in the highest terrain elevations of 1.5 atm.

Figure 3-7 Layout of water supply system Aleko Konstantinovo

Table 3-21 General features of water supply system Aleko Konstantinovo in Pazardzhik municipality

Component	Description
Water Sources	1 tube well /TW 2 backup/ with capacity 8-23l/s.
Treatment Facilities	The disinfection is performed with sodium hypochlorite in the pressure pipe of the pumps. The disinfected water is supplied directly into the network of the settlement.
Water Storage	None
Pumping Stations	1 pumping station
Transmission mains	1.1 km of asbestos cement pipes
Connected Settlements	1 settlement
Total Population in Service Area	2,714
Connected Population	2,714
% of connected population	100%

Water supply system „Ognyanovo" includes the water source, the trunk water main and the facilities providing the independent water supply of the village of Ognyanovo. The water sources are 2 tube wells situated in the regulated area of the village. In the pump compartment have been installed 2 pumps 25E 50 AM /operating and backup/. The pump supplies water into a tower reservoir with V= 250 m^3 and H= 25 and from there to the distribution network of Ognyanovo

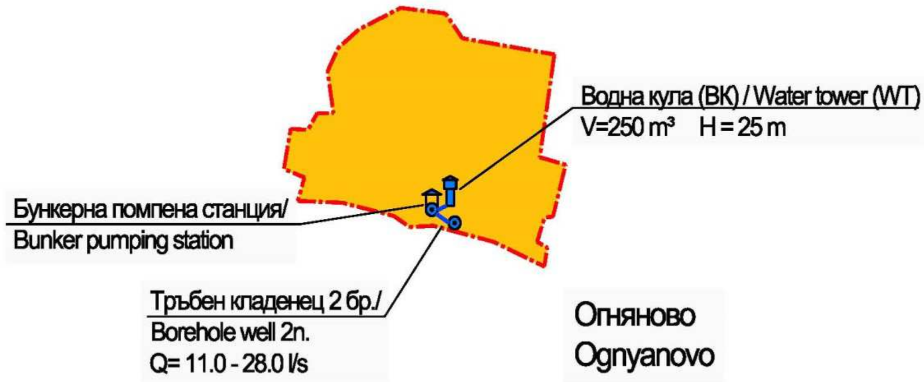


Figure 3-8 Layout of water supply system Ognyanovo

Table 3-22 General features of water supply system Ognyanovo in Pazardzhik municipality

Component	Description
Water Sources	2 tube wells with capacity of 11-28l/s.-
Treatment Facilities	The disinfection is performed with sodium hypochlorite in the pressure pipe of the pumps and from there to a tower reservoir 250m3.
Water Storage	Tower reservoir V=250 m^3
Pumping Stations	1 BPS
Transmission mains	None
Connected Settlements	1 settlement
Total Population in Service Area	2,353
Connected Population	2,353
% of connected population	100%

Eight of the settlements combined in groups of two form the following water supply systems – Ovchepoltsi –Topli dol, Apriltsi-Sbor, Paralenitsa-Tsrancha and Rosen-Tsar Asen. In Pazardzhik municipality the villages of Hadzhievo, Gelemenovo, Yunatsite, Govedare, Sinitovo, Zvanichevo, Velichkovo and Debrashtitsa are supplied from local water sources independently and form separate systems.

The water supply systems of these settlements are presented in Appendix 3-8.

Table 3-23 Summary of the main deficiencies in the water supply systems of Pazardzhik municipality

№	Components	Main deficiency
1	(Water sources) Water abstraction	Water from the tube wells – 3 in WSZ Ivaylo is not compliant with the standards for the parameters nitrates, calcium, sulphates and total hardness.
		The water use permissions of 13 water sources have not been updated. The existing SPZ have not been established pursuant to Ordinance 3/ 16.10.2000.
		- the catchments are in bad condition and those for Tsrancha have small capacity. Two of the tube wells of WSZ Mokrishte pump water directly into the network of Pazardzhik. TW2 of WSS Yunatsite was decommissioned due to a flood in 2005. TW2 of WSS Lyahovo – Bratanitsa has sand in the water, pipes are displaced TW of WSS Hadzhievo has operating problems
2	Teatment	- apart from the water abstracted from the tube wells of Ivaylo the quality of the supplied water complies with the standards and no treatment has to be done before it is supplied for consumption. This water source is envisaged to be shut down and instead the villages will be supplied with water from Luda Yana dam. Water is treated in the treatment plant at the dam and the production capacity allows for diverting the necessary water quanity for satisfying the needed water. Due to the long trunk water mains we envisage the introduction of additional chlorine in some intermediate points. - part of the water sources have their water disinfected with chlorine gas. As with most WSS operators, here the safety of the staff is not secured, too, there are no devices indicating when the hermetic tightness of the disinfection system is damaged and there is no system for deactivation of chlorine eventually leaking from the installation. The disinfection at the rest of the water sources is done with sodium hypochlorite. For most of them the disinfectant is envisaged to be introduced by a flow pump. This is not the same as supplying the chlorine proportionally to the flowing water quantity since the flow of the pump is not constant. The deviations from the constant flow of the pumps are small but sufficient to influence the quantity of introduced chlorine. Apart from this maybe the main deficiency is that the dosage of the supplied disinfectant is not measured precisely according to the level of residual chlorine in the water. At some pumping stations with frequency regulation of rotation the chlorine is supplied in the pressure pipe of the pumps and then directly into the network of the settlement without providing the necessary contact duration for the chlorine action. In the pressure reservoir for the village of Tsrancha the hypochlorite is supplied manually which is not acceptable.
3	Storage (suction and pressure reservoirs)	The volumes outside the necessary for the hours with maximum consumption and backup which can be used for increasing the efficiency by using mainly low-tariff electricity for Pazardzhik amount in total to 36,000 m^3. There are no reservoirs for storing the maximum consumption reserve and the fire-fighting reserve for 15 settlements in 8 WSS. The volume of the existing reservoirs of

№	Components	Main deficiency
		the villages Apriltsi /50 $m^{3/}$ and Gelemenovo /100 m^3/ is not sufficient. The reservoirs were built after 1980 and are in good condition – they need only ongoing maintenance /replacement of stop valves and fixtures, corroded pipes, stairs and railings/. Major repairs are required for: pressure reservoir Ovchepoltsi and tower reservoir Sinitovo. Hydro insulation must be laid in: tower reservoir Ognyanovo and PR Velichkovo and Dabrashtitsa
4	Pumping stations	Most of them are in good structural condition but the equipment is outdated. The buildings need rehabilitation. The pumps in PS "Mokrishte " are severely amortised and need replacement. Some of the buildings of the pumping stations are not used for their actual purpose /only chlorination is performed/. The submersible pumps send water directly into the distribution networks of the settlements – the features of the pump units which send water directly into the networks of the settlements are complied with the variable water quantity supplied so that the pressure mains and systems do not operate in efficient mode /frequency regulators have been installed/.
5	Transmission water mains	The trunk water mains from the water sources to the pressure ground and tower reservoirs and directly to the settlements were built of asbestos cement and steel pipes in the period from 1929 to 1978. The asbestos cement water mains are severely amortised and ineffective /only a small share have been replaced/. The reinforced concrete pressure water main to the PR of Pazardzhik is in very bad condition and it takes a lot of time and costs to repair breakdowns. The same refers to the pressure main to the PR of Velichkovo village – frequent breakdowns and interruption of water supply to the reservoirs.
6	Water metering	There are no water meters installed at the inlets of all settlements in WSS Pazardzhik - Pazardzhik, Dobrotitsa, Ivaylo, Saraya and Dragor villages.

3.4.2.2.3. *Water supply systems on the territory of Septemvri Municipality*

Water supply system "Septemvri – Zlokuchene" includes the two settlements – the town of Septemvri and the village of Zlokuchene. It is supplied by 5 tube wells in the terrace of the Maritsa – right-side bank on the territory of Vetren village, "Gorna ada" area. The water from the TW passes through tower reservoirs with V=250 m3 and H= 25 m and enters into the distribution network of Septemvri. The existing facilities – pumping station and PR with V= 4000 m^3 are not currently used. In the suction reservoir used to flow water supplied to the town of Septemvri from the water sources of WSS "Vetren". At present due to the interrupted water main crossing the Maritsa river the town is not supplied from these water sources. The water main network of Zlokuchene is supplied by gravity from the network of Septemvri.

Information provided by the operator shows that due to the compromised TW their operation is impeded and the continuous water supply to the territory of Septemvri and Zlokuchene is not guaranteed.

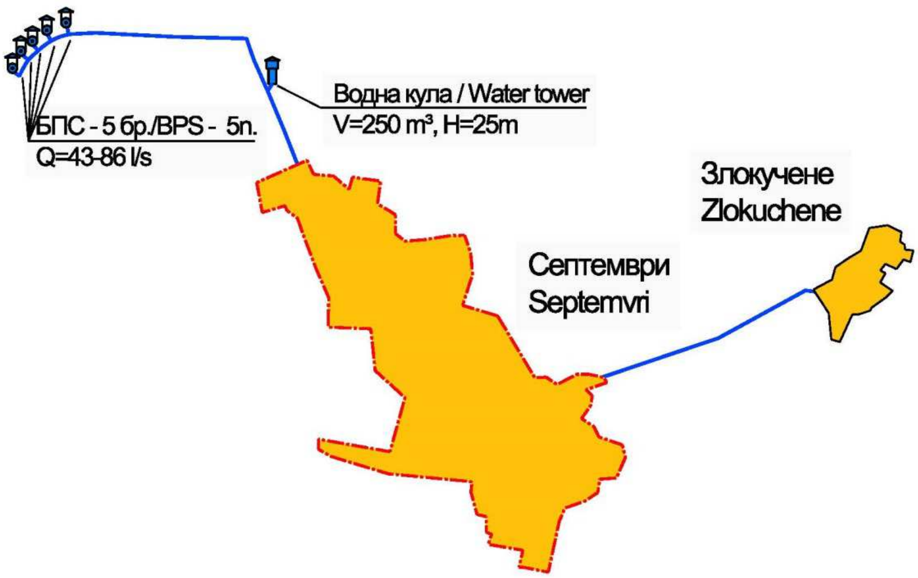


Figure 3-9 Layout of water supply system Septemvri - Zlokuchene

Table 3-24 General features of water supply system Septemvri - Zlokuchene in Septemvri Municipality

Component	Description
Water Sources	5 tube wells with total capacity of 43-86l/s.-
Treatment Facilities	The abstracted water is only disinfected. Sodium hypochlorite is added by a dosping pump in the pressure pipe of the pumps in the pumping tstaion. The contact time for the disinfected water is provided in the tower reservoir with volume of 250 m3
Water Storage	Tower reservoir with V= 250 m^3, SR with V= 4,000 m^3 /not used/
Pumping Stations	5 BPS and pumping station /not used/
Transmission mains	4.53 km – 2.955 of asbestos cement pipes; 1.57 km of steel pipes
Connected Settlements	2 settlements
Total Population in Service Area	8,729
Connected Population	8,729
% of connected population	100%

Water supply system “Lozen- Kovachevo” includes the two villages in one system supplied from a tube well in the terrace of the Chepinska river at about 300 m west from Kovachevo village. Due to the plain nature of the terrain the pressure reservoir with V= 500 m^3 is situated at about 5 km form the well, northwest of the village of Lozen. The reservoir serves as a counter – reservoir for Kovachevo and transit reservoir for Lozen.

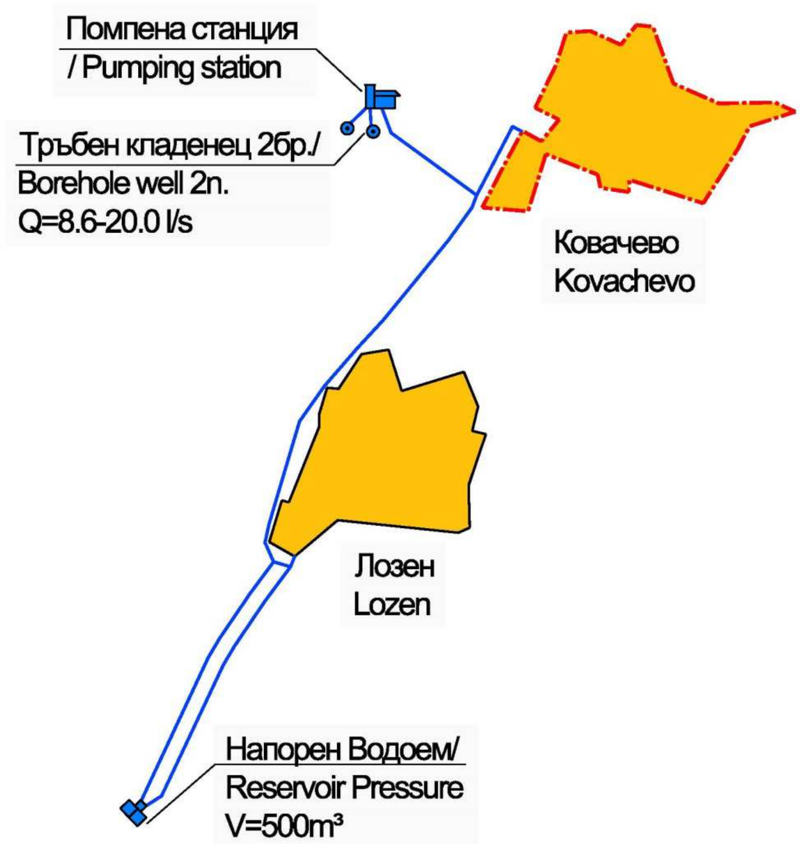


Figure 3-10 Layout of water supply system Lozen- Kovachevo

Table 3-25 General features of water supply system Lozen- Kovachevo in Septemvri Municipality

Component	Description
Water Sources	1 tube well /1 sealed and 1 not working/ with capacity of water 20l/s.-
Treatment Facilities	The water is disinfected with sodium hypochlorite in the pressure pipe of the pumping station. The pump regulation is activated automatically with the switching. 1 dosing pumping unit - chlorination with sodium hypochlorite at the PS switched on when the pump starts and stops
Water Storage	PR with V= 500 m^3
Pumping Stations	1 pumping station
Transmission mains	5.3 km. asbestos cement pipes
Connected Settlements	2 settlements
Total Population in Service Area	3,421
Connected Population	3,421
% of connected population	100%

Water supply system "Varvara – Vetren dol" includes the two villages and is supplied from 3 TW. The water from the two water sources is pumped to SR with V= 25 m^3. One group of pumps installed at pumping station II-nd uplift sends the water to the pressure reservoirs of Varvara. The second group of pumps is used in emergency situations. The reservoirs of the village of Vetren dol are supplied directly from the third water source /submersible pump installed at the TW pumps water to the reservoirs/.

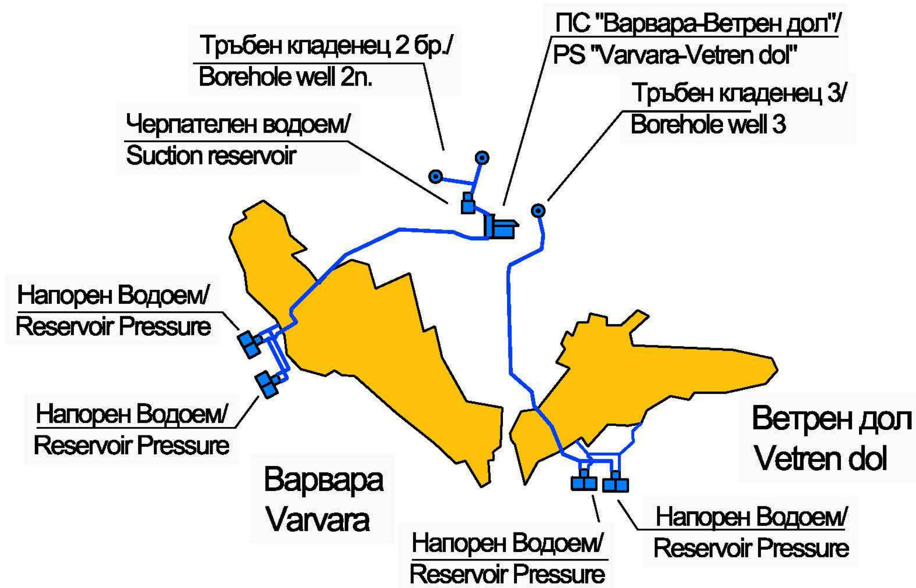


Figure 3-11 Layout of water supply system Varvara – Vetren dol

Table 3-26 General features of water supply system Varvara – Vetren dol in Septemvri Municipality

Component	Description
Water Sources	3 tube wells with capacity of 26.2 - 44l/s.-
Treatment Facilities	The water for Varvara is disinfected with sodium hypochlorite in the pressure pipe of the pumping station PS II uplift. Hypochlorite is added by means of dosing pump. Water from TW 3 is supplied directly into the reservoir of Vetren dol where it is disinfected. Hypochlorite is added by means of dosing pump.
Water Storage	4 pressure reservoirs with total volume of V=795 m^3 SR of V=25 m^3
Pumping Stations	1 pumping station and 3 submersible pumps
Transmission mains	4.4 km of steel pipes
Connected Settlements	2 settlements
Total Population in Service Area	3,513
Connected Population	3,513
% of connected population	100%

The remaining 4 settlements form two water supply systems – "Karabunar – Boshulya" and "Semchinovo - Simeonovets". These water supply systems are presented in Appendix 3-8.

The village of Dolno Varshilo in Septemvri municipality is supplied with water from old catchments and reservoirs with small volume and the water supply system is not served by the WSS Company. The number of inhabitants in 2011 according to information from NSI is 4. The village is used as summer house area. The local water source supplies the needs of the local consumers from the village but not of the temporary residents in the summer house area. Regulation plans of the area are currently being developed.

Table 3-27 Summary of the main deficiencies in the water supply systems of Septemvri Municipality

№	Components	Main deficiency
1	(Water sources) Water abstraction	Systematic reduction of the designed /permitted/ capacity of the wells covering the consumption of WSS Septemvri due to clogging or reduction of static and therefore dynamic levels in the wells.
		The water use permissions of the 2 water sources have not been updated. The existing SPZ have not been established pursuant to Ordinance 3/ 16.10.2000.
		The 7 catchments of WSS Semchinovo – Simeonovets are in bad condition.
2	Treatment	- the quality of the supplied water complies with the standards and no treatment has to be done before it is supplied for consumption. - the disinfectant is supplied by dosing pumps but not proportionally to the flowing water quantity. Setting the dosing pump to the factory set capacity does not mean proportional dosing. The flow of the pumps supplying water to the population is variable though not significantly but enough so that the disinfectant is not supplied in efficient and sufficient quantity. Apart from this the dosage of the supplied disinfectant is not measured precisely according to the level of residual chlorine in the water. The disinfection systems are not equipped with automatic installation considering the quantity of residual chlorine and modifying the disinfectant quantity according to the pump flow /whether sodium hypochlorite or chlorine gas/.
3	Storage (suction and pressure reservoirs)	The reservoir of Boshulya has insufficient volume for storing the maximum consumption reserve and the fire-fighting reserve. Three reservoirs need major repair and laying of hydro insulation - PR Karabunar, PR Boshulya and PR Varvara. Amortised stop valves and corroded pipe connections in the reservoirs.
4	Pumping stations	Most of them are in good structural condition but the equipment is outdated; horizontal pumps are manufactured by Vipom – Vidin and commissioned in 1985-1986 with low efficiency and relatively high energy consumption.
5	Transmission water mains	Most of the external water mains from the water sources to the pressure ground and tower reservoirs of the settlements were built in the period from 1970 to 1986. Most of the pipes are old and amortised. They are in bad condition and are a potential source of problems regardless of the small number of breakdowns registered.
6	Water metering	There are no water meters installed on the inlet and trunk pipes of the reservoirs.

3.4.2.2.4. *Water supply systems on the territory of Lesichovo Municipality*

In Lesichovo Municipality the settlements of Lesichovo, Tserovo, Kalugerovo and Borimechkovo are included in the main WSS Vetren and the remaining three settlements form water supply system “Dinkata-Starkovo-Pamidovo” with water source 2 tube wells, which is presented in Appendix 3-8.

Table 3-28 Summary of the main deficiencies in the water supply systems of Lesichovo Municipality

№	Components	Main deficiency
1	(Water sources) Water abstraction	The existing SPZ have not been established pursuant to Ordinance 3/ 16.10.2000.
		The application for extending the validity of the water use permission for the water sources of WSS Dinkata-Starkovo-Pamidovo has not been submitted.
2	Treatment	- the water is disinfected with sodium hypochlorite but not proportionally to the flowing water quantity. The dosage of the supplied disinfectant is not measured precisely according to the level of residual chlorine in the water.
3	Storage (suction and pressure reservoirs)	Insufficient volume for storing the maximum consumption reserve and the fire-fighting reserve of the common reservoir for the villages Shtarkovo and Dinkata /100 m^3 /. The reservoirs are in good condition – only ongoing maintenance is required /replacement of stop valves and fixtures, corroded pipes, stairs and railings/.
4	Pumping stations	The existing pumping station at WSS Dinkata-Starkovo-Pamidovo is not used – it is in bad condition. /the submersible pumps in the TW pump water directly into the reservoirs of the villages/.
5	Transmission water mains	The asbestos cement water mains are amortised and useless. The main problems are the compromised connections, broken and burst pipes. The external steel water mains of the settlements in the municipality connected to WSS Vetren were replaced in 1993-1995 but regardless of this breakdowns occur. The main problem of steel pipes is corrosion. Regardless of the small number of registered breakdowns along the water mains they are in bad condition.
6	Water metering	There are no water meters installed on the inlets of all settlements of WSS Dinkata-Starkovo-Pamidovo.

3.4.2.3. *Water sources*

All water sources have established sanitary protection zones. There are no updated registrations of the SPZ pursuant to the requirements of Ordinance No3/16.10.2000.

The overall condition of the water sources on the territory of ViK EOOD Pazardzhik is good. The exceptions are the spring catchments for the villages of Tsrancha, Patalenitsa, Semchinovo, Simenovets and Debrashtitsa and the 5 tube well on the right-side terrace of the Maritsa river which cover the consumption of Septemvri and Zlokuchene.

During the performed surveys and from the information provided by the Operator /analyses of samples taken from the distribution networks of the settlements Ivaylo, Saraya, Dragor, the northern part of Pazardzhik and Dobrovnitsa/ was established pollution with nitrates, calcium, sulphates and total hardness. These settlements are supplied with water from WSZ „Ivaylo” – 3 tube wells. The conditions for the presence of nitrates are the following:

- in the sanitary protection zone are included the entire regulated territories of the villages Ivaylo and Dragor and the southern part of the Saraya village territory. All three settlements have no sewerage networks.
- During the recent years the use of fertilizers, pesticides and herbicides for the treatment of arable lands has increased, combined with irrigation from independent boreholes in most of the fields.

The chemical analyses performed in 2011 show that there is no change in the values of the parameters nitrates, sulphates and calcium. Pursuant to letter from RHI Pazardzhik /№1-1935/28.02.13/ in 2012 the levels of the sulphates and calcium are within the permissible limits. The nitrate content has also decreased, which is assumed to result from the partially built sewerage network in the village of Ivaylo. The samples taken from the water of the 3 tube wells in March 2013 show obvious decrease of the nitrate concentration and again excess levels of calcium, sulphates and total hardness.

The features of the water sources are presented for all water supply systems (groups) in more details for each water source in section 3.1. and Appendices 3-3;3-4 and 3-9.

3.4.2.4. *Treatment of the drinking water*

The raw water quality complies with the requirements of Ordinance No9 and does not require special treatment for improving the drinking quality. An exception from this is the water source for the village of Ivaylo where nitrate pollution of the water has been established. It has already been confirmed with great certainty that the pollution is a result of diffuse pollution of the groundwater from the settlement. After the construction of part of the sewerage network in the village is observed a sudden decrease of the nitrate contents in the water which almost reaches the limits set in Ordinance No9. There is an obvious trend for cleaning the aquifer in time. Until then however the pollution still exists.

There is no need of drinking water treatment plants and such have not been built. The only treatment of water is disinfection. It is executed with sodium hypochlorite and chlorine gas in some locations.

Chlorination with chlorine gas is done at:

- WSS „Pazardzhik” in the chlorination compartments of PS "Mokrishte" II $^{-nd}$ uplift and PS „Ivaylo”.
- WSS „Vetren” in the chlorination compartment of "Vetren" II $^{-nd}$ uplift;

It must be clearly stated that the WSS operator has not permitted any faults in terms of the water disinfection during the supply process. No supply of non-disinfected water has been established.

During the inspection of the faults of the WSS system were established several common deficiencies:

- In none of the chlorine gas water disinfection installations a system for measuring the residual chlorine has been built and the quantity of the supplied disinfectant is not measured precisely depending on the quantity of the residual chlorine.

- In none of the chlorine gas water disinfection installations detectors for detecting leaking chlorine gas in case of damaged hermetic tightness of the system has been installed. The facilities have not been equipped pursuant to the standard requirements for providing the safety of the operating staff and their life is exposed to danger.

Considering the long external water mains of WSS Vetren towards the settlements of the system additionally chlorine is added to the water in 3 points – PR high zone – Vetren, PR V=600 m3 for Lesichovo and PR Tserovo.

At the rest of the water sources the disinfection is done with sodium hypochlorite at the water sources and the following reservoirs – PR Apriltsi and PR Velichkovo - Pazardzhik municipality, PR Vetren dol, PR Semchinovo and PR Simeonovets in Septemvri municipality.

In the old reservoir of Tsrancha the sodium hypochlorite is supplied manually.

In some of the settlements are used pumps with frequency regulation of rotation for covering the hydraulic parameters of the respective water supply system. This results in reduced volumes for water reserve and security in terms of maintaining the hydraulic parameters as well as possibility of quicker reaction of the pumping system including in cases of fire. At some places the water abstraction is done by horizontal pumps aiming to maintain the constant pressure and the water is chlorinated in the pressure pipe of the pump and then supplied directly to the water supply network. It is the Consultant's opinion that such a design must be used very carefully and the time until the water is supplied in the network when the consumption is at its highest must be carefully calculated. The Consultant's expectation is that in practice part of the population will consume non-disinfected water since there will be not enough time for establishing contact between the chlorine and the water. We recommend building of small reservoirs which will provide 30-minute stay of the water during maximum consumption period and the disinfection will be performed successfully.

Figure 3-12 Disinfection with chlorine gas in Mokrishte PS - II lift

Figure 3-13 Disinfection with sodium hypochlorite in Zvanichevo PS

Figure 3-14 Disinfection with sodium hypochlorite in Lyahovets-Bratanitsa PS

Figure 3-15 Disinfection with sodium hypochlorite in the chlorination facility nect to Sinitevo PS

Figure 3-16 Disinfection with sodium hypochlorite in Ognyanovo PS

Figure 3-17 Disinfection with sodium hypochlorite in Hadzhievo PS

Figure 3-18 Disinfection with sodium hypochlorite in Govedare PS

Figure 3-19 Figure 3 18 Disinfection with chlorine gas in the chlorination station next to Vetren PS – II lift

Figure 3-20 Disinfection with sodium hypochlorite in PR of V=500 m3– high zone for the village of Simeonovets

Figure 3-21 Disinfection with sodium hypochlorite Dinkata PS

3.4.2.5. Water storage

The volumes of the existing suction reservoirs at the respective pumping stations as well as the volumes of the pressure reservoirs providing the necessary quantity for the hours of maximum consumption and the pressure in the settlements are presented in the table below.

3.4.2.5.1. Reservoirs on the territory of Pazardzhik municipality

Table 3-29 Reservoirs of the water supply systems of Pazardzhik municipality

Reservoir	Number of chambers	Volume [m³]	Total volume [m³]	Year of construction	observations
Water supply system Pazardzhik					
Pressure reservoir Pazardzhik	3	12,000	36,000	1985	in good condition
Suction reservoir	1	300	300	1975	Amortised fixtures and corroded pipes, damaged hydro insulation
Water supply system Chernogorovo					
Suction reservoir	1	100	100	1999	Restoration of hydro insulation, there is no pressure reservoir
Water supply system Sinitovo					
Water tower Sinitovo	1	20	20	1957	Major repairs
Water supply system Ognyanovo					
Water tower Ognyanovo	1	250	250	1976	Amortised fixtures and corroded pipes, damaged hydro insulation of the water tank
Water supply system Aleko Konstantinovo					
None					
Water supply system Ivaylo					
None					

Reservoir	Number of chambers	Volume [m³]	Total volume [m³]	Year of construction	observations
Water supply system Govedare					
None					
Water supply system Hadzhievo					
None					
Water supply system Malo Konare					
None					
Water supply system Bratanitsa - Lyahovo					
None					
Water supply system Zvanichevo					
None					
Water supply system Yunatsite					
None					
Water supply system Velichkovo					
Pressure reservoir Velichkovo	2	160 500	660	1958 1987	Amortised fixtures and corroded pipes, damaged hydro insulation of the water chamber
Water supply system Debrashtitsa					
Pressure reservoir Debrashtitsa	2	120 300	420	1935 1998	Amortised fixtures and corroded pipes, damaged hydro insulation of the water chamber
Water supply system Ovchepoltsi – Topli dol					
Pressure reservoir Ovchepoltsi	2	300 140	440	1987 1966	major repairs
Suction reservoir	2	25 50	75	1998 2002	in good condition
Pressure reservoir Topli dol	1	180	180	1987	Amortised fixtures and corroded pipes
Water supply system Rosen- Tsar Asen					
Pressure reservoir Rosen	1	200	200	1987	in good condition
Pressure reservoir Tsar Asen	1	120	120	1963	Amortised fixtures and corroded pipes
Water supply system Patalenitsa -Tsrancha					
Pressure reservoir Patalenitsa	5	30 75 135 450 120	810	1937 1975 1966 1987 1975	Amortised fixtures and corroded pipes, damaged hydro insulation of the water chamber
Pressure reservoir Tsrancha	1	260	260	1968	Amortised fixtures and corroded pipes, insufficient volume
Suction reservoir	1	100	100	1995	in good condition

Reservoir	Number of chambers	Volume [m³]	Total volume [m³]	Year of construction	observations
Water supply system Gelemenovo					
Pressure reservoir Gelemenovo	1	160	160	1967	Amortised overflow system, fixtures and pipes, insufficient volume
От water supply system Apriltsi - Sbor					
Pressure reservoir Sbor	1	120	120	1969	Amortised fixtures and corroded pipes
Pressure reservoir Apriltsi	1	100	100	1969	Amortised overflow system, fixtures and pipes, insufficient capacity

Figure 3-22 PR of V=36,000m3 for the town of Pazardzhik

Figure 3-23 Suction tank of V=30m3 of Mokrishte PS – II lift

Figure 3-24 Water tower of V=20m3 for the village of Sinitevo

Figure 3-25 Water tower of V=250m3 for the village of Ognyanovo

3.4.2.5.2. Reservoirs on the territory of Septemvri Municipality

Table 3-30 Reservoirs of the water supply systems of Septemvri Municipality

Reservoir	Number of chambers	Volume [m³]	Total volume [m³]	Year of construction	observations
Water supply system Vetren					
Pressure reservoir Vetren – low zone	1	100	100	1966	major repairs
Pressure reservoir Vetren – high zone	1	550	550	1990	in good condition
Pressure reservoir Vinogradets	1	300	300	1956	major repairs, insufficient volume
Pressure reservoir Slavovtsi	1	260	260	1988	bad condition of pipe system and fixtures
Pressure reservoir Akandzhievo	1	180	180	1999	bad condition of pipe system and fixtures
Pressure reservoir G. Varshilo	1	140	140	1978	Water chamber needs hydro insulation
Suction reservoirs	3	75 50 100	225	1984	In good condition
Water supply system Septemvri -Zlokuchene					
Suction reservoir	1	4000	4000	1984	Not operating, the level not allow for supplying
Water tower Septemvri	1	250	250	1984	Cannot hold water, pumps are equipped with frequency transformer and push water directly to the netwotk of the town
Water supply system Varvara – Vetren dol					
Suction reservoir	1	25	25	1973	in good condition

Reservoir	Number of chambers	Volume [m³]	Total volume [m³]	Year of construction	observations
Pressure reservoir Varvara	2	300 260	560	1987 1981	Water chamber needs hydro insulation, bad condition of pipe system
Pressure reservoir Vetren dol	1	160 75	235	1970 1958	bad condition of pipe system
Water supply system Karabyna - Boshulya					
Pressure reservoir Karabunar	1	250	250	1959	major repairs
Pressure reservoir Boshulya	1	150	150	1960	major repairs, insufficient volume
Water supply system Semchinovo - Simeonovets					
Suction reservoir	1	25	25	1984	in good condition
Pressure reservoir Semchinovo	2	120 250	370	1927 1984	major repairs in good condition
Pressure reservoir Simeonovets	2	500 80	580	1984 1960	in good condition bad condition of pipe system
Water supply system Lozen – Kovachevo					
Pressure reservoir Lozen	2	500	500	1974	bad condition of pipe system

3.4.2.5.3. *Reservoirs on the territory of Lesichovo Municipality*

Table 3-31 Reservoirs of the water supply systems of Lesichovo Municipality

Reservoir	Number of chambers	Volume [m³]	Total volume [m³]	Year of construction	observations
Water supply system Vetren					
Pressure reservoir Kalugerovo	1	500	500	1983	replacement of pipe system and stop valves
Pressure reservoir Tserovo	2	105 400	505	2002 1969	replacement of pipe system and stop valves
Pressure reservoir Lesichovo	3	250 200 600	1050	1970 1961 1983	damaged hydro insulation , amortised stop valves
Pressure reservoir Borimechkovo	1	200	200	1995	damaged hydro insulation , amortised stop valves
Suction reservoirs	1	50	50	1995	damaged hydro insulation , amortised stop valves
Water supply system Dinkata					
Pressure reservoir Shtarkovo	1	220	220	1968	insufficient volume, amortised stop valves, corroded pipe system
Pressure reservoir Pamidovo	1	120	120	1968	insufficient volume, amortised stop valves, corroded pipe system

Figure 3-26 Figure 3 25 Suction tank of V=100m3 of Vetren PS – II lift

Figure 3-27 Suction tank of V=50m3 of Vetren PS – III lift

Figure 3-28 Suction tank of V=25m3 of Varvara –Vetren Dol PS – II lift

Figure 3-29 Water tower of V=250m3 for the town of Septemvri

Figure 3-30 Suction tank of V=4,000m3 of Septemvri PS – II lift

Figure 3-31 PR of V=120m3 and PR of V=250m3 for the village of Semchinovo

Figure 3-32 PR of V=500 m3– high zone for the village of Simeonovets

Figure 3-33 Suction tank of V=25m3 of Semchinovo-Simeonovets PS

Although the structural condition of most reservoirs is good, the stop valves in the dry chambers are amortised and need repalcement.

In Appendix 3-10 is presented the data from the inspection of the required volume of the reservoirs.

3.4.2.6. Pumping stations

Pumping stations of Pazardzhik municipality

During the period from 1999 to 2002 the pumping equipment of the tube and shaft wells has been entirely replaced with efficient submersible pumps /14/. Out of a total of 35 installed horizontal pumping units serving the groundwater sources in this period were replaced only 3. The rest were commissioned in the period from 1970 to 1985. They have low efficiency and relatively high energy consumption. The information about the pumps installed at the tube and shaft wells /submersible or horizontal pumps/ are presented in Appendix 3-11.

3.4.2.7. Transmission water mains

The list of the transmission water mains of the settlements over 2,000 inhabitants with their diameters and material, year of construction and condition is presented in the table below. A detailed list of all external water mains with sections is presented in Appendix 3-12.

The asbestos cement and steel transmission water mains built before 2002 are amortised and need to be replaced.

Table 3-32 Transmission water mains of the main water supply systems of ViK EOOD Pazardzhik

Transmission water main	Material	Diameter [mm]	Length [km]	Year of construction	Observations
Water supply system Pazardzhik					
From the water source to PS Mokrishte and Pazardzhik	Steel	273	100	1979	
	Mannesmann	200	200	1964	
	Steel	159	3,100	1967	
	AC	200,250,300 350,400	3,816	1981-1988	
	AC	475	1900	1983	
	AC	546	1,140	1981	
	steel	475	1,140	2000	
From PS Mokrishte to PR V=12000 m3	Reinforced concrete	1200	4,721	1995	in very bad condition, frequent breakdowns /high repair costs/
	Steel	920	1200	1995	
	Steel	820	30	1995	
PS Ivaylo -Pazardzhik -Dragor village -Saraya village	Mannesmann	300	2,396	1930	In bad condition
	AC	300	2,200	1980	
	AC	100	1,000	1958	
	AC	125	2,000	1969	
From PS Mokrishte to Mokrishte village	Steel	133	2,245	1978	
From Pazardzhik to Dobrotitsa village	PE	160	3,036	2011	in good condition
From Pazardzhik to Miryantsi village	AC	150	3,824	1965	
Water supply system Aleko Konstantinovo					
from water source to the inlet of	AC	200	1,098	1987	
Water supply system Chernogorovo					
from water source to the inlet of Chernogorovo	steel	219	1,823	1990	corroded pipes
From Chernogorovo village to Krali Marko village	AC	300	1,542		
Water supply system Malo Konare					
from water source to the inlet of Pishtigovo	PVC	200	2,857	2002	

Transmission water main	Material	Diameter [mm]	Length [km]	Year of construction	Observations
from water source to the inlet of Malo Konare	AC	100	927		
Water supply system Lyahovo – Bratanitsa					
from water source to the inlet of villages	AC	125	460	1962	high losses from breakdowns
	AC	150	690	1962	high losses
Other settlements with a population of below 2,000 inhabitants	AC, Mannesmann, steel, PVC	60-200	74,752	1937- 2002	Obsolete pipes

Table 3-33 Transmission water mains of the main water supply systems of Septemvri Municipality

Transmission water main	Material	Diameter [mm]	Length [km]	Year of construction	Observations
Water supply system Vetren					
From PS II-nd uplift Vetren to PS II-rd uplift	steel	426	4,230	1987	amortised water mains
From water source to PS II-nd uplift Vetren	AC	150,200, 250,300	1,207	1965	
From PS II-rd uplift to PR low zone Vetren	PVC	200	1,606	2001	amortised water mains
From PS II-rd uplift to PR Vinogradets	steel	325,377 256	3,989	1990	
	AC	300	1,475	1972	
	PVC	250	750	1999	
From PS II-rd uplift to PR low zone Vetren	steel	325	1,440	1996	
From PR high zone Vetren to PS Slavovitsa IV-th uplift	Steel	273	1,856	1988	
	PVC	315	2,517	1997	
From PS Slavovitsa IV-th uplift to PS G. Varshilo V uplift	steel	150	1,050	1988	
from G. Varshilo V uplift uplift to PR	AC	80	2,543	1973	amortised water mains
From PS Vetren III-rd uplift to PR Akandzhievo	AC	100	2,520	1971	
Water supply system Septemvri					
From water source to water tower	steel	159,219 325	358 1,570	1986	
From water tower to Septemvri	AC	350	1,110	1986	
From Septemvri to Zlokuchene	AC	125	1,845	1971	
Water supply system Kovachevo - Lozen					
From water source to PR. Lozen	AC	200	5,300	1974	amortised water mains
Water supply system Varvara – Vetren dol					

Transmission water main	Material	Diameter [mm]	Length [km]	Year of construction	Observations
From water source to PR Vetren dol	steel	159	1,300	1986	
from PS ro PR Varvara	steel	219	3,100	1984	
Other settlements with a population of below 2,000 inhabitants	AC, Mannesmann, steel, PVC	60-200	51,619	1959-2001	Obsolete pipes

Table 3-34 Transmission water mains of the main water supply systems of Lesichovo Municipality

Transmission water main	Material	Diameter [mm]	Length [km]	Year of construction	Observations
Water supply system Vetren					
from PS Slavovitsa to DC	Steel	325	2,541	1993	
From DC to PR Lesichovo	Steel	219	4,670	1993	
	steel	273	650	1993	
From PR Lesichovo to PS I-st uplift Borimechkovo	steel	219 159	1,344 1,662	1993	Heavily
from PS I-ви uplift.to PS II-nd uplift Borimechkovo	steel	108	2,975	1995	corroded
to PS II-nd uplift Borimechkovo tp PR	steel	108	1,915	1995	pipes
From DC to Tserovo PR	PE	110	1,200	2007	Good condition
Other settlements with a population of below 2,000 inhabitants	AC	100-200	10,552	1959	Obsolete pipes

The asbestos cement and steel transmission water mains built before 2002 are amortised and need to be replaced. The laid PVC pipes are not in good condition – they break down often and need to be replaced.

3.4.2.8. Water supplied settlements

Table 3-35 Settlements connected to the main water supply systems of Pazardzhik municipality

Settlement	Total population	Population connected to the network	Share of population connected to the network	Supplied water quantity	Installed water meter
	[number]	[number]	[%]	[m³/year]	[yes/no]
WSS Pazardzhik	83,679	83 679		9,041,560	
Pazardzhik	71,979	71,979	100%	862,238	
Ivaylo	2,841	2,841	100%	263,045	
Glavinitsa	2,282	2,282	100%	368,307	settlement inlet
Dragor	1,422	1,422	100%	94,287	
Saraya	1,356	1,356	100%	85,376	
Miryantsi	568	568	100%	72,404	settlement inlet
Mokrishte	1,851	1,851	100%	159,882	settlement inlet
Dobrovnitsa	1,380	1,380	100%	136,030	

Settlement	Total population	Population connected to the network	Share of population connected to the network	Supplied water quantity	Installed water meter
	[number]	[number]	[%]	[m³/year]	[yes/no]
WSS Ognyanovo	2,353	2,353		300,653	
Ognyanovo	2,353	2,353	100%	300,653	settlement inlet
WSS Govedare	1,634	1,634		82,901	
Govedare	1,634	1,634	100%	82,901	settlement inlet
WSS Hadzhievo	1,027	1,027		141,114	
Hadzhievo	1,027	1,027	100%	141,114	settlement inlet
WSS Sinitevo	1,950	1,950		108,860	
Sinitevo	1,950	1,950	100%	108,860	settlement inlet
WSS Malo Konare	5,390	5,390		331,630	
Malo Konare	4,353	4,353	100%	267,522	settlement inlet
Pishtigovo	1,037	1,037	100%	64,108	settlement inlet
WSS Aleko Konstantinovo	2,714	2,714		192,776	
Aleko Konstantinovo	2,714	2,714	100%	192,776	settlement inlet
WSS Yunatsite	1,522	1,522		79,517	
Yunatsite	1,522	1,522	100%	79,517	settlement inlet
WSS Patalenitsa - Tsrancha	1,435	1,435		549,754	
Patalenitsa	1,228	1,228	100%	306,552	settlement inlet
Tsrancha	207	207	100%	243,202	settlement inlet
WSS Bratanitsa - Lyahovo	2,484	2,484		231,705	
Bratanitsa	2,093	2,093	100%	188,567	settlement inlet
Lyahovo	391	391	100%	43,138	settlement inlet-supply pipe
WSS Debrashtitsa	910	910		100,350	
Debrashtitsa	910	910	100%	100,350	settlement inlet
WSS Velichkovo	1,020	1,020		224,579	
Velichkovo	1,020	1,020	100%	224,579	settlement inlet
WSS Zvanichevo	1,899	1,899		160,584	
Zvanichevo	1,899	1,899	100%	160,584	settlement inlet
WSS Chernogorovo	2,393	2,393		245,930	
Chernogorovo	2,203	2,203	100%	224,720	water supply system inlet
Krali Markovo	190	190	100%	21,210	settlement inlet
WSS Rosen- Tsar Asen	797	797		126,969	
Rosen	516	516	100%	73,575	
Tsar Asen	281	281	100%	53,394	Inlet pipe of PR and settlement inlet
WSS Gelemenovo	695	695		74,870	
Gelemenovo	695	695	100%	74,870	settlement inlet
WSS Ovchepoltsi – Topli	1,240	1,240		155,962	

Settlement	Total population	Population connected to the network	Share of population connected to the network	Supplied water quantity	Installed water meter
	[number]	[number]	[%]	[m³/year]	[yes/no]
dol					
Ovchepoltsi	972	972	100%	121,333	Inlet pipe of PR.
Topli dol	268	268	100%	34,629	Supply pipe of PR
WSS Apriltsi - Sbor	775	775		71,102	
Apriltsi	526	526	100%	34,534	
Sbor	249	249	100%	36,568	settlement inlet
Total for the municipality	113,917	113,917		12,220,996	

Table 3-36 Settlements connected to the main water supply systems of Septemvri Municipality

Settlement	Total population	Population connected to the network	Share of population connected to the network	Supplied water quantity	Installed water meter
	[number]	[number]	[%]	[m³/year]	[yes/no]
WSS Vetren	5,540	5,540		1,056,450	
Vetren	3,221	3,221	100%	553,794	
Slavovitsa	376	376	100%	127,502	Pressure main in PS Slavovitsa IV-th uplift
Gorno Varshilo	42	42	100%	14,729	Pressure main in PS Gorno Varshilo V-th uplift
Vinogradets	1,481	1,481	100%	285,089	
Akandzhievo, Belovo municipality	420	420	100%	75,336	At the water main to the PR of the village
WSS Septemvri	8,729	8,729		865,350	
Septemvri	7,869	7,869	100%	814,367	
Zlokuchene	860	860	100%	50,983	
WSS Karabunar-Boshulya	2,165	2,165		315,260	
Karabunar	1,349	1,349	100%	201,930	Inlet pipe of the PR and settlement inlet
Boshulya	816	816	100%	113,330	DC supply pipe - settlement inlet
WSS Lozen-Kovachevo	3,421	3,421		208,870	
Lozen	1,019	1,019	100%	76,393	
Kovachevo	2,402	2,402	100%	132,477	
WSS Varvara-Vetren dol	3,513	3,513		779,678	
Varvara	2,061	2,061	100%	508,407	

Settlement	Total population	Population connected to the network	Share of population connected to the network	Supplied water quantity	Installed water meter
	[number]	[number]	[%]	[m³/year]	[yes/no]
Vetren dol	1,452	1,452	100%	271,271	
WSS Semchinovo-Simeonovets	2,841	2,841		469,675	
Simeonovets	898	898	100%	187,313	settlement inlet
Semchinovo	1,943	1,943	100%	282,362	settlement inlet
Total for the municipality	26,209	26,209		695,283	

Table 3-37 Settlements connected to the main water supply system of Lesichovo Municipality

Settlement	Total population	Population connected to the network	Share of population connected to the network	Supplied water quantity	Installed water meter
	[number]	[number]	[%]	[m³/year]	[yes/no]
WSS Vetren	3,472	3,472		616,177	
Lesichovo	828	828	100%	195,928	DC supply pipe before the village
Tserovo	911	911	100%	151,517	DC supply pipe before the village
Borimechkovo	569	569	100%	63,347	supply pipe PR
Kalugerovo	1,164	1,164	100%	205,385	DC supply pipe before the village
WSS Dinkata	1,936	1,936		181,705	
Dinkata	1,164	1,164	100%	91,093	
Shtarkovo	394	394	100%	48,456	
Pamidovo	378	378	100%	42,156	
Total for the municipality	5,408	5,408		797,882	

3.4.2.9. *Efficiency of the water supply system*

The region of the three municipalities – Pazardzhik, Septemvri and Lesichovo the water supply systems of which are served by ViK EOOD Pazardzhik has sufficient groundwater sources. The existing 25 water supply systems with 112 water abstraction facilities have collected and built-up water quantities far exceeding the necessary at 90% provision of the supply. Problems arise from the condition of the external (transmission) and internal (distribution) water mains systems which are severely amortised, as well as from the fact that there are no reservoirs built for part of them.

Analysing the inefficiency of the water supply systems it must be pointed out that it consists of several components:

- Interrupted continuity of the water supply and losses due to inefficient water mains, amortised and technically outdated equipment of the pumping stations, repairs of the facilities, etc.
- Self-limitations due to economic reasons and lack of existing sewerage systems;
- Nitrate pollution – resulting from incomplete sewerage network of Ivaylo village which is situated in the SPZ of the water source /3 TW of WSZ Ivaylo/.

Problems with the pipes and reliability of the water supply – the big number of the breakdowns along the asbestos cement pipes are due to amortised gaskets which cause hidden constant leaks which are hard to detect. When the water supply is suspended for repairing the breakdowns and then resumed water hammers occur which due to amortised gaskets result in new breakdowns.

The breakdowns on the steel pipes are caused by corrosion – internal caused by chlorine compounds which are used for disinfection of the water, and external – caused by the poor insulation of the pipes and the aggressive impact of the high groundwater, acidic rains, hidden leaks on the water main network and polluted soils.

Table 3-38 Number of breakdowns

Section	Unit	Quanity	Number of breakdowns	Number / length =3/2
Pazardzhik region				
Trunk water mains	km	118. 812	56	0,4713
WSPS/BPS	No	24	253	10.5417
Distribution network	km	596.078	567	0.9512
SC	No	28.970	670	0.0231
Septemvri - Lesichovo region				
Trunk water mains	km	118.527	80	0,675
WSPS/BPS	No	15	26	1.7333
Distribution network	km	295.648	323	1.0925
SC	No	14,815	145	0,0098
Total for WSS EOOD Pazardzhik				
Trunk water mains	km	237.339	136	0.5729
WSPS/BPS	No	39	279	7.1538
Distribution network	km	891.726	890	0.9981
SC	No	43,785	815	0.0186

WSPS – Water supply puming station, BPS – bunker pumping station; SC – service connection

<u>Water losses</u>

The appended table – Balance of the water quantities in 2011 of ViK EOOD Pazardzhik shows that the non-revenue water is 62.8% and a large part of it comes from internal losses which amount to 51.1% of the total quantity at the inlet of the system.

<u>Energy efficiency</u>

The big losses of electricity for the abstraction and transmission of the water and the lack of financial resources for rehabilitation generate a very high price of the water. The pumping units of the bigger systems – Vetren and Pazardzhik in the pumping stations II-nd uplift are amortised, old models and have low efficiency. After the rehabilitation of the worn-out gaskets and frames of the fixtures on the trunk water mains in the pumping stations and reservoirs the economic efficiency of the water supply infrastructure in the region served by ViK EOOD Pazardzhik ican be improved significantly.

Metering the water supplied to the villages

The water supplied from the water sources is metered regardless that not all permissions have been renewed and no individual ones have been issued.

The water supplied to the settlements is metered in most of them at the settlement inlet. Water meters are installed also on the supply pipes of the PR but they are not enough.

In term s of the energy efficiency of the water supply systems it is recommended:

- Very low energy efficiency /14% of the existing pumps feature very low energy efficiency and need to be replaced in the short term/;
- Gradual replacement of the existing pumps after they reach the end of their service life of 20 years;
- Commissioning existing water sources which are not used currently after proving the economic efficiency and bringing them in compliance with Ordinance No1/10.2007;
- Rehabilitation of the constructed facilities which have not been commissioned so far with the appropriate motivation;
- The disinfection facilities using chlorine gas are old and unreliable, no system for the detection and deactivation of leaking chlorine in the working premises is installed and this creates danger for the life of the workers in the chlorination compartment and in case of higher quantities of chlorine also for people around the chlorination station.
- All systems for disinfection must be equipped with automatic monitoring system for the quantity of residual chlorine and according to its quantity the supplied disinfectant to be increased or reduced
- Many reservoirs are outdated and must be rehabilitated or reconstructed in accordance with the information given in Table 3-18.
- The equipment in many pumping stations is amortised, inefficient and/or highly energy consuming.
- The water mains were built in the period between 1930 and 1986. The pipes are old and amortised and the leakage percentage in them is high and need to be replaced.

3.4.3. DISTRIBUTION NETWORKS

The distribution networks of all settlements operated by ViK EOOD Pazardzhik, encompassing the Municipalities of Pazardzhik, Septemvri and Lesichevo are examined below. Detailed information on the distribution networks of all settlements is given in ***Appendix 3-13***.

3.4.3.1. *Characteristics of distribution networks*

3.4.3.1.1. *Distribution network in the Town of Pazardzhik*

The existing water distribution network of the town of Pazardzhik is depicted in: Layout 8 – Existing internal water supply network of the town of Pazardzhik.

Water Supply Network

The town of Pazardzhik is divided into two zones as according to the water sources. The industrial zone and two quarters (Garata and Lagera) receive water directly from Garata PS and the rest of the town gets its water from Mokrishte water yielding zone (the major part) and from Ivaylo water yielding zone (northern part of the town). The two zones are connected and, if necessary, water can be supplied from the urban part of Pazardzhik to the industrial zone and both quarters.

The types of pipes by diameters and material are presented in the table below.

Table 3-39 Water distribution network in the town of Pazardzhik

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of construction	Observations
AC	60 - 546	123.170	71.20	1955-1981	Obsolete pipes. Failures are mainly common for these pipes.
Steel	76-920	25.330	14.64	1977-1995	Obsolete pipes without cathodic protection.
Mannesmann	60-150	2.420	1.40	1931-1942	Old, obsolete pipes.
Galvanized steel pipes	1“	0.090	0.05	1981	Poor condition. Corrosion. Small diameters.
Cast iron	100-600	1.960	1.14	1996-2002	Very good condition.
PE	63-400	19.940	11.53	after 2000	Very good condition.
PVC	100	0.070	0.04	after 2000	Very good condition.
Total:		172.980	100		
Servce connections	Galvanized 3/4“-2“ PE 25-125	9,819		1955-1995 after 2000	The majority of galvanized steel pipes are old and in poor condition. Corrosion. The new connections made of PE are in good condition.

The greater part of the distribution network (87%) consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement, steel, Mannesmann, galvanized).

There are frequent failures in the network (1.53 pcs/km for the year 2011).

The existing fire hydrants and stop valves are insufficient and many of them are out of operation.

Pazardzhik Municipality has been granted financing under Priority Axis 1 of Operational Programme Environment 2007-2013 (OPE) under procedure BG161PO005/10/1.11/03/19 „Preparation and Implementation of Projects for Improvement and Development of Water and Wastewater Infrastructure in Agglomerations with over 10,000 PE", under ***NoDIR-51011119-***

C010 „Extension of WWTP for nutrient removal (nitrogen and phosphorus), rehabilitation and extension of the WSS network of the town of Pazardzhik, signed on 14.09.2011 for BGN 49,822,725.

The currently elaborated preliminary design envisages rehabilitatation of 15.740 km of the network (9%).

Water Storage

Water storage facilities of the town of Pazardzhik are presented in 3.4.2.3. – Water Storage.

Pressure reservoirs have sufficient capacity,exceeding 50% of the maximum daily consumption of the town.

3.4.3.1.2. *Distribution network in the Village of Malo Konare*

The existing water distribution network of the village of Malo Konare is depicted in: **Layout 10** - Existing internal water supply network of the village of Malo Konare.

Water Supply Network

The village of Malo Konare has a pump-fed distribution network. It is supplied directly from tube well 2, located in Doganovo area.

The types of pipes by diameters and material are presented in the table below.

Table 3-40 Water distribution network in the village of Malo Konare

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of constructio n	Observations
AC	60 - 300	51.208	95.11	1957-1975	Obsolete pipes. Failures are mainly common for these pipes.
PVC	75-200	2.630	4.89	1999-2001	Very good condition.
Total:		**53.838**	**100**		
Service connections	3/4“-2“	1,876 pcs			The majority of galvanized steel pipes are old and in poor condition. Corrosion.

The greater part of the distribution network (95%) consists of old asbestos cement pipes, which have reached the end of their service life and feature low reliability

The existing fire hydrants and stop valves are insufficient and many of them are out of operation.

Water Storage

The village of Malo Konare has no water storage facilities.

3.4.3.1.3. *Distribution network in the Village of Ivaylo*

The existing water distribution network of the village of Ivaylo is depicted in: **Layout 12** - Existing internal water supply network of the village of Ivaylo.

Water Supply Network

The village of Ivaylo has a pump-fed distribution network. It is supplied directly from the tube wells located in the village.

The types of pipes by diameters and material are presented in the table below.

Table 3-41 Water distribution network in the village of Ivaylo

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of constructio n	Observations
AC	60 - 300	13.715	66.51	1958-1975	Obsolete pipes. Failures are mainly common for these pipes.
Steel	300	1.315	6.38	1977-1982	Obsolete pipes without cathodic protection.
PE	90-315	5.590	27.11	1998-2005	Very good condition.
Total:		20.620	100		
Service connections	3/4“-1 1/2“	956 pcs			The majority of galvanized steel pipes are old and in poor condition. Corrosion.

The greater part of the distribution network (73%) consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement and steel).

The existing fire hydrants and stop valves are insufficient and many of them are out of operation.

Water Storage

The village of Ivaylo has no water storage facilities.

3.4.3.1.4. Distribution network in the Village of Aleko Konstantinovo

The existing water distribution network of the village of Aleko Konstantinovo is depicted in: **Layout 14** – Existing internal water supply network of the village of Aleko Konstantinovo.

Water Supply Network

The village of Aleko Konstantinovo has a pump-fed distribution network. It is supplied directly by Aleko Konstantinovo PS.

The types of pipes by diameters and material are presented in the table below.

Table 3-42 Water Distribution network in the village of Aleko Konstantinovo

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of constructio n	Observations
AC	60 - 150	16.956	93.68	1951-1967	Obsolete pipes. Failures are mainly common for these pipes.
Steel	159	0.173	0.96	1977-1981	Obsolete pipes without cathodic protection.
PVC	90	0.971	5.36	1999	Very good condition.
Total:		18.100	100		

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of construction	Observations
Service connections	3/4“-2“	852 pcs			The majority of galvanized steel pipes are old and in poor condition. Corrosion.

The prevailing pipe diameters are ∅60 and ∅80 – asbestos cement. Water pipelines are obsolete and feature low reliability.

The distribution network is not zoned – stop valves in the nodal intersections are insufficient. Most of the installed stop valves are out of operation.

Only 10 of the existing fire hydrants are operational.

Water Storage

The village of Aleko Konstantinovo has no water storage facilities.

3.4.3.1.5. *Distribution network in the Village of Ognyanovo*

The existing water distribution network of the village of Ognyanovo is depicted in: **Layout 16** - Existing internal water supply network of the village of Ognyanovo.

Water Supply Network

The existing water distribution network is a loop one.

The types of pipes by diameters and material are presented in the table below.

Table 3-43 Water distribution network in the village of Ognyanovo

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of construction	Observations
AC	60 - 300	16.612	77.45	1963-1976	Obsolete pipes. Failures are mainly common for these pipes
Mannesmann	40-50	3.324	15.50	1935-1939	Old, obsolete pipes.
Galvanized steel pipes	¾’’	0.318	1.48	1981-1987	Poor condition. Corrosion. Small diameters.
PE	63-110	1.194	5.57	2002-2006	Very good condition.
Total:		21.448	100		
Service connections	3/4“-1 1/2“	969 pcs			The majority of galvanized steel pipes are old and in poor condition. Corrosion.

The greater part of the distribution network (94%) consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement, Mannesmann, galvanized).

The existing fire hydrants and stop valves are insufficient and many of them are out of operation.

Water Storage

Water storage facilities of the village of Ognyanovo are presented in 3.4.2.3. – Water Storage.

The water tower has sufficient capacity, exceeding 20% of the maximum daily consumption of the village.

3.4.3.1.6. *Distribution network in the Village of Glavinitsa*

The existing water distribution network of the village of Glavinitsa is depicted in: **Layout 18** - Existing internal water supply network of the village of Glavinitsa.

Water Supply Network

The village of Glavinitsa has pump-fed and gravity-fed water supply. The pump-fed water supply is carried out by Garata PS located on the territory of Pazardzhi and the gravity-fed water supply – by the reservoirs of the town of Pazardzhik. A pressure regulator is mounted on the transmission main from the reservoirs, which reduces the pressure 35 m downstream of it.

The types of pipes by diameters and material are presented in the table below.

Table 3-44 Water distribution network in the village of Glavinitsa

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of construction	Observations
AC	60 - 150	13.676	87.60	1951-1973	Obsolete pipes. Failures are mainly common for these pipes.
Steel	108-159	1.035	6.63	1975-1983	Obsolete pipes without cathodic protection.
PVC	90	0.900	5.77	1998-1999	Very good condition.
Total:		15.611	100		
Service connections	3/4“-2“	745 pcs			The majority of galvanized steel pipes are old and in poor condition. Corrosion.

The greater part of the distribution network (94%) consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement and steel).

The existing fire hydrants and stop valves are insufficient and many of them are out of operation

Water Storage

Water storage for gravity-fed water supply is carried out in the pressure reservoirs of the town of Pazardzhik. The village has not water storage facility for pump-fed water supply.

3.4.3.1.7. *Distribution network in the Village of Chernogorovo*

The existing water distribution network of the village of Chernogorovo is depicted in: **Layout 20** - Existing internal water supply network of the village of Chernogorovo.

Water Supply Network

The village of Chernogorovo has a pump-fed water supply network – directly by Chernogorovo PS. There are frequency controlled pumps, which maintain pressure between 1.5 – 3.5 atm.

The types of pipes by diameters and material are presented in the table below.

Table 3-45 Water distribution network in the village of Chernogorovo

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of construction	Observations
AC	60 - 250	25.800	94.37	1967-1971	Obsolete pipes. Failures are mainly common for these pipes.
Steel	219	0.995	3.63	1977-1986	Obsolete pipes without cathodic protection.
Galvanized steel pipes	¾''	0.335	1.23	1981-1987	Poor condition. Corrosion. Small diameters.
PE	63	0.210	0.77	after 2000	Very good condition.
Total:		27.340	100		
Service connections	3/4“-1 1/2“	997 pcs			По The majority of galvanized steel pipes are old and in poor condition. Corrosion.

The greater part of the distribution network (99%) consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement, steel, galvanized).

The existing fire hydrants and stop valves are insufficient and many of them are out of operation.

Water Storage

The village of Chernogorovo has no water storage facilities.

3.4.3.1.8. Distribution network in the Village of Bratanitsa

The existing water distribution network of the village of Bratanitsa is depicted in: **Layout 22** - Existing internal water supply network of the village of Bratanitsa.

Water Supply Netwok

The village of Bratanitsa has a pump-fed distribution network. It is supplied directly from a tube well located between the villages of Bratanitsa and Lyahovets.

The types of pipes by diameters and material are presented in the table below.

Table 3-46 Water distribution network in the village of Bratanitsa

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of construction	Observations
AC	60 - 125	14.005	89.49	1963-1971	Obsolete pipes. Failures are mainly common for these pipes.
PE	90-100	1.645	10.51	after 2000	Very good condition.
Total:		15.650	100		

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of construction	Observations
Service connecions	3/4“-1 1/2“	709 pcs			The majority of galvanized steel pipes are old and in poor condition. Corrosion.

The greater part of the distribution network (90%) consists of old asbestos cement pipes, which have reached the end of their service life and feature low reliability.

The existing fire hydrants and stop valves are insufficient and many of them are out of operation.

Water Storage

The village of Bratanitsa has no water storage facilities.

3.4.3.1.9. Distribution network in the Town of Septemvri

The existing water distribution network of the town of Septemvri is depicted in: **Layout 24** – Existing internal water supply network of the town of Septemvri.

Water Supply Network

The existing distribution network was mainly built of asbestos cement pipes about 30 years ago and pipes are already obsolete.

Water supply system consists of three main branches with diameters from ∅150 to ∅ 350 mm and secondary branches with diameters from ∅80 to ∅ 100 mm. Due to the lack of connections between the main branches the transmission network functions as a branched system. The entire water system operates as a loop one in the secondary branches.

The network is in very poor technical condition. Based on data provided by the operator, physical water losses are estimated to be 48% of the water supplied to the town.

The types of pipes by diameters and material are presented in the table below.

Table 3-47 Water distribution network in the town of Septemvri

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of construction	Observations
AC	60 - 350	46.775	97.68	1967-1987	Obsolete pipes. Failures are mainly common for these pipes.
Steel	150	0.204	0.43	1987-1989	Obsolete pipes without cathodic protection.
Galvanized steel pipes	1 ½”	0.658	1.37	1981-1987	Poor condition. Corrosion. Small diameters.
PE	63-180	0.247	0.52	1999	Very good condition.
Total:		47.884	100		
Service connections	3/4"-150	2,636 pcs			The majority of galvanized steel pipes are old and in poor condition. Corrosion.

The greater part of the distribution network (99%) consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement, steel, galvanized). There are frequent failures in the network (1.15 pcs/km for the year 2011).

The existing fire hydrants and stop valves are insufficient and many of them are out of operation.

Septemvri Municipality has obtained financing under Priority Axis 1 of Operational Programme Environment 2007-2013 (OPE) under Procedure BG161PO005/10/1.11/02/16 „Improvement and development of drinking and wastewater infrastructure in agglomerations over 10 000 P.E.", with ***NoDIR-51011116-C055 „Water Cycle Improvement in the town of Septemvri",*** signed on 20.11.2012.

The above-mentioned project envisages rehabilitation of 2.956 of the network (6.17%).

Water Storage

Water storage facilities of the town of Septemvri are presented in 3.4.2.3. – Water Storage.

The existing water tower and suction tank have sufficient capacity,exceeding 60% of the maximum daily consumption of the town. The facilities are currently not in use.

3.4.3.1.10. *Distribution network in the Town of Vetren*

The existing water distribution network of the town of Vetren is depicted on: **Layout 26** – Existing internal water supply network of the town of Vetren.

Water Supply Network

The distribution network of the town of Vetren is divided into two zones (high and low), fed from the respective reservoirs. Each zone is divided into 2 sub-zones by means of the installed pressure reducing valves. The high sub-zones are characterised by hydrostatic head exceeding the standards of 60 m. (Pressure reducing valves are installed in accordance with the requirements of the former water supply standards for permissible pressure of Hman = 80 m). Each of the sub-zones operates as loop network.

The types of pipes by diameters and material are presented in the table below.

Table 3-48 Water distribution network in the town of Vetren

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of constructio n	Observations
AC	60 – 200	20.765	90.66	1966-1973	Obsolete pipes. Failures are mainly common for these pipes.
Steel	125-159	2.140	9.34	1976-1982	Obsolete pipes without cathodic protection.
Total:		22.905	100		
Service connections	3/4"-1 1/2"	1,579 pcs			The majority of galvanized steel pipes are old and in poor condition. Corrosion.

The entire distribution network consists of old pipes, which have reached the end of their service life and feature low reliability. There are frequent failures in the network (2.14 pcs/km for the year 2011).

The existing fire hydrants and stop valves are insufficient and many of them are out of operation.

Water Storage

Water storage facilities of the town of Vetren are presented in 3.4.2.3. – Water Storage.

Pressure reservoirs have sufficient capacity, exceeding 55% of the maximum daily consumption of the town.

3.4.3.1.11. *Distribution network in the Village of Kovachevo*

The existing water distribution network of the village of Kovachevo is depicted in: **Layout 28** - Existing internal water supply network of the village of Kovachevo.

Water Supply Network

The village of Kovachevo has a pump-fed distribution network – directly by Kovachevo-Lozen PS.

Due to the flat terrain the pressure reservoir is located about 4.5 km. away from the village. The reservoir serves as counter pressure tank for the village of Kovachevo.

The types of pipes by diameters and material are presented in the table below.

Table 3-49 Water distribution network in the village of Kovachevo

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of construction	Observations
AC	60-200	15.158	100	1965-1974	Obsolete pipes. Failures are mainly common for these pipes.
Total:		15.158	100		
Service connections	3/4“-1“	719 pcs			The majority of galvanized steel pipes are old and in poor condition. Corrosion.

The entire distribution network consists of old asbestos cement pipes, which have reached the end of their service life and feature low reliability.

The existing fire hydrants and stop valves are insufficient and many of them are out of operation.

Water Storage

Water storage facilities of the village of Kovachevo are presented in 3.4.2.3. – Water Storage.

The pressure reservoir has sufficient capacity, equal to 60% of the maximum daily consumption of the villages (The reservoir is joint to the villages of Kovachevo and Lozen).

3.4.3.1.12. *Distribution Network in the Village of Varvara*

The existing water distribution network of the village of Varvara is depicted in: **Layout 30** - Existing internal water supply network of the village of Varvara.

Water Supply Network

The distribution network of the village of Varvara is divided into two zones (high and low) by means of the mounted pressure reducing valves.

The types of pipes by diameters and material are presented in the table below.

Table 3-50 Water distribution network in the village of Varvara

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of construction	Observations
AC	60-125	18.059	88.89	1958-1971	Obsolete pipes. Failures are mainly common for these pipes.
Steel	60-150	2.107	10.37	1979-1983	Obsolete pipes without cathodic protection.
PE	63	0.154	0.76	2006-2007	Very good condition.
Total:		20.320	100		
Service connections	3/4“-1“	884 pcs			The majority of galvanized steel pipes are old and in poor condition. Corrosion.

The greater part of the distribution network (99%) consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement and steel). There are frequent failures in the network (1.97 pcs/km for the year 2011).

Varvara-Vetren Dol water supply group is the system characterised by the highest percentage of water losses in ViK Pzardzhik (total loss of 84.5% for the year 2011). Losses are mainly generated in the distribution network of the settlements.

The existing fire hydrants and stop valves are insufficient and many of them are out of operation.

Water Storage

Water storage facilities of the village of Varvara are presented in 3.4.2.3. – Water Storage.

Pressure reservoirs have sufficient capacity, exceeding 60% of the maximum daily consumption of the village.

3.4.3.1.13. *Distribution Network of Settlements with a Population of less than 2,000 inhabitants*

The table and analyses presented below refer to all of the 42 settlements with a population of less than 2,000 inhabitants, operated by ViK Pazardzhik

Water Supply Networks

The types of pipes by diameters and material are presented in the table below.

Table 3-51 Water distribution netowork in settlements with a population of below 2,000 inhabitants

Material	Nominal diameter [mm]	Length [km]	Share of total length [%]	Year of construction	Observations
AC	60-200	392.287	87.85	1951-1987	Obsolete pipes. Failures are mainly common for these pipes.
Steel	89-159	1.324	0.30	1975-1986	Obsolete pipes without cathodic protection.
Galvanized steel pipes	3/4"-2“	3.538	0.79	1981-1987	Poor condition. Corrosion. Small diameters.
Mannesmann	50-125	14.141	3.17	1935-1939	Old, obsolete pipes.
PVC	90-110	6.587	1.48	after 2000	Very good condition.
PE	90-160	28.647	6.42	after 2000	Very good condition.
Total:		446.524	100		
Service connections	3/4“-1“				The majority of galvanized steel pipes are old and in poor condition. Corrosion.

Th existing distribution networks of the villages are old and obsolete. Asbestos cement pipes are prevailing (88%). Water pipelines were mainly built in the 60's and 70’s. Most of the networks are branched. More detailed data on the distribution networks of settlements with a population of less than 2,000 inhabitants are given in Appendix 3-13.

Water Storage

Water storage facilities of settlements with a population of below 2,000 inhabitnts are presented in 3.4.2.3. – Water Storage.

The verification concerning the sufficiency of the capacity of water storage facilities for all settlements is presented in Appendix 3-10.

3.4.3.2. *Water metering*

Metering of water supplied to the distribution network

Water supplied to the distribution of the 44 settlements is metered at the inlet of the settlement, which is either on the outlet pipes downstream of the reservoirs (water towers) or on the pressure pipes (for direct pump-fed water supply).

The water meters for Tsar Assen, Ovchepoltsi and Karabunar are installed on the inlet pipes of the pressure reservoirs.

Water supplied to Pazardzhik, Ivaylo, Dobrovnitsa, Apriltsi, Vetren, Vetren Dol and Shtarkovo is not metered.

Turbine water meters are installed. They are in good condition and relatively new. Most of them were mounted less than 10 years ago. Water meters are regularly calibrated (according to the approved programme) and feature good accuracy.

Consumption metering

Consumer metering is carried out as follows:

According to data obtained from the operator i.e. ViK Pazardzhik, 99% of the customers in the service area are endowed with water meters and 1% of the customers are not metered and pay based on estimate.

Besides the individual meters, all block of flats are equipped with master meters.

All public and industrial consumers are metered.

Water meters are read on a monthly basis.

The operator has established a programme for gradual replacement of water meters, which were installed more than 10 years ago. The programme has been partially implemented (50%). 5,050 meters were planned to be replaced for 2011. 2,029 meters were replaced. At present, the efforts of the operator are mainly focused on the replacement of master meters of the block of flats and some large consumers. Over the last 4-5 years about 10,000 meters were replaced (14% of total meters installed). Currently, around 86% of meters are old (installed more than 10 years ago) and need to be replaced.

It might be generally concluded that water consumed on the territory of ViK Pazardzhik is conscientiously and correctly measured. Metering accuracy is within the current capacity of the operator. Due to the large number of old and non-replaced meters (mostly domestic water meters) water consumption metering accuracy may be considered unsatisfactory (though much better as compared to other water operators in Pazardzhik District).

Consumer metering in ViK Pazardzhik for the year 2011 is presented in the table below as well as in Appendix 3-14:

Table 3-52 Consumer metering in ViK EOOD Pazardzhik

Settlement	Number of service connections	Total number of customers	% of total customers	Number of customers without water meters	% of customers without water meters	Total number of customers with operational water meters	% Total number of customers with operational water meters	Number of water meters installed
Pazardzhik Municipality								
The town of Pazardzhik	9,819	34,084	100%	436	1%	33,648	99%	37,833
The village of Glavinitsa	754	886	100%	0	0%	886	100%	904
The village of Ivaylo	956	987	100%	3	0%	984	100%	1,007
The village of Malo Konare	1,876	1,878	100%	17	1%	1,861	99%	1,887
The village of Chernogorovo	997	997	100%	0	0%	997	100%	1,002
The village of Bratanitsa	709	702	100%	36	5%	666	95%	706
The village of Aleko Konstantinovo	852	832	100%	0	0%	832	100%	836

Settlement	Number of service connections	Total number of customers	% of total customers	Number of customers without water meters	% of customers without water meters	Total number of customers with operational water meters	% Total number of customers with operational water meters	Number of water meters installed
The village of Ognyanovo	969	968	100%	3	0.3%	965	100%	973
Settlements below 2,000 inh.	12,,038	12,225	100%	31	0.3%	12,194	99.7%	12,286
Total:	28,970	53,559		526		53,033		57,434
Belovo Municipality								
Settlements below 2,000 inh.	313	313	100%	0	0%	313	100%	315
Total:	313	313		0		313		315
Septemvri Municipality								
The town of Septemvri	2,636	2,988	100%	0	0%	2,988	100%	3,197
The town of Vetren	1,579	1,623	100%	0	0%	1,623	100%	1,631
The village of Varvara	884	883	100%	0	0%	883	100%	887
The village of Kovachevo	719	713	100%	0	0%	713	100%	717
Settlements below 2,000 inh.	5,183	5,139	100%	0	0%	5,139	100%	5,165
Total:	11,001	11,346		0		11,346		11,597
Lesichevo Municipality								
Settlements below 2,000 inh.	3,501	3,502	100%	0	0%	3,502	100%	3,520
Total:	3,501	3,502		0		3,502		3,520
Total for ViK Pazardzhik:	43,785	68,720		526		68,194		72,865

Notes:

1. There may be more than one consumer on a single service connection.
2. One customer may be provided with more than one water meter.

3.4.3.2.1. *Water Supply Systems Performance*

Pipe failures and water supply insecurity:

Based on data obtained from the operator, the number of failures in the distribution network of the settlements for the year 2011 is indicated in the table below as well as in Appendix 3-15:

Table 3-53 Pipe failures in the year 2011

Settlement	Failures in water distribution pipelines [number]	Length of distribution network [km]	Number of failures per km [number/km]	Failures in service connections [number]	Service connections [number]	Number of failures per number of service connections [number/number]
Pzardzhik Municipality						
The town of Pazardzhik	265	172.980	1.53	300	9 819	0.0306
The village of Glavinitsa	6	15.611	0.38	4	754	0.0053
The village of Ivaylo	12	20.620	0.58	16	956	0.0167
The village of Malo Konare	14	53.838	0.26	23	1 876	0.0123
The village of Chernogorovo	6	27.340	0.22	9	997	0.0090
The village of Bratanitsa	9	15.650	0.58	16	709	0.0226
The village of Aleko Konstantinovo	6	18.100	0.33	16	852	0.0188
The village of Ognyanovo	11	21.448	0.51	17	969	0.0175
24 settlements below 2,000 inh.	238	250.491	0.95	269	12 038	0.0223
Total:	567	596.078	0.95	670	28 970	0.0231
Belovo Municipality						
The village of Akandzhievo	1	6.623	0.15	0	313	0.0000
Total:	1	6.623	0.15	0	313	0.0000
Septemvri Municipality						
The town of Septemvri	55	47.884	1.15	37	2 636	0.0140
The town of Vetren	49	22.905	2.14	15	1 579	0.0095
The village of Varvara	40	20.320	1.97	7	884	0.0079
The village of Kovachevo	15	15.158	0.99	7	719	0.0097
10 settlements below 2,000 inh.	123	116.224	1.06	49	5 183	0.0095
Total:	282	222.491	1.27	115	11 001	0.0105
Lesichevo Municipality						
7 settlements below 2,000 inh.	40	66.534	0.60	30	3 501	0.0086
Total:	40	66.534	0.60	30	3 501	0.0086

Settlement	Failures in water distribution pipelines [number]	Length of distribution network [km]	Number of failures per km [number/km]	Failures in service connections [number]	Service connections [number]	Number of failures per number of service connections [number/number]
Total for ViK Pazardzhik:	890	891.726		815	43 785	0.0186

Notes:

The number of failures mentioned above only applies to visible failures that are detected without using special equipment.

According to information provided by ViK Pazardzhik the largest number of failures occur in asbestos cement pipes that represent 86% of the length of the networks, served by the operator. A significant number of failures take place in water supply service connections, which are made of old galvanized pipes.

Despite the substantial number of failures, water supply to consumers is sufficiently well guaranteed. Water supply is disconnected in a given quarter or street only during the performance of intervention works for the respective failure (failures are repaired within 6 - 8 hours). There is good emergency response organization.

Water Losses:

Non-revenue water assessment for all settlements served by the operator i.e. ViK EOOD Pazardzhik has been presented in Item 3.3.2 Water Balance and Non-revenue Water Assessment as well as in Appendix 3-6.

With reference to Chapter 3.3.2 Water Balance and Non-revenue Water and Appendix 3-6, it can be seen that non-revenue water for the individual settlements varies within wide limits (from 20% to 84% of the water supplied to the respective settlement).

However, it may be indicated that non-revenue water for the town of Pazardzhik is 59%, while non-revenue water for the remaining settlements with a population of over 2,000 inhabitants (11 settlements) varies from 45% to 85% of water supplied.

NRW percentage for the smaller settlements ranges from 45% to 78% of water supplies.

From the information given above, it can be concluded that water losses in the settlements, served by the operator are very high. (In Bulgaria losses in this range are not considered unusual for non-rehabilitated networks.)

Several settlements are observed to have remarkably low water losses compared to the remaining ones i.e. the village of Gelemenovo - 37%, the village of Sinitovo – 30%, the village of Yunatsite – 20%. The material and structure of these villages are the same as those of the remaining settlements – they are mainly built of asbestos cement pipes (94-96% asbestos cement pipes). It may be assumed that the relatively small water losses are due to the low pressure, maintained in the networks of these villages. As a result of the absence of accurate measurements and detailed surveys of the networks of the three villages, no further comments can be made.

The table below presents water losses of the settlements in the territory, operated by ViK EOOD Pazardzhik.

Table 3-54 Water losses in the distribution networks for the year 2011

Settlement	Total water supplied	Commercial losses		Real losses		Total water losses	
	m3/year	m3/year	%	m3/year	%	m3/year	%
The town of Pazardzhik	7,862,238	928,823	12%	3,712,293	47%	4,641,116	59%
The village of Aleko Konstantinovo	192,776	22,372	12%	89,487	46%	111,859	58%
The village of Bratanitsa	188,567	25,509	14%	102,035	54%	127,544	68%
The village of Chernogorovo	224,720	29,560	13%	118,239	53%	147,799	66%
The village of Glavinitsa	368,307	43,511	12%	174,043	47%	217,554	59%
The village of Ivaylo	263,045	31,075	12%	124,302	47%	155,377	59%
The village of Malo Konare	267,522	24,080	9%	96,319	36%	120,399	45%
The village of Ognyanovo	300,653	30,064	10%	120,258	40%	150,322	50%
The town of Septemvri	814,367	97,923	12%	391,691	48%	489,614	60%
The town of Vetren	553,794	86,620	16%	346,079	62%	432,699	78%
The village of Kovachevo	132,477	12,070	9%	48,179	36%	60,249	45%
The village of Varvara	508,407	85,914	17%	343,406	68%	429,320	84%
43 settlements below 2,000 inh.	5,037,288	683,366	14%	2,730,969	54%	3,414,335	68%
Total	16,714,161	2,100,887	13%	8,397,300	50%	10,498,187	63%

Commercial losses are generated by water abstraction from illegal service connections (water theft) and inaccurate water consumption metering (old and inaccurate meters).

Real losses are generated by leakages resulting from failures (visible and hidden) in the distribution branches and service connections due to emptying of water supply networks for repairs and overflows at pressure reservoirs.

The consultant notes that the settlements featuring very large total losses (66-84%) are likely to have commercial losses significantly higher than those indicated by the operator (as compared to real losses). These are the settlements of Bratanitsa, Chernogorovo, Vetren and

Varvara. High commercial losses are mainly caused by the presence of unauthorised connections for irrigation of yards and gardens.

Detailed tables of the water balance including the types of losses of the settlements are given in Appendix 3-6.

3.4.3.2.2. Summary of Main Deficiencies

The maintenance of the distribution networks of the settlements, served by the operator ViK Pazardzhik is mainly reduced to repair of failures, which in some of the settlements are very frequent and deteriorate the quality of service (interruption of water supply to consumers for a few hours). Preventive activities are limited. There is no systematic search and localisation of hidden leakages and failures by means of special equipment. Daily maintenance of networks such as inspections of equipment and fixtures, cleaning and flushing of water pipeline sections are difficult to achieve as efforts are primarily focused on repair of registered failures. It may be stated that the repair of failures is becoming one of the main activities of the Water Company due to the highly obsolete distribution networks and associated facilities. The repair of failures takes a major part of the company's resources.

The table below summarises the main deficiencies of the water distribution networks in the settlements.

Table 3-55 Summary of main deficiencies in the distribution networks of the settlements

Components	Distribution network	Service connections	Water metering	Water storage facilities
The town of Pazardzhik	87% of the network consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement, steel, Mannsmann, galvanized pipes). There are frequent failures in the network (1.53 pcs/ km for the year 2011). The existing fire hydrants and stop valves are insufficient and many of them are out of operation.	Over 80% of the service connections are in poor condition – old galvanized pipes, which are corroded and suffering frequent failures. Presence of unauthorised connections (losses due to theft - 8% of water supplied).	Water supplied to the town is not metered at all water sources. Inaccurate consumer metering – a large number of uncalibrated water meters	Obsolete pipe systems and fittings in the pressure reservoir.
The village of Malo Konare	36% of the network consists of pipes having small diameter (∅60) , which is not compliant with the regulatory requirements. 95% of the distribution network consists of old asbestos cement pipes , which have reached the end of their service life and feature low reliability. The existing fire hydrants and stop valves are insufficient.	Over 90% of the service connections are in poor condition – old galvanized pipes. Presence of unauthorised connections (losses due to theft - 4% of water supplied).	Inaccurate consumer metering – a large number of uncalibrated water meters	No water storage facilities.
The village of	73% of the distribution network	Over 70% of the	Water	No water storage

Components	Distribution network	Service connections	Water metering	Water storage facilities
Ivaylo	consists of old pipes , which have reached the end of their service life and feature low reliability (asbestos cement and steel). The existing fire hydrants and stop valves are insufficient.	service connections are in poor condition – old galvanized pipes. Presence of unauthorised connections (losses due to theft - 8% of water supplied).	supplied to the village is not metered. Inaccurate consumer metering – a large number of uncalibrated water meters	facilities.
The village of Aleko Konstantinovo	23% of the network is built of pipes having small diameter (∅60). 95% of the distribution network consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement and steel). The existing fire hydrants and stop valves are insufficient.	Over 90% of the service connections are in poor condition – old galvanized pipes. Presence of unauthorised connections (losses due to theft - 7% of water supplied).	Inaccurate consumer metering – a large number of uncalibrated water meters	No water storage facilities.
The village of Ognyanovo	64% of the network is built of pipes having small diameter (∅60). 94% of the distribution network consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement, Mannesmann and steel). The existing fire hydrants and stop valves are insufficient.	Over 90% of the service connections are in poor condition – old galvanized pipes. Presence of unauthorised connections (losses due to theft - 5% of water supplied).	Inaccurate consumer metering – a large number of uncalibrated water meters	The water tower needs to be provided with hydro insulation. Obsolete pipe systems and fittings in the water tower.
The village of Glavinitsa	94% of the distribution network consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement and steel). The existing fire hydrants and stop valves are insufficient.	Over 90% of the service connections are in poor condition – old galvanized pipes. Presence of unauthorised connections (losses due to theft - 8% of water supplied).	Inaccurate consumer metering – a large number of uncalibrated water meters	There is no water storage facility for the pump-fed water supply to the village.
The village of Chernogorovo	53% of the network is built of pipes having small diameter (∅60). 99% of the distribution network consists of old pipes, which have reached the end of their service	Over 95% of the service connections are in poor condition – old galvanized pipes. Presence of	Inaccurate consumer metering – a large number of uncalibrated water meters	No water storage facilities.

Components	Distribution network	Service connections	Water metering	Water storage facilities
	life and feature low reliability (asbestos cement, Mannesmann and steel). The existing fire hydrants and stop valves are insufficient.	unauthorised connections (losses due to theft - 10% of water supplied).		
The village of Bratanitsa	29% of the network is built of pipes having small diameter (∅60). 90% of the network consists of old asbestos cement pipes, which have reached the end of their service life and feature low reliability. The existing fire hydrants and stop valves are insufficient.	Over 85% of the service connections are in poor condition – old galvanized pipes. Presence of unauthorised connections (losses due to theft - 10% of water supplied).	Inaccurate consumer metering – a large number of uncalibrated water meters	No water storage facilities.
The town of Septemvri	99% of the network consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement, steel and galvanized pipes). There are frequent failures in the network (1.15 pcs/ km for the year 2011). The main branches are loop. The existing fire hydrants and stop valves are insufficient.	Over 95% of the service connections are in poor condition – old galvanized pipes. Presence of unauthorised connections (losses due to theft - 8% of water supplied).	Inaccurate consumer metering – a large number of uncalibrated water meters	There are water storage facilities, but they are currently not in use.
The town of Vetren	The entire distribution network consists of old pipes, which have reached the end of their service life and feature low reliability. There are frequent failures in the network (2.14 pcs/ km for the year 2011). The existing fire hydrants and stop valves are insufficient. Pressure in the zones is higher than the standard.	Service connections are in poor condition – old galvanized pipes. Presence of unauthorised connections (losses due to theft - 13% of water supplied).	Water supplied to the town is not metered. Inaccurate consumer metering – a large number of uncalibrated water meters	Obsolete pipe systems and fittings in the pressure reservoirs.
The village of Kovachevo	The entire distribution network consists of old pipes, which have reached the end of their service life and feature low reliability. The existing fire hydrants and stop valves are insufficient.	Service connections are in poor condition – old galvanized pipes. Presence of unauthorised connections (losses due to theft - 4% of	Inaccurate consumer metering – a large number of uncalibrated water meters	Obsolete pipe systems and fittings in the pressure reservoir.

Components	Distribution network	Service connections	Water metering	Water storage facilities
		water supplied).		
The village of Varvara	59% of the network is built of pipes having small diameter (∅60). 99% of the network consists of old pipes, which have reached the end of their service life and feature low reliability (asbestos cement and steel). There are frequent failures in the network (1.97 pcs/ km for the year 2011). Varvara is characterized by the highest percentage of water losses in ViK Pazardzhik. (total losses of 84.5% for the year 2011). The existing fire hydrants and stop valves are insufficient.	Over 90% of the service connections are in poor condition – old galvanized pipes. Presence of unauthorised connections (losses due to theft - 15% of water supplied).	Inaccurate consumer metering – a large number of uncalibrated water meters	Pressure reservoirs need major repairs and hydro insulation. Obsolete pipe systems and fittings in the pressure reservoirs.
42 settlements with a population of below 2,000 inhabitants	The majority of the distribution networks (92.3%) consist of old pipes, which have reached the end of their service life and feature low reliability (88% of asbestos cement, 0.3% of steel, 3% of Mannesmann, 1% of galvanized pipes). They are characterized by failures and hidden leakages. The existing fire hydrants and stop valves are insufficient.	Over 90% of the service connections are in poor condition – old galvanized pipes. Presence of unauthorised connections (losses due to theft - 10% of water supplied).	Water supplied to 4 villages is not metered. Inaccurate consumer metering – a large number of uncalibrated water meters	14 of the settlements have no water storage facilities. The existing water storage facilities in 6 of the settlements have insufficient capacity. The pressure reservoirs in 4 of the settlements need hydro insulation. The pressure reservoirs in 7 of the settlements need major repairs. The existing facilities have obsolete pipe systems and fittings.

3.5. WASTEWATER INFRASTRUCTURE

3.5.1. WASTEWATER INFRASTRUCTURE OF PAZARDZHIK AGGLOMERATION

3.5.1.1. General features

For the town of Pazardzhik, the share of already constructed wastewater network is approximately 95%, there is a treatment plant constructed, without nitrogen and phosphorus removal. The water treated in WWTP Pazardzhik is discharged according to permit № 33140041/27.01.2009, modified with resolution № PP- 1529/28.06.2012, for the use of surface water site for discharge of wastewater, issued by the Director of BDMWEARB. The discharge point is in Maritsa River, 4 km southeast of the town of Pazardzhik, „Chamur tarla“ area, landings of the village of Miryantsi - UCATTE 48 444 - receiving water body Category III. Geographic coordinates of the discharge point: N-42°08'45,8663" E - 24°23 1 20,44".

Pazardzhik municipality has been granted financing under Priority Axe 1 of Operational Programme Environment 2007-2013 (OPE) under procedure BG161PO005/10/1.11/03/19 „Preparation and Implementation of Projects for Improvement and Development of Water and Wastewater Infrastructure in Agglomerations with over 10,000 PE”, with ***NoDIR-51011119-C010 „Extension of WWTP for removal of biogenic elements nitrogen and phosphorus, rehabilitation and extension of the WSS network of the town of Pazardzhik,*** signed on 14.09.2011 for BGN 49,822,725.

The on-going project consists of three project phases:

- **Feasibility study** – the scope of Pazardzhik agglomeration is defined and approved (which settlements are previewed to include in the future to WWTP Pazardzhik). It has been proven that the capacity of WWTP Pazardzhik is sufficient to receive the wastewater from the following settlements : Aleko Konstantinovo, Glavinitsa,Ornyanovo, Golemanovo, Saraya, Dragor, Mokrishte, Dobrovnitsa, Miryantsi, Sinitievo and Hadzhievo. More details about WWTP Pazardzhik in the following items;
- **Preliminary design –** it is being reviewed by the approving authority MOEW. In this phase is defined the future development of the wastewater network of the town of Pazardzhik, two options are developed. Detailed description is provided in Chapter 4.3. It is partially approved.
- **Detailed design –** this is the phase, following the preliminary design, it should be developed after the approval of the preliminary design. Detailed designs are approved (forthcoming preparation).

The project is under construction, it is not finally approved. Chapter 4.3 shall discuss in more details the options for development of the wastewater network and the envisaged measures. The data provided in the table below refer to the existing wastewater network in 2011.

Table 3-56 General characteristics of the wastewater system the town of Pazardzhik

Component	Existing situation
Wastewater network	Combined system – 142,331 km
Pumping stations	5

Component	Existing situation
WWTP	1
Connected settlements	1 (Ivaylo)
Total number of inhabitants in the town of Pazardzhik	71,979
Total number of inhabitants connected to wastewater network	68,565
% of population connected to wastewater network	95.22%

Layout of the existing wastewater network is shown in Layout №32.

3.5.1.2. *Wastewater collection system*

The town of Pazardzhik is located in the East Aegean River Basin, in the river basin of Maritsa River. The wastewater receiving body is Maritsa River.

The town of Pazardzhik is category II. The surface of the settlement is 1,202.40 ha

The wastewater network of the town of Pazardzhik is constructed and operating as combined system, where household, production and stormwater are collected together and transported to WWTP Pazardzhik

The town of Pazardzhik is considered as the flattest town in Bulgaria. The highest above sea level is 208,80 m in the north part of the town /the beginning of the wastewater network/, and the lowest is 203,20 m in the southeast part /the exit of the main collector at the belt road/.

Due to terrain's features, in separate low areas with recently constructed wastewater network that could not be connected by gravity to existing collectors, there are constructed and operational sewerage pumping stations, their technical parameters are shown in the next item.

The construction of the wastewater network has started in the middle of the 19 century, the main construction of the wastewater network took place in the period until 1970, according to our studies the following parameters have been used then:

- Probability of the design rain P= 0,5 – 1,0 year ;
- Duration of the rain 15 minutes;
- Intensity of the design rain below q=100 l/sec/ha.

The parameters provided here above are significantly lower than the current ones. The construction of the wastewater network distributed over the years is as follows:

Table 3-57 The construction of the wastewater network the town of Pazardzhik over the years:

Wastewater network - Pazardzhik		
Development over the years		
№	period	%
1	until 1960	25.6%
2	from 1960 to 1970	33.2%
3	from 1970 to 1980	32.0%
4	from 1980 to 1990	2.9%
5	from 1990 to 2000	3.8%
6	from 2000 to 2011	2.5%
		100.0%

Source: ViK EOOD Pazardzhik

More and more detailed information in **Appendix 3-16**

The table here below shows summarised technical specification of the existing wastewater network.

Table 3-58 Technical specification of the wastewater network

material	diameter mm	Concrete m	PE m	Unknown m	total m
Concrete	unknown			19,485	19,485
	200	50,422			50,422
	300	22,199	605		22,804
	400	17,683	505		18,188
	500	6,752	1,167		7,919
	600	9,171	478		9,649
	700	664			664
	900	5,635			5,635
	1000	560	163		723
	1200	272			272
	1500	1,016			1,016
	Y100/66	578			578
	Y120/78	1,661			1,661
	У 140/88	1,891			1,891
	У 200/127	1,424			1,424
	Total :	119,928	2,918	19,485	142,331

Source : ViK EOOD Pazardzhik

Layout No32 „Layout of the existing wastewater network “.

On the grounds of the current project, after on-site inspections and discussions with the experts of ViK EOOD Pazardzhik and the municipalities, the main problems in connection with the wastewater network are summarised as follows:

- Flat terrain – the slope of the terrain from the north to the south to the river is 0,23% /for minimum inclination of pipes Ф500 – 0,25%/, and the smaller slope of the terrain in west-east direction, parallel to the river is 0,06% / for minimum inclination of pipes Ф1500 – 0,08%/.
- The low riverside of Maritsa River that does not allow discharge of the stormwater above the height of allowable probability at 1% of river water, as well as Topolnitsa River on the west and Luda Yana River.
- High groundwater level on the territory of the entire town, varying between 1,0-1,5 m near the river and 3,0 - maximum 4,0 m in the central, the north part of the town, even in dry weather;
- The wastewater network of the town is made of concrete and reinforced concrete pipes – more than 98% and it is near the end of its useful life (100% of the pipes are more than 35 old).The connections between the pipes cause infiltration and exfiltration from and into the collectors. There are displacements and collapses. There is infiltration in street sewers both from the obsolete water supply network and from high level of groundwater;

- Part of the sewers and the inspection shafts are filled with alluvium and pieces of stones and concrete, causing obstruction of the wastewater flow; also when it is raining the adjacent terrains and houses are flooded.
- The oldest built sewers /"gerizi"/ are not shown on any map, there are no IS on their traces for check-up and inspection, and due to their small depth these are probably cut by underground communication networks, installed later on – cables, water supply and gas network;
- Insufficient number of stormwater overflows, discharging the wastewater network;
- The depth of the wastewater network is relatively small – the elevation of the bed is mainly between 2,40 and 3,20 - 3,50, except for the central part of the town and the industrial zone, where it reaches 4,50 m for the main collectors.
- The larger part of the sewers are clogged, the inspection shafts are filled with alluvium. Part of the industrial zone does not have wastewater network;
- The construction of the wastewater network has started from the centre of the town towards the periphery, and it is not taken in account for the design of the collectors in the central part of the town. Part of the streets have two wastewater systems – an older one with small diameter and a newer one with larger diameter.
- The minimum gradients of the entire wastewater network cause deposition of alluvium in dry weather. Water mixed with decaying alluvium is directed, in case of rain, directly to WWTP or the rivers, which is confirmed by the samples taken during rains at the entrance of the WWTP. The decaying alluvium in the wastewater network is one of the reasons for the relatively big biologic load in the north zone of the town, serving 100 000 P.E., where live in fact approximately 70 000 inhabitants and there is no industry at all /especially polluted wastewater/.
- The larger part of the pipes have additionally decreased diameter, there are also separate areas where the sewer profile is clogged to 40 and 60%.
- During the following years a new problem is noticed in initial sections of the sewerage branches and at wastewater service connections /especially for residential buildings/, where there are no big water quantities from rainfall, with the accumulation in the wastewater network of wet sanitary textile tissues that do not dissolve in the wastewater network.
- Lower capacity of the wastewater network, head and pressure movements in rainy weather, major problems occur in the main collectors, that are overloaded from 8 to 30 times in some places.

<u>The most problematic sections of the wastewater network:</u>

- ✓ The biggest overload is in Main Collector 2, 6 and 7 from 10 to 30 times (Layout №32);
- ✓ Main collectors 3,3-1 and 3-2 – overloaded up to 5 times, in the last section wastewater springs from stormwater overflows (Layout №32);
- ✓ Problems with Main collector 8 almost always under pressure; in the entire section along Sinitevska Street there is no water flow and it has turned into a mud trap, with static water level of 1,2 m from the elevation of the cover in the lower section /for depth of 4,60 m/;
- ✓ R.q. Yabalka the main diameter ⌀ 200, the gradients are small and the failures are very frequent;

- ✓ In the residential part of the town, north of Maritsa River, there is designed and realised stormwater overflow to the river, except for the lower part of the covered section of the former draining sewer „Deli ark", which is relatively shallow, filled with waste and draining the stormwater only from adjacent sewerage branches.
- ✓ R.q. Iztok – clogged, shallow, blocked and compromised, when raining the service connections and basements are filled with mixed wastewater.
- ✓ The wastewater network in the north zone has errors, it has been constructed without organisation, in the last sections it is 50 cm deep;
- ✓ There are permanent clogging problems in the area of Main Collector 5-1 and the sections included in the area of r.q. „Yabalkite" between Stefan Karadzha street and Rila street. Besides the small diameters – Φ200 of the street sewers and the small gradients, the clogging in the area is due also to stock breeding in the backyards.

Figure 3-34 Collector 8 (Sinitevska Str.)

Figure 3-35 Collector 8 (Sinitevska Str)

Figure 3-36 Outfall of drainage canal of Collector

Figure 3-37 Storm overflow 1

Table 3-59 Parameters of the wastewater network

№	Indicator	Existing situation
1	Total length of the wastewater network	142,331 m
1.1	*Length of main wastewater collectors*	*22,873 m*

№	Indicator	Existing situation
1.2	*Length of secondary wastewater collectors*	*72,127 m*
2	Type of the wastewater network	combined
3	Length of the wastewater network, recently rehabilitated (during the last 5 years.)	3,052 m
4	Share of rehabilitated the wastewater network (connected to the existing network)	2%
5	Number of population / length of the wastewater network	506 inh/ km
6	Number of unauthorised discharges to the receiving body	-
7	Number of wastewater service connections	16,500

3.5.1.3. Wastewater pumping stations

Wastewater pumping stations in the wastewater network and their characteristics are presented in the table below.

Table 3-60 Wastewater pumping stations – the town of Pazardzhik

Location	Number Pumps / kW	Total production Pumping station capacity	Year of construction	Observations
WWPSt.”Bolnichna”/Dunav	1 FLIGT	70 l/sec 10 m 22kW	1985	No reserve and mechanical screen
WWPSt.”Iztok”	1 FLIGT	70 l/sec 10 m 22kW	1985	Bad condition of the mechanical screen
WWPSt.”Maritsa”	1 FLIGT	30 l/sec 8 m 1,5kW	1996	No reserve
WWPSt.”Bila	1 PMC30/70	20l/sec 10 m 2,2kW	1996	No reserve and mechanical screen
WWPSt.”Industrialni vodi”	2+1 pump units KSB	195l/sec 11 m 37 kW	2008	Good condition

Disadvantages:

• when it is raining, stormwater is pumped too

The location of the wastewater pumping station is indicated on Layout No32: Existing wastewater network.

Figure 3-38 WWPS Bila

Figure 3-39 WWPS Industrial water

3.5.1.4. *Wastewater treatment facilities*

The wastewater treatment plant Pazardzhik has been constructed under ISPA Program. The project has been assigned by MOEW and Pazardzhik municipality. The plant has been commissioned on September 23, 2008. According to contract of 15.07.2008 between PAZARDZHIK MUNICIPALITY and „ViK" EOOD Pazardzhik, THE MUNICIPALITY grants the right of using the WWTP for the period of three years to the WSS Company. After the end of this period, there is a new contract signed between PAZARDZHIK MUNICIPALITY and „ViK" EOOD PAZARDZHIK of 15.09.2011 for another three years.

The project for the construction of WWTP – Pazardzhik includes mechanical, biological treatment, anaerobic stabilisation of sludge and dewatering of sludge through centrifugation, in order to achieve the exit parameters of the wastewater and regulatory requirements for the project category of the water of Maritsa River, as follows:

Table 3-61 Characteristic quantities and composition, used for the design of the existing WWTP

Parameters	Project	unit
Population equivalent according to European standards	150,000	PE
Average quantity in dry weather – Qd	52,000	m3/d
Maximum quantity in dry weather – Qd,max	3,600	m3/h
Maximum quantity in rainy weather – Qd,max	6,500	m3/h
Pollution		
BOD5 – load	9,000	kg/d
BOD5 – concentration	173	mg/l
SS – load	9,750	kg/d
SS – concentration	188	mg/l
NT – load	1,500	kg/d
NT – concentration	29	mg/l
PT – load	260	kg/d

Table 3-62 Quality of treated water, according to permit to discharge in Maritsa River – low sensitive zone.

Parameters	Directive EU 91/271/EEC mg/l	Ordinance №6 / 09.11.2000 mg/l	Project parameters mg/l
BOD5 – without nitrification	25	25	25
COD	125	125	125
SS	35	35	35

The requirements about the water on the exit, according to the project refer to receiving body „non-sensitive zone". There is a contract signed between PAZARDZHIK MUNICIPALITY and MOEW on future extension of the treatment plant in order to achieve the requirements for receiving body „sensitive zone", which is Maritsa River now.

The design parameters of the treatment plant, defined during the additional study, carried out on the grounds of the new permit for discharge of treated water, is shown in the next table:

Table 3-63 Characteristic quantities, used for the design of WWTP in the additional stud, carried out on the grounds of the new permit for discharge

Parameter	Designation	Value	unit
Year		2025	
Population		88,069	inhabitants
Population equivalent	P.E.	140,942	inhabitants
Water quantities			
Twenty-four hour average water quantity form the population	$Q^{pop.}_{av.\ day}$	10,124.63	m3/day
		421.86	m3/hour
		117.18	l/sec
Maximum hourly water quantity form the population	$Q^{pop.}_{max\ hour}$	649.36	m3/hour
		180.38	l/sec
Twenty-four hour average water quantity from production	$Q^{pr.}_{av.\ day}$	414.60	m3/day
Maximum hourly water quantity from production	$Q^{pr.}_{max\ hour}$	59.22	m3/hour
		16.45	l/sec
Infiltration value adopted	Qinf.	38,941.00	m3/day
		1,622.54	m3/hour
		450.71	l/sec
Design water quantities			
Twenty-four hour average water quantity	$Q^{op.}_{av.\ day}$	49,480.23	m3/day
		2,061.68	m3/hour
		572.69	l/sec
Maximum hourly water quantity	$Q^{op.}_{max\ hour}$	2,331.12	m3/hour
		647.53	l/sec
Maximum hourly water quantity when raining	$Q^{op.}_{rain.}$	5,000.00	m3/hour
		1,388.89	l/sec
Pollution at the entrance of the WWTP			
Biochemical Oxygen Demand	BOD5	8,456.52	kg/day
		170.91	mg/l
Suspended solids	SS	9,865.94	kg/day

Parameter	Designation	Value	unit
		199.39	mg/l
Total nitrogen	TN	1,550.36	kg/day
		31.33	mg/l
Total phosphorus	TP	253.70	kg/day
		5.13	mg/l

The new study of the treatment plant was conducted based on the currently existing industry. The decreased PE gives grounds to include an additional part of the nearby villages. According to the information obtained by the Water Operator, the current water quantities are close to the design ones. It is expected that the rehabilitation of the sewerage network and the newly envisaged sewer branches will significantly reduce the amount of infiltration.

Note:

With the calculations for defining the exit design parameters of the water at the entrance of the plant, the quantity transported to the treatment plant in case of rainfall is estimated to amount to 3039,69 m3/hour. The designers suggest that the WWTP should be designed for maximum hourly water quantity in case of rainfall amounting to 5,000 m3/hour for the following reasons:

- This water quantity /bigger than the calculated 3,039.69 m3/hour/, allows treatment of bigger pollution in rainfall, due to washing out of sludge, settled in the collectors, due to low speed, resulting from the small gradients of the collectors. The treatment plant e designed to receive 6 500 m3/hour water in rainfall according to the main detailed design, i.e. it would be able to receive without any problems 5,000 m3/hour. The secondary clarifiers, according to the present study, could not receive 6,500 m3/hour due to the higher concentrations of activated sludge in the bio tanks.
- This water quantity can be received by the secondary clarifiers after the extension - 3 existing and 1 for extension.

According to a modification of discharge permit № 33140041/27.01.2009 with resolution № PP 1099/19.01.2011 on the use of surface water site for discharge of wastewater, issued by the Director of BDMWEARB – Plovdiv, the treatment of the wastewater should be done until obtaining the requirements for sensitive zone, when biogenic elements should be treated too – nitrogen and phosphorus. Treated wastewater should have concentrations of pollution not exceeding:

Table 3-64 Characteristics of treated wastewater after the WWTP according to the modified permit to discharge in Maritsa river – sensitive zone

Pollution after WWTP			
Biochemical Oxygen Demand	BOD5	25.00	mg/l
Chemical oxygen demand	COD	125.00	mg/l
Suspended solids	SS	35.00	mg/l
Total nitrogen	No	10.00	mg/l
Total phosphorus	Po	1.00	mg/l

The following main groups of facilities are designed and constructed:

Screens (coarse and fine) retain the suspended solids bigger than 6 mm.

Sand filter –horizontal sand is separated from the oils and the petrol products through aeration

Primary radial clarifiers / PRC – 2 The wastewater free of coarse waste is sent to 2 PRC, through a pipeline with a diameter of 1500 mm, which section is always filled at 100%. An ultrasonic flow meter is installed in this pipeline.

Biological treatment This is the main process of treatment, when organic polluting substances are removed from water.

The biological treatment unit includes:

- bio tanks BT,
- secondary clarifiers SC for separation of activated sludge AS
- PS for recirculation of activated sludge.

The existing treatment plant is constructed based on conventional technologic scheme for biological treatment that does not offer a solution for the treatment of biogenic pollution – nitrogen and phosphorus. It is suggested in the design that the treatment of nitrogen pollution to be done in the bio tanks after their reconstruction and extension, taking in account their regime of operation for nitrification and denitrification. In the bio tanks there are aeration zones, where the nitrification of ammonium pollution is done – oxidation to obtain nitrates. In the denitrification zone, with no aeration, the oxygen dissolved in the water is extracted and special denitrification bacteria decompose the nitrates to oxygen, that they need for living and nitrogen that goes to the atmosphere.

In the specific case, in order to achieve the necessary effect of treatment of ammonium pollution, simultaneous denitrification is envisaged.

The aeration of water in the bio tanks is done with membrane aerators, the same as the ones installed currently in the treatment plant. It is suggested in the design that the aerators of the two existing bio tanks to be replaced with new ones.

The removal of phosphorus form the wastewater should be done in a combined way – in biologic way, allowing decrease of phosphorus pollution to 50 % and in chemical way in order to guarantee the desired concentrations at the exit of the treatment plant. The biological treatment of phosphorus relies on one anaerobic selector, where to the settled water, supplied by the primary clarifiers is added recirculating activated sludge. In the conditions of „oxygen hunger“ the activated sludge takes bigger quantities of phosphorus in the cells, which is than extracted from the system with the superfluous activated sludge. With the biologic way only it cannot be always guaranteed that the high requirements for treatment of phosphorus pollution shall be achieved. Therefore chemical treatment of phosphorus with iron(III) chloride is envisaged too, it should be added in the aeration part of the bio tank. Therefore a reagent unit for iron(III) chloride should be constructed, consisting of storage tank providing a 20-day reserve and a dosing system.

In the technological scheme of the constructed treatment plant, there is a primary clarifier, that ensures 50-60 % decrease of suspended solids and thirty and more per cent decrease of carbon pollution, measured with BOD5. For the denitrification there need to be sufficient carbon substrate at the entrance of the bio unit. Therefore, it is recommended treatment plants, where denitrification is needed, to be constructed without preliminary clarification or with reduced stay respectively clarification effect. It is suggested to use for primary clarification only one of the two constructed primary clarifiers. The second one is excluded to increase the BOD load to the denitrification zone.

The mixture of wastewater / activated sludge is sent to the secondary clarifiers, where the activated sludge is settled, it is pushed with sludge cleaners to the central sludge pit, from where it is sent to the pumping station for activated sludge.

The wastewater and recirculating activated sludge sent to the bio tanks shall be mixed in the distribution device before the bio tanks, these are evenly distributed to the separate sections of the bio tanks. The anaerobic selector is envisaged within the bio tanks, separated with a wall.

The design of the treatment plant defines the additional water quantities and pollution loads of sludge water of the treatment plant. They represent significant part of pollution loads entering the plant, which is acknowledged also by the monitoring of the constructed treatment plant. It is suggested this water to be retained in retention reservoir and discharged during the night when practically the water is much diluted. This is how can be avoided the need of transportation of pollution loads of sludge water, as additional pollution, to the ones generated by the population and the production enterprises in the town. In order to so, stormwater should be separated as much as possible from the wastewater network and it should be sent separately from the domestic one. The sludge water from the sludge compactors, from the open decay beds and sludge water extracted from the mechanical dewatering shall be transported to a new pumping station for sludge water, which shall than pump it to the retention reservoir for sludge water.

Technological scheme for treatment of biogenic pollution of WWTP – Pazardzhik includes:

The process scheme for biogenic pollution treatment includes:

- distribution device before the biological unit
- anaerobic selector for biological treatment of phosphorus
- bio tank, operating in regime of nitrification and simultaneous denitrification
- secondary clarifiers
- pumping station for activated sludge
- pumping station for sludge water
- retention reservoir for sludge water
- reagent unit for iron(III) chloride

In the technological scheme for treatment of biogenic pollution there is a possibility for biological treatment of phosphorus pollution, there is a volume previewed in the bio tank, where the mixture activated sludge/ wastewater stays for approximately 0,5 hours in anaerobic conditions. This solution allows to decrease the costs for iron(III) chloride for the subsequent chemical treatment of phosphorus to a significant per cent – up to 50 %. As the biological decrease of phosphorus is reversible process and in anaerobic conditions for the sludge, part of the phosphorus may return to the sludge water, the reagent unit should be designed for the possibility to treat 100 % of the phosphorus only chemically, with iron(III) chloride, added at the exit of the bio tanks.

The proposed technological scheme guarantees achieving the requirements set in the discharge permit.

3.5.1.5. *Performance of the wastewater system*

Operation and maintenance of the wastewater network:

- The operator carries out only emergency cleaning of the wastewater network. Insignificant cloggings are manually cleaned by the Water operator. More substantial blockings, which need cleaning through suction and jetting are assigned to external service provider.
- No preventive maintenance and inspection is conducted through CCTV observation of wastewater network (large part of the sewers are clogged, which obstructs the video observation)
- Data from simulation studies (if any) about hydraulic capacity of the existing wastewater network for characteristic hydraulic loads using software products - no data from simulation studies.
- The operating company „ViK" has 3 old, not effective machines for cleaning of sewers, commissioned between 1977 and 1987, of which – a van with volume of 1 m3, for unclogging of small pipes and 1 suction machine for extraction of liquid sludge with a volume of the tank of 5 m3, they both are often out of order and cannot be used for planned cleaning of entire parts of the wastewater network. In case of emergency unclogging in separate sections, it practically solves a local problem, as the sludge is moved to an upper or lower section of the wastewater network.

Operation and maintenance of WWTP:

WWTP Pazardzhik is constructed and commissioned in 2008 It includes a complex set of facilities highly automated and with process control. There is a SCADA system designed and commissioned for control and monitoring of the entire station. There is highly competent personnel employed consisting of 16 experts in the different parts. In the operation process, some of the „narrow" places have been identified; the operation personnel is successfully dealing with these even if with some difficulties. Some of the main points of the plant – the air blowing station, the open decay beds, show defects that affect seriously the achievement of the desired results and the cleaning effect and the treatment of the sludge. Another part of the facilities cannot be operated normally in heavy winter conditions; this is related to hard and unattractive manual work for keeping the plant in normal operation.

The treatment plant is maintained properly. The on-going repair journals are kept according to the requirements of the technical specification of the installed equipment.

The management staff of the plant has succeeded in implementing good organisation for the implementation of personnel's obligations at all levels of operation of the plant.

3.5.1.6. *Summary of major deficiencies*

Table 3-65 Major deficiencies of the wastewater system of Pazardzhik agglomeration

№	Components	Major deficiencies
1	Wastewater network	All the wastewater systems have minimum or below the allowed gradient, in many places the gradient is even negative, there are also many sections, where the pipe entering the IS is lower than the one at the exit. All the groundwater on the territory of the entire town, varying between

№	Components	Major deficiencies
		1,0-1,5 m near the river and 3,0 – maximum 4,0 m in the central, north part of the town, even in dry weather; Wastewater network of the town is made of concrete and reinforced concrete pipes – over 98% and is approaching the end of its useful life (100% of the pipes are more than 35 years old).The connections between the pipes cause infiltration and exfiltration from and in the collectors. There are displacements and collapses in separate places. There is infiltration in the street sewers both from the obsolete water supply network and from the high level of groundwater; Part of the sewers and the inspection shafts are filled with alluvium and pieces of stones and concrete, causing obstruction of the wastewater flow; also when it is raining the adjacent terrains and houses are flooded. Insufficient number of stormwater overflows, for unloading of the wastewater network; The depth of the wastewater networks is relatively small – the elevation of the bed is mainly between 2,40 and 3,20 - 3,50, except for the central part of the town and the industrial zone, where it reaches 4,50 m for the main collectors. The larger part of the sewers is clogged, the inspection shafts are filled with alluvium. Part of the industrial zone does not have a constructed wastewater network yet; The construction of the wastewater network has started from the centre of the town to the periphery, but this is not taken in account for the design of the collectors in the central part of the town. Part of the streets have two wastewater systems – an older one with small diameter and a newer one with larger diameter. The minimum gradients of the entire wastewater network cause deposition of alluvium in dry weather. Water mixed with decaying alluvium, is directed in case of rain, directly to WWTP or the rivers, which is confirmed by the samples taken during rains at the entrance of the WWTP. The decaying alluvium in the wastewater network is one of the reasons for the relatively big biologic load in the north zone of the town, serving 100 000 P.E., where live in fact approximately 70 000 inhabitants and there is no industry at all /especially polluted wastewater/. The larger part of the pipes have additionally decreased diameter, there are also separate areas where the sewer profile is clogged to 40 and 60%. During the following years a new problem is noticed in initial sections of the sewerage branches and at wastewater service connections /especially for residential buildings/, where there are no big water quantities from rainfall, with the accumulation in the wastewater network of wet sanitary textile tissues, that do not dissolve in the wastewater network. Lower capacity of the wastewater network, head and pressure movements in rainy weather, major problems occur in the main collectors, that are overloaded from 8 to 30 times in some places.
2	Wastewater	Lack of spare pumps;

№	Components	Major deficiencies
	pumping stations	Lack of mechanical screens; Overloading in rainfall;
3	Wastewater treatment plant	There is no secondary power supply and the operation of the plant is not backed up, according to the requirements of regulations. The load entering for maximum water quantities seriously encumbers the regular load of the plant. In winter conditions the bridge mud cleaner is not operating and the sand is not extracted There are problems related to the air blowing station, the pumping stations for drain water, pumping station for primary sludge, pumping station for raw sludge, pumping station for decayed sludge In the project no spare pumps are foreseen for floating substances above 5 points There is spare pump for test pit № 23 "The bio filter" /the system for odour removal/ – the filter does not retain the smell. The tank for dewatered sludge is deformed and dangerous for the operation personnel. There are no spare engines and spare reducer for the bridges "INFILCO", /two for PRC and three for SC/. The working wheels with polyurethane coating Φ 400 x 120 mm are obsolete and there are no spare ones The equipment of the dewatering unit with centrifuges should be completed.

3.5.2. SLUDGE MANAGEMENT

During the processes of treatment of the wastewater sludge is formed, that should be treated separately to their final removal or reuse. Now the existing technological scheme, and after the extension and the reconstruction, the technological scheme of the regional wastewater treatment plant - Pazardzhik, includes also sludge treatment facilities together with the facilities for treatment of the wastewater.

The following technological units and facilities described above are previewed for the treatment of the wastewater

1. Mechanical unit
2. Biological unit

During the processes of treatment of the wastewater according to the retained option waste and sludge from the following facilities shall be retained and separated:

- Coarse and fine screens – the retained waste shall be compacted and separated in containers for removal from the treatment plant
- Sand filter – the retained sand shall be washed, dewatered and separated in containers for removal from the treatment plant. The separated oils and grease shall be removed in a reservoir for gravity dewatering, and then sent for reuse.

- Bio tanks – the superfluous activated sludge shall be subject of subsequent treatment with compacting, anaerobic stabilisation and mechanical dewatering.
- For the treatment of the superfluous activated sludge, separated by the bio tanks, in the technological scheme of the WWTP, are previewed the following facilities:
- Gravity compactor for compacting of sludge to obtain humidity of approximately 97 %
  - Anaerobic stabilisation /open decay beds/ with a pumping station attached.
  - Complex of centrifuges – for dewatering of sludge in order to obtain humidity of approximately 75 %.
    - Silo – for temporary storage of the dewatered sludge

Table 3-66 The quantities of the waste and the sludge, separated in the regional treatment plant - Pazardzhik, according to data available in the on-going project.

Types of waste and sludge	WWTP – Pazardzhik		
	weight kg/d	humidity %	quantity m3/d
waste from screens	120	75	730
sand from sand filter	302	60	370
Stabilised sludge, dewatered by a centrifuge	965	75	12775 (for humidity of 84%)

From the bio tanks, the superfluous activated sludge shall be transferred to a gravity compactor. In it the superfluous activated sludge shall be compacted in order to obtain humidity of approximately 97%, than it shall be transferred for dewatering .

After dewatering of the stabilised sludge by a centrifuge, their humidity is reduced to approximately 75 %, their consistency (similar to the consistence of the humid soil) allows loading and transporting it outside of the treatment plant with minimum expenses.

According to the data from the monitoring obtained so far, about the type and the quality of industrial wastewater of Pazardzhik, and in observance of the conditions of Ordinance 7 on the discharge of production wastewater into urban wastewater networks, and effective control on water emissions from industrial enterprises, the sludge, removed from the treatment plant has not been acknowledged to contain heavy metals and other toxic substances; this makes them suitable for reuse in the agriculture and forestry.

- The disposal to the regional SDW landfill is supposed to be a temporary solution, until decision on the way of reusing the sludge and concluding of the respective contracts.
- The environmentally friendly solution for reuse of sludge from urban wastewater treatment plants consists also in using it for recultivation of damaged terrains.
- The arable lands and forest massifs in Pazardzhik municipality occupy significant surfaces, this is a favourable precondition for reuse of sludge for fertilisation of agricultural and forest surfaces.

For the sludge from wastewater treatment plant of Pazardzhik after the reconstruction, there is an elaborated and approved Report on sludge management It recommends the sludge from the future wastewater treatment plant to be stored in the existing domestic waste landfill, until the construction of the regional SDW landfill. The approved report on the sludge management clearly states that the practice of disposal of sludge on solid domestic waste landfills is acceptable only for the time to define the qualities of the sludge and recommend the most appropriate reuse.

In the area of Pazardzhik municipality, despite the good opportunities so far no suitable agricultural and forest terrains have been identified for fertilisation, no damaged terrains needing recultivation either. There are no contracts concluded for the reuse of sludge in the agriculture or in forestry.

The envisaged in the project of the wastewater treatment plant technologies for treatment and removal of sludge comply fully with the requirements of the national legislation.

The total quantity of sludge from the wastewater treatment plant of Pazardzhik amounts to:
Waste from the screens – 730 m3/year
Waste from the sand filters – 370 m3/year
Dewatered sludge after centrifuge – 38 m3/d = 12 775 m3/year
Total waste: 13,875 m3/year

In the requirements for the preparation of the projects of the regional landfill for solid domestic waste, it is stated that volume of received waste must include also the sludge and the waste from the future wastewater treatment plants в in the corresponding region, including from the treatment plants of the town of Pazardzhik.

The management of sludge from WWTP in the area of Pazardzhik municipality complies the requirements of the national legislation in this sector and it is not expected to create insurmountable problems. For the regional landfill installation for treatment of drain water from the territory of the landfill is envisaged.

„Regional management of the waste in the region of Pazardzhik“ is about to be implemented for non-hazardous waste from the municipalities of Pazardzhik, Septemvri, Lesichovo, Peshtera, Belovo, Bratsigovo, Rakitovo, Batak and Velingrad that consists of regional landfill, installation for separation, facilities for composting, regional recycling centre, facility for construction waste and overload station (Velingrad/Rakitovo), including facilities for preliminary treatment and site for composting. The site of the RSDW should have a total surface of 349 dca, of which 123 dca are from the existing landfill in the landings of the village of Aleko Konstantinovo. (it should be recultivated and included in the terrain of the RSDW).

The total quantity of sludge from both stations amounts to 16 393 m3/year

Table 3-67 Treatment of sludge and reuse/disposal from WWTP Pazardzhik

Settlement WWTP	Year of commissioning	Capacity in P.E.	Technology of treatment of the sludge	Type of reuse of the sludge/disposal	Volume of the sludge	
					to DS[8]/a	Humidity [%]
WWTP Pazardzhik	Commissioned in 2008	150000	Anaerobic stabilisation and mechanical	Planned regional landfill in Pazardzhik and after defining the	currently 12775 m3/year	75 %

[8] Dry substance

Settlement WWTP	Year of commissioning	Capacity in P.E.	Technology of treatment of the sludge	Type of reuse of the sludge/disposal	Volume of the sludge	
					to DS[8]/a	Humidity [%]
			dewatering through centrifuge	qualities - for reuse		

3.5.3. WASTEWATER INFRASTRUCTURE OF IVAYLO AGGLOMERATION

3.5.3.1. *General features*

For the village of Ivaylo, the share of constructed wastewater network is approximately 35% , wastewater is collected at WWPSt. Ivaylo and pumped into the network of the town of Pazardzhik and treated at WWTP Pazardzhik

Table 3-68 General characteristics of the wastewater system of the village of Ivaylo

Component	Existing situation
Wastewater network	Combined network – 6 425 m
Pumping stations	1
WWTP	WWTP Pazardzhik
Connected settlements	none
Total number of inhabitants in the agglomeration	2 841
Total number of inhabitants connected to wastewater network	994
% of population connected to wastewater network	35%

Layout of the existing wastewater network is shown in:(Layout №34).

3.5.3.2. *Wastewater collection system*

The village of Ivaylo is located in the East Aegean River Basin in the basin of Maritsa River. The wastewater receiving body is Maritsa River, after its treated in WWTP Pazardzhik.

The village of Ivaylo is category III. The surface of the settlement is 141 ha

The wastewater network of the village of Ivaylo is constructed and operating as combined system, where household, production and stormwater are collected together. The relief of the terrain allows gravity collection to the lowest point of the town, where WWPSt. "Ivaylo" is constructed; it pumps the water in the wastewater network of the town of Pazardzhik and then it is treated at WWTP Pazardzhik. The correction of draining sewer „Deli ark", that crosses the settlement has the role of main collector.

The construction of the wastewater network took place in 2008, the table here below shows summarised technical specification of the existing wastewater network

Table 3-69 Technical specification of the wastewater network

Diameter	Length the network [m]			
[mm]	Concrete	PVC/PE/PP	Reinforced concrete	Total length
Wastewater network /combined/				
300	-	2,150	-	2,150
400	-	890	-	890
600	-	740	-	740
800	-	650	-	650
1000	490	-	-	490
1250	-	-	325	325
1500	-	-	1,180	1,180
Total	490	4,430	1,505	6,425

Layout No34 „Layout of the existing wastewater network“ shows graphically the information in in the table here above.

After onsite inspections, analyses and discussions with the experts of ViK EOOD Pazardzhik and Pazardzhik municipality, the main problems connected to the wastewater network can be summarised as follows:

- *Domestic wastewater is discharged via the correction of the draining sewer crossing the settlement;*
- *The coverage of the wastewater network is 35%.*

Table 3-70 Parameters of the wastewater network of the village of Ivaylo

№	Indicator	Existing situation
1	Total length of the wastewater network	6,425 m
2	Type of the wastewater network	combined
3	Length of the wastewater network, recently rehabilitated (during the last 5 years.)	6,425
4	Share of rehabilitated the wastewater network (connected to the existing network)	Newly constructed
5	Number of population / length of the wastewater network	155 inh/ km
6	Number of unauthorised discharges to the receiving body	4
7	Number of wastewater service connections	330

3.5.3.3. Wastewater pumping stations

Wastewater pumping stations in the wastewater network and their characteristics are presented in the table below.

Table 3-71 Wastewater pumping stations – the village of Ivaylo

Name	Number of pumps	Total production Pumping station capacity	Year of construction	Observations
WWPS "Ivaylo"	1+1	25 l/s 4 m 2,7kW	2008	The pumps are in good condition

Figure 3-40 WWPS Ivaylo

Figure 3-41 WWPS Ivaylo

The location of the wastewater pumping station is indicated on Layout No 34 : Existing wastewater network.

3.5.3.4. *Wastewater treatment facilities*

The wastewater is pumped into the wastewater network of the town of Pazardzhik and then treated at WWTP Pazardzhik.

3.5.3.5. *Performance of the wastewater system*

Operation and maintenance of the wastewater network:

- The operator carries out only emergency cleaning of the wastewater network. Insignificant cloggings are manually cleaned by the Water operator. More substantial blockings, which need cleaning through suction and jetting are assigned to external service provider.
- No preventive maintenance and inspection is conducted through CCTV observation of wastewater network
- Data from simulation studies (if any) about hydraulic capacity of the existing wastewater network for characteristic hydraulic loads using software products - **no data from simulation studies.**

3.5.3.6. Summary of major deficiencies

Table 3-72 Major deficiencies of the wastewater system of Draginovo agglomeration

№	Components	Major deficiencies
1	Wastewater network	✓ Domestic wastewater is discharged via the correction of the draining sewer crossing the settlement; ✓ The coverage of the wastewater network is 35%.
2	WWPSt.“Ivaylo“	*none*
3	Wastewater treatment plant	For more detailed information see **Table 3-65** Major deficiencies of the wastewater system of Pazardzhik agglomeration

3.5.4. WASTEWATER INFRASTRUCTURE FOR SEPTEMVRI AGGLOMERATION

3.5.4.1. General features

Municipality of Septemvri has obtained financing under Priority Axe 1 of Operational Programme Environment 2007-2013 (OPE). Under Procedure BG161PO005/10/1.11/02/16 „Improvement and development of drinking and wastewater infrastructure in agglomerations over 10 000 P.E.”, with ***No DIR-51011116-C055 „Improvement of the water cycle of the town of Septemvri“,*** signed on 20.11.2012

The project mentioned above previews construction of WWTP Septemvri, serving the town of Septemvri, the villages of Varvara and Vetren dol. As well as construction and reconstruction of 3,8 km wastewater network.

Table 3-73 General characteristics of the wastewater system the town of Septemvri

Component	Existing situation	On-going project
Wastewater network	Combined network – 39,958 m	Combined network – 43,777 m
Pumping stations	None	1
WWTP	None	1
Connected settlements	None	2 (Varvara with a population of 2,061 inh. and and Vetren dol with a population of 1,452 inh.)
Total number of inhabitants in the town of Septemvri	7,869	7,869
Total number of inhabitants connected to wastewater network	6,846	7,869
% of population connected to wastewater network	87%	100%

Layout of the existing wastewater network is shown in:(Layout №36)

3.5.4.2. *Wastewater collection system*

The town of Septemvri is located in the East AegeanRiver Basin, in the river basin of Maritsa River. The wastewater receiving body is Kaliman creek.

The town of Septemvri is category III. The surface of the settlement is 354 ha.

The wastewater network of the town of Septemvri is constructed and operating as combined system, where household, production and stormwater are collected together. The configuration of the terrain allows gravity collection of the wastewater to the future WWTP Septemvri, only in Romany residential quarter construction of a WWPSt is envisaged.

The construction of the wastewater network, took place mainly in the seventies of the last century, no as-built drawings are kept, as well as the project used for construction.

The table here below shows summarised technical specification of the existing wastewater network

Table 3-74 Technical specification of the wastewater network

Diameter [mm]	Length the network [m]			
	Concrete	PVC/PE/PP	Unknown	Total length
Wastewater network /combined/				
250	131	-	-	131
300	29,068	-	-	29,068
350	314	-	-	314
400	1991	-	-	1,991
450	188	-	-	188
500	434	-	-	434
600	310	-	-	310
800	659	-	-	659
Я600/900	281	-	-	281
Я700/1050	2,132	-	-	2,132
Я800/1200	991	-	-	991
П1100/1100	128	-	-	128
П1150/1150	199	-	-	199
П1200/1200	644	-	-	644
П1200/1200	190	-	-	190
П1300/1300	246	-	-	246
П1600/1600	647	-	-	647
У1000/675	168	-	-	168
У1150/776	300	-	-	300
У250/1562	937	-	-	937
Total	39,958	-	-	39,958
On-going project				
	Yug residential quarter			
300	-	632	-	632
400	-	354	-	354
600	-	546	-	546

Diameter	Length the network [m]			
[mm]	Concrete	PVC/PE/PP	Unknown	Total length
800	-	881	-	881
1,000	-	550	-	550
Romany residential quarter				
300	-	856	-	856
Total	-	3,819	-	3,819
Total:				43,777

Layout No 36 „Layout of the existing wastewater network“ shows graphically the information in the table here above.

After on-site inspections, analyses and discussions with the experts of ViK EOOD Pazardzhik and municipality of Septemvri, the summarised problems connected to the wastewater network are:

- In places the gradients of the wastewater network are reverse or below the minimum allowed
- No as-built drawings and there is no information concerning the grade line of the wastewater network.
- Lack of stormwater overflows for unloading of the network;
- The wastewater system of the town is approaching the end of its useful life (100% of the pipes are more than 35 years old), made of concrete pipes, connected with cement grout. The connections between the pipes cause infiltration and exfiltration from and in the collectors. There are displacements and collapses in places. In the street sewers there is infiltration both from the obsolete water supply network and from the high groundwater level in case of rain and snow melting;
- Part of the sewers and the inspection shafts are filled with alluvium and pieces of stones and concrete, causing obstruction of the wastewater flow;
- Minimum gradients in the construction and the operation of the wastewater network.

Table 3-75 Parameters of the wastewater network

№	Indicator	Existing situation	On-going project
1	Total length of the wastewater network	39,958 m	43,777 m
2	Type of the wastewater network	combined	combined
3	Length of the wastewater network, recently rehabilitated (during the last 5 years.)	no	3 819
4	Share of rehabilitated the wastewater network (connected to the existing network)	no	8,7%
5	Number of population / length of the wastewater network	171 inh/ km	180 inh/ km
6	Number of unauthorised discharges to the receiving body	2	none
7	Number of wastewater service connections	2 080	2 350

3.5.4.3. *Wastewater pumping station*

Wastewater pumping stations in the wastewater network and their characteristics are presented in the table below.

Table 3-76 Wastewater pumping stations – the town of Septemvri

Name	Number pumps	Total production Pumping station capacity	Year of construction	Observations
WWPS "Romany residential quarter"	1+1	5 l/s 7 m 2,7kW	-	On-going project

The location of the wastewater pumping station is indicated on Layout No36

3.5.4.4. *Wastewater treatment facilities*

For the WSS systems of the town of Septemvri and the villages of Varvara and Vetren dol there are feasibility studies (FS) and preliminary design (PD) prepared in 2011. The feasibility studies include two main alternatives of the technological schemes for treatment of wastewater from the three settlements with two or three options for each alternative. Alternative I provides for independent WWTP for the town of Septemvri, for which there are three options for the technological schemes, and for the villages of Varvara and Vetren dol one separate WWTP is previewed for each of them, with two technological schemes. Alternative II provides for construction of one joint regional treatment plant for the wastewater of the town of Septemvri and the villages of Varvara and Vetren dol, in the FS there are three technological schemes envisaged. On the grounds of the presented technical and economic analyses in the FS, Alternative II is proposed for development in the next project phase – PD - (regional WWTP) with options 1 and 3 (according to FS); they differ mainly by the type of the facilities for biological treatment. After the technological calculations made in the PD and the technical and economic analysis option 3 according to FS is finally retained (option 2 according to PD) for Alternative II with bioreactors of the type SBR.

So far the wastewater network of the town of Septemvri is 90 % completed, and it is almost missing in the villages of Varvara and Vetren dol, except for draining of some administration buildings.

According to the preliminary design, the wastewater treatment plant in option 3 is previewed to operate for 30 years – until the end of 2043 with a capacity of 14000 population equivalent (P.E.) of which 8155 are actual population, 1372 P.E. stand for industrial pollution, and 775 P.E. – breeding in private yards. After the conducted detailed survey of the water consumption in the preliminary design, the outflow norm adopted for the town is 144 l/inh.day, and for both villages – 135 l/inh.day. The regional wastewater treatment plant of the town of Septemvri in option 3 is intended for 24-hour average quantity of the wastewater Qav day = 2419 m3/d in 2043, including industrial and agricultural wastewater and infiltrated groundwater.

Receiving body of treated wastewater is „Kalimana" creek (or draining sewer „Kalimana", part of Napoitelni sistemi – Pazardzhik) in the river basin of Maritsa River, second category, according to Appendix № 3 of Order № РД-272/03.05.2001 of the Minister of environment and water and it falls in the list if sensitive zones, according to Order № РД-970/28.07.2003 of the

Minister of environment and water. Therefore, the concentrations of the biogenetic elements nitrogen and phosphorus in the treated wastewater should comply with the requirements of Ordinance 6, Appendix 3, Table 2. This is taken in account during the preparation of the preliminary design of regional WWTP for the town of Septemvri and the villages of Varvara and Vetren dol, where removal of the biogenetic elements nitrogen and phosphorus is previewed.

The terrain selected for the regional WWTP, is located southwest of the town of Septemvri, situated in LP 000143 in Koraba area, in the landings of the town. The selected has a surface of 15000 sq.m. and it is private public property. All administration procedures in connection with the terrain has been passed and it has been defined as „Special purpose terrain - for PWWTP". The site of the future regional WWTP cannot be flooded by high river water but groundwater is approximately 4 m below the surface.

The adopted in the preliminary design technological scheme of WWTP includes technological unit for mechanical treatment and biological treatment in bio tanks SBR type with low sludge load, nitrification and denitrification and biological removal of phosphorus. The technological scheme of PWWTP - Septemvri is presented on Fig. 1.

Table 3-77 Characteristic quantities of the wastewater in 2043, for which is created the preliminary design of the treatment plant

Type of water quantities	WWTP-Septemvri in 2043		
	m3/d	m3/h	l/s
24-hour average from population and industrial enterprises - Qav. d	2026	84,4	23,4
24-hour average with infiltrated – Qav. d + Qinf	2419	100,8	28,0
Infiltrated - Qinf	393	16,4	4,6
Maximum hourly Qmax,h = Qmax,h,dom + Qmax,h,ind + Qinf	-	206,2	57,3
When raining ≈ 2Qmax,h	-	390,5	108,5

Table 3-78 The loads and the concentrations of the main polluters in the wastewater at the entrance of the treatment plant in 2043, taking in account the sludge water, according to the preliminary design.

Quality parameters	Norms	Loads	Concentrations
	g/cap.d	kg/d	mg/l
BOD5	60	966	399.3
Suspended solids	70	1,078	445.6
COD	120	1,932	798.6
Total nitrogen	11	184.8	76.4
Total phosphorus	1.8	25.6	10.6

According to the adopted technological scheme for the retained option the preliminary design of the regional treatment plant the following technological units and facilities are envisaged:

1. Technological unit for mechanical treatment

Pumping station. Raw wastewater from the leading pipeline from the town of Septemvri and from the two villages, shall enter the feeding reservoir of the pumping station at the entrance of the treatment plant. Then the designed water quantity shall be pumped (with two operational and one reserve pump) to the treatment facilities. At the entrance of the WWTP two coarse screens with openings of 40 mm are envisaged.

- Fine screen together with a sand filter. One combined facility is envisaged. The fine screen is "screw" type. It is combined together with sand/oil filter with a capacity of 110 l/s. The solid substances separated by the fine screen shall be compacted with a washing screw press and shall be transferred into containers. The substances removed by the screens shall be transported in containers to a solid domestic waste landfill (SDW). The mixtures of oils and grease separated on the surface, shall be collected and transferred for dewatering. From here they shall be transferred for transportation in covered container with the waste from the screens. The sand separated by the filters, shall be washed and dewatered in a separate classifier, then removed from the treatment plant in a container.

2. Technological unit for biological treatment

- Cyclic operation bioreactor (SBR) with nitrification/denitrification, stabilisation of the activated sludge and biological removal of phosphorus. In the facility shall take place a line of processes of biological treatment, clarification of suspended biomass (activated sludge), removal of decanted (treated) wastewater and the superfluous activated sludge. The bioreactor is constructed with two parallel operating facilities, each with a volume of 3809 m3.

3. Technological unit for disinfection of the wastewater

- Installation for UV radiation. It is previewed to install UV radiation lamps in an open sewer.

4. Technological unit for treatment of sludge

- Gravity compactor. One facility is envisaged, constructed as a vertical clarifier with a volume of 157 m3, where the humidity of the stabilised superfluous activated sludge to be reduced to 97 %. Then it shall be sent to a temporary storage silo.
- Silo. Compacted superfluous activated sludge shall be stored in a silo with a total volume of 280 m3, ensuring 6 days stay for the sludge, it shall also serve as feeding reservoir for the installation for mechanical dewatering.
- Screw filter press for dewatering of sludge. One screw filter press with capacity of 5 m3/h is envisaged for the quantity of the dewatered sludge, as well as the respective aggregated for preparation and dosing of the flocculent and belt conveyor for removal of the dewatered sludge. The dewatered sludge shall be stored temporarily on a drained site with a surface of 1160 m2, and then transported for reuse.

Table 3-79 The data about the expected concentrations of major polluters in treated wastewater, according to the preliminary design of the selected option

Quality parameters	Unit	Concentrations
BOD5	mg/l	25
COD	mg/l	125
Suspended solids	mg/l	35
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2

The above listed values of the indicators comply with the regulatory requirements for water emissions, discharged into water bodies second category, sensitive zone.

3.5.4.5. *Performance of the wastewater system*

Operation and maintenance of the wastewater network:

- The operator carries out only emergency cleaning of the wastewater network. Insignificant cloggings are manually cleaned by the Water operator. More substantial blockings, which need cleaning through suction and jetting are assigned to external service provider.
- No preventive maintenance and inspection is conducted through CCTV observation of sewerage.
- Data from simulation studies (if any) about hydraulic capacity of the existing wastewater network for characteristic hydraulic loads using software products - **no data from simulation studies**.

Operation and maintenance of WWTP:

On-going project

3.5.4.6. *Summary of major deficiences*

Table 3-80 Major deficiencies of the wastewater system of agglomeration Ivaylo

№	Components	Major deficiencies
1	Wastewater network	In paces the gradients of the wastewater network are reverse or below minimum allowed No as-built drawings and there is no information concerning the grade line of the wastewater network. Lack of stormwater overflows for unloading of the network; The wastewater system of the town is approaching the end of its useful life (100% of the pipes are more than 35 years old), made of concrete pipes, connected with cement grout. The connections between the pipes cause infiltration and exfiltration from and in the collectors. There are displacements and collapses in places. In the street sewers there is infiltration both from the obsolete water supply network and from high level groundwater in case of rain and snow melting; Part of the sewers and the inspection shafts are filled with alluvium and pieces of stones and concrete, causing obstruction of the wastewater flow
2	WWPST	On-going project
3	WWTP	On-going project

3.5.5. SLUDGE MANAGEMENT

For the town of Septemvri and the villages of Varvara and Vetren dol construction of one regional wastewater treatment plant (WWTP) is envisaged.

During the processes of treatment of the wastewater sludge is formed, that should be treated separately to their final removal or reuse..

The selected option of the technological scheme of the regional wastewater treatment plant - the town of Septemvri, together with the facilities for treatment of the wastewater includes also sludge treatment facilities.

The following technological units and facilities described above are previewed for the treatment of the wastewater:

1. Mechanical unit

- Coarse screens
- Fine screens
- Sand filter

2. Biological unit

- Cyclic operation bioreactors (SBR type)

3. Unit for disinfection of the wastewater

- Installation for disinfection with UV radiation

During the processes of treatment of the wastewater of the selected option, waste and sludge from the following facilities shall be filtered and separated:

- Coarse and fine screens – the retained waste shall be compacted and separated in containers for removal from the treatment plant.
- Sand filter – the retained sand shall be washed, dewatered and separated in containers for removal from the treatment plant. The separated oils and grease shall be removed in a reservoir for gravity dewatering, and then sent for reuse.
- Cyclic operation bioreactors – the superfluous activated sludge (biologically stabilised) shall be subject of subsequent treatment with compacting (significant decrease of the volume through removal of the main quantity of sludge water) and mechanical dewatering
- For the treatment of the superfluous activated sludge, separated by the cyclic operation bioreactors (SBR type), in the technological scheme of the regional wastewater treatment plant - the town of Septemvri of the selected option, the following facilities are envisaged:

- Gravity compactor for compacting of sludge in order to obtain humidity of approximately 97 %
- Aerobic stabilisation for biological stabilisation of sludge
- Silo – for temporary storage of the stabilised and compacted sludge
- Screw filter press – for dewatering of sludge in order to obtain humidity of approximately 75 %

Table 3-81 Data about the quantities of the waste and the sludge, separated in the regional treatment plant - the town of Septemvri, according to data available in the preliminary design

Types of waste and sludge	Regional WWTP – Septemvri		
	weight kg/d	humidity %	quantity m3/d
screenings	120	75	0,48
sand from sand filter	302	60	0,42
oils from sand filter	4,4	80	0,03
superfluous activated sludge after the cyclic bioreactors (SBR type)	965	99	96,5
Stabilised sludge, dewatered на screw filter press	965	75	6,0 (for humidity of 84%)

From the cyclic operation bioreactors the superfluous activated sludge shall be transferred to a gravity compactor. In the gravity compactor the superfluous activated sludge shall be compacted in order to obtain humidity of approximately 97%, then it shall be transferred to a reservoir-silo.

After dewatering of the stabilised sludge with a screw filter press with capacity of 5 m3/h, their humidity is reduced to approximately 75%, their consistency (similar to the consistence of the humid soil) allows loading and transporting it outside of the treatment plant with minimum expenses.

According to the data in FS and PD about the type and the quality of industrial wastewater of the town of Septemvri and the villages of Varvara and Vetren dol, and in observance of the conditions of Ordinance 7 on discharge of production wastewater into urban wastewater networks, and effective control on water emissions from industrial enterprises, it is not expected the sludge removed from the future treatment plant to contain heavy metals and other toxic substances; this makes them suitable for reuse in the agriculture and forestry.

In 2011 has been prepared and submitted to the investor a “Program for management of sludge from WWTP Septemvri and the villages of Varvara and Vetren dol”. It envisages the possibilities for disposal or reuse of sludge - summarised, as follows:

- The site of the existing landfill for domestic waste is located in the area “Gorni Bashali”, in the landings of the town of Vetren. The landfill is located 13 km north of the town of Septemvri. The territory of the landfill of the town of Septemvri is a former stone-pit (for extraction of granite) and it does not comply with the contemporary requirements. It shall be recultivated, there is a project prepared. The alternative of the disposal of sludge from the future WWTP would be to send it temporarily, until defining their composition, to the newly constructed regional SDW landfill for Pazardzhik municipality.
- The environmentally friendly solution for reuse of sludge from urban wastewater treatment plants is also using it for recultivation of damaged terrains, There is no data about the existence of such terrains on the territory of Municipality of Septemvri. The dewatered and stabilised sludge from WWTP can be used for the technical recultivation of the existing SDW landfill of the town of Septemvri after mixing it with soil in specific mixtures.

- Reuse of sludge from the regional WWTP-Septemvri for production of bio humus and biomass for feeding of birds and animals. The bio humus is approved as trading product by the Ministry of Health of R, of Bulgaria with Ordinance No 01156-2000. It is included as organic fertiliser also in Ordinance No 22/4.07.2001 of the Ministry of agriculture forests of R. of Bulgaria, which recommends it as a licensed agriculture product under the denomination of "Lumbricompost – excrements of the red California worm". In the village of Vinogradets, Municipality of Septemvri, is located eco-farm „Feratitsa" for production of bio humus of the red California worm, located approximately 14 km from the future WWTP – the town of Septemvri, the village of Varvara and the village of Vetren dol. The farm is functioning since 2007. It has a useful surface of 3000 m2 – capacity, enough to receive the dewatered sludge from WWTP.
- The arable lands and forest massifs in Municipality of Septemvri occupy significant surfaces which represents a good precondition for reuse of sludge from the future regional WWTP-Septemvri for fertilisation of agricultural and forest surfaces.
- The present Regional Master Plan recommends the sludge from the future regional wastewater treatment plant - Septemvri to be removed at the regional SDW landfill, until assessment of the readiness of the agriculture and forestry, as well as of the eco-farm „Feratitsa" to receive it for reuse and after conducting of the respective administration procedures.

Table 3-82 Treatment of sludge and reuse/disposal at the Regional WWTP of the town of Septemvri, the village of Varvara and the village of Vetren dol

Settlement WWTP	Year of commissioning	Capacity в P.E.	Technology of treatment of the sludge	Type of reuse of the sludge/disposal	Volume of the sludge	
					DS[9]/a	Humidity [%]
WWTP Septemvri	After completion of the construction	14000	Aerobic stabilisation and mechanical dewatering through screw filter press	Municipal landfill Septemvri / planned regional landfill в Pazardzhik	2190 m3/year	75 %

3.5.6. WASTEWATER INFRASTRUCTURE FOR AGGLOMERATION ALEKO KONSTANTINOVO

The village of Aleko Konstantinovo has a population of 2,714 inhabitants. There is no sewerage network built, wastewater is envisaged to be treated in WWTP Pazardzhik.

3.5.7. WASTEWATER INFRASTRUCTURE FOR AGGLOMERATION GLAVINITSA

The village of Glavinitsa has a population of 2,282 inhabitants. There is no sewerage network built, wastewater is envisaged to be treated in WWTP Pazardzhik

[9] Dry substance

3.5.8. Wastewater infrastructure for agglomeration Ognyanovo

The village of Ognyanovo has a population of 2,353 inhabitants. There is no sewerage network built, wastewater is envisaged to be treated in WWTP Pazardzhik

3.5.9. Wastewater infrastructure for agglomeration Chernogorovo

The village of Chernogorovo has a population of 2,203 inhabitants. There is no sewerage network and treatment plant built.

3.5.10. Wastewater infrastructure for agglomeration Malo Konare

The village of Malo Konare has a population of 4,353 inhabitants. There is no sewerage network and treatment plant built.

3.5.11. Wastewater infrastructure for agglomeration Bratanitsa

The village of Bratanitsa has a population of 2,093 inhabitants. There is no sewerage network and treatment plant built.

3.5.12. Wastewater infrastructure for agglomeration Varvara

The village of Varvara has a population of 2,061 inhabitants. There is no sewerage network built, wastewater is envisaged to be treated in WWTP Pazardzhik.

3.5.13. Wastewater infrastructure for agglomeration Vetren

The village of Vetren has a population of 3,221 inhabitants. There is no sewerage network and treatment plant built.

3.5.14. Wastewater infrastructure for agglomeration Kovachevo

The village of Kovachevo has a population of 2,402 inhabitants. There is no sewerage network and treatment plant built.

3.5.15. Industrial Wastewater Facilities

3.5.15.1. *General*

The joint disposal and treatment of industrial and domestic wastewater is possible and admissible only under certain conditions. This should be decided for each particular case. This issue is extensively examined in terms of regulatory framework in Annex №7 on the terms and conditions for wastewater discharge into the urban sewerage and the level of its treatment. Some additional requirements are given in Appendix №3-17

3.5.15.2. *Polluter pays principle*

The polluter-pays-principle is one of the core principles of international environmental law accepted by all governments of the OECD. The principle’s goal is that the polluter pays the full costs of the own pollution.

The polluter-pays-principal has been recognized as a general principle of international environmental law since 1990 [OECD 1989, 1992]. However, it is an economic and not a juridical principle. This implies that the principle does not mean to punish the polluter, but to establish the necessary economic conditions so that all the environmental costs associated with the operation of a polluter will be considered as leading to sustainable development. It is obvious that the principle aims at limiting waste in natural resources and reducing environmental costs.

According to international experience, a set of conditions should be met for the polluter-pays-principle to be implemented successfully:

- Clear determining of the pollution sources and accurate measurements of pollution loads;
- Sense of fairness should be present and understood by all involved parties so that they agree to cooperate in good will;
- Public support is needed;
- Strong institutional framework is also needed to implement any suggestions successfully.
- In addition, the implementation of the polluter-pays-principle can lead to better environmental conditions. This may take place by carrying out the principle and then it will create incentives for the industries to decrease pollution discharges.

Considering these general aspects, the application of the polluter-pays-principle will be an important task of WSS companies and should be included in the “Reduction Action Plan, Control of Industrial Discharges”, which are to be prepared by them.

3.5.15.3. *Inventory of industries*

On the territory of Pazardzhik agglomeration

The companies presented below form the industrial pollution load of WWTP Pazardzhik.

Table 3-83 Industrial companies in the southern industrial zone of Pazardzhik, connected to Pazardzhik WWTP

№	Industrial company	Type of production	Quantity of wastewater Qav. Day m^3/day	Is there an Industrial WWTP?
1	Ekovita OOD	Fruit and vegetable processing	22	Yes

№	Industrial company	Type of production	Quantity of wastewater Qav. Day m^3/day	Is there an Industrial WWTP?
2	Maritsa Olio	Vegetable oil and sunflower seed	156	Yes
3	Optela AD	Metal cutting machines, nodes and details	53,3	There is a design, forthcoming construction
4	Hlebmash komers 95 AD	Bread and baked goods	29,6	No
5	Melnitsa Pazardzhik OOD	Grain storage and flour production	3,7	No
6	Fedon OOД	Pastry shop	18	Yes
7	Ekoinvest EOOD	Non-metal products recycling	53,3	Yes
8	Vintehprom AD	Wine production	34,9	Yes
9	Podemstroy mash Invest EAD	Cranes and metal structures	17,8	No
10	Maritsa Eko Froze EAD	Fruit and vegetable processing, cannery production	26	No data
	Total		414,6	

Industrial companies on the territory of Pazardzhik with own local WWTPs.

Kauchuk AD - the company has its local WWTP as the wastewater treated in it is discharged in the Pishmanka river (Permission No 33150014/23.03.2010 for the use of Pishmanka river, Maritsa basin, for discharging wastewater from facilit "Rubber production plant, Pazardzhik, Pazardzhik district", issued by the Director of EASRBD- Plovdiv)

Elhim-Iskra AD – the company manufactures lead acid accumulator batteries. It has a treatment plant for chemically polluted wastewater. The treated wastewater is discharged in the Pishmanka river.

On the territory of the town of Septemvri

Industrial companies connected to Septemvri WWTP

Table 3-84 Industrial companies in the southern industrial zone of Septemvri

№	Industrial company	Type of production	Quantity of wastewater Qav. Day m^3/day	Is there an Idustrial WWTP?
1	Train car repair plant	Repair and restoration of running gear and major equipment	90	No data
2	Hebros Vinprom AD	Production of liquor excluding wine, the activity is currently	20	No data

№	Industrial company	Type of production	Quantity of wastewater Qav. Day m^3/day	Is there an Idustrial WWTP?
		in decline, tending to close down		
3	Oliva AD	Processing of sunflower seeds, vegetable oil production	20	No data
4	Vinprom AD	Production of wine and liquor	10	No data
	Total		140	

3.5.15.4. *Conclusions*

- The total quantity of the discharged industrial wastewater in the town sewerage system is at most 15% for the town of Septemvri and 11% for the town of Pazardzhik of the total quantity of wastewater generated in all agglomerations.
- The total industrial pollution expressed as BOD load of the industry based on the water quantity is at most 16% for the town of Septemvri and 12% for the town of Pazardzhik of the total load generated in the agglomerations (as BOD volume).

3.5.15.5. *Recommendations*

Building of **local treatment facilities** which must provide the necessary level of treatment of the industrial wastewater for achieving the parameters set in the contracts for connection to the urban sewerage system

3.6. DATA SUFFICIENCY

3.6.1. LIST OF DATA SOURCES

Information provided by the relevant institutions:

Information provided by the Municipalities

- Project No DIR-51011119-16-35 "Expansion of WWTP for removal of biogenic elements – nitrogen and phosphorus and expansion of WSS network of the town of Pazardzhik", funded by Operational Programme Environment 2007-2013 r.", Priority Axis 1, Procedure for direct grant award BG161PO005/10/1.11/03/19, Grant No DIR-51011119-C010 / 14.09.2011. Integrate water management of the town of Sarnitsa, Velingrad municipality, Pazardzhik district – draft project – 2012
- Previous draft projects for the settlements over 2,000 inhabitants – water supply, sewerage network and treatment. Project stage depending on the project readiness for the concerned settlement – technical, working or draft project.

- Regulation plan / cadastre plan of the town of Pazardzhik and the village of Chernogorovo – digital format;
- Regulation plan / cadastre plan of Ognyanovo, Glavinitsa, Aleko Konstantinovo, Bratanitsa, Ivaylo and Malo Konare – rasterformat;
- Municipal plan for the development of the municipality 2007-2013
- MUNICIPAL ENVIRONMENTAL PROTECTION PROGRAM
- WASTE MANAGEMENT PROGRAMME 2008–2013.

Information provided by ViK EOOD - Pazardzhik

- Water consumption data
- Generated water quantity data
- Supplied water quantity data
- Invoiced water quantity data
- Large water consumers data
- Drinking water quality data
- Breakdowns data – breakdown log books
- Information for the problems to be solved by the WSS operator
- Financial and economic data
- Layouts of the internal and external water main and sewerage networks – raster digital format

Information provided by the MRDPW and the MoEW

- Lists of assets
- Institute of Vodokanalproekt – Water supply programme for projection period until 2010 of the municipalities and the adjacent settlements in NRB, Plovdiv District, Pazardzhik Region, Pazardzhik, Septemvri and Lesichovo municipalities – 1989.
- Report for the implementation of the provisions of Directive 91/271/EEC concerning urban wastewater treatment

Regional Health Inspections (RHI)

- Quality of water in the settlements

Used sources:

- Kozhuharov D. et al., 1990 Geological map of Bulgaria. Map sheet of Plovdiv, scale 1:100 000;
- Kozhuharov D. et al., 1991 Geological map of Bulgaria. Map sheet of Chepelare, scale 1:100 000;
- Ruseva M. et al., 1991. Geological map of Bulgaria. Map sheet of Karlovo, scale 1:100 000;
- Cheshitev G. et al., 1993. Geological map of Bulgaria. Map sheet of Troyan, scale 1:100 000;
- Tsankov Ts.et al., 1992. Geological map of Bulgaria. Map sheet of Gabrovo, scale 1:100 000;

- Tsankov Ts. et al., 1995. Geological map of Bulgaria. Map sheet of Kazanlak, scale 1:100 000;
- Boyanov I. et al., 1990. Geological map of Bulgaria. Map sheet of Chirpan, scale 1:100 000;
- Boyanov I. et al., 1990. Geological map of Bulgaria. Map sheet of Iskra, scale 1:100 000;
- EASRBMD 2010. River Basin management Plan for the East Aegean Sea River Basin – Plovdiv;
- The Water Act;
- Ordinance No 1/10.10.2007 on the survey, utilization and preservation of groundwater;
- Ordinance for amendment and supplementation of Ordinance No 1 / 2007 on the survey, utilization and preservation of groundwater (SG No 15/2012)
- Ordinance No 2/13.09.2007 on preservation of water against nitrate pollution from agricultural sources;
- Ordinance No 3/16.10.2000 on the terms and conditions for the survey, design, approval and utilization of sanitary protection zones around the water sources and facilities for drinking and household water supply and around mineral water sources used for medical, prevention, drinking and hygienic purposes;
- Ordinance No 9/16.03.2001 on the quality of water intended for drinking and household purposes;
- Ordinance No РД-02-20-2/27.01.2012 on the design of buildings and facilities in seismic areas;
- Ordinance No 2/22.03.2005 and amendment from SG No 96/ 07.12.2010 on the design, construction and operation of water supply systems;
- Standards for design of sewerage systems;
- Standards for design of flat foundations;
- Directive 98/86/EC/ on the quality of water intended for human consumption;
- Information from Water Supply and Sewerage EAD – Pazardzhik
- Letter with ref. No I-1935/28.02.2013 of RHI - Pazardzhik to Consortium SEureca SCE, Arcadia, Hydroproekt containing results from the testing of nitrates in the water of Pazardzhik, Ivaylo, Dobrovnitsa and Saraya supplied from PS “Ivaylo“ in 2011 and 2012 г. .

3.6.2. DATA REVIEW

For the elaboration of the present analysis for the purposes of forecasting, available information obtained from the following sources has been used – ViK, Municipalities, NSI and the completed Questionnaires returned by the WSS Operator, as well as data collected by the consultant during the field visits. To get clearer notion of the quality of used information, an attempt has been made to systemize and arrange it in tabular form, as follows:

Table 3-85 Review of data

Parameter Description	Reliability and accuracy of input data
Number of population connected to water supply networks	Very high (data from WSS company and detailed designs)
Annual number of failures on external water pipelines, water distribution networks and service connections	Very high (official records)

Parameter Description	Reliability and accuracy of input data
Number of water supply service connections, number of water meters and number of customers	Very high (official records)
Lengths and diameters of external water mains	High. Data from WSS company, business plan and drawings
Lengths and diameters of water distribution networks	High. Data from WSS company, business plan and drawings
Data on water delivered from water sources to distribution networks	High as regard water supplied from the water sources;Insufficient reliability as regards water supplied to the distribution networks.
Data water consumed (invoiced)	Very high. Data from Collection Department of WSS operator. The accuracy of water metering is questionable
Condition of water supply facilities – pumping stations, reservoirs, water sources	Very high. Inspections carried out by the Consultant. Data from WSS company
Number of population using sewerage services of WSS company	
Annual number of failures on sewerage service connections	Very high (official records)
Number of sewerage service connections operated by WSS operator	Very high (official records)
Annual number of failures in wastewater network	Very high (official records)
Lengths and diameters of wastewater network	Very high (official records)
Depths of wastewater network	High (Data from WSS operator, Business plan and maps drawn up in Feasibility study, Preliminary and Detailed designs
Total area of the town of Panagyurishte, serviced by WSS operator	High. Elaborated maps
Total design capacity of water supply and sewerage networks	High. Elaborated maps
Number of WSS operator personnel, responsible for provision of water supply services	Very high. Based on approved detailed and technical designs
Number of WSS operator personnel, responsible for provision of sewerage services	
Annual number of occupational accidents	Very high
Total number of personnel, providing water supply and sewerage services	Very high
Total number of drinking water treatment plants	Very high
Number of samples for drinking water quality, complying with regulatory requirements for physicochemical and radiological indicators	Very high
Total design capacity of wastewater treatment plant	
Number of population connected to water supply networks	Very high
Annual number of failures on external water	Very high. Data from official records of laboratory

Parameter Description	Reliability and accuracy of input data
pipelines, water distribution networks and service connections	analyses.
Number of water supply service connections, number of water meters and number of customers	
Lengths and diameters of external water mains	Very high. Based on approved detailed and technical designs

3.6.3. Recommendations

The Consultant recommends the application of the following measures in order to improve data availability concerning water supply, sewerage and treatment systems:

- Improvement of mapping for the external water supply systems: Changes in the system should be timely depicted on maps and plans
- Introduction of Geographic Information System, using GIS based software.
- Measurement of water supplied to water distribution networks has to be improved, yearly and monthly water supply should be metered.
- Collection of additional data on water quality and/or initiating a campaign for water quality analysis (for priority areas in the feasibility study and for the other regions included in the terms of reference of the forthcoming technical assistance contracts.
- Renegotiating the conditions for connection of waste water to the urban sewerage with the industrial customers on the basis of the requirements laid down in Ordinance № 7 on the quality of industrial waste water discharged in the sewerage systems of the settlements. Obliging the enterprises to conclude a contract for own monitoring with an accredited laboratory.
- Collection of data for yearly, daily and hourly wastewater flow from discharge points of industrial undertakings in conformity with Ordinance №2 of 8th June 2011 on the issuance of permits for wastewater discharge into water bodies and determination of individual emission limitations of point sources of pollution.
- Average (daily mixed sample) and maximum data (from random samples) on quality of wastewater and quantity in different discharge points, should be collected.

3.7. Conclusions and Recommendations

3.7.1. Water Resources

Conclusions:

The water supply of the settlements on the territory of Pazardzhik is carried out only from groundwater resources with total produced water quantity of 12,220,996 m3 year /equal to 387.5 l/s/. This quantity comes from a big number of wells in the terrace of the Maritsa river and its tributaries with some insignificant exceptions. The total available resource of groundwater is 21.3 million m^3 /equal to 675.3 l/s/.

The existing water resources are sufficient for supplying the settlements with drinking water /there's no water scarcity/. Some of the settlements also have backup water sources.

On most of the territory there is enough groundwater with quality compliant with the drinking water standards located on a depth between 10-100 metres under the surface. Some of the local water sources don't have renewed water use permissions and all sanitary protection zones are not compliant with the provisions of Ordinance No3/16.10.2000.

Most of the abstracted water /82 % of the total water quantity/ complies with the Bulgarian drinking water quality standards but in some settlements the water is not suitable for drinking purposes due to the contents of nitrates, calcium, sulphates and total hardness.

There is no dispatch station for monitoring and control of the facilities of incoming water , the reservoir system and the main facilities on the water supply network. Problems are not visualized which refers to the water meter system, too and the system is not computerized.

Recommendations:

For providing the high level of security and reliability of the water supply the Consultant recommends keeping the existing local water sources and maintaining them in good condition regardless that the consumption of 21 settlements is provided with treated water from Luda Yana dam.

The water quantities with increased nitrate content should be compensated with treated water from Luda Yana dam. In all case the immediate implementation of the Nitrate Control Action Programme is of primary importance.

3.7.2. WATER POLLUTION

The performed on-site inpections have shown that the current polluters of the Maritsa River basin are the settlements in the designated territory of the water operator in Pazardzhik. A wastewater treatment plant is built for the town of Pazardzhik. With the re-classification of the Maritsa River within the scope of Pazardzhik WWTP, project documentation was prepared for the removal of nitrogen and phosphurus from treated wastewater. When examining of the problem, the Consultant found are on-going procedures related to the elaborated project studies for removal of nitrogen and phosphorus. A builder has not been selected yet and the construction of the extension of the plant has not been started. The regional wastewater treatment plant of the town of Septemvri and the villages of Vetren Dol and Varvara are in the avanced stage of preparation for construction works. Design solutions are elaborated and funding is provided for the site. As for Pazardzhik, the procedures are to be finalized and a builder is to be selected. It is expected that with the commissioning of the treatment plant for industrial and domestic wastewater of the town of Pazardzhik and the regional WWTP of Septemvri, the pollution of the Maritsa River will be substantially reduced and it will consequently have a positive effect on its emission condition. It is necessary that the operating water company renegotiate the conditions for connection of industrial wastewater to the urban sewerage system on the basis of Ordinance № 7 and the elaborated studies for Pazardzhik WWTP and the regional plant for the town of Septemvri and the villages of Vetren Dol and Varvara.

After building the new regional solid household waste landfill near Pazardzhik the currently existing landfill will be closed and recultivated. Thus the infiltration of polluted water from the landfill will cease.

3.7.3. CURRENT WATER CONSUMPTION

Conclusions:

At present 147,659 inhabitants (100% connection rate) in the designated territory receive water, consuming 5,057,645 m^3/year water with average per capita consumption of 74 l/inh./day. Apart from that the non-domestic consumers use 1,152,079 m^3/year and thus the total consumption of water in the territory served by ViK EOOD – Pazardzhik is about 6,209,724 m^3/year (9,523 m^3/day, 112 l/s). We have data only for 2011.

The average percentage of non-revenue water for the territory of ViK EOOD Pazardzhik is 63% of which 50% are real (technical) losses along the networks and about 13% are commercial losses (1% comes form metering inaccuracies). Non-revenue water for the different settlements ranges within wide limits from 20 to 84% . In most of the settlements, where water losses are over 50% (the villages of Varvara, Vetren dol – 84%, Vetren, G. Varshilo, Semchinovo, Simeonovets, Slavovitsa, Vinogradets, Kalugerovo, Lesichovo, Tserovo, Borimechkovo, Akandzhievo – 78%, Karabunar, Boshulya, Tsrancha, Patalenitsa, Hadzhievo – 74 %). It is obvious that the water losses in the water supply systems but noy unusual for the water supply in Bulgaria.

Recommendations:

- Implementation of an advanced leakage monitoring system (i.e. installation of district metering areas or other strategies for water loss reduction)
- Replacement of old water transmission pipes and distribution networks.
- Installation and/or renovation of bulk water meters at all water intakes and reservoirs;
- Installation of water meters at the reservoirs and replacement of the amortised water meters.

3.7.4. WATER SUPPLY INFRASTRUCTURE

3.7.4.1. *External water supply systems*

Conclusions:

Water abstraction

- 14 renewed permissions, 6 applications submitted at EASRBD – Plovdiv, 4 prepared but not submitted applications. At present the applications for the rest of the water sources are being prepared – 6.
- All water sources have sanitary protection zones but they are not compliant with the provisions of Ordinance No3/16.10.2000.
- Nitrate concentration over the maximum permissible levels up to 2011 was found in the settlements which are supplied from WSZ „Ivaylo” /Ivaylo, Dragor, Saraya, Dobrovnitsa and the northern part of Pazardzhik/.

Treatment

- On the territory of ViK EOOD – Pazardzhik there are no DWTP.
- Improperly used disinfection facilities.

Storage/Reservoirs

- Structurally all reservoirs are in satisfactory condition but the pipes and the equipment are old and amortised.
- Lack of ground reservoirs or storage towers for fire firghting reserve of 15 settlements in the following 8 WSS – “Aleko Konstantinovo”, “Ivaylo”, “Govedare”, “Hadzhievo”, “Malo Konare”, “Bratanitsa-Lyahovo”, “Zvanichevo and “Yunatsite”, creating problems with water supply security.

Pumping stations

- Some of the pumping station buildings are used for water disinfection /chlorination compartments/ as the submersible pumps send the water directly into the PR or distribution networks.
- The equipment of the tube and shaft wells has been replaced from 1999 to 2002.
- The horizontal pumping units commissioned between 1970 and 1985 have low efficiency and relatively high energy consumption and are characterised in general as low efficient
- About 40 % of the buildings have structural deficiencies
- Some of the pumps send the water directly into the network without ground or tower reservoirs.

Transmission water mains

- The external water mains with total length of 644 km were built in the period 1929-1986.
- The structural condition of the transmission systems is bad
- - the long service period of the asbestos cement pipes results in worn-out gaskets, broken or damaged sockets and pipes, frequent breakdowns, high losses and interruption of water supply to consumers;
- - the steel water mains have cathodic protection but need replacement since the ones built during the 1970’s were laid without insulation.
- In 2011 were registered 136 breakdowns on the trunk water mains.
- The facilities on these water mains are in bad condition and need overall renovation.

Water metering

- There is a water metering system but supplied water is not measured in all settlements

Recommndations:

Water abstraction

- Obtaining permissions for all operating water sources.

- Establishing sanitary protection zones /three belts/ in compliance with the Bulgarian regulatory requirements /Ordinance No 3/16.10.2000/.
- Treating the water from the water sources polluted with nitrates or decommissioning them.

<u>Treatment</u>

- All existing disinfection systems should be placed in appropriate premises compliant with the sanitary and hygienic requirements. The systems themselves should be further equiped with the necessary hardware and software for control of the residual chlorine in the water of the network. For that purpose, the amount of the added disinfectant should be automatically adjusted by the introduced automated control system and automated system management.

<u>Reservoirs</u>

- Renovation of the existing reservoirs (structural damages, pipe connections and equipment).
- Building additional volumes of the pressure reservoirs and new ones where necessary for providing optimal water supply;
- Building contact reservoirs where necessary for providing the required contact of the chlorine for proper water disinfection.

<u>Pumping stations</u>

- Rehabilitation of the pumping stations /starting with the most pressing repairs/.
- Replacement of the inefficient equipment of the pumping stations and replacement of the amortised pumping units starting with PS Vetren III-rd and II-nd uplift and PS Patalenitsa.

<u>Transmission water mains</u>

- Gradual replacement of the trunk water mains starting from the most problematic ones in the short-term investment period /2016 - 2021/ for preventing the risk of frequent and prolonged interruptions of water supply during repairs.
- Gradual replacement of all external transmission water mains built before 2002 depending on their condition, affected population and lack of alternative supply.
- Monitoring on the transmission mains, pipe systems, air chambers and overflows for timely detection and repair of small /hidden/ but continuous leaks which generate substantial losses;

<u>Water metering</u>

- Completion and improved precision of the water meter system;

3.7.4.2. *Water distribution networks*

ViK Pazardzhik operates 54 distribution networks with a total length of 891,726 km on the territory of the Municipalities of Pazardzhik, Septemvri and Lesichovo.

<u>Conclusions:</u>

Water distribution networks in all settlements, served by the operater, are in poor condition.

The majority of distribution networks (92%) in the settlements are made of old pipes (86% of asbestos cement, 3% of steel, 2% of Mannesmann, 1% of galvanized pipes), mostly laid in the 60's and 70's.

In general, water distribution pipelines made of asbestos cement have reached the end of their service life and are characterised by the presence of damaged couplings (gaskets which have lost their elasticity). Asbestos cement water pipelines suffer frequent failures as well as visible and hidden leaks.

Steel water pipelines (steel, Mannesmann and galvanized pipes) are also in poor condition and in some places are heavily corroded (without cathodic protection).

Real losses in the distribution networks of the settlements range within 36-68% of water supplied.

Fittings in the distribution networks (stop valves and fire hydrants) are insufficient. A major part of these fittings are out of operation.

Service connections are in poor condition as well. The greater part of them (over 90%) consists of old galvanized steel pipes, which are corroded and suffer frequent failures (leakages, cloggings, etc.). Distribution networks probably have a significant number of unauthorised connections, particularly in the networks of the villages where water is used for irrigation of yards and gardens.

Water supplied to the distribution networks of 47 settlements is not metered and water of 7 settlements is currently not metered.

Water consumption is generally metered. Over 99% of consumers are endowed with water meters. A large number of small (domestic) meters (86%) are old and inaccurate, and usually measure water quantity less than reported. The activities related to verification, calibration and replacement are not sufficient. The approved programme for inspection and replacement of meters is implemented at 50%.

Recommendations:

It is recommended that an overall replacement of obsolete asbestos cement and steel pipes is carried out. Replacement should be conducted in stages, which are consistent with the state of individual water pipeline branches and sections (with priority for sections featuring a large number of failures).

It is estimated that the total length of water pipelines, which need to be replaced in the villages, operated by ViK Pazardzhik (within the three programming periods) is 680.422 km.

Where possible, it is recommended that the rehabilitation of the water distribution network is carried out simultaneously with the construction of the sewerage network.

The old water supply service connections should be replaced along with the water distribution network. During the overall replacement of distribution branches, illegal service connections will be detected and interrupted.

As regards water metering, it is necessary to carry out as follows:

- Installation of water meters on all water pipelines, feeding distribution networks (if any);
- Installation of water meters for all consumers, which are not metered;
- Strict implementation of the programme for inspection and replacement of water meters, accepted by the operator;

3.7.5. WASTEWATER INFRASTRUCTURE

3.7.5.1. *Sewerage network*

➢ ***The designated agglomerations on the territory of ViK EOOD – Pazardzhik****,* according to a report on the implementation of directive 91/271/EEC concerning treatment of wastewater from the settlements are:

In Pazardzhik municipality*:*

- Agglomeration Pazardzhik with 85 058 P.E.;
- Agglomeration Aleko Konstantinovo with 2 628 P.E.;
- Agglomeration Bratanitsa with 2 034 P.E.;
- Agglomeration Chernogorovo with 2 189 P.E.;
- Agglomeration Glavinitsa with 2 282 P.E.;
- Agglomeration Ivaylo with 2 841 P.E.;
- Agglomeration Malo Konare with 4 353 P.E.;
- Agglomeration Ognyanovo with 2 353 P.E.;

In municipality Septemvri:

- Agglomeration Septemvri with 7 869 P.E.;
- Agglomeration Vetren with 3 221 P.E.;
- Agglomeration Kovachevo with 2 402 P.E.;
- Agglomeration Varvara with 2 061 P.E.

On-going project

Under procedure BG161PO005/10/1.11/03/19 "Preparation and Implementation of Projects for Improvement and Development of Water and", with **NoDIR-51011119-C010 „Extension of WWTP for removal of biogenic elements nitrogen and phosphorus, rehabilitation and extension of the WSS network of the town of Pazardzhik**", signed on 14.09.2011 for BGN 49 822 725.

The project envisages construction of unit for treatment of nitrogen and phosphorus at WWTP Pazardzhik. Reconstruction, completion of water supply и wastewater network. The part of the project concerning the wastewater network is in the phase of preliminary design, two options are developed. An Option for development of the wastewater network is in process of approval.

Municipality of Septemvri has obtained financing under Priority Axe 1 of Operational Programme Environment 2007-2013 (OPE). Under Procedure BG161PO005/10/1.11/02/16 „Improvement and development of drinking and wastewater infrastructure in agglomerations over 10 000 P.E.", with ***NoDIR-51011116-C055 „Improvement of the water cycle of the town of Septemvri",*** signed on 20.11.2012

It envisages construction of WWTP Septemvri, including the settlements Septemvri, Varvara и Vetren dol. Completion and reconstruction of 3.8 km wastewater network of the town of Septemvri and construction of WWPS in Romany residential quarter of the town of Septemvri

Sewerage network

Pazardzhik

- ✓ All the wastewater systems have minimum or below the allowed gradient, in many places the gradient is even negative, there are also many sections, where the pipe entering the IS is lower than the one at the exit.
- ✓ High groundwater level on the territory of the entire town, varying between 1,0-1,5 m near the river and 3,0 – maximum 4,0 m in the central, north part of the town, even in dry weather;
- ✓ Wastewater network of the town is made of concrete and reinforced concrete pipes – over 98% and is approaching the end of its useful life (100% of the pipes are more than 35 years old).The connections between the pipes cause infiltration and exfiltration from and in the collectors. There are displacements and collapses in separate places. There is infiltration in the street sewers both from the obsolete water supply network and from the high level of groundwater;
- ✓ Part of the sewers and the inspection shafts are filled with alluvium and pieces of stones and concrete, causing obstruction of the wastewater flow; also when it is raining the adjacent terrains and houses are flooded.
- ✓ The larger part of the sewers is clogged, the inspection shafts are filled with alluvium. Part of the industrial zone does not have a constructed wastewater network yet;
- ✓ The construction of the wastewater network has started from the centre of the town to the periphery, but this is not taken in account for the design of the collectors in the central part of the town. Part of the streets have two wastewater systems – an older one with small diameter and a newer one with larger diameter
- ✓ The minimum gradients of the entire wastewater network cause deposition of alluvium in dry weather. Water mixed with decaying alluvium, is directed in case of rain, directly to WWTP or the rivers, which is confirmed by the samples taken during rains at the entrance of the WWTP. The decaying alluvium in the wastewater network is one of the reasons for the relatively big biologic load in the north zone of the town, serving 100 000 P.E., where live in fact approximately 70 000 inhabitants and there is no industry at all /especially polluted wastewater/.
- ✓ The larger part of the pipes have additionally decreased diameter, there are also separate areas where the sewer profile is clogged to 40 and 60%.
- ✓ During the following years a new problem is noticed in initial sections of the sewerage branches and at wastewater service connections /especially for residential buildings/, where there are no big water quantities from rainfall, with the accumulation in the wastewater network of wet sanitary textile tissues, that do not dissolve in the wastewater network.
- ✓ Lower capacity of the wastewater network, head and pressure movements in rainy weather, major problems occur in the main collectors, that are overloaded from 8 to 30 times in some places. Insufficient number of stormwater overflows,

Septemvri

- ✓ In places the gradients of the wastewater network are reverse or below the minimum allowed
- ✓ No as-built drawings and there is no information concerning the grade line of the wastewater network
- ✓ Lack of stormwater overflows for unloading of the network;
- ✓ The wastewater system of the town is approaching the end of its useful life (90% of the pipes are more than 35 years old), made of concrete pipes, connected with cement grout. The connections between the pipes cause infiltration and exfiltration from and in the collectors. There are displacements and collapses in places. In the street sewers there is infiltration both from the obsolete water supply network and from the high groundwater level in case of rain and snow melting;
- ✓ Part of the sewers and the inspection shafts are filled with alluvium and pieces of stones and concrete, causing obstruction of the wastewater flow.

Ivaylo

- ✓ Domestic wastewater is discharged via the correction of the draining sewer crossing the settlement;
- ✓ The coverage of the wastewater network is 35%.

Aleko Konstantinovo

No wastewater network, future treatment at WWTP Pazardzhik

Glavinitsa

No wastewater network, future treatment at WWTP Pazardzhik

Chernogorovo

No wastewater network и WWTP

Bratanitsa

No wastewater network и WWTP

Malo Konare

No wastewater network и WWTP

Ognyanovo

No wastewater network и WWTP

Vetren

No wastewater network и WWTP

Kovachevo

No wastewater network и WWTP

Varvara

No wastewater network, future treatment at WWTP Septemvri

Recommendations

- Reconstruction and construction of new wastewater network in order to preserve the environment and increase the sanitary and hygiene status of the population;
- Update of network information systems;

- Update of existing map material for the village of Dorkovo, survey of the wastewater network.
- Provision of equipment for maintenance and operation of the wastewater system;
- Provision of operation and maintenance so that the sewerage system meets the requirements of the European standards and the local Bulgarian regulations
- An Action plan may help for ensuring fully effective operation. The plan should contain tasks for inspection, instructions for operation in relation to the system parts and emergency procedures. The plan has to include the type of maintenance strategy, which needs to be applied to the individual parts of the system as well as the requirements for monitoring and frequency of execution;

3.7.5.2. *Wastewater treatment plants*

There is constructed and operational wastewater treatment plant for the agglomeration of Pazardzhik, serving 150 000 population equivalent.

For the agglomeration of Septemvri the construction of regional wastewater treatment plant is envisaged, including water from the villages of Varvara and Vetren Dol, serving 14 000 population equivalent.

Recommendations:

Wastewater treatment plant Pazardzhik

- ✓ Construction of compensating reservoir that should receive the load of maximum water quantities to ensure even load for the plant.
- ✓ Actualisation of the state of the treatment plant in the part of air blower, pumping stations for drain water, pumping station for primary sludge, pumping station for raw sludge, pumping station for decayed sludge.
- ✓ Renovation ”Bio filter” /the system for removal of odours/ of the building screens
- ✓ Renovation of the tank for dewatered sludge, that is dangerous for the operating personnel
- ✓ Renovation of bridge constructions of all the radial clarifiers – primary and secondary
- ✓ The equipment of the dewatering unit with centrifuges should be completed.
- ✓ Ensuring the mobility of the personnel in order to perform urgent deliveries and others.
- ✓ Actualisation of the state of the chlorination unit in the part of deactivation of the extracted chlorine

Wastewater treatment plant Septemvri

Construction of wastewater treatment plant for the town of Septemvri and the villages Varavara and Vetren dol.

3.8. ON-GOING AND PENDING PROJECTS

Several equipment or infrastructure improvement projects have been conducted lately by different interested organizations out of the framework of the present Regional Master Plan. Once identified, these projects are considered in different ways:

- Completed projects to date are included in the existing situation

- On-going projects (projects that were approved and financed before 15th July 2012 but not completed to date) are also included in the existing situation. In fact, corresponding assets are considered as existing, investment costs are not included within the Regional Master Plan but future operation and maintenance costs are included in the macro-affordability assessment.
- Projects not approved to date, but the purpose of which are in line with the Regional Master Plan objectives, are included in the Regional Master Plan. Corresponding investments and timeframes are determined in accordance with the Consultant's methodology
- Other projects, which are not in line with the objectives and criteria of the Regional Master Plan, are either not included or substantially altered.

For the Regional Master Plan of ViK EOOD Pazardzhik, the on-going projects, indicated above in Chapter 3, are not included in the investment programme, but their sections out of the framework of the approved funding are included in the investment programme together with the projects which have no approved financing until 15th July 2012.

Table 3-86 Existing projects included in the Regional Master Plan

Municipality	Project
Pazardzhik*	Extension of WWTP for nutrient removal (nitrogen and phosphorus), rehabilitation and extension of WSS network of the town of Pazardzhik
Septemvri*	Water cycle improvement in the town of Septemvri
Pazardzhik	Technical assistance for preparation of integrated investment project in the water sector of the villages of Aleko Konstantinovo and Glavinitsa, Pazardzhik Municipality

*Approved funding

4. PRIORITIES FOR THE DEVELOPMENT OF THE WATER AND WASTEWATER INFRASTRUCTURE TO ACHIEVE COMPLIANCE WITH EU DIRECTIVES AND ENVIRONMENTAL ACQUIS

4.1. METHODOLOGY AND ASSUMPTIONS

4.1.1. BASIC DESIGN CRITERIA

4.1.1.1. *Reference periods for investment programmes*

Investment program periods are set as follows[10]:

- Short-term: 2014 – 2020;
- Medium term: 2021 – 2028;
- Long term: 2029 – 2038.

In addition to the above mentioned key dates for the investment programming periods, the Consultant defined the following dates and terms:

- **Existing situation**: Average of data from 2009 to 2011; Infrastructure which has been put into operation until the end of 2011 has been taken into account;
- **Situation after implementation of on-going projects**: All on-going projects approved before 15th July 2012 will not be included in the Regional Master Plans' investment programme, but respective data is presented separately in Chapter 3. The impact of these investment projects with completion dates between 2012 and 2016 will be taken into consideration in the year 2016 (first year of projection);
- **2016**: First year of operation of infrastructure proposed in the Short-term investment programme.

4.1.1.2. *Population forecast criteria*

Population forecast takes into account:

- NSI population forecasts up to the year 2060, with starting level corresponding to 2011 census data;
- Population is forecasted based on population dynamics: birth rate, death rate and net migration (mechanical growth);
- Birth rate and death rate are forecasted with conventional methods. A trend is established and a constant coefficient or a steady increase/decrease over the years is applied. This approach takes into account the population specifics of each municipality and settlement.

[10] In agreement with MRDPW the program periods deviate from those defined in the ToR in order to ensure consistency with the operational programming period.

The forecast for each subsequent year is obtained from the population of the previous year, by adding births and subtracting deaths and net migration. In practical terms:

Population for the forecasted year	**=**	**Population for the year before**	**+**	**Births**	**-**	**Deaths**	**+**	**Net migration**

The population forecast for the Central Region of Bulgaria are presented in Chapter 5.1 related to socio-economic projections.

4.1.1.3. *Water supply systems*

This section develops the design criteria which were used for defining and designing the proposed infrastructures for water supply systems.

At regional master plan level only basic design criteria have been taken into consideration, while more detailed criteria will be developed in the subsequent feasibility studies.

4.1.1.3.1. *Water demand forecast and design flows*

The "effective water demand" is the quantity of water demanded of a given quality at a specified price. The analysis of demand for water, including realistically forecasted future levels of demand, is an important and critical step in the realization of a Regional Master Plan, for both water supply and sewer systems. This section presents the methodology for assessing the evolution of water demand from present situation till the design horizon. This methodology is based on the water balance defined by the IWA and synthesized in the following table.

Table 4-1 Water balance according to IWA terminology

<table>
<tr><td rowspan="5">Own sources</td><td rowspan="10">Total system input volume</td><td>Water exported</td><td rowspan="5">Authorised Consumption</td><td rowspan="3">Invoiced Authorized Consumption</td><td>Invoiced water exported</td><td rowspan="3">Revenue Water</td></tr>
<tr><td rowspan="9">Water supplied</td><td>Invoiced metered consumption</td></tr>
<tr><td>Invoiced unmetered consumption</td></tr>
<tr><td rowspan="2">Uninvoiced Authorized Consumption</td><td>Uninvoiced metered consumption</td><td rowspan="7">Non-Revenue water</td></tr>
<tr><td>Uninvoiced unmetered consumption</td></tr>
<tr><td rowspan="5">Water imported</td><td rowspan="5">Water losses</td><td rowspan="2">Commercial losses</td><td>Unauthorised Consumption (illegal connections…)</td></tr>
<tr><td>Customer metering inaccuracies</td></tr>
<tr><td rowspan="3">Physical losses</td><td>Leakage on Mains</td></tr>
<tr><td>Leakage on Service Lines</td></tr>
<tr><td>Leakage & Overflows at Storage</td></tr>
</table>

The Water Demand includes the following components:

- o **Revenue water, including:**
  - Invoiced exported water;
  - Invoiced domestic consumption;
  - Invoiced industrial consumption;

- Invoiced commercial and institutional consumption.

o **Non-Revenue Water** (NRW), including:

- Uninvoiced water (cleaning of the streets, public parks watering, fire service...);
- Apparent losses such as illegal consumptions and accuracy errors of the water meters;
- Real losses which correspond to pipe leaks.

Unrealistic projections could lead to inadequate priority and long-term investment programs in terms of sizing of the facilities and can have serious consequences on the functioning of water supply systems (insufficient/excessive pressures, dysfunction of pumping stations and reservoirs, excessive residence time and low water quality...).

Numerous factors can directly or indirectly influence water demand. They are synthesized in the following diagram.

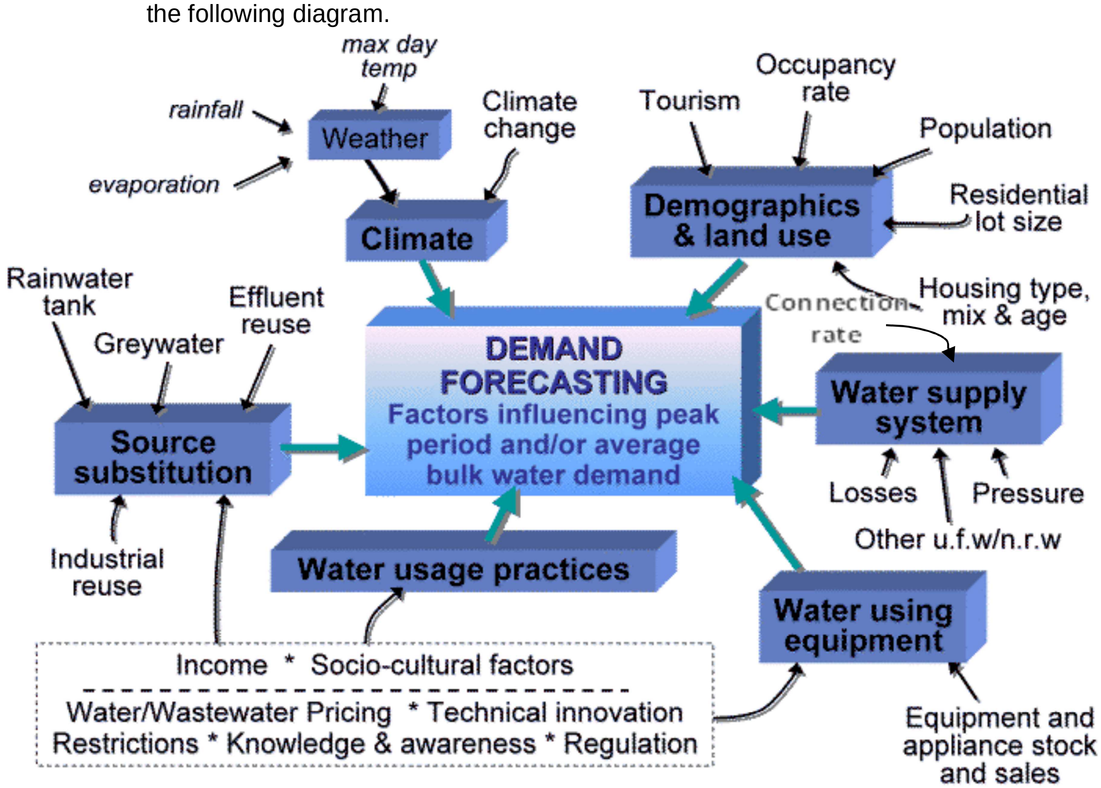


Figure 4-1 Factors influencing water demand

Domestic consumption

- Connection rate and population served

The connection rate to water supply system is determined through the following principles:

- For year 2011, this rate is the present rate provided by the WSSCs;
- For year 2021 and the following years, this rate is set to 100%;
- For year 2016, this rate is assessed by taking into account the current situation and the on-going projects which will impact this rate (extension of water supply systems…).

The population served is then deducted by multiplying the total population assessed on the considered date by the connection rate assessed on the same date.

- Domestic per capita consumption
- Calculation of present permanent consumption per capita:

The present domestic consumption in 2011 is the average domestic consumption from 2009 till 2011 provided by the WSSCs. The consumption per capita can then be deducted from the previous value and from the official population data (census 2011).

It was noticed that for some of the settlements in the study area, this specific consumption per capita per day reaches a very high level, up to 400 l/c/d and even more. Additional investigations showed that these high rates are due to seasonal factors, such as temporary agricultural works (grape harvest…), temporary population having holiday homes... This temporary population not being accounted in the population statistics from the census, the Consortium proposes the following methodology:

- Calculation of consumption per capita based on average domestic consumption from 2009 to 2011 and corresponding population data from the same year;
- Identification of settlements affected by **temporary consumption** (settlements with consumption per capita **above 120 l/c/d**);
- For settlements not concerned with such temporary consumption, calculation of the **permanent consumption per capita** by averaging data from 2009 to 2011 (**temporary consumption** being null in this case);
- For settlements affected by temporary domestic consumption, **permanent consumption per capita is set to 120 l/c/d**, the rest of the consumption being considered as temporary consumption[11].

- Calculation of permanent consumption per capita in 2038:

The permanent consumption per capita is set to 120 l/c/d [12]

- Calculation of the permanent consumption per capita for intermediate reference dates (2016, 2021 and 2028):

Consumption per capita is assessed based on a linear interpolation between present and 2038 values.

Note: Regarding the Macro-Affordability Model for the assessment of the proposed investment programmes, the affordability criterion is that the monthly water bill should not exceed 4% of

11 Example: Small village with consumption per capita (average from 2009 to 2011) equal to 220 l/day/inh., with 500 inhabitants. Then, the permanent consumption per capita will be assumed to be 120 l/day/inh. and the rest, e.g. 100 l/day/inh. x 500 = 50 m^3/day will be considered as temporary domestic consumption.

[12] According to Ordinance N°2 from March 2005 for “Desi gn, construction and exploitation of water supply systems”, see Appendix 1.

the average monthly household income at a consumption level of 2.8 m^3 per person per month (93.3 l/capita/day)[13].

- o Average domestic consumption

It is proposed to assess the average domestic consumption as follows for each of the reference dates:

- Calculation of the present domestic consumption:

- ➢ Calculation of the **permanent domestic consumption** by multiplying the consumption per capita on the considered date by the total population served on the same date;

- ➢ For settlements affected by temporary domestic consumption, calculation of **temporary domestic consumption** based on the difference between average domestic consumption from 2009 to 2011 and previous permanent domestic consumption.

- Calculation of the domestic consumption in 2038: The main assumption is that in 2038, all households will get house connection and reach the reference per capita domestic consumption:

- ➢ Calculation of **permanent domestic consumption** based on consumption per capita of 120 l /c/d[14] and permanent population forecast in 2038;

- ➢ Calculation of **temporary domestic consumption** on the basis of present assessed value and socio-economic forecast.

- Calculation of the permanent and temporary domestic consumptions for intermediate reference dates (2016, 2021 and 2028) based on a linear interpolation between present and 2038 values.

- o Daily peak coefficient and domestic consumption

The daily peak consumption is assessed by multiplying the daily peak coefficient (5) (see Appendix 4-1) and the average domestic consumption.

- o Hourly peak coefficient and domestic consumption

The hourly peak consumption is assessed by multiplying the hourly peak coefficient (see Appendix 4-1) and the daily peak domestic consumption.

Non-domestic consumption

It is proposed to apply the following principles:

- o Categories: the non-domestic consumption is divided into three categories:

- Public facilities;

- Industrial;

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[13] According to the Terms of Reference, Art. 6.2 Macro-Affordability Assessment.

[14] According to Ordinance N°2 from March 2005 for "Desi gn, construction and exploitation of water supply systems", see Appendix 1.

- Agricultural.

o Calculation of non-domestic consumption in 2011:

- If the information for 2011 is known, the non-domestic water demand for subsequent reference years is obtained by linear extrapolation, applying the following two rates:

➢ Projected economic growth, (based on data from International Institutions like the World Bank, the Internatonal Monetary Fund and Economist Intelligence Unit);

➢ 1% of annual decrease of the initial consumption, as a consequence of a water savings policy for businesses and public institutions.

- If the information is unknown for the year 2011, the non-domestic water demand for subsequent reference years is assessed accordingly with the following principles:

➢ For settlements with less than 2,000 inhabitants in 2011, the unit consumption will be 12 litres/capita/day (10% of the target consumption per capita), from which the non-domestic water demand is deducted by multiplying this unit consumption by the estimated population of the reference year for which it is calculated;

➢ For settlements with more than 2,000 inhabitants in 2011, the unit consumption will be 40 litres/capita/day [15][16], from which the non-domestic water demand is deducted by multiplying this unit consumption by the estimated population of the reference year for which it is calculated.

Non-Revenue Water

Non-Revenue Water (NRW) is the sum of:

o Unbilled authorized consumption;

o Apparent losses (unauthorised consumption and customer metering inaccuracies);

o Real losses (leakages).

Water losses are the sum of apparent losses and real losses. At the Regional Master Plan stage, the repartition between these two types of losses cannot be estimated.

The commercial losses should be reduced through targeted rehabilitation programs which are defined in the Regional Master Plan as well as through specific NRW Reduction programs to be implemented by water supply and sewerage companies before the reference year 2021.

In order to asses NRW on the reference dates, the following criteria are used:

o In the case of a new or rebuilt water supply network, the NRW Rate will be as follows:

- 2011: 0% (non-existent network);
- 2016: 15% (new network);
- 2021 and 2028: linear interpolation between the values for 2016 and 2038;

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[15] In conformity with Ordinance N°2 from March 2005 for "Design, construction and exploitation of water supply systems", Art 17.7, §(2), see Appendix 1.

[16] In conformity with the Operational Programme Environment 2007 – 2013, Requirements for preparation of investment projects in agglomerations of between 2,000 and 10,000 PE.

- 2038: 20 %.

o In the case of an existing water supply network, the NRW Rate will be as follows:

- 2011: present value provided by the WSSCs and based on water loss monitoring data (assessment based on water loss measurements carried out by the VIK);
- 2016, 2021 and 2028.

➢ If no particular rehabilitation program is defined in the Regional Master Plan, linear interpolation between the values for 2011 and 2038, in relation with the NRW reduction program to be implemented by the ViK.

➢ If specific rehabilitation program is defined, calculation of the NRW rate at the date of rehabilitation based on 15% NRW rate for the rehabilitated network and linear interpolation between the values for 2011 and 2038 for the rest of the network.

- 2038: 25% (target for an existing network in operation)[17];
- Particular case: if, when calculated by linear interpolation, the NRW rate for the reference year 2021 exceeds 35%, it is set at 35% for 2021 and the value for 2016 is assessed through interpolation between present and 2021 values. The NRW rate for the reference year 2028 is subsequently set to 32%.

Note: Obviously, the reduction of NRW Rate is closely linked to the NRW reduction programs implemented by the various WSSCs. In fact, the NRW reduction programmes to be implemented are designed so that the above-mentioned objectives are met.

Summary – Water supply component

The methodology for water demand forecast is summarised hereafter:

$$\boxed{\textbf{Population served} = (\text{Present or forecasted Population}) \times (\text{Connection rate})}$$

$$\boxed{\begin{array}{l}\textbf{Domestic Water consumption} = \\ (\text{Present or forecasted Population}) \times (\text{Present or forecasted Consumption per capita per day}) + \\ (\text{Present or forecasted temporary consumption})\end{array}}$$

$$\boxed{\textbf{Non Domestic Water Consumption} = \begin{cases}\text{Present or forecasted value if known or, if unknown:} \\ \quad \text{Population} \times 12 \text{ LPCD if Population} < 2000\ inh. \\ \quad \text{Population} \times 40 \text{ LPCD if Population} > 2000\ inh.\end{cases}}$$

$$\boxed{\textbf{Water Consumption} = (\text{Domestic Water Consumption}) + (\text{Non Domestic Water Consumption})}$$

$$\boxed{\textbf{Non} - \textbf{Revenue Water} = \frac{(\text{Present or forecasted water consumption})}{(1 - \text{Present or forecasted NRW Rate})}}$$

$$\boxed{\textbf{Total Water Demand} = (\text{Water Consumption}) + (\text{Non} - \text{Revenue Water})}$$

Note: LPCD = Litres Per Capita per Day

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[17] To maintain conformity with European Standards, the objective of 20% is kept but for a year beyond 2038.

4.1.1.3.2. Technical design criteria

Water resources and Treatment

- Technical and Sanitary Criteria

Within the present Regional Master Plan, the sanitary criteria required by the European Union (EU Drinking Water Directive 98/83/EC) and the Government of Bulgaria (Ordinance N°2 from March 2005 for "Design, construction and exploitation of water supply systems") have to be met for all housings (Described in Ch.1).

- Technical Description of treatment processes

The following table summarizes the arguments for the different treatment processes and gives a qualitative evaluation for the operation under general conditions. This table doesn't summarize disinfection processes. It has to be noted that, when treatment options are chosen, the type of treatment is to be discussed at the Feasibility Study stage.

Table 4-2 Technical description of treatment processes

	Usual treatment				Complementary treatment		
Type	Primary Sedimentation	Sand filtration	Coagulation + Flocculation + Settling	Filtration by membranes	Activated carbon + Filtration	Aeration + Filtration	KMnO4 + Filtration
Type of raw water	High turbidity (>200NTU). Used as pre-treatment	Low turbidity (<2NTU) with some variation of turbidity	Higher turbidity (>2NTU) with some variation of turbidity	High turbidity (<200NTU). Used with pre-treatment	Used with presence of organic matter	Used with presence of Iron or/and manganese	Used with presence of Manganese and/or Iron
Technical	⊕Very simple technology ⊕Variation of flow and load possible ΘLarge surface	⊕Simple technology ⊕Variation of flow and load possible ⊕ Small surface	⊕ Small surface ⊕Variation of flow and load possible Θ Require coagulant and polymer	⊕High treatment standards ⊕ Compact plant Θ Sophisticated technology	⊕Simple technology ΘRequire regular removing of activated carbon	⊕Simple technology Θ	ΘRequire KMnO4, which is dangerous product
Operational	⊕Easy O&M ⊕ Low energy input	⊕Easy O&M ⊕ Low energy input	⊕ Low energy input ΘModerate maintenance costs ΘModerate O&M. Need availability of the operator staff.	⊕Energy consumption Θ Complex technology ΘComplex O&M	⊕Easy O&M ⊕ Low energy input ⊕Moderate maintenance costs	⊕Easy O&M ⊕ Low energy input	⊕Moderate O&M ⊕ Low energy input ⊕Moderate maintenance costs

	Usual treatment				Complementary treatment		
Type	Primary Sedimentation	Sand filtration	Coagulation + Flocculation + Settling	Filtration by membranes	Activated carbon + Filtration	Aeration + Filtration	KMnO4 + Filtration
Economical	⊕Low investment costs ⊕Low O&M costs	⊕Low investment costs ⊕Low O&M costs	⊕Moderate investment costs ⊕Moderate O&M costs	ΘHigh investment costs Θ High O&M costs (energy consumption)	⊕Moderate investment costs ⊕Low O&M costs	⊕Moderate investment costs ⊕Low O&M costs	⊕Moderate investment costs ⊕Moderate O&M costs
Application	⇨ Rural areas ⇨Small-medium-large size WTP	⇨Rural areas ⇨Small-medium size WTP	⇨Small-medium size WTP	⇨Large WTP	⇨Small-medium-large size WTP	⇨Small-medium-large size WTP	⇨Medium-large size WTP

o Technical Description of disinfection processes

The treatment will depend on the quality and length of the network.

The following table summarizes the arguments for the different disinfection processes and gives a qualitative evaluation for the operation under general conditions.

Table 4-3 Technical description of disinfection processes

Type	UV	Bleach	Chlorinated water	Cl_{2g} (Chlorine)	ClO (Dioxide chlorine)	Ozone
Network	⊕ Short and/or clean network. In good condition and well-maintained network ⊕ Low and high flow	⊕ All type of network ⊕ Low flow	⊕ Long and/or dirty network. Defective and poorly maintained network ⊕ Low flow	⊕ All type of network ⊕ High flow	⊕ Long and/or dirty network. Defective and poorly maintained network ⊕ High flow	⊕ Short and/or clean network. In good condition and well-maintained network ⊕ High flow
Technical	⊕ Simple technology ⊕ Variation of flow possible	⊕Simple technology ⊕Variation of flow possible ⊕ Easy to conserve bleach solution	⊕Simple technology ⊕Variation of flow possible ⊕ easy to conserve bleach solution	⊕Variation of flow possible Θ Sophisticated technology Θ Dangerous product: high risk of explosion. Need important rules of security to conserve it	⊕Variation of flow possible Θ Sophisticated technology Θ Dangerous product: high risk of explosion. Need important rules of security to conserve it	⊕ Variation of flow possible Θ Sophisticated technology Θ Dangerous product: high risk of explosion. Need important rules of security to conserve it

Type	UV	Bleach	Chlorinated water	Cl_{2g} (Chlorine)	ClO (Dioxide chlorine)	Ozone
Operational	⊕ Easy O&M Θ Moderate energy consumption Θ Moderate maintenance costs	⊕ Easy O&M ⊕ Low energy consumption ⊕ Moderate product cost	⊕ Easy O&M ⊕ Low energy consumption ⊕ Moderate product cost	⊕Moderate energy consumption Θ Complex and dangerous technology ΘComplex O&M	⊕Moderate O&M ⊕ Moderate energy input ⊕Moderate maintenance costs	⊕High energy consumption Θ Complex and dangerous technology ΘComplex O&M
Economical	⊕Low investment costs ⊕Low O&M costs	⊕Low investment costs ⊕Low O&M costs	⊕Moderate investment costs ⊕Moderate O&M costs	Θ High investment costs (need specific storage) ⊕Moderate O&M costs	⊕Moderate investment costs ⊕Moderate O&M costs	ΘHigh investment costs ⊕Moderate O&M costs
Application	⇨ medium-large size WTP	⇨Rural areas ⇨Small-medium-large WTP	⇨Rural areas ⇨small-medium WTP	⇨Medium-large WTP	⇨Medium-large WTP	⇨Medium-large WTP

- Operational criteria

In order to guarantee an error-free function of the Water Treatment Plants, operational aspects have to be considered for the different technical options, which have been described above.

A simple and comprehensive operation shall ensure that:

- the personnel can be trained quickly in operation and maintenance;
- the staff could intervene quickly in case of an emergency;
- the staff is able to identify operation problems early.

Furthermore, an operation concept shall assure that:

- the technical requirements concerning effluent standards can be met permanently;
- the plant is operated economically;
- a maximum of accident prevention is foreseen.

If these precautions are not taken, any malfunction of a water treatment plant can cause a sanitary damage (diseases) for humans. This damage can cause legal actions such as claim of compensation.

Storage facilities

The dimensioning of the storage is made according to Ordinance N°2 from March 2005 for “Design, construction and exploitation of water supply systems” (.

Network

According to Ordinance N°2 from March 2005 for "Des ign, construction and exploitation of water supply systems", several parameters were taken into account for the dimensioning of the network.

Pumping stations

According to Ordinance N°2 from March 2005 for "Des ign, construction and exploitation of water supply systems", several parameters were taken into account for the dimensioning of the network .

4.1.1.4. Sewerage systems

This section develops the design criteria, which were used for defining and designing the proposed infrastructures for sewerage systems.

4.1.1.4.1. Dry weather discharges and pollution loads

The dry weather flows include the following components:

- o Sanitary flows, generated by domestic and non-domestic customers;
- o Ground Water Infiltration (GWI) flows, generated by the drainage of ground water through the sewerage network;
- o Runoff flows, generated by rainfall events in combined sewer systems.

The dry weather wastewater flows are determined by:

- o The drainage factor of consumed water (proportion of water demand discharged into the sewerage network);
- o The groundwater infiltration rate;
- o The connection rate (proportion of water users connected to the sewerage network).
- o The network characteristics (combined or separated)

Unrealistic projections could lead to inadequate priority and long-term investment programs in terms of sizing of the facilities and can have serious consequences on the functioning of sewer systems (overflows occurring in Dry Weather Flow conditions, overloading of the network and of the treatment facilities...).

Connection rate and connected population

The connection rate to sewerage system is determined as follows:

- o For year 2011, this rate is the present rate provided by the WSSCs;
- o For settlements with over 2,000 inhabitants:
    - For the reference years 2016 and 2021 the rate is set to 90% (or the 2011 rate if it is more important than 90%);
    - For the following years, the rate ranges from 90 to 100% depending on the proposed investment programmes.

- For the settlements with less than 2,000 inhabitants [18]:
  - For the reference year 2028, an intermediate value is determined depending on the proposed investment programmes;
  - For the reference year 2038, the rate is set, as a minimum, to 90%;
- Particular case: if a settlement is already connected (or if there is an existing project for its connection) to a city of over 2,000 inhabitants, the connection rate is set, as a minimum, to 90% for the reference year 2028. For the other reference years, an intermediate value is determined based on the investment programmes to be proposed.

The connected population is then deducted by multiplying the total population assessed on the considered date by the connection rate assessed on the same date.

Domestic Wastewater discharges

- Wastewater generation factor and discharge rate

The wastewater generation factor, which corresponds to the ratio between wastewater discharge and water consumption, is considered to be constant equal to 0.9 [19].

The wastewater discharge rate, which corresponds to the average daily wastewater discharge per capita and per day, is assessed for each reference date by multiplying the consumption per capita (see o by the wastewater generation factor.

$$\boxed{\textbf{Wastewater discharge rate} = (\text{Consumption per capita}) \times (\text{wastewater generation factor})}$$

- Average domestic wastewater discharge

It is proposed to assess the average permanent domestic wastewater discharge as follows according to the Bulgarian norms [20], by multiplying the wastewater discharge rate on the considered reference date by the total connected population on the same date:

$$Q_{av,d} = \frac{N \times a}{1000}$$

Where:

- $Q_{av,d}$ is the daily average wastewater flow in m^3 per day
- N is the connected population on the reference date
- a is the wastewater discharge rate in l/c/d

Moreover, for settlements affected by temporary domestic consumption, the **temporary domestic wastewater discharge** is assessed by multiplying the **temporary domestic**

[18] According to the Terms of Reference and according to the European Directive 91/271/EEC, settlements below 2,000 PE should be included in this study.

[19] According to the Terms of Reference, Art. 5.1 Proposal of Basic Design Criteria, and according to the effective Standards for design of sewerage systems of 1989, Art. 33

[20] Bulgarian Norms for design of sewerage systems, issued in 1990

consumption (see o on the considered date by the wastewater generation factor and the connection rate.

$$\text{Domestic Wastewater discharge} = [(\text{Wastewater discharge rate}) \times (\text{Population}) + (\text{temporary domestic consumption}) \times (\text{wastewater generation factor})] \times (\text{Wastewater Connection Rate})$$

- Common unevenness peak coefficient and hourly peak wastewater discharges

Common unevenness peak coefficient for sewerage systems is set as follows, in accordance with Bulgarian norms [(21)]:

$$Q_{\mathrm{max,h}} = Q_{\mathrm{av,d}} \times K_{0\ \mathrm{max,h}}$$

Where:

- $Q_{max,h}$ is the maximum hourly wastewater flow, in m^3 per day
- $Q_{av,d}$ is the daily average wastewater flow in m^3 per day
- $K_{0\ max,h}$ is the coefficient for common unevenness, calculated as follows:

$$K_{0\ \mathrm{max,h}} = 1 + \frac{2.5}{Q_{\mathrm{av,d}}{}^{0.22}}$$

Non-domestic wastewater discharges

Non-domestic wastewater discharge, comprising discharges from industries as well as public-servicing buildings, is assessed based on:

- Non-domestic water consumption, comprising consumption from industries and public-servicing buildings;
- Connection rate of the non-domestic consumers to the sewerage system;
- Wastewater discharges from customers that have their own water supply resource and are connected to the sewerage network;
- Wastewater generation factor;
- The average time of activity of the considered customer.

$$\text{Non Domestic Wastewater Discharge} = [(\text{Non Domestic Water Consumption}) \times (\text{Non} - \text{domestic connection rate}) + (\text{Water Volumes from own resource})] \times (\text{Wastewater generation factor}) \times (\text{Average daily activity time})/24$$

Groundwater and leakage infiltration discharge

Concerning the permanent groundwater and leakage infiltration discharge in sewerage networks, in dry weather conditions, we propose to implement the following methodology in accordance with the requirements for the preparation of investment projects under priority axis

[21] Bulgarian Norms for design of sewerage systems, issued in 1990, Chapter 3, Part 1, Article 34

1 of OPE (Operational Programme – Environment 2007 - 2013) approved by the Minister Nona Karadzhova on 30.06.2010 (page 20):

- In case of available measurements and detailed study regarding the studied sewerage system, it is proposed to take into account the results of the study regarding the infiltration discharges to take into account for present situation and to project it for reference dates based on the evolution of the area of the catchment area;
- In case no such study is available, the methodology defined in the German technical guidance – Document ATV/DWA – A128e is applied, e.g.

- Infiltration water are related to the total sewerage catchment area $A_{C,s.}$
- The infiltration discharge in dry weather conditions is determined as follows using a location-specific infiltration discharge rate q_{iw}:

$$Q_{iw} = q_{iw} \cdot A_{C,s}$$

Where:

- q_{iw} corresponds to the infiltration water discharge rate in dry weather condition, which should be between 0.05 and 0.15 l/s/ha, depending on the state of the sewerage network and the level of leakages in the water supply system.
- $A_{C,s}$ corresponds to the area of the catchment area covered by the sewerage system

Pollution loads

In accordance with the Terms of Reference, the rates of pollution loads of domestic wastewater are set as follows:

- BOD_5 : 60 g/person/day;
- Suspended Solids : 70 g/person/day;
- Total Nitrogen : 11 g/person/day;
- Total Phosphorus : 2 g/person/day;
- COD: 120 g/person/day.

Pollutant concentrations of non-domestic wastewater will be based on Appendix 2 of "Ordinance N°7 of November 14, 2000, for Conditions and order for discharge of industrial waste waters in sewerage systems of settlements.

Concerning hazardous contents, maximum permissible concentrations are based on Ordinance N°6 of November 9, 2000 on emission standards for levels of dangerous substances in wastewater discharged into water bodies.

Default values are set based on the intermediate values proposed by the State Energy and Water Regulatory Commission, as of 31.12.2012 (II degree in the table below). Concerning BOD5, the extreme values admissible is between 25 mg/l (in accordance with I degree below), and 400 mg/l (in accordance with Ordinance n°7).

These values may be modified in the case of an apparent particular context, after justification by an analysis of the existing situation in the settlement.

Table 4-4 Pollution loads depending on pollution degree

N	Parameter	Value (mg/l) I degree	Value (mg/l) II degree	Value (mg/l) III degree
1.	Non suspended solids	‹ 50	‹ 300	› 300
2.	BOD 5	‹ 25	‹ 200	› 200
3.	COD Chemical oxygen demand	‹ 50	‹ 400	› 400

Wastewater quality

It has to be noted that the wastewater quality needs to be assessed more in depth at the Feasibility Study stage.

4.1.1.4.2. *Stormwater discharges*

Separate sewerage systems

In the case of separate sewerage systems, there is always a part of unavoidable stormwater run-off entering the sewerage system, in relation with improper customer connections (internal stormwater networks connected to the public wastewater network) and other factors such as infiltration from the manhole covers…

In order to assess these unavoidable run-off flows, it is proposed to implement the methodology detailed hereafter, compliant with Bulgarian Norms for design of sewerage systems, issued in 1990:

- o In case of available measurements and detailed study regarding the studied separate sewerage system, it is proposed to take into account the results of the study regarding the run-off flows in stormy weather conditions to take into account for present situation;
- o In case no such study is available, it is considered that the amount of stormwater discharge, together with the groundwater infiltration into the sewerage system, is equal to the hourly peak wastewater discharge:

$$\mathrm{Q_{isw}} = \mathrm{Q_{av,d}} \times \mathrm{K_{0\ max,h}}$$

Combined sewerage systems

In that case, stormwater flow is a normal component of the total discharge in the sewers and is defined according to the rational method, in accordance with *Bulgarian Norms for design of sewerage systems, issued in 1990*.

4.1.1.4.3. *Synthesis of the design flows for sewerage systems*

Based on the previous methodology, the following formula should be used in order to determine the design flow for the elements of the **separate sewer systems** (gravity collectors, pumping stations, pressure pipes…):

$$\mathrm{Q_{Design}} = 2 \cdot \mathrm{Q_{av,d}} \cdot \mathrm{K_{0\ max,h}} + Q_{Max,h,Non-Domestic}$$

Regarding the combined sewer systems, the following formula should be used in order to determine the design flow for the elements of the system (gravity collectors, pumping stations, pressure pipes, storm overflows…):

$$\mathrm{Q_{Design}} = \mathrm{Q_{av,d}} \cdot \mathrm{K_{0\ max,h}} + Q_{Max,h,Non-Domestic} + Q_{iw} + Q_{SW}$$

4.1.1.4.4. Technical design criteria

Gravity collectors

For gravity sewerage systems, two different systems can be implemented. While combined sewer systems are designed to convey both wastewater and stormwater flows, separate systems are designed in order to convey separately wastewater and stormwater flows through different networks. For new networks, separate systems will be usually preferred. Advantages and disadvantages are presented in Appendix 4-2.

Designs were made in accordance with Bulgarian Norms for design of sewerage systems, issued in 1990.

Pressure pipes

Designs were made in accordance with Bulgarian Norms for design of sewerage systems, issued in 1990.

Pumping Stations

Designs were made in accordance with Bulgarian Norms for design of sewerage systems, issued in 1990.

Storm overflows

Designs were made in accordance with Bulgarian Norms for design of sewerage systems, issued in 1990.

Retention tanks

Designs were made in accordance with Bulgarian Norms for design of sewerage systems, issued in 1990.

Wastewater treatment plant

- Technical and Environmental Criteria

Within the present Regional Master Plan, the environmental criteria required by the European Union and the Government of Bulgaria have to be met for all agglomerations with a population equivalent of more than 2,000.

Due to high risk of eutrophication and the risk of high concentrations of nitrates in surface waters jeopardizing the quality of drinking water in the region, the territory of Bulgaria has been classified as Sensitive Area. Technically the current law requires the implementation of advanced treatment considering the additional removal of nitrate and phosphorus for agglomerations with a population equivalent of more than 10,000.

- Technical Description of treatment processes

Treatment processes will depend on the inlet load which can be translated by Population Equivalent (P.E.):

Table 4-5 Wastewater treatment system depending on the amount of Population Equivalent

P.E.	Treatment System
0 – 5,000	SBR or Bio-rotating filters
5,000 – 50,000	Extended aeration

Above 50,000 -	Activated sludge with anaerobic stabilisation.

The following table summarizes the arguments for the different treatment processes and gives a qualitative evaluation for the operation under general conditions.

Table 4-6 Technical description of wastewater treatment processes

Type	Pond Systems	Aerated Lagoons	Trickling Filter	Activated Sludge Treatment (with digestion)	Extended Aeration Process	SBR	Membrane Technology
Technical	⊕Very simple technology ΘLimited treatment capacity ΘLarge surface	⊕Simple technology ΘLimited nutrient removal	Θ Nitrogen removal not possible Θ No integrated sludge stabilisation	⊕High treatment standards ⊕Sophisticated technology ⊕Integrated nutrient removal	⊕Process allows integrated sludge stabilisation ⊕Process allows nitrification Θ No denitrification	⊕Very compact plant ΘRequires constant flow + loads	⊕Very high treatment standard ΘVery sophisticated technology
Operational	⊕Easy O&M ⊕Low energy input	⊕Moderate O&M ΘHigher energy input	⊕process allows easy operation of the plant	⊕Energy consumption Θ Complex technology	⊕Process allows easy operation of the plant ⊕Moderate maintenance costs ΘHigher energy consumption	ΘVery complex O&M	ΘVery complex O&M
Economical	⊕Low investment costs ⊕Low O&M costs	⊕Low investment costs ΘHigher O&M costs (energy)	⊕Moderate investment costs	⊕Low O&M costs (energy production) ΘRelatively high investment costs	⊕Moderate investment costs	ΘHigh investment costs	Θ High investment costs Θ High O&M costs
Application	⇨ Rural areas ⇨ Developing Countries	⇨Rural areas	⇨Small-medium size WWTP	⇨Large WWTP	⇨Small-medium size WWTP	⇨Industrial application	⇨Industrial application ⇨Application for very sensitive areas

- Operational Criteria

In order to guarantee an error-free function of the Wastewater Treatment Plants, operational aspects have to be considered for the different technical options which have been described above.

A simple and comprehensive operation shall ensure that:

- the personnel can be trained quickly in operation and maintenance;
- the staff could intervene quickly in case of an emergency;

- the staff is able to identify operation problems early.

Furthermore, an operation concept shall assure that:

- the technical requirements concerning effluent standards can be met permanently;
- the plant is operated economically;
- a maximum of accident prevention is foreseen.

If these precautions are not taken, any malfunction of a wastewater treatment plant can cause a substantial environmental damage (fish dying or eutrophication) in the receiving water bodies. This damage can cause legal actions such as claim of compensation. It is furthermore to be considered that biological processes, which usually form the basis of appropriate municipal wastewater treatment options, need a relatively long time to overcome breakdowns and to regain full treatment capacity.

Wastewater Sludge treatment

- Technical and Environmental Criteria

To choose the right sludge treatment, it is important to know the final destination of the sludge. For example, if there are industries in the area, heavy metals are expected to be found in the sludge. Sludge should be sent in land disposal.

If there are no major industries in the area, no heavy metals are expected to be found in the sludge. Sludge could be used in agriculture as a fertilizer.

- Technical Description of Treatment Processes

In order to minimize transportation cost and to facilitate sludge handling a sludge dryness of 25% will be targeted.

Anaerobic digestion of the sludge or sludge drying requires high capital expenses (CAPEX) and a technicality that is not thought to be relevant of the wastewater and sludge treatment plant.

Table 4-7 Sludge treatment system depending on the amount of Population Equivalent

P.E	Treatment system
0 – 5,000	Thickening or Dewatering
5,000 – 50,000	Dewatering
Above 50,000	Dewatering and stabilization (required)

- Technical, Operational and Economic Criteria

The following table summarizes the arguments for the different treatment processes and gives a qualitative evaluation for the operation under general conditions:

Table 4-8 Technical description of sludge treatment processes

Type	Thickening	Dewatering	Stabilisation
Technical	⊕Very simple technology ⊖Sludge is still liquid and difficult to transport	⊕Simple technology ⊕Sludge is solid and easy to transport	⊖ Technology more complicate ⊖ Need reagent

Operational	⊕Easy O&M ⊕ Low energy input	⊕Moderate O&M ΘHigher energy input	⊕Moderate O&M ⊕process allows easy operation of the plant
Economical	⊕Low investment costs ⊕Low O&M costs	ΘHigher investment costs ΘHigher O&M costs (energy)	⊕Moderate investment costs ΘHigher O&M costs (reagent and energy)
Application	⇨WWTP with Drying bed or other waste treatment plant near WWTP	⇨small size WWTP	⇨Small-medium size WWTP

<u>Overview of possible final disposal routes</u>

Wastewater treatment shall not be envisaged without thinking about the way of handling the sludge that is produced during the wastewater treatment process. The following features should be investigated when setting up sludge management plans.

- The quantity and the quality of the sludge, which differ depending on the processes implemented at the WWTP;
- The local regulatory framework related to sludge management and disposal;
- The possibilities of considering sludge as a product and not only as a waste, through adapted treatment and/or monitoring procedures.

The main final sludge disposal routes, as can be experienced worldwide, are presented in the following sections.

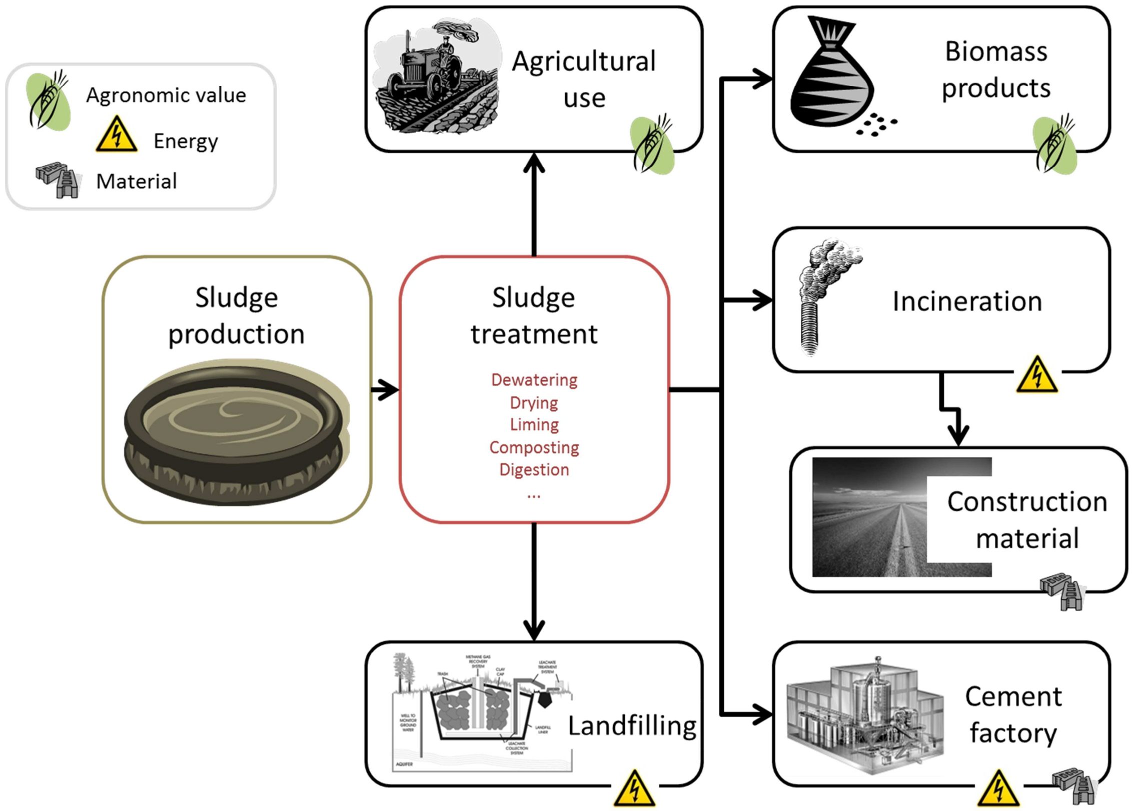

Figure 4-2 Presentation of main final sludge disposal routes

Each process for possible final disposal route is detailed in Appendix 4-3.

Odour treatment facilities

- o Description of the possible odour treatment processes

The main sources of odours in a WWTP are generally located at the following places:

- At the first stages of the wastewater treatment schemes (i.e. in the pre-treatment building);
- In the sludge treatment building and sludge storage facilities.

Odours are caused by various molecules that are released during the transformation of wastewater, during its transport in the sewerage network, and the subsequent wastewater and sludge treatment processes. These molecules can contain sulphide (such as H_2S and mercaptans), nitrogen (ammonia, methylamine, indole, etc.) or oxygen (various acids) and are spread around the WWTP depending on the wind direction and strength.

In order to limit odour spreading and to protect the neighbourhood from odours it is recommended to install the pre-treatment works inside a building from which air is extracted by dedicated fans and transferred to an air treatment facility. Similarly the extracted air from the sludge treatment facility would be directed to the air treatment facility.

Air treatment can be performed in different ways. Chemical and biological and physical processes can be differentiated as follows.

Physico-chemical treatment

It consists in transferring the molecules at stake from the gas phase to the liquid phase in a reactor, where air is contacted with chemical solutions of different characteristics thus allowing the phase transfer. The treated air is released into the atmosphere while the liquid phase is generally sent back to the wastewater treatment line.

Biological processes

They rely on the ability of a specific biomass – generally fixed to a supporting material to degrade the molecules responsible for odours.

Physical processes

They include adsorption onto activated carbon surface, thermal oxidation and photo-catalysis.

- Process selection

The same criteria apply for the air treatment process selection as for the wastewater process selection. They are the following:

- Robustness;
- Flexibility;
- Cost-efficiency.

In the local context of Bulgaria it is therefore recommended to extract the air of sensitive buildings and to transfer the polluted air to biological filters that do require neither a high CAPEX nor a high OPEX since they are almost maintenance-free and do not require any chemical.

The polluted air is distributed through the central cylindrical screen of the biofilter to the filter media and evacuated through the external perforated fibre glass structure. The filters are filled with special calibrated organic media that provides support for the biomass to grow and also provides the necessary nutrients that the microorganisms need in order to biodegrade the volatile pollutants. The lifespan of the filtering media is 5 years. Water is sprayed on top of the filters to provide the necessary humidity for the microorganisms.

4.1.1.4.5. *Climate change impact*

Several scenarios have been developed trying to forecast the evolution of climatic environment and its impact on the regional hydrologic conditions. The effects of a possible climatic evolution are presented in Appendix 4-4.

Practically, in regions which could be submitted to a reduction of precipitation, the options to be considered will have to include the improvement of water supply safety for places already enduring water scarcity or having a water use close to the maximum potential of natural resource.

4.1.2. PROPOSED UNIT COSTS

To calculate the investment costs for each investment measures, a Unit Cost Data Base (UCDB) has been developed. This database is mainly based on the unit cost database of the

Ministry of Environment and Water, which was completed with missing prices and slightly adjusted.

The calculated investment costs will be compared to cost estimates of available designs projects, if existing. In case of major differences between cost estimates of existing design projects and the Consultant's cost estimate the most reasonable costs will be retained (expert's assessment).

The unit costs presented in below are net costs excluding VAT, constant price base 2011 in EURO.

Safety coefficients were applied in case of dense urban context, difficult geological conditions, asphalt covering.

4.1.2.1. *Water supply*

4.1.2.1.1. *Investment costs*

The following unit costs were considered in the framework of the project. Intermediate values were interpolated based on a polynomial regression. The assets are ranging from minimum to maximum values. A complete list is presented in Appendix 4-5.

Table 4-9 Investment costs (Water Supply)

Description	Unit	Unit Cost (€)
Construction of well		
Q = 5 l/s	mWC	230.00 €
Q = 100 l/s	mWC	765.00 €
Construction of Drinking Water Treatment Plant[22]		
Capacity = 10 l/s	U	300,000 €
Capacity = 2,500 l/s	U	17,950,000 €
Supply and installation of water mains and distribution pipes		
DN75	m	75.00 €
DN710	m	440.00 €
Supply and installation of service connection		
Cost per service connection	U	400.00 €
Construction of water tower		
Capacity = 50 m³	U	70,000.00 €
Capacity = 15,000 m³	U	6,040,000.00 €
Construction of ground reservoir		
Capacity = 50 m³	U	45,000.00 €
Capacity = 15,000 m³	U	2,400,000.00 €
Construction of pumping station - H = 40 m		
Capacity = 5 l/s	U	24,000.00 €
Capacity = 100 l/s	U	110,000.00 €
Construction of pumping station - H = 80 m		
Capacity = 5 l/s	U	49,000.00 €
Capacity = 100 l/s	U	379,000.00 €

[22] *Costs refer to "classical" raw water treatment, including Flocculation/Sedimentation, filtration and disinfection*

Description	Unit	Unit Cost (€)
Construction of well		
Implementation of District Metering Areas for leakage reduction and operational management		
Control Centre	U	100,000.00 €
Network	km	735.00 €
Facilities (production points, water tanks and pumping stations)	U	8,000.00 €
Local and detailed study of type: network diagnostic study and regional master plan		
Network diagnostic study and regional master plan, minimum below 300 inhabitants	U (number of settlements)	10,000.00 €
Network diagnostic study and regional master plan, above 300 inhabitants	U (number of inhabitants)	35.00 €

The other types of investments, such as rehabilitation of existing facilities, were calculated on a case-by-case basis, as they strongly depend on the context and general unit costs can be defined.

For settlements of less than 2,000 inhabitants, a solution must be found in the following situations:

- Rate of Population not connected to a network of drinking water less than 100%;
- Problem of water quality;
- Problem of water scarcity.

The proposed work or study can be integrated into the short-term investment programmes.

Moreover, the share of investment per type of material, which was considered, is the following:

Table 4-10 Share of investment per type of material (Water Supply)

Infrastructure	*Pipes*	*Civil works*	*Mechanical &Electrical Equipment*
Wells		70%	30%
Reservoirs		85%	15%
Water mains	100%		
Pumping stations		60%	40%

4.1.2.1.2. *Operation and maintenance costs for new assets and investments*

Operation costs

- o Pumping Stations

The operation costs related to pumping stations, which were considered, are the following:

<u>Electricity costs*:</u> 0.11 €/kWh or 0.043 €/m³/100m.

They were calculated either based on rate in €/m³/100mWC or with own assessment of pump capacity and given electricity tariff.

- DWTP

Operation costs related to water treatment were assessed on a case-by-case basis as they strongly depend on the type of pollution and of the treatment process.

Maintenance costs

The maintenance costs, which were considered, including staff (repair, material, etc.) but excluding engineering costs, design and works supervision, as well as replacement costs, are the following, expressed in % of investment costs per year:

- Water Mains: 0.15% / year;
- Distribution network: 0.50% / year;
- Civil works (Reservoirs, buildings, etc.): 0.50% / year;
- Equipment, machinery: 3% / year.

4.1.2.2. Wastewater

4.1.2.2.1. Investment costs

The following unit costs were considered in the framework of the project. Intermediate values were interpolated based on a polynomial regression. The assets are ranging from minimum to maximum values. A complete list is presented in Appendix 4-6.

Table 4-11 Investment costs (Wastewater)

Description	Unit	Unit Cost
Supply and installation of gravity collectors		
DN200	ml	165.00 €
DN2400	ml	2,300.00 €
Installation of service connections		
Installation of service connection	U	700.00 €
Construction of Pumping Station		
Power = 5 kW	U	12,000.00 €
Power = 5,000 kW	U	324,500.00 €
Supply and installation of pressure pipes		
DN63	m	28.00 €
DN400	m	144.00 €
Construction of Wastewater Treatment Plant[23]		
Capacity = 2,000 PE	U	1,650,000.00 €
Capacity = 150,000 PE	U	12,100,000.00 €
Implementation of flow monitoring		

[23] *Cost refer to "classical" wastewater treatment, including pretreatment (screening, grit removal, fat and grease removal…), primary treatment and secondary treatment (activated sludge).*

Description	Unit	Unit Cost
Control Centre	U	60,000.00 €
Network	km	260.00 €
Facilities (overflows and pumping stations)	U	7,000.00 €
Local and detailed study of type: network diagnostic study and regional master plan		
Network diagnostic study and regional master plan, minimum below 300 inhabitants	U (number of settlements)	15,000.00 €
Network diagnostic study and regional master plan, above 300 inhabitants	U (number of inhabitants)	50.00 €
Settlements below 2,000 inhabitants		
Zoning sanitation study, minimum below 667 inhabitants	U (number of settlements)	10,000.00 €
Zoning sanitation study, above 667 inhabitants	U (number of inhabitants)	15.00 €
Establishment of a sanitation system for settlements with less than 2,000 inhabitants in programs for medium and long term	U (number of inhabitants	650.00 €

The other types of investments, such as rehabilitation of existing facilities, were calculated on a case-by-case basis as they strongly depend on the context and general unit costs can be defined.

For settlements with less than 2,000 inhabitants, not connected to an agglomeration with more than 2,000 inhabitants and with a rate of population connected to the sewerage system less than 90%, a Sewerage Zoning study must be proposed into short-term investment programmes. The Sewerage Zoning study will define collective sanitation, small collective sanitation, autonomous sanitation and rainwater purification systems zones for the studied settlements. The implementation of solutions presented in the Sewerage Zoning study must be proposed into medium and long-term investment programmes.

Moreover, the share of investment per type of material, which was considered, is the following:

Table 4-12 Share of investment per type of material (Wastewater)

Infrastructure	Distribution network	Main collectors	Civil works*	M&E
WWTPS			55%	45%
Main collector		100%		
Pumping station			60%	40%
Sewerage Network	100%	100%		
* 30% Buildings and 70% Facilities (as per requirements defined by the National Regulator)				

4.1.2.2.2. *Operation and maintenance costs for new assets and investments*

Operation costs

- Pumping stations

The operation costs related to pumping stations, which were considered, are the following:

- <u>Electricity costs*:</u> 0.11 €/kWh or 0.026 €/m³** (0.01 – 0.05 €/m3)

* For specific pumping stations with more than 5 m elevation, calculation was done based on electricity consumption.

** For pumping stations with up to 5 m elevation, the simplified cost estimate was applied, based on annual pumped volume and the following rates:

- Flat areas with long distance transport and no gravity flow: 0.05 €/m³;
- Areas with good drainage and mainly gravity flow: 0.01 €/m³;
- Average (if no information available): 0.026 €/m³.

- Wastewater Treatment Plant

  See below

Maintenance costs

Wastewater Maintenance costs, which were considered for sewer network and pumping stations, including staff (repair, material, etc.), but excluding engineering costs, design and works supervision as well as replacement costs, are the following, expressed in % of investment costs per year:

- Equipment, machinery: 3% / year;
- Main collector: 0.20% / year;
- Secondary sewer network: 0.60% / year;
- Civil works (buildings, etc.): 0.60% / year.

The average annual operation and maintenance costs related to Wastewater Treatment Plants, all inclusive were assumed to be 4.5% / year of the investment costs (see here before).

4.1.3. GENERAL METHODOLOGY FOR OPTION ANALYSIS

4.1.3.1. *Objective*

The general objective of the option analysis is, for each identified deficiency in the systems, to duly justify the proposed investment measures by considering other alternatives, calculating and comparing costs and benefits and finally selecting the most appropriate option considering technical, financial and environmental factors.

The process for such analysis is the following:

- Identification and screening of options for each water supply and wastewater zone, the objective being to define the set of options or alternatives to be compared;
- Evaluation of options, through NPV calculation and analysis of the key benefits on health, environment, quality of service.

4.1.3.2. *Identification and screening of options for each water supply and wastewater zones*

Description of key deficiencies

The first step of the option analysis consists in synthesizing, for each of the agglomerations in the study area, the key deficiencies identified through the assessment of the existing situation.

Identification of potential options

Then, the potential options enabling to solve these deficiencies and the timeframe for their implementation, depending on the urgency of rectification, must be clearly identified. As far as possible, a minimum of 2 options must be considered for each of the deficiencies to be solved.

Depending on the deficiency to be suppressed, the options can consist in:

- Considering centralized / decentralized systems for water treatment (DWTP and WWTP);
- Considering various tracings and configurations for the network to be built/renewed;

Screening based of qualitative analysis – Advantages / Disadvantages

The third step consists in performing a qualitative analysis of each of the potential options previously selected and identifying their key advantages / disadvantages from the technical, sanitary, operational, environmental and social points of view.

Selection of viable options to be further analysed

Then, the options to be evaluated are selected based on the results of the previous analysis. Ideally, a minimum of 2 options should be considered for each option. However, for some “trivial” investments, a unique option can be analysed but it should then clearly be justified.

4.1.3.3. *Evaluation of options*

Description of the necessary investments

For each of the options to be evaluated, the investments to be performed need to be described and quantified in order to further evaluate their cost.

The “basic” design of each of the investments (capacity of pumping stations, reservoirs, DWTP and WWTP, diameter of the pipes and collectors…) must be briefly justified (reference to hydraulic / quality calculation).

Risk assessment (externalities - health, environmental…)

For each investment, risk assessment will be performed for each selected option in order to compare them. Risk assessment consists, at the technical, operational, sanitary, environmental and social levels, in:

- Determining which risks are likely to affect the project;
- Documenting the characteristics of each;
- Assessing the intensity of the impact (High / Medium / Low) and its probability of occurrence (Unlikely / Probable / Very likely);
- Prioritizing these risks based on the previous parameters.

Cost assessment and financial assessment

The methodology for cost assessment is the following:

- Assessment of the investment costs based on the Unit Cost Data Base (UCDB, see 4.1.2) and on case-by-case basis for particular investments, such as rehabilitation measures;
- Synthesis of the investment costs per category of investment:
- For Water Supply:
- ➢ Water Abstraction/Wells;
- ➢ Drinking Water Treatment Plant;
- ➢ Water Mains;
- ➢ Distribution Network;
- ➢ Reservoirs and Tanks;
- ➢ Pumping Stations;
- ➢ Miscellaneous.
- For Sewerage:
- ➢ Waste Water Treatment Plant;
- ➢ Main Collectors;
- ➢ Sewerage Network;
- ➢ Pumping Stations;
- ➢ Miscellaneous.
- Assessment of the annual operation and maintenance costs for each of the options and each category of investment (see 4.1.2).

Financial assessment

Based on these costs, financial assessment is then performed through NPV (Net Present Value) calculation with the following parameters:

- Reference period: 2013 – 2038 (25 years);
- Discount rate: 5%;

- Considered lifespan[24]:
  - Pipes: 50 years;
  - Civil works : 45 years[25];
  - Electrical and mechanical equipment: 10 years.
- Renewal of the investment at the end its lifespan (equipment renewed every 10 years…);
- Residual value of the investment at the end of the reference period is assessed by considering a linear decrease of its value through its lifespan.

Synthesis of selected option

By default, in case the risk levels are not too high and/or similar, the option with the lowest NPV is selected for each investment.

A table is prepared for each of the investments emphasizing:

- The key deficiency that the investment enable to solve;
- For each evaluated option:
  - The risk level;
  - The investment and O&M costs;
  - The NPV of the investment.
- Justification of the selected option, if it doesn't have the lowest NPV, due to the results of risk assessment.

4.1.4. GENERAL METHODOLOGY FOR PHASING AND PRIORITIZATION

4.1.4.1. *Identification of measures*

All measures identified by the Consultant during its assessment are included into the investment program. Projects for which financing has been approved before 15th July 2012 are considered as "*on-going*" and therefore have not been included into the investment program.

4.1.4.2. *Phasing of investments*

The identified investment measures have been grouped into the three investment phases, based on the following criteria:

Phase 1: Short-term investment program

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[24] As per requirements defined by the National Regulator

[25] As per requirements defined by the National Regulator, assuming that Civil works consists of 30% Buildings and 70% Facilities.

- All investments necessary to achieve compliance with *Directive 91/271/EEC* - Urban Wastewater Treatment Directive (UWWTD) and the respective Bulgarian legislation. This will include compliance with Article 3 of the UWWTD (wastewater collection) and Article 4 of the UWWTD (wastewater treatment) as well as measures necessary to ensure effective operation of the systems;
- All investments necessary to achieve compliance with the *Directive 98/83/EC* – Drinking Water Directive (DWD) and the respective Bulgarian legislations. This will include all measures aiming to remediate major deficiencies related to water quality and water quantity.

Phase 2: Medium-term investment program

- Investment measures aiming to improve efficiency of the systems (NRW reduction, energy efficiency);
- Rehabilitation of water supply and wastewater systems to ensure sustainability (replacement of assets);
- Priority replacement of networks (i.e. asbestos cement pipes, pipes with high number of bursts);
- Improvement of the level of service (i.e. pressure, shortages…).

Phase 3: Long-term investment program

- All other measures not mentioned above;
- Continuation of measures started in Phase 2 (i.e. measures aiming to reduce water losses, infiltration into sewer networks, etc.).

4.1.4.3. *Prioritization of investment measures*

Priorities of investment measures will be defined by the Ministry according to the European Directives and applied at national level.

A tentative prioritization system based on five criteria has been set up and is presented in Appendix 4-7.

4.2. OPTIONS FOR THE DEVELOPMENT OF THE WATER SUPPLY SYSTEM

4.2.1. STRATEGY OF THE NON-REVENUE WATER REDUCTION PROGRAMME

A non-revenue water reduction programme is based on the following four pillars:

- Active search for leaks
- Rapid response to repair detected leaks
- Pressure management and control
- Targeted asset management

First, it is necessary to evaluate the rate of physical and commercial losses.

However, in order to be effective, a non-revenue water reduction programme must be based on the actual situation and the particular context in which it is applied. In addition, its approach must include other system parameters.

The situation of drinking water systems in Bulgaria and on the territory of the WSS operator in particular is very critical. It can be summarized as follows:

- Low reliability of water metering at subscriber level, which leads to major uncertainties about the actual rate of physical and commercial losses.
- Lack of accurate water metering from the water sources, which leads to unclear points regarding the water abstraction.
- High rate of estimated losses.
- The majority of the pipes is made of asbestos cement or partially of steal. These pipes are with expired service life and are highly obsolete.
- Insufficient number of stop valves, leading to the discharging of large sections of the network during breakdowns.
- The number of illegal connections is assumed by operators and municipalities, which leads to major uncertainties about the actual rate of physical and commercial losses

In this context, a strategy primarily based on targeted asset management is proposed, namely:

- Recommendation: The operators must have a policy for the management and replacement of water meters, based on their age (recommended maximum between 10 and 14 years), the efficiency of the measurement (the water meter size should be in accordance with consumption of the subscriber) and the quality of the installation and monitoring. The same policy should be conducted at the level of the metering points on the external water supply system (the age of replacement depends on the material). This is an important recommendation but it is not integrated since it is not possible to determine the parameters and since this programme should be financed by the operators.
- Priority measure implementation: Replacement / renewal / rehabilitation of pipes. This is the only measure that can significantly reduce both physical losses and health risks (simultaneous removal of asbestos cement pipes and resizing). In addition, the implementation of policy for a systematic replacement of connections, contributes to the detection of illegal connections and thus to the reduction of commercial losses.
- As a second step, in the case of large water systems, it is proposed that the principle of pressure control should be applied. In fact, the physical losses rate can be greatly reduced by positioning autonomous pressure regulators in appropriate (feasible) locations (without the use of external energy). The purpose of these regulators is to lower the pressure at times of low water demand (usually at night) and to allow a greater pressure during peak periods. In theory, the loss rate depends on the diameter of the pipe, its material as well as the power of the water pressure.
- Finally, in the medium or long term, the Consultant proposes the application of the principle of diagnosis and permanent monitoring of flow, pressure and water levels at the production level but also working on strategic points of the distribution network.

This leads to a permanent sectorization system. From the results of the self-monitoring, research programmes and removal of leakages can be conducted. This principle is effective but only when the actual loss rate is within a reasonable range (lower than 30-35%) in order to achieve efficiency of about 80 - 90%.

4.2.2. STRATEGIC OPTIONS FOR THE DEVELOPMENT OF THE EXTERNAL WATER SUPPLY SYSTEMS

4.2.2.1. *Strategic options for the development of the external water supply system from Luda Yana Dam*

4.2.2.1.1. *Defining options*

The Consultant has examined all the possible options for the territory serviced by ViK EOOD Pazardzhik in terms of their advantages and disadvantages. The results are presented in the tables below. More detailed description is given in Appendix 4-8.

At the current stage, Luda Yana Dam, located on the territory of Panagyurishte Municipality, is in the process of implementation. The project for Luda Yana Dam was commenced in 2012. It is expected that the construction works will be finished in 2016. The funding for the dam and the treatment plant was provided through the International Bank for Reconstruction and Development (World Bank).

The completion works on the dam and the associated treatment plant have commenced. It is expected that the construction works will be completed in 2016.

In terms of reference, the total capacity of the treatment plant is determined for 300 l/s.

Based on the decreased consumption of the villages within Panagyurishte Municipality and Strelcha Municipality (the two municipalities have their own WSS operator), it is obvious that part of the treated water from Luda Yana Dam can be supplied to the territory of the operation area of ViK EOOD Pazardzhik by gravity. The scope of the water supply system supplied from Luda Yana Dam can be extended in order to cover not only the town of Panagyurishte, the villages of Panagyurishte Municipality and the settlements of Strelcha Municipality, but also an additional 21 settlements (5 from Lesichovo Municipality, 11 from Pazardzhik Municipality and 3 settlements from Septemvri Municipality).

The table below presents an examination of the technical parameters of the developed options.

Table 4-13 Examination of the options – Water supply of 21 settlements from Pazardzhik Municipality, Septemvri Municipality and Lesichovo Municipality

Water supply zone	Description of the main deficiencies	Defining options	First examination	Choice motivation
Water supply system from Luda Yana Dam	Lack of reserve volumes that provide reserve for the peak consumption	Option 1. Retaining the existing water supply scheme for the 21 settlements from the	Rejected	Advantages: - possibility for resource security of the construction – staged reconstruction of the transmission water mains and facilities depending on their condition;

Water supply zone	Description of the main deficiencies	Defining options	First examination	Choice motivation
	hours and preservation of the fire-fighting reserve. External transmission water mains operating for decades, obsolete and in need of rehabilitation.	municipalities of Pazardzhik, Septemvri and Lesichovo after the rehabilitation of the water supply systems.		- rehabilitation is required only for the existing facilities; Disadvantages: - operation and maintenance of water abstraction facilities and pumping stations; -maintenance of the sanitary protection zones aimed at the protection of water against pollution; - high operation costs for electricity; - low energy efficiency. The water needs to be pumped to a height of elevation of 300, 354, 370, 382 m; - vulnerability of the system to potential power failures; Motivation for rejection: More facilities that need to be maintained and operated. Greater risk of deterioration of the qualities of the water from the local water sources.
		Option 2. Water supply of the 21 settlements from the three municipalities – Pazardzhik, Septemvri and Lesichovo, with treated water from Luda Yana Dam.	Approved	Advantages: - the pumping water supply from groundwater is replaced by gravity water supply; - ensuring continuous water supply – by gravity, from regulated high mountain water with guaranteed quantities and qualities - lowered energy consumption; - better energy efficiency (much lower height of pumping to the DWTP). - by changing the direction of the water supply, conditions are created for the construction of the missing water reservoirs – the configuration of the terrain in the case of gravity water supply from the dam allows this to happen; - better opportunity to automate the maintenance and the control over the water quality; - centralized metering of the supplied water; - possibility for redirection of the water for the compensation of the decrease in the flow rates of the water abstraction

Water supply zone	Description of the main deficiencies	Defining options	First examination	Choice motivation
				facilities of WS Septemvri - the continuous water supply of the settlements in Lesichovo Municipality is ensured – settlements located most remotely from the system and which can receive water, when in emergency mode, from the existing water sources supplying WS Vetren. Disadvantages: - Larger length of the transmission water mains to the water reservoirs of the settlements; Choice motivation: Reliable water source of good water qualities and high water supply security. Partial completion of Luda Yana Dam.

The Consultant suggests that the water supply of the 21 settlements (from the municipalities of Pazardzhik, Septemvri and Lesichovo) within the territory of ViK EOOD Pazardzhik should be carried out from the DWTP at Luda Yana Dam.

4.2.2.1.2. Description of the activities intended for implementation for the water supply of 21 settlements from the Luda Yana system

The table below describes the investments required for the construction of the new external water supply system from DWTP at Luda Yana Dam suggested by the Consultant and encompassing 21 settlements from three municipalities – Pazardzhik, Septemvri and Lesichovo.

Table 4-14 Investments required for the construction of a new external water supply system, which includes 21 settlements on the territory of ViK EOOD Pazardzhik

Description of components	Specific investments
Water supply from Luda Yana	
Transmission water mains	- New gravity water main form DC 4 near the village of Levski to the pressure reservoirs of the villages of Sbor, Apriltsi, Gelemenovo with length of L=15.81 km. - New gravity water main from DC Svoboda to the pressure reservoirs of the villages of Tsar Asen, Rosen, Ovchepoltsi, Topoli Dol and Chernogorovo, with length of L=26.055 km. - New gravity water main from Transition reservoir of V=25 m³ to the pressure reservoirs of the villages of Shtarkovo, Pamidovo, Kalugerovo, Karabunar, Boshulya and Vinogradets and to DC Borimechkovo, length of L=33.676 km. - Rehabilitation of gravity water main to the pressure reservoirs of the villages Lesichovo and Tserovo with length of L=6.80 km. - Rehabilitation of pressure pipelines to the pressure reservoirs of the village of Borimechkovo, with length – L=4.89 km.

Description of components	Specific investments
Water supply from Luda Yana	
Facilities	Construction of new pressure reservoirs Common for the villages of Ivaylo, Dragor, Saraya, with capacity of 1,000 m^3 Common for the villages of Chernogorovo, Krali Marko and Pishtigovo with capacity of 650 m^3 For the village of Pamidovo – 50m^3 For the village of Apriltsi – 50m^3 For the village of Boshulya – 100 m^3 For the village of Vinogradets – 100 m^3 Construction of pressure relief reservoirs – 5 reservoirs. Rehabilitation of 22 PR, 2 ST (suction tanks) and 2 PS. Pressure regulators
Treatment	Construction of 2 chlorination stations for the additional chlorination of water from Luda Yana Dam. The stations are equipped with a system for automated monitoring of the residual chlorine and correction of the quantity of the introduced disinfectant.

For more details, see map N°4.

4.2.2.2. *Strategic options for the development of the external water supply system Ivaylo*

Description of the options

Three settlements are separated from WS Pazardzhik – the villages of Ivaylo, Dragor and Saraya. The system will satisfy its consumption from Mokrishte water supply zone, whose water sources secure it in terms of water quantities and qualities. The three separated settlements establish a separate water supply system – WS Ivaylo, for which alternative solutions are prepared.

The separation of the three settlements into a separate system is consistent with the upcoming reconstruction of the distribution network of the town of Pazardzhik. The water supply network on the territory of the north part of the town of Pazardzhik and the distribution network of the village of Dobrotitsa will be supplied with water from the existing water reservoirs of the town and not from Ivaylo water supply zone.

The tables below present the options for WS Ivaylo and the definition of the selected option.

Table 4-15 Examination of the options – External water supply system Ivaylo

Water supply zone	Description of the main deficiencies	Defining options	First examination	Choice motivation
Ivaylo Water supply system Ivaylo	1. Presence of nitrates in the water sources of water supply zone Ivaylo – 3 tube wells.	Option 1 Water supply of the settlements of WS Ivaylo – the villages of Ivaylo, Dragor and Saraya, with treated water from Luda Yana Dam.	Approved	Advantages: - Gravity water supply; - Security of the water supply; - Lower operation costs; Disadvantages: - higher investment costs and greater length of the transmission water mains to the villages. Choice motivation: Reliable water source of good water quality and high water supply security.
		Option 2 Retention of the current water supply scheme of the settlements from WS Ivaylo – the villages of Ivaylo, Dragor and Saraya, after the treatment of the water from the water source – 1 TW.	Rejected	Advantages: - The existing scheme of the transmission water mains and the facilities to the villages of Ivaylo, Dragor and Saraya is retained – only rehabilitation is needed. Disadvantages: - lower security of the water supply; - degraded water qualities of the water source – treatment is required. Choice motivation: High operation costs. More maintenance and operation facilities.

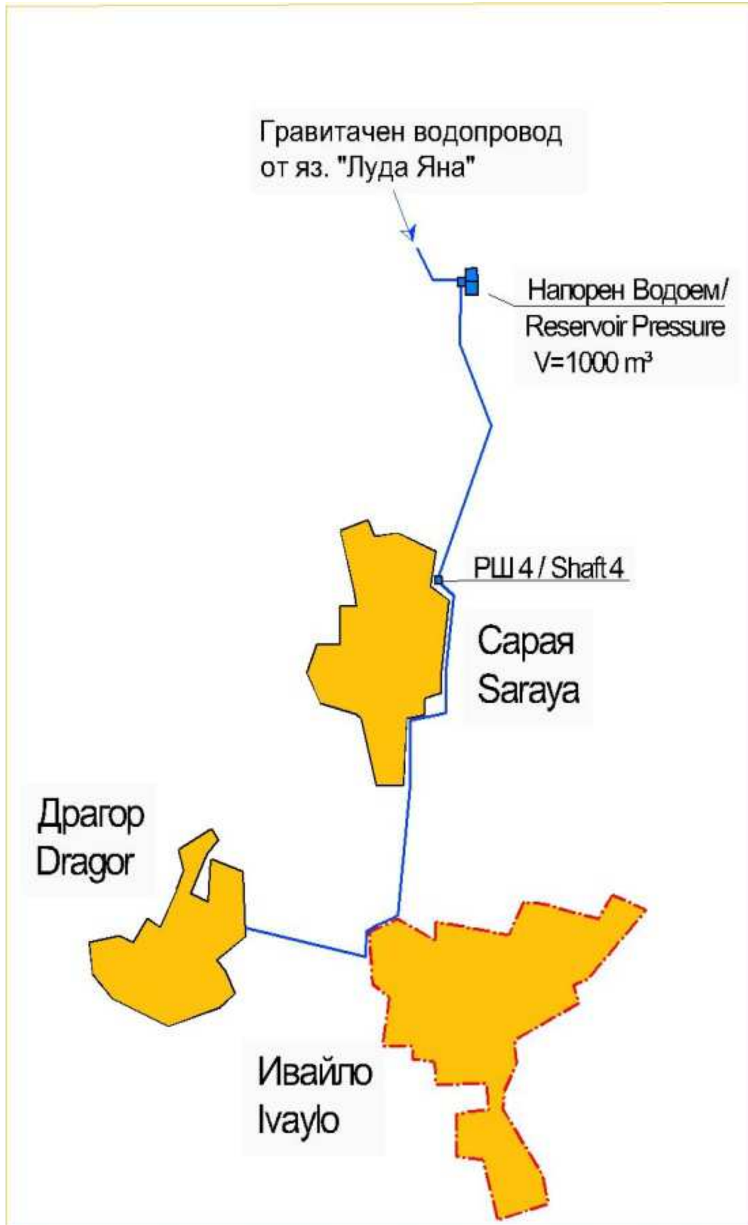

Figure 4-3 Scheme of Option 1

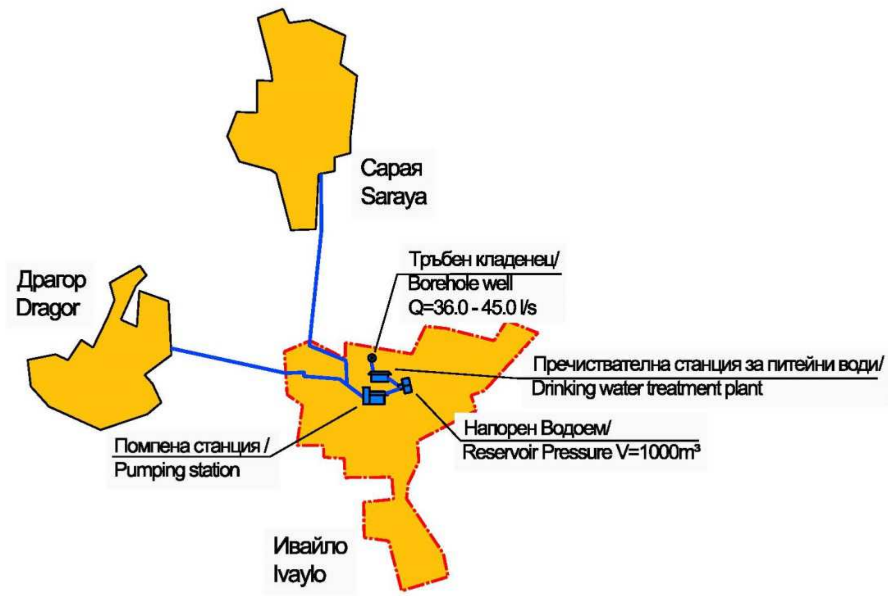

Figure 4-4 Scheme of Option 2

4.2.2.3. Strategic options for the development of the external water supply system Septemvri-Zlokuchene

The tables below present the options for the water supply system Septemvri-Zlokuchene and the defining of the selected option.

Table 4-16 Examination of the options – External water supply system Septemvri-Zlokuchene

Water supply zone	Description of the main deficiencies	Defining options	First examination	Choice motivations
Septemvri Water supply system Septemvri-Zlokuchene	1.Compromising of the tube wells and problems with their operation. 2. Tendency to decreasing of the capacities of the wells.	Option 1. Covering the consumption of the settlements from 4 TW in the terrace of the left bank of Maritsa River.	Approved	Advantages: - lower investment costs for the water sources – only the equipment for the 4 TW is required; - using resources of a water source with good water qualities and security. Disadvantages: - higher electricity costs. Choice motivation: Reliable water source of good water qualities and high water supply security.

Water supply zone	Description of the main deficiencies	Defining options	First examination	Choice motivations
		Option 2. Covering the consumption of the settlements after the rehabilitation of the existing water sources – 3 TW on the right bank of Maritsa River.	Rejected	Advantages: - lower electricity costs Disadvantages: - lower water supply security; - higher investment costs for the rehabilitation of the water source. Choice motivation: Higher capital investments /duplication and equipment of TWs/

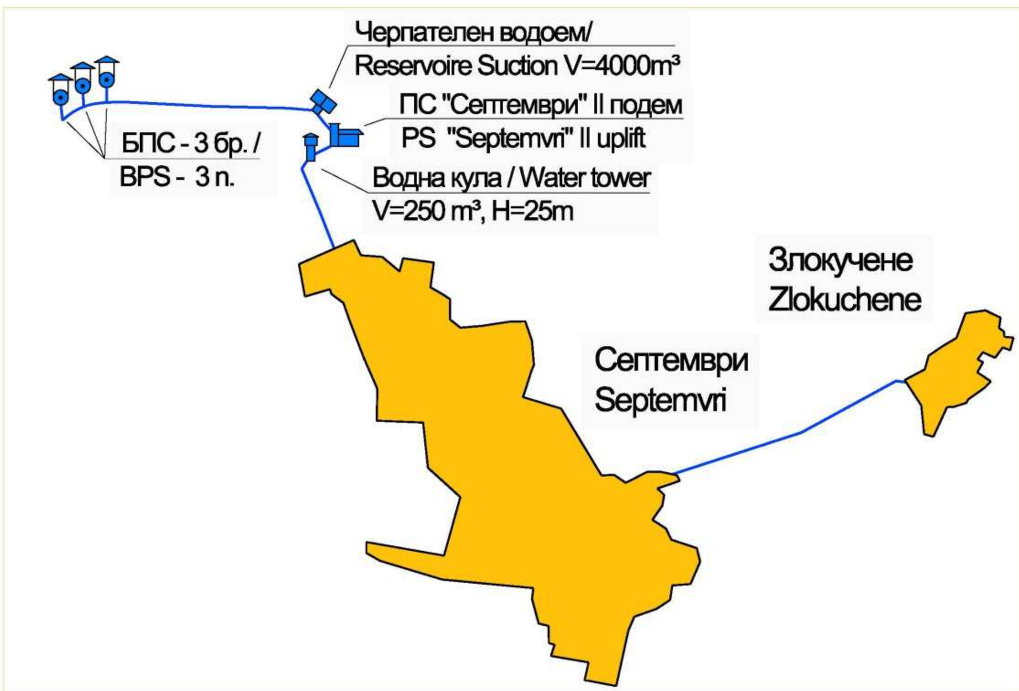

Figure 4-5 Scheme of Alternative 1

Figure 4-6 Scheme of Alternative 2

4.2.3. EVALUATION OF THE OPTIONS FOR THE EXTERNAL WATER SUPPLY SYSTEMS

4.2.3.1. *Option for the water supply system Septemvri-Zlokuchene, Septemvri Municipality*

The tables below contain a description of the investments required for the suggested options for Septemvri Municipality:

Table 4-17 Description of the options for Septemvri Municipality

Option	Description of the options	Specific investments
1. Water supply from 4 TW in the terrace of the left bank of Maritsa River	Water supply of the settlement of WS – the town of Septemvri and the village of Zlokuchene, from 4 TW at the town of Vetren /left bank of Maritsa River/. The water supply will be carried out from the existing water source – 4 TWs. The water is transferred to a water reservoir by means of submersible pumps and then reaches the PS 2nd uplift, from where it is transferred to a water tower and from there is supplied to the consumer by gravity – the	Operation of 4 tuber wells Rehabilitation of 1 water reservoir Rehabilitation of 1 water tower Rehabilitation and replacement of pumps in the pumping station for the supply of the water tower External water mains – with total length of 2,500 m, from which 250 m are pressure pipelines and 2,250 m are gravity water mains. External gravity water main to the village of

Option	Description of the options	Specific investments
	water supply network of the town of Septemvri and the water supply network of the village of Zlokuchene.	Zlokuchene with length of 1,845 m.
2. Rehabilitation of the existing water sources – 3 TW on the right bank of Maritsa River	Water supply of the settlements of WS – the town of Septemvri and the village of Zlokuchene, from 3 TW at the town of Septemvri /right bank of Maritsa River/. The water supply of the two settlements will be carried out from the existing tube wells after the duplication of three of them. The water is transferred to a reservoir by means of submersible pumps and is then, again by pumps installed in the PS 2nd uplift, transferred to the water tower from where it reaches the consumers by gravity – water supply network of the town of Septemvri and water supply network of the village of Zlokuchene.	Duplication of 3 tube wells and operation. Rehabilitation of 1 water reservoir. Rehabilitation of 1 water tower. Rehabilitation and replacement of pumps in the pumping station for the supply of the water tower. External water mains – pressure pipeline with length of 1,570 m, External gravity water main to the village of Zlokuchene with length of 1,845 m.

The comparison of the suggested options: Option 1 – Water supply of the settlements of WS – the town of Septemvri and the village of Zlokuchene from 4 TWs at the town of Vetren/ left bank of Maritsa River/ with Option 2 – Water supply of the settlemets of WS – the town of Septemvri and the village of Zlokuchene from 3 TWs at the town of Septemvri /right bank of Maritsa River/ indicates the following difference in the investments:

Table 4-18 Comparison of the investments – water supply system Septemvri-Zlokuchene

Option	Investment
Water supply from 4 TWs in the terrace of the left bank of Maritsa River	1.Reconstruction of gravity water main built of asbestos cement with HDPE pipes with length of 2.25 km. 2. Reconstruction of pressure pipelines with length of 0.25 km. 3. Equipment for 4 TWs. 4. Crossing Maritsa River. 5. Rehabilitation of PR. 6. Rehabilitation of water tower – 1. 7. Rehabilitation of PS 2nd uplift and equipment. 8. Rehabilitation of the disinfection.
Rehabilitation of the existing water sources – 3 TWs on the right bank of Maritsa River.	1.Reconstruction of the transmission water mains consisting of pressure pipelines built of asbestos cement with HDPE pipes with length of 1.57 km. 2. Duplication and equipment of 3 TWs. 3. Rehabilitation of PR. 4. Rehabilitation of PS 2nd uplift and equipment. 5. Rehabilitation of water tower – 1. 6. Rehabilitation of the disinfection.

Financial assessment

Based on the assumptions, the Financial and Economic Assessment shows the following results. Detailed calculations are presented in **Appendix 4-9**.

Table 4-19 Calculating the net present value of the strategic options – Water supply system Septemvri-Zlokuchene

Parameter	Option 1	Option 2
Investment costs in €	362,827	443,609
Operation and maintenance costs for a 30-years period in €	324,027	450,310
NPV, in €	363,203	562,271

Selected option

The initial investment costs as well as the operation and maintenance costs and the NPV of Option 1 are lower than those of Option 2.

The Consultant suggests Option 1 – Water supply of the settlements from water supply system – the town of Septemvri and the village of Zlokuchene, from 4 TWs at the town of Vetren /left bank of Maritsa River/.

4.2.3.2. Option for water supply system Ivaylo, Pazardzjik Municipality

The table below describes the investments required for the suggested options for Pazardzhik Municipality.

Table 4-20 Description of the options for Pazardzhik Municipality

Option	Description of option	Specific investments
1. Water supply of the settlements Ivaylo, Dragor and Saraya from Pazardzhik Municipality from DWTP at Luda Yana Dam	For covering the water consumption of the three settlements, treated water is transferred through gravity water main from the transmission water main to a pressure reservoir, from where it reaches the distribution networks of the settlements through external water mains.	New reservoir and 2 pressure relief chambers with total capacity of V=1,050 m³ New external water mains – gravity water mains to the three settlements with total length of 19,750 m.
2. Water supply of the settlements Ivaylo, Dragor and Saraya from water source 1 tube well.	The water supply for the three villages is carried out from an existing tube well on the territory of the village of Ivaylo. The water is pushed to the treatment plant by means of submersible pump. After the treatment it enters the ST of the PS 2nd uplift, from where it is transferred by pumping to the distribution networks of the three settlements.	Rehabilitation and operation of 1 TW. Rehabilitation and replacement of pumps in the pumping station for the supply to the distribution networks. New reservoir of V=1,000 m³. External water mains – pressure water mains to the two settlements with total length of 3,500 m. New treatment plant with capacity for 16 l/s.

The comparison of the suggested options: Option 1 – Water supply of the villages of Ivaylo, Drtagor and Saraya from Luda Yana Dam with Option 2 – Local water source after the treatment of the water for the water supply of the villages of Ivaylo, Dragor and Saraya indicates the following difference in the investments:

Table 4-21 Comparison of the investments – water supply system Ivaylo

Option	Investment
Water supply of the settlements Ivaylo, Dragor and Saraya of Pazardzik Municipality from the DWTP at Luda Yana Dam	1.Construction of gravity water main with diameter of 180 instead of diameter of 110, built of HDPE pipes with length of 13.35 km. 2. New water main from PR to the villages of Saraya, Ivaylo and Dragor with length of 6.4 km. 3. Crossing the highway. 4. New pressure relief chambers – 2. 5. New water reservoir – 1. 6. Pressure regulators – 2. 7. Additional chlorination – 2.
Water supply of the settlements Ivaylo, Dragor and Saraya from water source - 1 tube well at the village of Ivaylo, after the treatment of the water.	1. Reconstruction of transmission water mains - reconstruction of pressure pipelines built of asbestos cement with HDPE pipes with length of 3.5 km from PS 2nd uplift to the villages of Dragor and Saraya. 2. Equipment for 1 TW. 3. New DWTP including treatment of water from the regeneration of the ion-exchanging filters. 4. Rehabilitation of PS 2nd uplift and equipment. 5. New water reservoir – 1. 6. Rehabilitation of the disinfection.

Financial assessment

The analysis of the financial flows of the options described above indicates that Option 1 – Water supply of the villages of Ivaylo, Dragor and Saraya with treated water from Luda Yana Dam on the territory of ViK Panagyurishte is characterized by higher investment costs, however due to the centralized character of the water supply system, the operation costs are two times lower. The significant difference is due to the much higher power consumption of the decentralized system (240 kW vs. 510 kW). As a result of these differences, the centralized system is more suitable in the long term from a financial perspective. Appendix 4-10 Calculations to the assessment of the options.

Table 4-22 Calculation of the net present value for the strategic options – Water supply system Ivaylo 5

Parameter	Option 1	Option 2
Description	Water supply of the villages of Ivaylo, Dragor and Saraya from Pazardzhik Municipality from DWTP at Luda Yana Dam	Water supply of the villages of Ivaylo, Dragor and Saraya from water source – 1 tube well at Ivaylo after the treatment of the water.
Investment costs in €	2,539,821	2,437,940
Operation & Maintenance costs in € (total for a 30-year period)	293,801	4,183,300
Net Present Value in €	1,460,682	4,204,278
Risks	Risks of discontinuation of the	Risk of discontinuation of the water

Parameter	Option 1	Option 2
	water supply in case of breakdown of the transmission main, which is very long.	supply in case of power supply breakdown.

Selected option

Option 1 Water supply of the settlements – Ivaylo, Dragor and Saraya (Pazardzhik Municipality), from the DWTP at Luda Yana Dam was selected as preferable option due to the fact that in the long-term it guarantees lower operation costs and an overall lower net present value of the entire investment.

4.2.3.3. *Suggested options*

The table below summarizes the suggested options for the external water supply systems in Pazardzhik Municipality and Septemvri Municipality.

Table 4-23 Summary of the options analysis – Water supply

No.	Name of water supply zone/ inhabitants in 2011	Settlement	Analysed options		Preferred option
1	Ivaylo water supply 5,619 inhabitants	The village of Ivaylo 2,841 inhabitants The village of Dragor 1,422 inhabitants The village of Saraya 1,356 inhabitants	Option 1 Water supply from Luda Yana Dam	Option 2 Water supply from local water source – TW after the treatment of the water	Option 1 Water supply from Luda Yana Dam
2	Spetemvri water supply 8,729 inhabitants	The town of Septemvri 7,869 inhabitants The village of Zlokuchene 860 inhabitants	Option 2 Water supply from 4 TWs in the terrace of the left bank of Maritsa River	Option 2 Rehabilitation of the existing water sources – 3 TWs at the right bank of Maritsa River	Option 1 Water supply from 4 TWs in the terrace of the left bank of Maritsa River

4.2.4. STRATEGIC OPTIONS FOR THE WATER DISTRIBUTION NETWORKS

4.2.4.1. *Defining options*

The distribution networks of the settlements in the service area are constructed at 100%, which means that no construction of new distribution networks is envisaged.

Taking into account the poor condition of the existing networks with an average percentage of the water losses in 2011 amounting to 63% (technical and commercial), significant investments will be required for the achievement of the stated objectives – 35% of NRW for 2021 and 25% in 2038.

There are two options for the achievement of these objectives:

1. Overall, staged replacement and rehabilitation of the distribution networks.
2. A more in-depth diagnostics and preparation of a programme for the detection and repair of leakages and a programme for permanent flow and pressure monitoring in the pipes, as well as pressure management in the networks.

Taking into account the following circumstances:

- The lack of training of the local WSS operator's staff in permanent monitoring programmes and pressure management;
- Inability or extreme difficulty in implementing the permanent monitoring and management of small (rural) networks.
- Extremely poor condition of the old pipes, mainly asbestos cement pipes (old gaskets with great loss of flexibility), which makes their repair works a constant and pointless activity (repair works of all connections).
- A permanent monitoring and pressure management programme will lead to reduction of losses taking into account the poor condition of the distribution network.
- Health and hygiene problems caused by the old asbestos cement pipes.

The preferred and significantly more efficient is the first option – overall, staged replacement of old street water mains and the associated service connections.

4.2.4.2. *Activities, intended to develop and improve the condition of the distribution network of the town of Pazardzhik*

The Consultant suggests that the development of the urban water supply network of the town of Pazardzhik should be carried out as follows:

- Feasibility study under the project '*Expansion of the WWTP for the Removal of Biogenic Elements of Nitrogen and Phosphorous, Rehabilitation and Expansion of the WSS network of the Town of Pazardzhik'* with *No.DIR-51011119-C010*.
- Concept phase of the project '*Expansion of the WWTP for the Removal of Biogenic Elements of Nitrogen and Phosphorous, Rehabilitation and Expansion of the WSS network of the Town of Pazardzhik'*.

The abovementioned developments are under the Operational Programme Environment 2007-2013 (OPE) under Priority Axis 1. The beneficiary of the project is Pazardzhik Municipality, procedure with reference number.BG161PO005/10/1.11/03/19.

Based on the prepared feasibility study, the project has been approved for funding and it is expected that the first stage of its implementation will commence in the following months.

The prepared project includes a conceptual solution for the network. An overall staged rehabilitation of the existing distribution water mains and the associated service connections is envisaged. The project also envisages the construction of new branches for the new residential quarters, whose construction is imminent.

Under the already funded part of the project, rehabilitation of 15.75 km of distribution branches will be carried out. This length includes only water supply sections parallel to the sewerage branches that are to be constructed under the same project.

Regarding the town of Pazardzhik, the Consultant suggests that 74.760 km of water mains and the associated service connections should be rehabilitated and new ones should be constructed within the programme period between 2016 and 2038. The major part of the water mains envisaged for construction should be built parallel to the sewerage branches that are to be constructed within the same programme period.

The activities envisaged for implementation are consistent with the methodology and the proposals presented in Chapter 4.1.1.

The table below contains a description of the activities and investments required for the implementation of the rehabilitation of the distribution network of the town of Pazardzhik.

Table 4-24 Required activities and investments

Description of the main deficiencies of the distribution network	Description of the required activities	Specific Investments
- Old and obsolete pipes (87% of the network consists of old asbestos cement, steel, Mannesmann and galvanized pipes). - Over 80% of the service connections are in poor condition. - Significant number of failures (1.53 failures per km in 2011). - Significant technical losses (47%). - Insufficient number of fire hydrants and stop valves (their number is not consistent with the statutory requirements). - The water supplied to the network is not metered in all of the water mains that are feeding the network. - The water supplied from the network of the town of Pazardzhik to the village of Dobrovnitsa is not metered.	- Overall staged replacement of old and obsolete pipes and the associated service connections. - Installation of water meter devices at all of the water mains that are feeding the network.	- Rehabilitation of 63.724 km of water distribution branches. - Construction of 11.036 km of water supply branches for the new residential quarters. - Rehabilitation of about 3,606 service connections. - Construction of 624 new service connections. - Construction of 3 water meter chambers and installation of water meter devices (2 for the water coming from the PS Mokrishte and PR of V=36,000 m^3 and 1 at the diversion to the village of Dobrovnitsa).

The expected positive effects of these measures are as follows: reducing non-revenue water, optimizing the operation, saving electricity, reducing health risks to the population as well as reducing the infiltration in the sewerage pipes. The timely construction of the water mains in the new residential quarters will ensure that the new subscribers will be supplied with water. For more details, see drawing N°9.

4.2.4.3. *Activities intended to develop and improve the condition of the distribution network of the town of Septemvri*

The Consultant suggests that the development of the urban water supply network should be carried out according to:

- Feasibility study under the project '*Improving the water cycle of the town of Septemvri*' with *No. DIR-51011116-C055*.
- Conceptual phase of the project '*Improving the water cycle of the town of Septemvri'.*

The abovementioned developments under the Operational Programme Environment 2007-2013 (OPE) under Priority Axis 1. The beneficiary of the project is Septemvri Municipality, procedure with reference number BG161PO005/10/1.11/02/16.

Based on the prepared feasibility study, the project has been approved for funding and it is expected that the first stage of its implementation will commence in the following months.

The prepared project includes a conceptual solution for the network. An overall staged rehabilitation of the existing distribution water mains and the associated service connections is envisaged. The project also envisages the construction of new branches for the new residential quarters, whose construction is imminent. Under the already funded part of the project, rehabilitation will be carried out of 2.956 km of distribution branches. This length includes only water supply sections parallel to the sewerage branches that are to be constructed under the same project.

Regarding the town of Septemvri, the Consultant suggests that 44.681 km of water mains and the associated service connections should be rehabilitated and new ones should be constructed within the programme period between 2016 and 2038. The major part of the water mains envisaged for construction should be built parallel to the sewerage branches that are to be constructed within the same programme period.

The activities envisaged for implementation are consistent with the methodology and the proposals presented in Chapter 4.1.1.

The table below contains a description of the activities and investments required for the implementation of the rehabilitation of the distribution network of the town of Septemvri.

Table 4-25 Required activities and investments

Description of the main deficiencies of the distribution network	Description of the required activities	Specific Investments
- 99% of the network consists of old pipes with expired operation period and of low reliability (asbestos cement, steel, galvanized). - Over 95% of the service connections are built of old galvanized pipes in poor condition. - Failures in the network are frequent (1.15 failures per km in 2011). -Significant technical losses (48%) - Insufficient number of fire hydrants and stop valves (their number is not consistent with the statutory requirements).	- Overall staged replacement of old and obsolete pipes and the associated service connections.	- Rehabilitation of 44.681 km of water distribution branches. - Rehabilitation of about 2,460 service connections.

The expected positive effects of these measures are as follows: reducing non-revenue water, optimizing the operation, saving electricity, reducing health risks to the population as well as reducing the infiltration in the sewerage pipes. For more details, see drawing N°25.

4.2.4.4. Activities intended to develop and improve the condition of the distribution networks of the villages of A. Konstantinovo, Bratanitsa, Chernogorovo, Glavinitsa, Ivaylo, Malo Konare, Ognyanovo, Vetren, Kovachevo and Varvara

Regarding the ten settlements with population over 2,000 inhabitants, the main efforts will be aimed at rehabilitation of the water supply branches and the associated service connections.

The Consultant suggests that rehabilitation of the water supply branches in these settlements should be connected with the parallel construction of the sewerage branches and collectors.

The major part (90% of the network) will be implemented within the short-term investment programme due to the fact that the construction of the main part of the sewerage for these settlements is envisaged to be carried out precisely in this period.

The final rehabilitation of the distribution networks of these settlements is envisaged to be carried out in the medium-term investment period.

The activities intended for implementation are consistent with the methodology and assumptions presented in Chapter 4.1.1.

The table below contains a description of the activities and investments required for the implementation of the rehabilitation of the distribution network of the 10 settlements with population over 2,000 inhabitants.

Table 4-26 Required activities and investments

Description of the main deficiencies of the distribution network	Description of the required activities	Specific Investments
- Old and obsolete pipes (94% of the network consists of asbestos cement, steel, Mannesmann and galvanized). - Over 80% of the service connections are in poor condition. - Significant number of failures (for the town of Vetren – 2.14 failures per km in 2011). - Significant technical losses (52%). - - Insufficient number of fire hydrants and stop valves (their number is not consistent with the statutory requirements). - Pipes with small diameter Ø60 (do not comply with the requirements of Ordinance №I3-1971). - The water supplied to the network of the town of Vetren is not metered. - Regarding the town of Vetren, the pressure in the zones of the distribution network is higher than the one required by the norms.	- Overall staged replacement of old and obsolete pipes and the associated service connections. - Installation of water meter devices after the pressure reservoirs of the town of Vetren. - Regarding the town of Vetren, amending the boundaries of the zones in order to achieve pressures consistent with the regulatory requirements.	- Rehabilitation of 214.840 km of water distribution branches (50.598 km for Krali Marko, 13.44 km for Ivaylo, 17.129 km for A. Konstantinovo, 20.254 km for Ognyanovo, 14.711 km for Glavinitsa, 27.13 km for Chernogorovo, 14 km for Bratanitsa, 22.9 km for Vetren, 15.158 km for Kovachevo, 19.51 km for Varvara). - Rehabilitation of about 9,690 service connections. - Construction of 2 water meter chambers and installation of water meter devices – PR of V=500 m³ - low zone, PR of V=500 m³ and PR of V=400 m³ - high zone for the town of Vetren). - For the town of Vetren – installation of pressure reducing valve and modification in the

Description of the main deficiencies of the distribution network	Description of the required activities	Specific Investments
		connection of the water mains.

The expected positive effects of these measures are as follows: reducing non-revenue water, optimizing the operation, saving electricity, reducing health risks to the population as well as reducing the infiltration in the sewerage pipes.

For more details, see maps:

- N°11 - Malo Konare
- N°13 - Ivaylo
- N°15 - A. Konstantinovo
- N°17 - Ognyanovo
- N°19 - Glavinitsa
- N° 21 - Chernogorovo
- N°23 – Bratanitsa
- N°27 - Vetren
- N°29 - Kovachevo
- N°31 - Varvara

4.2.4.5. *Activities intended to develop and improve the condition of the distribution networks of the villages with population below 2,000 inhabitants*

Regarding the villages whose population is below 2,000 inhabitants and which are not intended to join agglomerations above 2,000 PE (according to Chapter 4.3), the main efforts will be aimed at rehabilitation of the water supply branches and the service connections.

The Consultant suggests that the rehabilitation of the distribution networks of these villages should be carried out within the medium-term and the long-term investment programme. An annual replacement rate of 2% of the total length of the network in the respective settlement has been adopted.

Regarding the villages whose population is over 2,000 inhabitants and which are intended to be a part of an agglomeration with over 2,000 PE (pursuant to Chapter 4.3) , the main efforts will also be aimed at the rehabilitation of the water supply branches and the associated service connections.

The Consultant suggests that the rehabilitation of the water supply branches in these settlements should be connected to the parallel construction of sewerage branches and collectors.

The major part (90% of the network) will be implemented within the short-term investment programme due to the fact that the construction of the main part of the sewerage for these settlements is envisaged precisely in this period.

The final rehabilitation of the distribution networks of these settlements is envisaged to be carried out in the long-term investment period.

Pursuant to the prepared Regional Master Plan of ViK-Belovo EOOD, it is envisaged that the required water mains and facilities for supplying water to the village of Akandzhievo within the service area of ViK-Belovo EOOD will be constructed within the investment period between 2016 and 2021. Rehabilitation of the water supply network of the village is envisaged within the same development. As a result, no investments for the village of Akandzhievo are envisaged in the current development.

The activities intended for implementation are consistent with the methodology and assumptions presented in Chapter 4.1.1.

The table below contains a description of the activities and investments required for the implementation of the rehabilitation of the distribution network of the settlements with population below 2,000 inhabitants.

Table 4-27 Required activities and investments

Description of the main deficiencies of the distribution network	Description of the required activities	Specific Investments
- The major part of the distribution network consists of old pipes with expired operation period and low reliability. The predominant pipes are built of asbestos cement (88%). Failures and hidden leakages occur in these pipes. - Over 90% of the service connections are in poor condition – old galvanized pipes. - Significant technical losses (54%). - The number of the existing fire hydrants and stop valves is insufficient and many of them are not working. - Pipes with small diameters Ø60 (do not comply with the regulatory requirements). -The water supplied to 4 of the villages is not metered.	- Overall staged replacement of old and obsolete pipes and the associated service connections. - Installation of water meter devices at all of the water mains that are feeding the villages of Apriltsi, Vetren Dol and Shtarkovo (the water meter for Dobrovnitsa is attached to Pazardzhik).	- Rehabilitation of 346.141km of water distribution branches from which: 211.007km are for 24 settlements in Pazardzhik Municipality; 111.182km for 10 settlements in Septemvri Municipality; 23.952km for 7 settlements in Lesichovo Municipality - Rehabilitation of about 16,555 service connections from which: 10,457 service connections for 24 settlements in Pazardzhik Municipality; 4,838 service connections for 10 settlements in Septemvri Municipality; 1,260 service connections for 7 settlements in Lesichovo Municipality; - Construction of 3 water meter chambers and installation of water meter devices (after the pressure reservoirs of Apriltsi, Vetren Dol and Shtarkovo.

The expected positive effects of these measures are as follows: reducing non-revenue water, optimizing the operation, saving electricity, reducing health risks to the population as well as reducing the infiltration in the sewerage pipes.

Besides the abovementioned activities, it is absolutely imperative for the operator ViK EOOD Pazardzhik to accelerate the activities for improvement of the consumed water metering in all of the settlements form the municipalities of Pazardzhik, Septemvri and Lesichovo:

- Compliance with the programme for verification and replacement of old water meters (installed more than 10-15 years ago). Currently about 86% of the water meters are precisely like that.
- Subscribers without water meters must be persuaded to install water meter devices.

4.3. OPTIONS FOR SEWERAGE SYSTEM DEVELOPMENT

4.3.1. STRATEGIC WASTEWATER OPTIONS

As mentioned in Chapter 3, all of the surface receiving water bodies within the territory of ViK EOOD Pazardzhik are included in the list of ‘sensitive areas’ (Maritsa River and its tributaries). The Consultant reminds that pursuant to Directive 91/271/EEC, WWTPs with capacity for over 10,000 PE, which discharge water in sensitive areas, must be equipped with a unit for tertiary treatment for nitrogen and phosphorus removal. In order to meet the European standards, all of the WWTPs on the territory of ViK EOOD Pazardzhik, must comply with the following maximal concentrations in the treated wastewater:

Table 4-28 Maximal concentration in treated wastewater

Parameter	Maximal concentration in the treated wastewater	
	Settlements with population from 10,000 to 100,000 PE	Settlements with population over 100,000 PE
BOD_5	25 mg/l	25 mg/l
COD	125 mg/l	125 mg/l
Suspended solids	35 mg/l	35 mg/l
N*	15 mg/l	10 mg/l
P*	2 mg/l	1 mg/l

** Concentration required for WWTPs treating over 600 kg of BOD5 per day.*

4.3.1.1. *Defining options*

Scope of options:

- Agglomerations above 2,000 PE.
- Settlements bellow 2,000 inhabitants, which can join an agglomeration above 2,000 PE (in compliance with the Report on the implementation of Directive 91/271/EEC).

The agglomerations within the service area of ViK EOOD Pazardzhik defined pursuant to the Report on the implementation of Directive 91/271/EEC are presented in the table below:

Table 4-29 Settlements above 2,000 PE within the territory of ViK EOOD Pazardzhik

Name of the settlement	Population 2011 (Census)	Population 2016	Population 2021	Population 2028	Population 2038
Aleko Konstantinovo	2,714	2,640	2,576	2,492	2,394
Bratanitsa	2,093	2,035	1,983	1,918	1,842

Name of the settlement	Population 2011 (Census)	Population 2016	Population 2021	Population 2028	Population 2038
Chernogorovo	2,203	2,142	2,087	2,019	1,939
Glavinitsa	2,282	2,219	2,162	2,091	2,009
Ivaylo	2,841	2,762	2,691	2,603	2,501
Malo Konare	4,353	4,233	4,124	3,989	3,832
Ognyanovo	2,353	2,288	2,229	2,156	2,071
Pazardzhik	71,979	69,987	68,185	65,952	63,358
Kovachevo	2,402	2,298	2,212	2,084	1,912
Septemvri	7,869	7,527	7,246	6,828	6,264
Varvara	2,061	1,972	1,898	1,788	1,641
Vetren	3,221	3,081	2,966	2,795	2,564

Their location is indicated in Layout 8 with the respective degree of completion of their sewerage network as per 2011.

As mentioned in Chapter 3, there is an approved current project for Pazardzhik Municipality. Two options were considered – centralized and decentralized. The centralized option was approved and funded, envisaging the treatment of the wastewater generated by the following settlements: Aleko Konstantinovo, Ognyanovo, Golemanovo, Saraya, Dragor, Mokrishte, Dobrovnitsa, Miryantsi, Sinitievo, Hadzhievo, Ivaylo and Pazardzhik, to be carried out in the existing WWTP Pazardzhik. The capacity of the WWTP is sufficient to cover the treatment of the wastewater from these settlements as well as the technical and economical capability for its transfer from each of the settlements. Shown in Layout 8. No strategic alternatives are considered for the settlements mentioned in this paragraph.

There is a current project for Septemvri Municipality, mentioned in Chapter 3. According to it, the construction of WWTP Septemvri is envisaged for the treatment of the wastewater from the town of Septemvri, the village of Varvara and the village of Vetren Dol. The strategic alternative for the future joining of the villages of Simeonovets and Semchinovo to the WWTP Septemvri is examined below.

The analysis of the strategic options for wastewater treatment has been carried out based on the methodology elaborated in Chapter 4.1.1. The results are presented in the table below, in which the population equivalent includes public and industrial activities:

Table 4-30 Options analysis for centralized or decentralized WWTP

Agglomeration code	Name of the settlement	Population equivalent for the design year	Cluster code/ Cluster name	Population equivalent for the design year
-	Gelemanovo	799	V25_WW_01 / Pazardzhik	98,223
BGAG46749_00	Malo Konare	4,353	V25_WW_02 / Malko Konare	7,783
BGAG81089_00	Chernogorovo	2,203		
	Pishtingovo	1,037		
	Krali Marko	190		
-	Patalenitsa	1,670	V25_WW_03 /	4,049

Agglomeration code	Name of the settlement	Population equivalent for the design year	Cluster code/ Cluster name	Population equivalent for the design year
-	Tsrancha	1,314	Patalenitsa	
-	Debrashtitsa	1,065		
BGAG06149_00	Bratanitsa	2,093	V25_WW_04 / Bratanitsa	4,383
	Lyahovo	391		
	Zvanichevo	1,899		
	Yunatsite	1,522	V25_WW_05 / Yunatsite	2,757
	Velichkovo	1,235		
	Semchinovo	1,859	V25_WW_06 / Septemvri	14,000 (current project)
	Simeonovets	859		
BGAG37491_00	Kovachevo	2,402	V25_WW_07 / Kovachevo	4,281
	Lozen	1,019		
	Zlokuchene	860		
	Vinogradets	1,349	V25_WW_08 / Vinogradets	3,646
	Karabunar	1,481		
	Boshulya	816		

Settlements, not concerned by the options

Regarding the settlements, which are not concerned by any of the abovementioned categories and have connection rate below 90%, Sewerage Zoning Studies are proposed in the short-term investment programme. As mentioned in Chapter 4.1.2.2., “The Sewerage Zoning Study will define best options among collective sanitation, small collective sanitation, autonomous sanitation, and rainwater purification systems zones for the studied settlements.” Then, the solutions presented in the Sewerage Zoning Study will be proposed for acceptance in the medium and long-term investment programmes.

Regarding ViK EOOD Pazardzhik, Sewerage Zoning Studies will be conducted in all of the remaining settlements (settlements within the service area excluding the 16 settlements, concerned by the options are listed in table 4-13). The table below summarizes the scope of the Sewerage Zoning Studies.

Table 4-31 Scope of the Sewerage Zoning Studies

	Number	Total population
Total settlements concerned	18	9,072
Settlements between 0 and 666 inhabitants	9	3,599
Settlements between 667 and 2,000 inhabitants	9	12,671

4.3.1.2. *Sludge management*

The sludge treatment methods and the options for their final utilization are described in detail in the chapter dedicated to the methodology (section 4.1.1.4.4 Technical Design Criteria, subsection Wastewater Sludge Treatment).

In Bulgaria, the final destination of sludge in almost all situations is its transportation to landfills, which is not encouraged and financed by the EU. However, in some cases, sludge enhancement is used for land use (non-farming) after sludge degradation (usually vermiculture).

This situation stems from the fact that first, non-domestic discharges in the urban sewerage are not contained by operators (risk of pollution of sludge) and secondly because prospective studies on sludge management for agricultural use have not been conducted.

These studies and actions are covered by the feasibility studies and design studies (or specific studies), not included as part of this regional master plan. Therefore, the Consultant's investment programmes do not include such measures.

The Consultant recommends that in future operation of the treatment plants, studies on the prospects in the management of sludge for use in various fields should be conducted, as well as initiation of a specific study for taking actions at regional and national level by defining several pilot sites.

The Consultant recommends possible alternatives for the sludge management in future operation of the treatment plants, as well as the initiation of a specific study for taking actions at regional and national level by defining several pilot sites.

The abovementioned study includes several components:

- Analysis and proposed regulatory changes regarding sludge management in Bulgaria
- Assessment of the industrial situation on the pilot sites
- Assessment of the existing management of sludge on the pilot sites
- Determination of potential agricultural uses on the pilot sites
- Future interaction with potential customers
- Socio-economic actions and communications to educate the public concerned
- Design educational courses
- Assistance in the implementation of contracts between operators and end users of sanitation sludge

The Consultant recommends integrating the reuse of treated water from WWTP to this sludge management approach. There is such experience with well-functioning WWTP in the recent past.

The Consultant recommends that a single pilot site should be selected within the territory of the district. In fact, this region is particularly suitable due to the availability of suitable forest lands in the mountain areas.

4.3.1.3. Evaluation of the options for Pazardzhik Cluster

The table below presents the investments required for connection of the village of Gelemenovo to Pazardzhik WWTP or construction of a local WWTP for the settlement.

Table 4-32 Description of the strategic options for Pazardzhik Cluster

Cluster Code/ Name	Options	Description / Investments	Existing situation – sewerage network coverage / WWTP	Selection justification
V25_WW_01 Pazardzhik	Option 1 – Centralised Malo Konare WWTP	Intercepting collector - 1,800m	0% / Pazardzhik WWTP	<u>Advantages</u>: Low operation costs Low investment costs More efficient wastewater treatment <u>Disadvantages:</u> External collectors.
	Option 2 - Decentralised	Local WWTP with a capacity of 799 PE,	0% / No WWTP	<u>Advantages</u>: No need for construction of intercepting collectors to the WWTP <u>Disadvantages:</u> Higher investment costs Higher Operation & Maintenance costs.

<u>Financial and economic evaluation</u>

Based on the assumptions made, the financial and economic evaluation indicates the following results.

Table 4-33 Financial evaluation

Parameter	Option 1	Option 2
Investment costs in €	**564,500**	**831,959**
- Investment costs for gravity intercepting collector with L =1.8 km	*564,500*	-
- Investment costs for local WWTP		*831,959*
Operation & Maintenance costs in € (total for a 30-year period)	**33,870**	**1,123,144**
Net Present Value at a discount rate of 5 % in €	**256,598**	**1,520,221**

<u>Selected option</u>

Option 1, Centralized solution, has been selected as the preferred option since:

- The O&M costs are lower in comparison with Option 2;
- The positive impact on health and environment will be achieved more rapidly;
- The treatment will be more efficient if carried out in a larger WWTP.

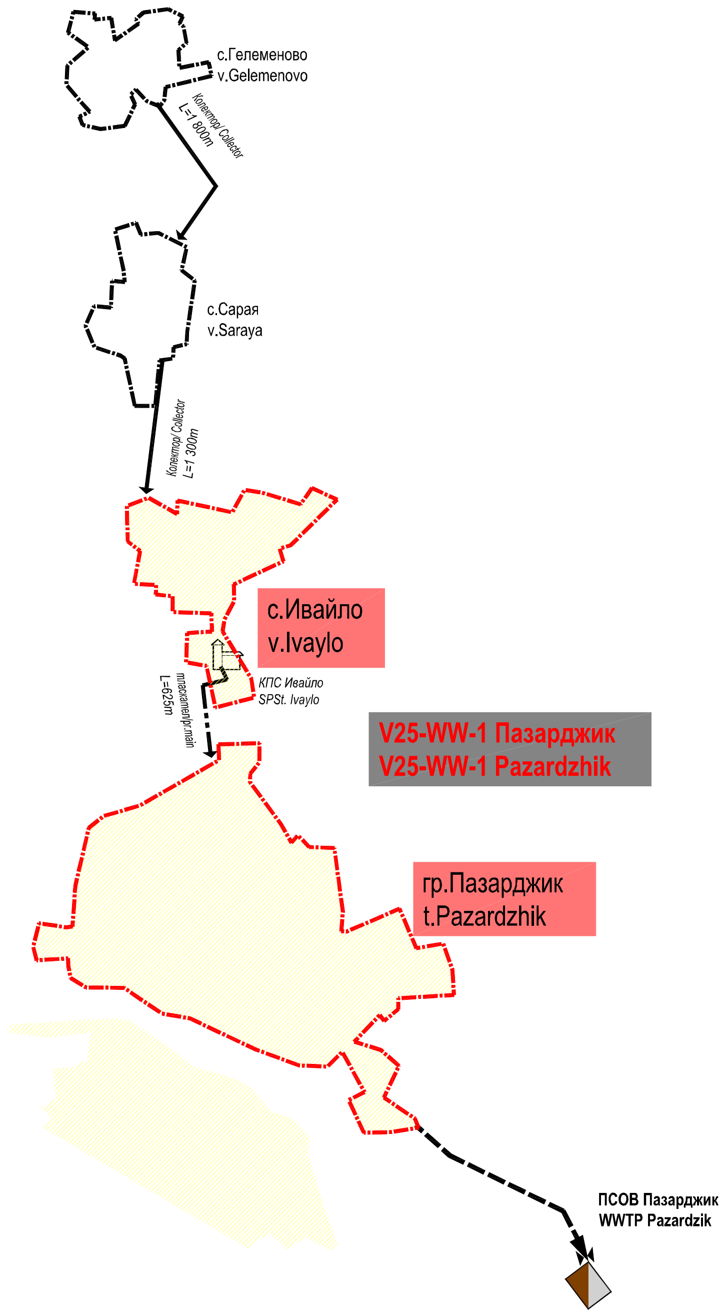

Figure 4-7 Option 1 – Centralised Oprion for the village of Gelemenovo

*Note: When considering the options, the village of Gelemenovo with a population forming 799 PE was not taken into account. We recommend that waterwater from the village of Gelemenovo be connected to the already existing wastewater treatment plant of the town of Pazardzhik. Wastewater from the village is equal to 86 m3 /day and does not affect the hydraulic loading of the facilities designed for 52 000 m3/day. BOD5 organic loading amounts to 47.94 kg BOD / day and does not alter the technological characteristics of the main facilities in terms of organic loading, designed for BOD5 load of 9,000 kg/BOD5 /day.

4.3.1.4. Evaluation of the options for Malo Konare Cluster

The table below contains a description of the required investments for both the centralized and the decentralized options, comparing their advantages and disadvantages.

Table 4-34 Description of the strategic options for Malo Konare Cluster

Cluster code/name	Options	Description/Investments	Existing situation – sewerage network coverage / WWTP	Choice motivation
V25_WW_02 Malo Konare	Option 1 – Centralized WWTP Malo Konare	Joint WWTP with capacity for 7,443 PE, 8,800 m of intercepting collectors (Chernogorovo 2,000 m, Krali Marko 1,000 m, Malo Konare 2,300, Pishtingovo 3,500 m)	0% / no WWTP	Advantages: Low operation costs Low investment costs More efficient wastewater treatment Disadvantages: External collectors.
	Option 2 – Decentralized	WWTP Chernogorovo 2,203 PE WWTP Krali Marko 190 PE WWTP Malo Konare 4, 353 PE WWTP Pishtingovo 1,037 PE	0% / no WWTP	Advantages: No need for the construction of intercepting collectors to the WWTP Disadvantages: Higher investment costs Higher Operation & Maintenance costs.

Financial and economic evaluation

Based on the assumptions, the financial and economic evaluation indicates the following results.

Table 4-35 Financial assessment

Parameter	Option 1	Option 2
Investment costs in €	**7,058,801**	**6,429,804**
- Investment costs for gravity intercepting collector of L=8.8 km	*3,173,800*	*-*
- Investment costs for WWTP Chernogorovo	*-*	*2,176,699*
- Investment costs for WWTP Krali Marko	*-*	*197,838*
- Investment costs for WWTP Pishtingovo	*-*	*1,079,776*
- Investment costs for WWTP Malo Konare	*-*	*2,975,491*
- Investment costs for the joint WWTP	*3,885,001*	*-*
Operation & Maintenance costs in € (total for a 30-year period)	**5,435,180**	**8,680,235**
Net Present Value at discount rate of 5 % in €	**8,710,332**	**11,749,051**

Selected option

Option 1, Centralized alternative, has been selected as the preferable option because:

- The O&M costs are lower in comparison with Option 2;

- The positive impact on health and environment will be achieved more rapidly;
- The treatment will be more efficient if carried out in a larger WWTP.

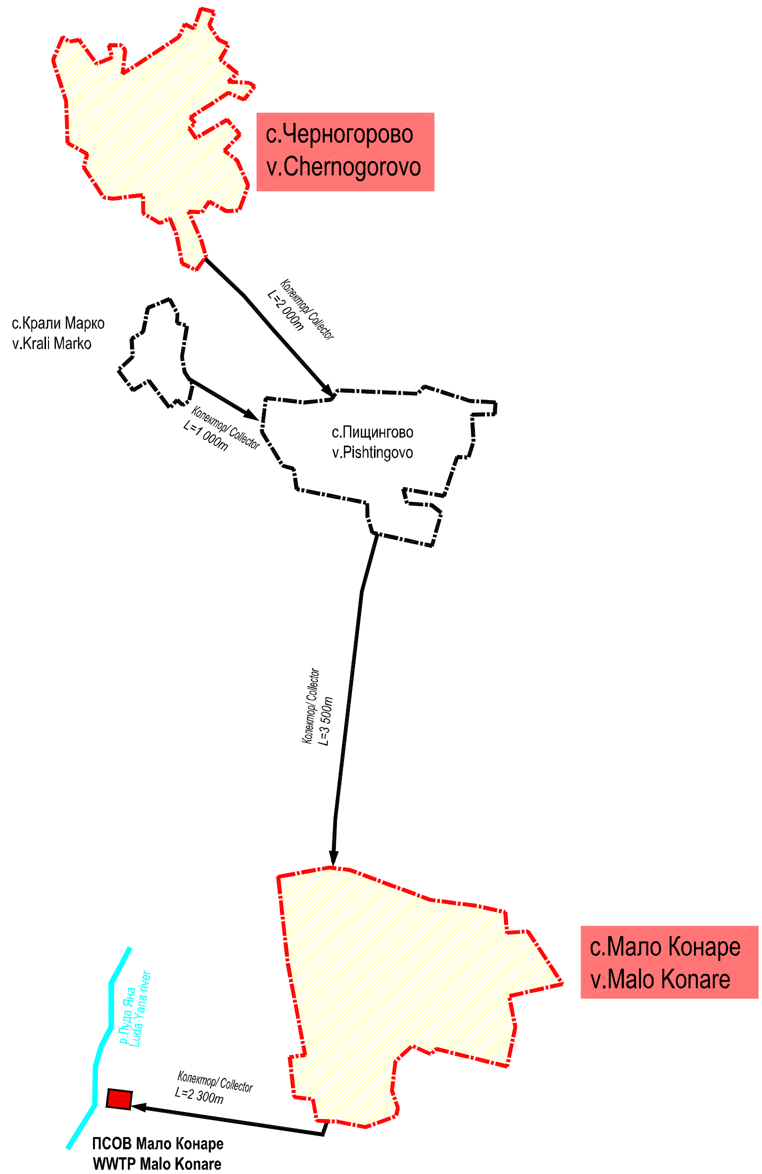

Figure 4-8 Option 1 – Centralized option for Malo Konare Agglomeration

Krali Marko has population of 190 inhabitants. It is shown that in case of construction of a sewerage system, wastewater from the settlement is more advantageously to be treated in the joint WWTP for the designated agglomeration. However, due to the small number of population of the village of Krali Marko, a solution can be sought in the construction of cesspits.

4.3.1.5. Evaluation of the option for Patalenitsa Cluster

The table below contains a description of the required investments for both the centralized and the decentralized options, comparing their advantages and disadvantages.

Table 4-36 Description of the strategic options for Patalenitsa Cluster

Cluster code/name	Options	Description/Investments	Existing situation – sewerage network coverage / WWTP	Choice motivation
V25_WW_03 Patalenitsa	Option 1 – Centralized WWTP Patalenitsa	Joint WWTP with capacity for 4,049 PE, 7,450 m of intercepting collectors (Patalenitsa 3,300 m; Tsrancha 3,650 m; Debrashtitsa 500 m)	0% / no WWTP	Advantages: Low operation costs Low investment costs More efficient wastewater treatment Disadvantages: Construction of intercepting collectors.
	Option 2 – Decentralized	WWTP Patalenitsa 1,670 PE WWTP Tsrancha 1,314 PE WWTP Debrashtitsa 1,065 PE	0% / no WWTP	Advantages: No need for the construction of intercepting collectors to the WWTP Disadvantages: Higher investment costs Higher Operation & Maintenance costs.

Financial and economic evaluation

Based on the assumptions, the financial and economic evaluation indicates the following results.

Table 4-37 Financial assessment

Parameter	Option 1	Option 2
Investment costs in €	**5,420,942**	**4,216,021**
- Investment costs for gravity intercepting collector of L=7.45 km	*2,878,242*	-
- Investment costs for WWTP Patalenitsa	-	*1,738,888*
- Investment costs for WWTP Tsrancha	-	*1,368,203*
- Investment costs for WWTP Debrashtitsa	-	*1,108,931*
- Investment costs for a joint WWTP	*2,542,700*	-
Operation & Maintenance costs in € (total for a 30-year period)	**4,038,189**	**5,691,629**
Net Present Value at discount rate of 5 % in €	**6,550,289**	**7,703,851**

Selected option

Option 1, Centralized alternative, has been selected as the preferable option because:

- The O&M costs are lower in comparison with Option 2;
- The positive impact on health and environment will be achieved more rapidly;

- The treatment will be more efficient if carried out in a larger WWTP.

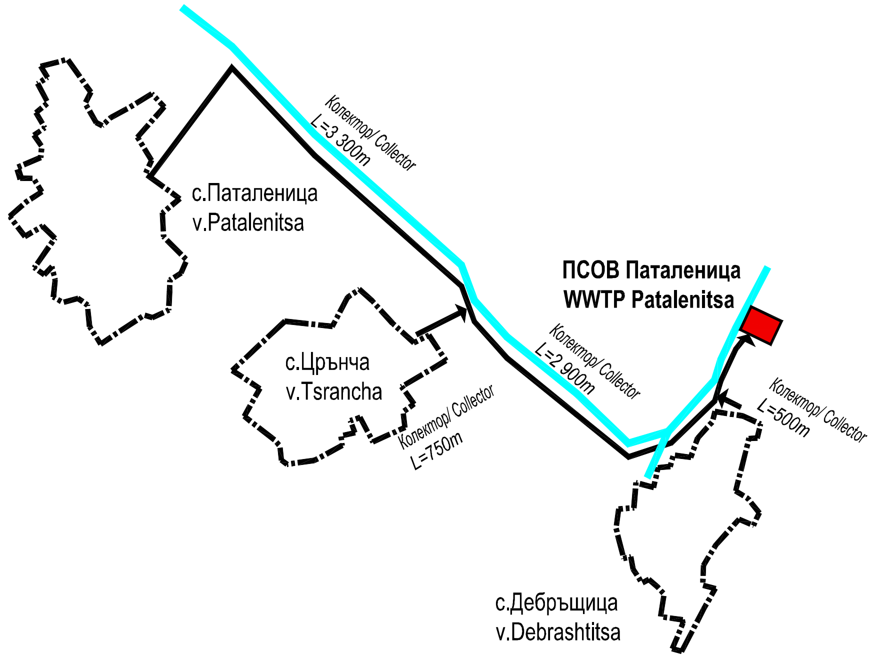

Figure 4-9 Option 1 – Centralized option for Patalenitsa Agglomeration

4.3.1.6. Evaluation of the options for Bratanitsa Cluster

The table below contains a description of the required investments for both the centralized and the decentralized options, comparing their advantages and disadvantages.

Table 4-38 Description of the strategic options for Bratanitsa Cluster

Cluster code/name	Options	Description/Investments	Existing situation – sewerage network coverage / WWTP	Choice motivation
V25_WW_04 Bratanitsa	Option 1 – Centralized WWTP Bratanitsa	Joint WWTP with capacity for 4,383 PE, 3,350 m of intercepting collectors (Lyahovo 750 m, Bratanitsa 2,100 m, Zvanichevo 500 m)	0% / no WWTP	Advantages: Low operation costs Low investment costs More efficient wastewater treatment Disadvantages: Construction of intercepting collectors.
	Option 2 – Decentralized	WWTP Bratanitsa 2,093 PE WWTP Lyahovo 391 PE WWTP 1,899 PE	0% / no WWTP	Advantages: No need for the construction of intercepting collectors to the WWTP Disadvantages: Higher investment costs Higher Operation & Maintenance costs.

Financial and economic evaluation

Based on the assumptions, the financial and economic evaluation indicates the following results.

Table 4-39 Financial assessment

Parameter	Option 1	Option 2
Investment costs in €	**4,661,986**	**4,510,582**
- Investment costs for gravity intercepting collector of L=3.35 km	*1,677,100*	-
- Investment costs for WWTP Bratanitsa	-	*2,126,120*
- Investment costs for WWTP Lyahovo	-	*407,129*
- Investment costs for WWTP Zvanichevo	-	*1,977,334*
- Investment costs for a joint WWTP	*2,984,886*	
Operation & Maintenance costs in € (total for a 30-year period)	**4,130,222**	**6,089,286**
Net Present Value at discount rate of 5 % in €	**6,305,691**	**8,242,096**

Selected option

Option 1, Centralized alternative, has been selected as the preferable option because:

- The O&M costs are lower in comparison with Option 2;
- The positive impact on health and environment will be achieved more rapidly;
- The treatment will be more efficient if carried out in a larger WWTP.

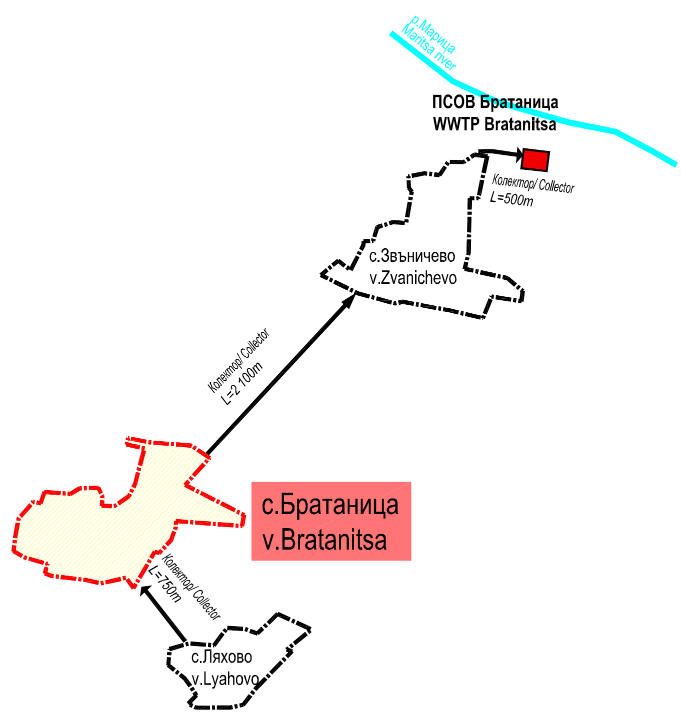

Figure 4-10 Option 1 – Centrallized option for Bratanitsa Agglomeration

4.3.1.7. *Evaluation of the options for Yunatsite Cluster*

The table below contains a description of the required investments for both the centralized and the decentralized options, comparing their advantages and disadvantages.

Table 4-40 Description of the strategic options for Yunatsite Cluster

Cluster code/name	Options	Description/Investments	Existing situation – sewerage network coverage / WWTP	Choice motivation
V25_WW_05 Yunatsite	Option 1 – Centralized WWTP Yunatsite	Joint WWTP with capacity for 2,757 PE, 3,100 m of intercepting collectors (Velichkovo 2,600 m, Yunatsite 500 m)	0% / no WWTP	Advantages: Low operation costs Low investment costs More efficient wastewater treatment Disadvantages: Construction of intercepting collectors.
	Option 2 – Decentralized	WWTP Velichkovo 1,235 PE WWTP Yunatsite 1,522 PE	0% Yunatsite; 57% Velichkovo / no WWTP	Advantages: No need for the construction of intercepting collectors to the WWTP Disadvantages: Higher investment costs Higher Operation & Maintenance costs.

Financial and economic evaluation

Based on the assumptions, the financial and economic evaluation indicates the following results.

Table 4-41 Financial assessment

Parameter	Option 1	Option 2
Investment costs in €	**3,530,766**	**2,870,726**
- Investment costs for gravity intercepting collector of L=3.1 km	*1,118,000*	-
- Investment costs for WWTP Velichkovo	-	*1,584,783*
- Investment costs for WWTP Yunatsite	-	*1,285,944*
- Investment costs for a joint WWTP	*2,412,766*	
Operation & Maintenance costs in € (total for a 30-year period)	**3,324,314**	**3,875,480**
Net Present Value at discount rate of 5 % in €	**4,976,410**	**5,245,620**

* At Regional Master Plan level it is not possible to determine which type of H_2S treatment will be selected as it depends on factors, which are yet to be defined such as the precise topography of the collector's route. Therefore, the type of H_2S treatment and its price will be assessed at feasibility study level. The current calculation does not include such price.

Selected option

Option 1, Centralized alternative, has been selected as the preferable option because:

- The O&M costs are lower in comparison with Option 2;
- The positive impact on health and environment will be achieved more rapidly;

- The treatment will be more efficient if carried out in a larger WWTP.

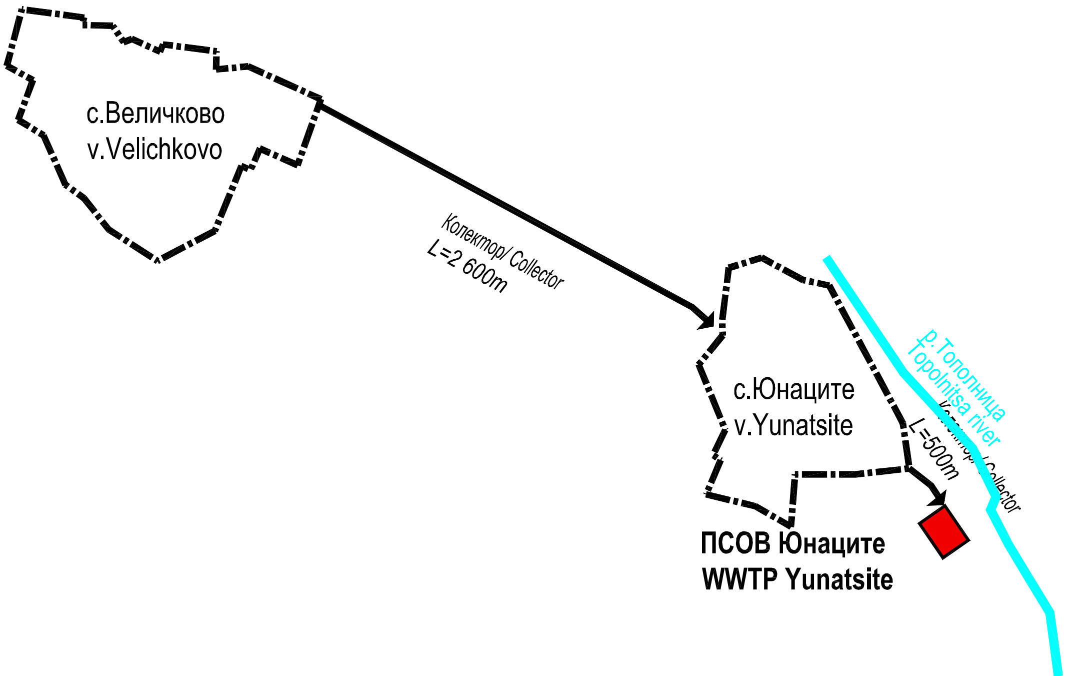

Figure 4-11 Option 1 – Cnetralized option for Yunatsite Agglomeration

4.3.1.8. *Evaluation of the options for Septemvri Cluster*

The table below contains a description of the required investments for both the centralized and the decentralized options, comparing their advantages and disadvantages. The option for the joining of Semchinovo and Simeonovets to the WWTP Septemvri (current project) is also examined.

Table 4-42 Description of the strategic options for Septemvri Cluster

Cluster code/name	Options	Description/Investments	Existing situation – sewerage network coverage / WWTP	Choice motivation
V25_WW_06 Septemvri	Option 1 – Centralized WWTP Septemvri	Joint WWTP with capacity for 14,000 PE, 6,050 m of intercepting collectors (Semchinovo 3,000 m; Simeonovets 3,050 m)	0% / WWTP (current project)	<u>Advantages:</u> Existing WWTP Low operation costs Low investment costs More efficient wastewater treatment <u>Disadvantages:</u> Construction of intercepting collectors.
	Option 2 – Decentralized	WWTP Simoenovots 1,859 PE WWTP Semchinovo 859 PE (WWTP Septemvri (WWTP Septemvri+Varvara+Vetren Dol) 11,265 PE, capacity for 14,000 PE)	0% / no WWTP	<u>Advantages:</u> No need for the construction of intercepting collectors to the WWTP <u>Disadvantages:</u> Higher investment costs Higher Operation & Maintenance costs.

Financial and economic evaluation

Based on the assumptions, the financial and economic evaluation indicates the following results.

Table 4-43 Financial assessment

Parameter	Option 1	Option 2
Investment costs in €	**2,182,100**	**2,830,118**
- Investment costs for gravity intercepting collector of L=6.05 km	*2,182,100*	-
- Investment costs for WWTP Semchinovo	-	*1,938,684*
- Investment costs for WWTP Simeonovets	-	*894,434*
Operation & Maintenance costs in € (total for a 30-year period)	**130,926**	**3,820,659**
Net Present Value at discount rate of 5 % in €	**1,107,858**	**5,171,417**

Selected option

Option 1, Centralized alternative, has been selected as the preferable option because:

- The O&M costs are lower in comparison with Option 2;
- Investment costs are lower in comparison with Option 2
- The positive impact on health and environment will be achieved more rapidly;
- The treatment will be more efficient if carried out in a larger WWTP.
- No need for the construction of a new WWTP.

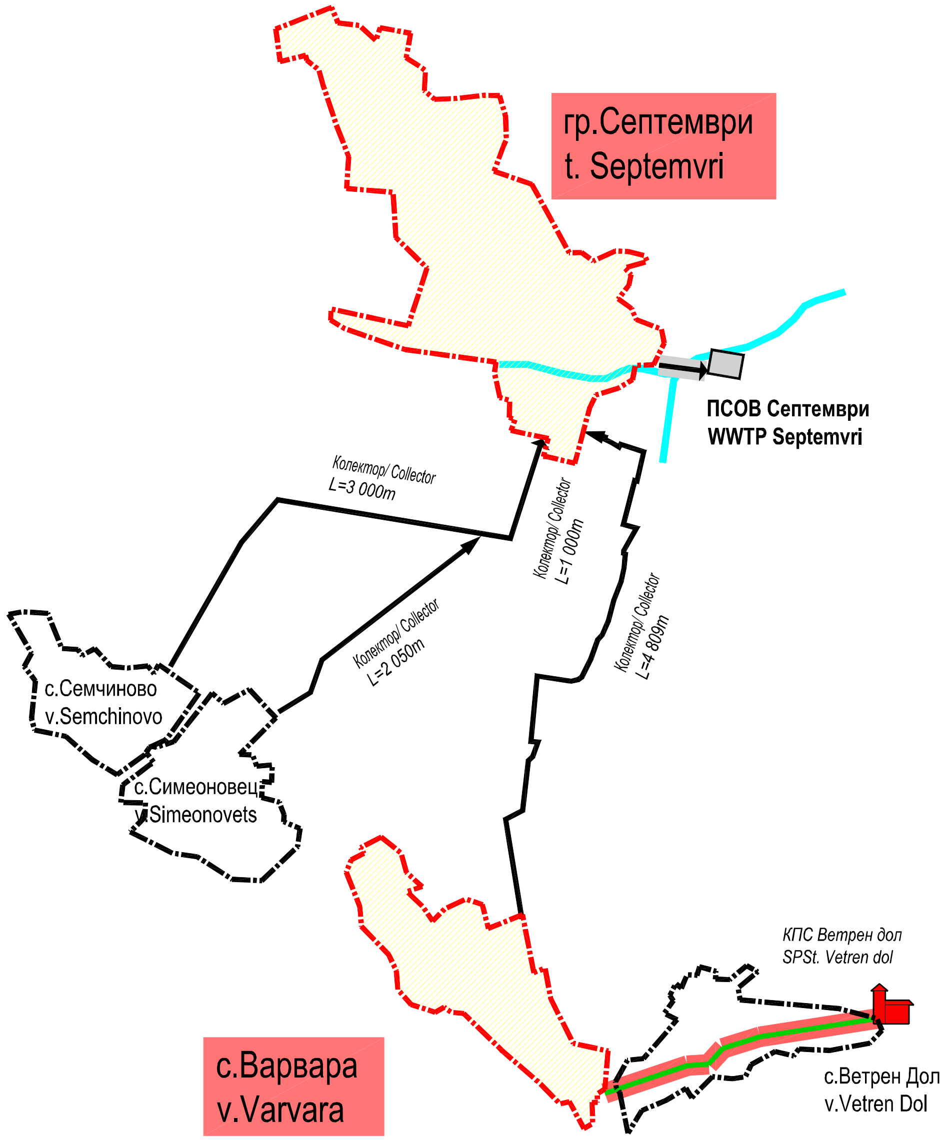

Figure 4-12 Oprion 1 – Centralized option for Septemvri Agglomeration

4.3.1.9. Evaluation of the options for Kovachevo Cluster

The table below contains a description of the required investments for both the centralized and the decentralized options, comparing their advantages and disadvantages.

Table 4-44 Description of the strategic options for Kovachevo Cluster

Cluster code/name	Options	Description/Investments	Existing situation – sewerage network coverage / WWTP	Choice motivation
V25_WW_07 Kovachevo	Option 1 – Centralized WWTP Kovachevo	Joint WWTP with capacity for 4,281 PE, 3,800 m of intercepting collectors, sewerage pumping station (SPS) Zlokuchene, 2,700 m of pressure pipelines.	0% / no WWTP	Advantages: Low operation costs Low investment costs More efficient wastewater treatment Disadvantages: Treatment of H_2S needs to be envisaged in the pressure collector. Construction of SPS and intercepting collectors
	Option 2 – Decentralized	WWTP Kovachevo 2,402 PE WWTP Lozen 1,019 PE WWTP Zlokuchene 860 PE	0% / no WWTP	Advantages: No need for the construction of intercepting collectors to the WWTP Disadvantages: Higher investment costs Higher Operation & Maintenance costs.

Financial and economic evaluation

Based on the assumptions, the financial and economic evaluation indicates the following results.

Table 4-45 Financial assessment

Parameter	Option 1	Option 2
Investment costs in €	**4,436,099**	**4,221,350**
- Investment costs for gravity intercepting collector of L=3.8 km	*1,195,700*	-
- Investment costs for 2,700 m of pressure pipelines	*257,600*	
-SPS Zlokuchene	*30,000*	
- Investment costs for WWTP Kovachevo	-	*2,264,841*
- Investment costs for WWTP Lozen		*1,061,034*
- Investment costs for WWTP Zlokuchene		*895,475*
- Investment costs for a joint WWTP	*2,952,799*	
Operation & Maintenance costs in € (total for a 30-year period)	**4,178,578**	**5,698,822**
Net Present Value at discount rate of 5 % in €	**6,351,420**	**7,713,587**

*At Regional Master Plan level it is not possible to determine which type of H2S treatment will be selected as it depends on factors, which are yet to be defined such as the precise topography of the collector's route. Therefore, the type of H2S treatment and its price will be assessed at feasibility study level. The current calculation does not include such price.

Selected option

Option 1, Centralized alternative, has been selected as the preferable option because:

- The O&M costs are lower in comparison with Option 2;
- The positive impact on health and environment will be achieved more rapidly;
- The treatment will be more efficient if carried out in a larger WWTP.

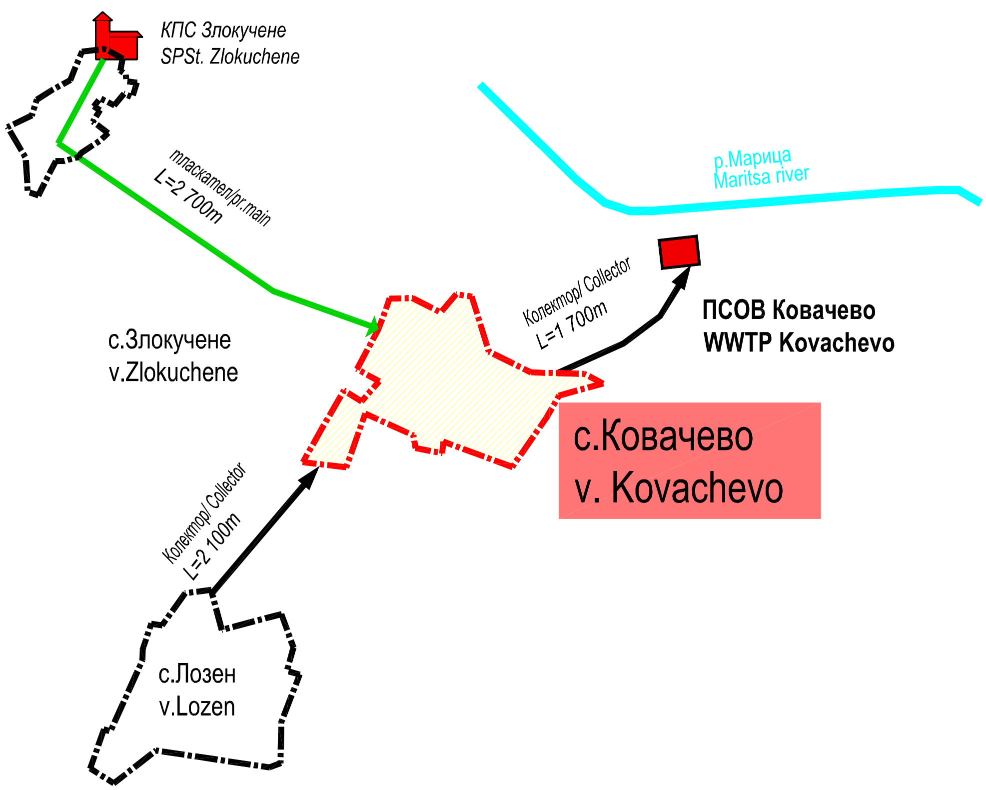

Figure 4-13 Option 1 – Centralized option for Kovachevo Agglomeration

4.3.1.10. Evaluation of the options for Vinogradets Cluster

The table below contains a description of the required investments for both the centralized and the decentralized options, comparing their advantages and disadvantages.

Table 4-46 Description of the strategic options for Vinogradets Cluster

Cluster code/name	Options	Description/Investments	Existing situation – sewerage network coverage / WWTP	Choice motivation
V25_WW_08 Vinogradets	Option 1 – Centralized WWTP Vinogradtets	Joint WWTP with capacity for 3,646 PE, 6,300 m of intercepting collectors (Vinogradets 3,000 m; Karabunar 1,300 m; Boshulya 2,000 m).	0% / no WWTP	Advantages: Low operation costs Low investment costs More efficient wastewater treatment Disadvantages: Construction of intercepting collectors.
	Option 2 – Decentralized	WWTP Vinogradets 2,402 PE WWTP Karabunar 1,481 PE WWTP Boshulya 816 PE	0% / no WWTP	Advantages: No need for the construction of intercepting collectors to the WWTP Disadvantages: Higher investment costs Higher Operation & Maintenance costs.

Financial and economic evaluation

Based on the assumptions, the financial and economic evaluation indicates the following results.

Table 4-47 Financial assessment

Parameter	Option 1	Option 2
Investment costs in €	**4,382,417**	**3,796,398**
- Investment costs for gravity intercepting collector of L=6.3 km	*1,639,400*	-
- Investment costs for WWTP Vinogradets	-	*1,404,646*
- Investment costs for WWTP Karabunar		*1,542,091*
- Investment costs for WWTP Boshulya		*849,660*
- Investment costs for a joint WWTP	*2,743,017*	
Operation & Maintenance costs in € (total for a 30-year period)	**3,801,437**	**5,125,137**
Net Present Value at discount rate of 5 % in €	**5,844,588**	**6,937,081**

Selected option

Option 1, Centralized alternative, has been selected as the preferable option because:

- The O&M costs are lower in comparison with Option 2;
- The positive impact on health and environment will be achieved more rapidly;
- The treatment will be more efficient if carried out in a larger WWTP.

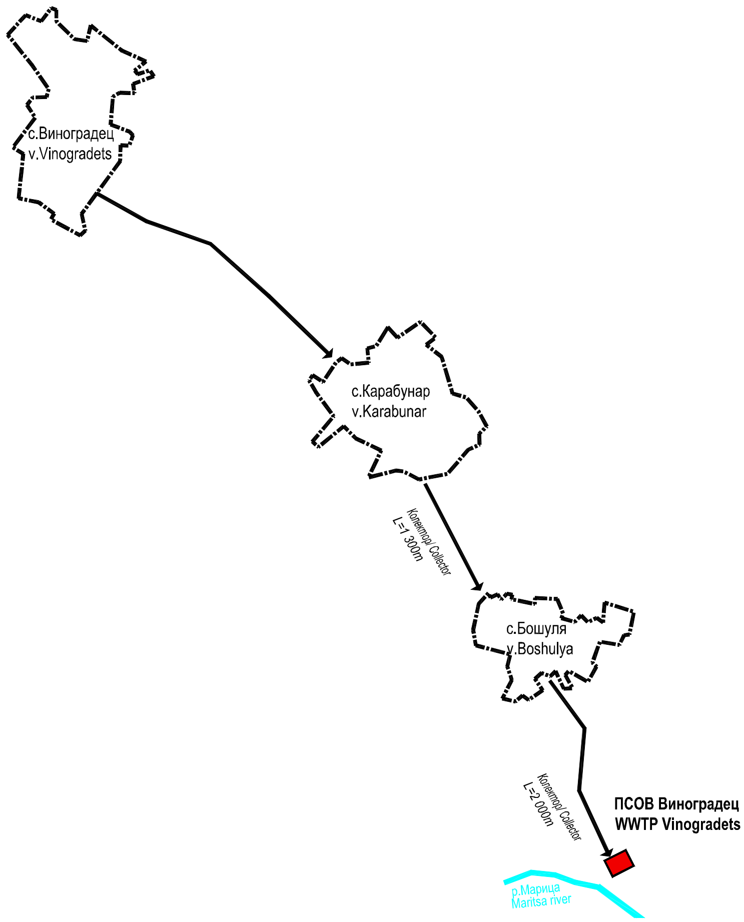

Figure 4-14 Option 1 - Centralized option for Vinogradets Agglomeration

4.3.1.11. Suggested options

The following agglomerations, shown in the table below, have been established in the service area of ViK EOOD Pazardzhik:

Table 4-48 Analysis of the approved strategic options

N°	Name of Agglomeration/Cluster	Preferred option
1	Pazardzhik	Joint WWTP (Glavinitsa, Aleko Konstantinovo, Ognyanovo, Golemanovo, Saraya, Dragor, Mokrishte, Dobrovnitsa, Miryantsi, Sinitievo, Hadzhievo, Ivaylo)
2	Malo Konare	Joint WWTP (Malo Konare, Chernogorovo, Pishtingovo and Krali Marko)
3	Patalenitsa	Joint WWTP (Patalenitsa, Tsrancha, Debrashtitsa)
4	Bratanitsa	Joint WWTP (Bratanitsa, Lyahovo and Zvanichevo)
5	Yunatsite	Joint WWTP (Yunatsite and Velichkovo)
6	Septemvri	Joint WWTP (Septemvri, Varvara, Vetren Dol, Semchinovo and Simeonovets)
7	Kovachevo	Joint WWTP (Kovachevo, Lozen and Zlokuchene)
8	Vinogradets	Joint WWTP (Vinogradets, Karabunar and Boshulya)

Based on the above described, the table below presents the final list of Agglomerations.

Table 4-49 Final list of agglomerations and clusters above 2,000 PE

Agglomeration code	Name of the settlement	Population equivalent for the design year	Cluster code/Cluster name	Population equivalent for the design year
BGAG46749_00	Malo Konare	4,353	V25_WW_02 / Malo Konare	7,783
BGAG81089_00	Chernogorovo	2,203		
	Pishtingovo	1,037		
	Krali Marko	190		
-	Patalenitsa	1,670	V25_WW_03 / Patalenitsa	4,049
-	Tsrancha	1,314		
-	Debrashtitsa	1,065		
BGAG06149_00	Bratanitsa	2,093	V25_WW_04 / Bratanitsa	4,383
	Lyahovo	391		
	Zvanichevo	1,899		
	Yunatsite	1,522	V25_WW_05 / Yunatsite	2,757
	Velichkovo	1,235		
	Semchinovo	1,859	V25_WW_06 / Septemvri	14,000 (current project
	Simeonovets	859		
BGAG37491_00	Kovachevo	2,402	V25_WW_07 / Kovachevo	4,281
	Lozen	1,019		
	Zlokuchene	860		
	Vinogradets	1,349	V25_WW_08 / Vinogradets	3,646
	Karabunar	1,481		
	Boshulya	816		

4.3.2. ALTERNATIVES FOR THE SEWERAGE NETWORKS

4.3.2.1. *Management of non-domestic wastewater*

This chapter applies to all types of non-domestic wastewater in urban sewerage. However, it does not take into account industries that discharge their wastewater directly into the receiving body since it falls under the responsibility of the RIEW. The following recommendation concern only industrial enterprises, which discharge their effluents into the wastewater collection system.

The implementation of this Regional Master Plan showed that overall the WSS operators cannot handle the management of such effluents.

The nature and amount of these effluents have a major impact on the management of wastewater collection systems and WWTP. They also have an impact on treated water and sludge, since their quality directly affects potential uses (e.g. agriculture) and their final destination.

Studying each particular case is not foreseen within the framework of the Regional Master Plan; however, a general recommendation can be made. It is important to note that the Bulgarian legislation is not fully in line with the corresponding European Directives. Therefore it is difficult to define specific measures without encountering contradictions between the different regulations.

The Consultant recommends the implementation of a comprehensive study, which may include the following:

- General study at national level:
  - Analysis and review of European legislation
  - Analysis and assessment of the Bulgarian legislation
  - Proposition of amendments
- General principles to implement at the local level:

Establishing a specific contract between the WSS operator and each wastewater sector stakeholders, which may include the following:

  - Descriptions of industrial processes and the nature of the effluent
  - Establishment of a point of continuous flow monitoring with periodic feedback data to the WSS operator and to the corresponding public authorities (municipality, municipal council etc…)
  - Implementation of a tracking point pollution control with periodic feedback data to the WSS operator and to the corresponding public authorities (choice of parameters depending on the nature of the effluent, the minimum COD, BOD_5, total suspended solids, N, P)
  - Discharge permit with a description of the permissible qualitative parameters of the effluent.

Implementation of treatment before discharge to the wastewater collection system with strict monitoring and periodic feedback data to the WSS operator and to the corresponding public authorities, if necessary.

Table 4-50 Industrial enterprises included in the WWTP Pazardzhik

№	Manufacturing enterprise	Type of production	Wastewater quantity Qaverage per day m³/day	Industrial WWTP
1	Ekovita OOD	Processing of fruits and vegetables	22	yes
2	Maritsa Olio	Vegetable oil and shelled seeds	156	yes
3	Optela AD	Metal cutting machines, blocks and details	53.3	There is a project and construction is forthcoming
4	Hlembash Komers 95 AD	Bread and bread products	29.6	no

№	Manufacturing enterprise	Type of production	Wastewater quantity Qaverage per day m³/day	Industrial WWTP
5	Melnitsa Pazardzhik OOD	Grain storage and flour production	3.7	no
6	Fedon OOD	preserved pastry goods	18	yes
7	Ekoinvest EOOD	Recycling of non-metal products	53.3	yes
8	Vintehprom AD	Wine production	34.9	yes
9	Podemstroi Mash Invest EAD	Cranes and metal constructions	17.8	no
10	Maritsa Eko Frouz EAD	Processing of fruits and vegetables, production of cans	26	N/A
	Total		414.6	

The Consultant recommends that the industrial enterprises which have not constructed treatment plants should built their plants aiming at reaching the indicators stated in the pre-accession contract with the WSS operator.

Kauchuk AD – The enterprise has a constructed industrial WWTP and the wastewater treated there is discharged in Pishmanka River.

Elhim – Iskra AD – The enterprise produces lead acid accumulators and accumulator batteries. It has a constructed WWTP for chemically polluted water. After treatment, wastewater is discharged in Pishmanka River.

4.3.2.2. *Defining alternatives*

The alternatives for the solution and the development of a sewerage network may be as follows:

Regarding the selection of the system. For the selection of the system, it is also taken into account that where a sewerage network is constructed as a combined one, it is difficult to convert it into a separate one, as the practice in Bulgaria proves that it continues to function as a combined one although the street sewerage has been reconstructed as a separate one. This is due to the fact that the transformation of the street sewerage into a separate one requires reconstruction of internal building installation in the block of flats, which is quite a capital consuming activity, which is difficult to synchronize under the conditions existing in our country.

Regarding the scheme – solution for sewerage network.

The general goals for improvement of the existing sewerage infrastructure are as follows:

- ✓ Replacement of old sewer pipes having diameter insufficient to convey the expected wastewater flow in order to prevent flooding, potential failures and operation problems.
- ✓ Replacement of sewerage network sections in bad structural condition, with poorly executed parts and built of low quality materials in order to reduce to the minimum

wastewater exfiltration in soil and infiltration of unwanted external water into the network to permissible levels for the network as well as for the wastewater treatment plant operation.

- ✓ Replacement of service connections in poor condition, causing exfiltration/infiltration.
- ✓ Possible future extension of the network for wastewater discharge from the future expansion areas, closing gaps in the system or relieving overloaded sections of the existing network.

As the funds for the measures are limited, the activities necessary to achieve the objectives should be carried out in stages:

Three phases were defined:

- Phase I from 2014 to 2020
- Phase II from 2021 to 2028
- Phase III from 2029 to 2038

4.3.2.3. *Defining the options for the town of Pazardzhik*

As mentioned in Chapter 3, there is a current project with approved funding for the town of Pazardzhik. Currently, a preliminary design is being developed examining both of the options for future development.

Option 1 – it is envisaged that the load on the existing main sewerage collectors will be reduced by the construction of pressure relief chambers, which will transfer the water quantities to the storm water outlet collectors. The pressure relief chambers will be constructed at critical points of the main sewerage collectors so that maximal results can be achieved in the operation of the sewerage network and in order to avoid overloading. The solution is shown in Layout….

Option 2 – the current scheme for the disposal of wastewater, without stormwater outlet collectors to the river, which do not meet the requirements for the minimum elevation of the crest higher than the water level in the river at overflow security of 1%. In this option, the main collectors are resized and the diameters are increased significantly in comparison with the existing ones.

The Consultant for the preliminary design has suggested Option 1, which is more technically and economically efficient and expedient. The suggested Option 1 is approved by Pazardzhik Municipality.

The Consultant recommends that after the implementation of the envisaged measures in the current project, a hydraulic model of the sewerage network should be prepared in order to obtain accurate and complete notion of its functioning. Thus, a clearer picture of the required technical measures for the future operation and development will be obtained.

The envisaged measures that have approved funding are presented in Layout 33. They will resolve the most problematic points of the sewerage network.

- ✓ *The transfer of wastewater from the south industrial zone to the existing SPS "Industrial wastewater" (and urban WWTP): - Main Sewerage Collector 8, Existing sewerage F800 concrete along Sinitevska Street, Main Sewerage Branch 10.*
- ✓ *Garata residential quarter – south from the industrial zone and the railway station, the construction of new sewerage of 2,560 m length is envisaged, SPS Glavinitsa (intended to serve Glavinitsa and Aleko Konstantinovo)*
- ✓ *Construction of sewerage of 3,630 m total length is envisaged in Iztok quarter*
- ✓ *SPS Maritsa is no longer needed. The water is diverted to SPS Spartak, which has the required capacity, the storm water quantities will be removed from it through Main Sewerage Collector 6.2.*
- ✓ *Reducing the load on the Main Collector 6, by means of Pressure relief collectors 1,3 and 7*
- ✓ *It is envisaged that in different locations throughout the town new sewerage will be constructed and different sections will be replaced with total length of 2,615 m*
- ✓ *Reconstruction in the area of Yabalka quarter and Collector 5*
- ✓ *Elimination of all of the unregulated discharges.*

Appendix 4-11 presents the technical specifications of the measures envisaged in the current project. The measures described above will solve the most urgent and important problems in the sewerage network. Regarding the remaining problems, the following investments are envisaged in the investment programme:

Short-term period – Reconstruction of the remaining part of the Main sewerage collectors in their most loaded sections and completion of the pressure relief channels. The table below illustrates the envisaged measures:

Table 4-51 Technical specifications of the measures envisaged in the short-term programme:

№	Type of collector	Diameter [mm]	Length. [m]
I	**Main sewerage collectors**		**17,394**
		315	214
		400	107
		500	637
		600	1,864
		700	831
		800	1,644
		900	2,275
		1,000	2,429
		1,100	1,372
		1,200	1,122
		1,300	1,997
		1,400	976
		1,500	866
		1,600	446
		1,800	614

II	**Stormwater sewerage collectors**		**5,777**
		1,000	30
		1,400	2,305
		1,500	457
		1,600	1,008
		1,800	1,420
		1,900	557
			23,171

Medium-term period – reconstruction and completion of the main sewerage collectors, as well as of parts of the sewerage network in Maritsa residential quarter, Paradaiz residential quarter and Romskata mahala. The envisaged measures are shown in the table below:

Table 4-52 Technical specifications of the measures envisaged in the medium-term investment period

№	Type of collector	Diameter [mm]	Length. [m]
I	**Main sewerage collectors**		**13,168**
		315	283
		400	1,093
		500	1,473
		600	802
		700	1,920
		800	1,653
		900	2,197
		1,000	965
		1,100	545
		1,200	1,291
		1,300	725
		1,400	180
		1,600	41
II	**Secondary sewerage network**		**17,667**
		315	4,059
		400	5,841
		500	3,706
		600	1,737
		700	1,033
		800	643
		900	305
		1,000	242
II	**SPS Spartak-2**		
		5,4x2	1
	Pressure pipeline	DN225	100
			30,835

- *Rehabilitation of the existing pumping stations*

Long-term period envisages reconstruction of the secondary sewerage network in the central part of the town, the closely located to the centre residential quarters and all of the larger collectors of the secondary sewerage network. The envisaged measures are shown in the table below:

Table 4-53 Technical specifications of the measures envisaged in the long-term investment period

№	Type of collector	Diameter [mm]	Length [m]
I	**Secondary sewerage network**		**30,327**
		315	5,467
		400	6,843
		500	8,828
		600	4,664
		700	1,442
		800	1,439
		900	629
		1,000	486
		1,100	353
		1,200	176
			30,327

The above-described measures of the investment programme are illustrated in Layout 33.

4.3.2.4. *Defining the options for the village of Ivaylo*

35% of the sewerage network are constructed and function as a combined one. Part of the wastewater is discharged in the correction of the gully that runs through the settlement and the rest is pumped in the sewerage network of the town of Pazardzhik. The Consultants suggests that the future sewerage network should function as a separate one. The measures for the switching from combined to separate sewerage network are:

- The existing channels with diameters from 300 to 400 receive only domestic wastewater. Removal or switching of the stormwater runoffs from them; construction of stormwater channels.
- The existing channels with diameters from 600 to 800 must receive only rainfall wastewater. For this purpose, channels receiving domestic wastewater are constructed in parallel.

Regarding the short-term period, it is envisaged that the settlement will be covered with sewerage network at 100%, in order to limit the entry of household wastewater in the correction of the gully and its infiltration into the soil. This is aimed at the protection of the catchment Ivaylo, located in the immediate proximity of the settlement.

The table below illustrates the envisaged measure:

Table 4-54 Technical specification of the measures envisaged in the short-term investment programme:

№	Type of collector	Diameter [mm]	Length [m]
1	New sewerage network		11,450
1.1	New routes	300	9,890
1.2	Along the route of the existing stormwater branches	300	1,560

The above-described measures are illustrated in Layout 35.

4.3.2.5. *Defining the options for the town of Septemvri*

As mentioned in Chapter 3, there is a current project with approved funding for the town of Septemvri, which encompasses Yug quarter and Romskiyat Kvartal quarter. The sewerage coverage after the implementation of the project will be 100%.

This project will solve the problematic points of the sewerage network, the wastewater is collected and transferred to the future WWTP Septemvri. The procedure for the selection of construction contractor is forthcoming. The envisaged measures are illustrated in Layout 37.

No investment measures are envisaged in the short-term period.

Medium-term period – reconstruction of the main sewerage collectors, as well as of parts of the secondary sewerage collectors. The table below illustrates the envisaged measures:

Table 4-55 Technical specifications of the measures envisaged in the medium-term investment period

№	Type of collector	Diameter [mm]	Length [m]
I	**Main collectors**		**8,165**
		300	173
		500	255
		600	774
		800	1,195
		1,000	3,881
		1,200	409
		1,400	531
		1,800	522
	Intercepting collector	400	425
II	**Discharge sewers**		**860**
	Discharge sewer	1,800	450
	Discharge sewer	1,400	410
III	**Secondary sewerage network**		**6,983**
		300	2,891
		400	1,927
		500	1,252
		600	555
		800	358
		Total	16,008

Appendix 4-12 presents the technical specifications of the sewerage network after the implementation of the envisaged investment measures.

Long-term period envisages the reconstruction of the remaining part of the main sewerage collectors and the sections of the secondary sewerage network. The envisaged measures are shown in the table below:

Table 4-56 Technical specifications of the measures envisaged in the long-term investment period

№	Type of collector	Diameter [mm]	Length [m]
I	**Main collectors**		**324**
		300	204
		400	120
II	**Secondary sewerage network**		**17,790**
		300	7,500
		400	5,000
		500	2,662
		600	1,469
		800	1,159
		Total	18,114

The above-described measures of the investment programme are illustrated in Layout 37.

4.3.2.6. Defining the options for the agglomerations without sewerage network

The agglomerations on the territory of Pazardzhik Municipality, Septemvri Municipality and Lesichovo Municipality with more than 2,000 PE, served by ViK EOOD Pazardzhik and without sewerage network, are envisaged, pursuant to the Directive, to have sewerage coverage of 90%.

The type of the sewerage system (combined/separate) is to be examined at Feasibility study stage, however due to ecological reasons and the configuration of the terrain (small slopes of the settlements along Maritsa River, difficulties in the realization of the stormwater overflows, which leads to long discharge sewers and shallow bottoms of the receiving bodies (rivers), the Consultant suggests the construction of a separate sewerage system with minimum diameter of ∅300.

The envisaged investment measures presented according to the investment periods and the agglomerations are summarized in the table below:

Table 4-57 Technical specifications of the envisaged measures

№	Type of collector	Diameter.	Length [m]		
		[mm]	Short-term	Medium-term	Long-term
I	**Pazardzhik Cluster (V25 - WW - 1)**				
1	**Glavinitsa**				
	Sewerage network	300	13,662	1,518	
2	**Aleko Konstantinovo**				
	Sewerage network	300	13,822	1,536	
	SPS Aleko Konstantinovo – (1+1) pumps, 15.8 kW each.				
	Pressure pipelines	180	300		
3	**Ognyanonvo**				
	Sewerage network	300	18,338	2,038	

№	Type of collector	Diameter. [mm]	Length [m]		
			Short-term	Medium-term	Long-term
	SPS Ognyanovo – (1+1) pumps, 34 kW each				
	Pressure pipelines	220	4,630		
4	**Golemanovo**				
	Sewerage network	300	7,987		887
	External collector	400	1,800		
5	**Saraya**				
	Sewerage network	300	8,294		922
	External collector	400	1,300		
6	**Dragor**				
	Sewerage network	300	5,756		640
	External collector	400	2,800		
7	**Mokrishte**				
	Sewerage network	300	7,452		828
	SPS Mokrishte– (1+1) pumps, 5.4 kW each				
	Pressure pipeline	120	1,640		
8	**Dobrovnitsa**				
	Sewerage network	300	13,392		1,488
	SPS Dobrovnitsa– (1+1) pumps, 5.4 kW each				
	Pressure pipeline	120	3,400		
9	**Miryantsi**				
	Sewerage network	300	4,860		540
	SPS Miryantsi– (1+1) pumps, 15.4 kW each				
	Pressure pipeline	180	1,700		
10	**Sinitievo**				
	Sewerage network	300	10,568		1,296
	SPS Sinitievo– (1+1) pumps, 7.1 kW each				
	Pressure pipeline	140	2,100		
11	**Hadzhievo**				
	Sewerage network	300	9,828		1,092
	SPS Hadzhievo– (1+1) pumps, 17 kW each				
	Pressure pipeline	110	2,100		
	Total sewerage network		112,640	4,905	7,891
	Total external collectors		5,900		
	Total pressure pipelines		15,870		
II	**Malo Konare Cluster V25 - WW - 2)**				
12	**Malo Konare**				
	Sewerage network	300	42,706	4,745	

№	Type of collector	Diameter. [mm]	Length [m] Short-term	Medium-term	Long-term
	External collector	400	2,300		
13	**Chernogorovo**				
	Sewerage network	300	20,470	2,274	
	External collector	400	2,000		
14	**Pishtingovo**				
	Sewerage network	300	15,120		1,680
	External collector	400	3,500		
15	**Krali Marko**				
	Sewerage network	300	4,061		451
	External collector	400	1,000		
16	**WWTP Malo Konare for 7,783 PE**			**Receiving body – Luda Yana River**	
	Total sewerage network		82,356	7,019	2,131
	Total external collectors		8,800		
III	**Patalenitsa Cluster (V25 - WW - 3)**				
17	Patalenitsa				
	Sewerage network	300	16,263		1,807
	External collector	400	6,200		
18	**Tsrancha**				
	Sewerage network	300	11,016		1,224
	External collector	400	500		
19	**Debrashtitsa**				
	Sewerage network	300	8,748		972
	External collector	400	350		
	WWTP Patalenitsa for 4,409 PE				
	Total sewerage network		36,027		4,003
	Total external collectors		7,050		
IV	**Bratanitsa Cluster (V25 - WW - 4)**				
20	**Bratanitsa**				
	Sewerage network	300	11,098	1,233	
	External collector	400	2,100		
21	**Lyahovo**				
	Sewerage network	300	6,138		682
	External collector	400	750		
22	**Zvanichevo**				
	Sewerage network	300	10,645		1,183
	External collector	400	1,800		
	WWTP Bratanitsa for 4,383 PE			Receiving body – Topolnitsa River	
	Total sewerage network		26,988	1,233	1,766

№	Type of collector	Diameter. [mm]	Length [m]		
			Short-term	Medium-term	Long-term
	Total external collectors		4,650		
V	**Yunatsite Cluster (V25 - WW - 5)**				
23	**Yunatsite**				
	Sewerage network	300	12,420		1,380
	External collector	400	500		
24	**Velichkovo**				
	Sewerage network	300	6,650		1,472
	External collector	400	2,600		
	WWTP Yunatsite for 2,847 PE			Receiving body – Maritsa River	
	Total sewerage network		19,070	0	2,852
	Total external collectors		3,100		
VI	**Septemvri Cluster (V25 - WW - 6)**				
25	**Varvara**				
	Sewerage network	300	17,604	1,956	
	External collector	400	4,809		
26	**Semchinovo**				
	Sewerage network	300	8,388		932
	External collector	400	4,000		
27	**Simeonovets**				
	Sewerage network	300	8,307		923
	External collector	400	2,050		
28	**Vetren Dol**				
	Sewerage network	300	15,210		1,690
	SPS Vetren Dol (1+1) pumps, 22 kW each				
	Pressure pipeline	120	2,280		
	Total sewerage network		54,810	1,956	4,134
	Total external collectors		10,859		
VII	**Kovachevo Cluster (V25 - WW - 7)**				
29	**Kovachevo**				
	Sewerage network	300	14,694	1,633	
	External collector	400	1,700		
30	**Lozen**				
	Sewerage network	300	9,636		1,071
	External collector	400	2,100		
31	**Zlokuchene**				
	Sewerage network	300	3,861		429
	SPS Zlokuchene – (1+1) pumps, 22 kW each				
	Pressure pipeline	120	2,280		

№	Type of collector	Diameter. [mm]	Length [m]		
			Short-term	Medium-term	Long-term
	WWTP Kovachevo for 3,421 PE			Receiving body – Maritsa River	
	Total sewerage network		30,021	1,633	1,703
	Total external collectors		3,800		
	Total pressure pipelines		2,280		
VIII	**Vinogradets Cluster (V25 - WW - 8)**				
32	**Vinogradets**				
	Sewerage network	300	22,113		2,457
	External collector	400	3,000		
33	**Karabunar**				
	Sewerage network	300	17,181		1,909
	External collector	400	1,300		
34	**Boshulya**				
	Sewerage network	300	8,640		960
	External collector	400	2,000		
	WWTP Vinogradets for 3,646 PE			Receiving body – Maritsa River	
	Total sewerage network		50,675	0	5,630
	Total external collectors		6,300		
IX	**Vetren Cluster (V25 - WW - 9)**				
35	**Vetren**				
	Sewerage network	300	17,780	1,975	
	External collector	400	1,000		
	WWTP Vetren for 3,221 PE			Receiving body – Selskoto Dere River	

The number of PE for each WWTP is shown in the table above. The diameters have been determined based on the water quantities defined in Chapter 5, according to the methodology in Chapter 4.1.

5. SOCIO-ECONOMIC PROJECTIONS AND MACROAFFORDABILITY ASSESSMENT

5.1. SOCIO-ECONOMIC PROJECTIONS

5.1.1. MACROECONOMIC FORECASTS

Macro-economic forecasts include relevant projections for gross-domestic product, inflation and unemployment rates at national and regional levels to be used in the financial analysis of selected investment measures. These forecasts are important as they exert significant influence over future operation and maintenance costs of water and wastewater systems, household incomes and affordability constraints. Relevant details for the specific impact and application of each indicator within the framework of water and sewerage investments are provided in its respective section.

Macro-economic projections are based on existing statistical data from official sources (National Statistical Institute, Regional Statistical Bureaus, National settlement register, Eurostat, International Monetary Fund, World Bank, etc.) and international and national guidance and methodological materials (Guidelines for cost benefit analysis of water and wastewater projects supported by the Cohesion fund in 2007-2013). These documents are cited accordingly throughout the report.

<u>Gross Domestic Product</u>

Gross domestic product (GDP) forecasts are indicative of the level of economic development at a certain territorial level (national, regional, local). In addition, real growth of GDP is the main indicator used for income projections[26] and expenditures for salaries and wages within the financial analysis of investment measures. Consequently, as a major driver for household income, GDP growth projections are crucial for determining macro affordability thresholds and therefore for establishing the maximum value of proposed investments in water and wastewater systems and networks.

As indicated in Section 2.3, GDP growth in the country has slowed down considerably since 2009, which was the first time in 10 years with a negative economic growth, caused by the consequences of the global financial and economic crisis. Current annual growth is within the limits of 0.5% to 2.0% and much lower than pre-crisis levels reaching 6%.

The "Guidelines for cost benefit analysis of water and wastewater projects supported by the Cohesion fund in 2007-2013", prepared with the assistance of JASPERS, assumes the following dynamics of real GDP growth over the 2006-2021+ period.

[26] "It is recommended considering household's disposable income growth as equal to GDP growth. As a result, current data collected, split by income decile, will be projected using a growth rate equal to the GDP growth" – "*Guidelines for cost benefit analysis of water and wastewater projects supported by the Cohesion fund in 2007-2013*"

Table 5-1 GDP growth assumptions (% per year), Guidelines for CBA

2006	2007	2008	2009	2010	2011	2012	2013
6.32	6.17	6.5	6.5	6.9	6.4	5.71	5.34
2014	2015	2016	2017	2018	2019	2020	2021 and beyond
5.02	4.67	4.39	4.02	3.74	3.57	3.38	3.3

The Guidelines advise that the assumptions should be used cautiously, making sure that they are consistent with the latest published forecasts. Since the above projections are based on figures before the crisis period, they need to be adjusted in accordance with current trends and economic development scenarios.

Several prominent financial institutions produce short- and medium-term economic forecasts. The International Monetary Fund (IMF) predicts Bulgarian real GDP growth of 0.8% for 2012, 1.5% for 2013 and 4.5% for 2014 (Source: http://www.imf.org/external/pubs/ft/weo/2012/01/pdf/text.pdf , World Economic Outlook 2012). An average growth of 2.7% for the period 2012-16 is expected by the Economist Intelligence Unit (EIU) with 0.7% increase for 2012 (Source: EIU Country Report – Bulgaria, http://country.eiu.com). The World Bank foresees a very modest growth of 0.6% for 2012 and 2.5% and 3.3% for 2013 and 2014 respectively (Source: EU11 Regular Economic Report, June 2012).

Based on the projections of these international financial organisations, the following GDP growth pattern has been established.

Table 5-2 GDP growth assumptions (% per year)

2012	2013	2014	2015	2016	2017	2018	2019	2020 and beyond
1.2	1.9	3.5	4.0	3.3	3.3	3.3	3.3	3.3

In medium-term (5 years), growth will follow the predictions of the World Bank, reaching 3.3% in 2016. Valid long-term GDP forecasts are very difficult to provide keeping in mind the uncertainty in European economic development. For these reasons, we have used the recommendations of the Contracting Authority. They are considered to be realistic and in line with expected EU economic growth.

Inflation

Inflation level forecasts are important for water and wastewater investments for two major reasons: 1) Inflation is used to determine constant and nominal costs and tariffs (e.g. conversion of data from operators' business plans); 2) Some relevant components of cost formation (e.g. fuels, electricity, etc.) might increase or decrease with lower or higher rates than the average inflation rate, which influences cost projections when constant values are used.

These considerations require that inflation forecasts be provided on 2 separate levels – total inflation, represented by the consumer price index and inflation for major cost components, used in water and wastewater investment projects. The differences between these two levels can be used when projecting the various costs for the proposed investment measures.

Average national inflation rate for the last 10 years has been 5.7%, ranging widely from 2.3% (2003) to 12.3% (2008). The last three years of this period (2009-2011) are most relevant, as inflation has stabilised within narrower limits to an average value of 3.1%.

The "Guidelines for cost benefit analysis of water and wastewater projects supported by the Cohesion fund in 2007-2013" assume the following dynamics of inflation rate over the 2006-2021+ period:

Table 5-3 Inflation dynamics assumptions (growth rate per year in %)

2006	2007	2008	2009	2010	2011	2012	2013 and beyond
6.08	11.57	9.24	4.41	5.22	4.07	3.00	2.7

IMF forecasts inflation rate of 2.1% in 2012, 2.3% in 2013 and 2.7% in 2014 (Source: World Economic Outlook Database, April 2012). Average inflation, according to the EIU, will be 2.7%, 2.5% and 3.5% for 2012, 2013 and 2014 respectively.

As the proposed values of inflation within the CBA Guidelines are consistent with the ones proposed by the most recent projections of international financial institutions, they are considered relevant and can be used in the financial analysis of investment alternatives.

Projection of operation and maintenance costs of water and wastewater systems requires prediction of individual inflation rates for the major cost categories – materials, fuels and electricity, and external services. These categories are not identically represented in the consumer price index and the following categories have been used as closest substitutions: non-food products, electricity, liquid fuels and services. The dynamics of these categories over the last 3-year period is presented in Table 5.1.4.

Table 5-4 Inflation dynamics of major cost categories (growth rate per year in %)

	2009	2010	2011	Average	Ratio to total inflation
Total inflation	2.8	2.4	4.2	3.1	
Non-foods (materials)	3.6	6.5	3.5	4.5	1.46
Services (incl. external)	4.8	1.2	1.6	2.5	0.82
Electricity	5.0	-0.8	1.9	2.1	0.67
Liquid fuels	-21.1	19.7	13.5	4.0	1.30

Materials and fuel prices grow at a faster rate compared to average inflation, while electricity and services tend to rise slower than the average inflation. Electricity and fuel prices in Bulgaria are dependent on global commodity prices thus making projections somewhat unreliable, but the existing stable trends provide some assurance to calculations. This reasoning is applied when determining growth assumptions for these major cost categories over the years.

Table 5-5 Inflation dynamics assumptions - cost categories (growth rate per year in %)

	2012	2013 and beyond
Total inflation	3.00	2.70
Non-foods (materials)	2.10	1.80
Services (incl. external)	3.70	3.30
Electricity	4.50	4.00
Liquid fuels	2.30	2.10

Exchange rate

Exchange rate is kept at a constant level of BGN 1.95583 for EUR 1. No recent changes are expected in this aspect. Even if Bulgaria joins the euro zone, the fixed rate will be applied for the conversion. The unlikely event of floating exchange rate would have immediate effect on inflation, which cannot be quantified at the present moment.

Taxation

All direct and indirect taxes (Table 5.1.6) are assumed to remain constant throughout the reference period of the regional master plan. Every change of these taxes (especially indirect taxes) will have immediate and potentially undesirable effect on inflation. If any long-term changes take place, inflation forecasts will need to be revised at least for the year of the change.

Table 5-6 Taxes by categories, 2011

Taxes	Value
Corporate tax	10%
Income tax	10%
Value Added Tax (VAT)	20%
Social security	22.3%
Health insurance	8%

Social security tax has different values depending on the scope of services for the insured persons - pensions, sickness, illness, maternity, etc., and also the year of birth as those born after 1959 have to pay an additional 5% for additional compulsory pension insurance. An average rate is adopted for the country, with employers currently paying about 60% of the contributions due, with a tendency to change this ratio by 2015 to 50% / 50% for the employer and employee respectively.

Unemployment

Unemployment levels have a noteworthy influence in water and wastewater investment projects and particularly on income projections and macro-affordability thresholds. Areas with higher unemployment have lower income and different income structure, relying more on pensions, social benefits and subsistence farming. These characteristics lead to lower affordability thresholds thus hindering large-scale investments.

As indicated in Section 2.3, regional unemployment in Pazardzhik district was 17.2% in 2011, which is higher than the rate for South Central Region (12.7%) and the national average. Despite the efforts of the municipality, the level of unemployment is one of the reasons for population migration and population decrease in the municipality.

NSI data on mechanical growth of population indicates that, on average, 343 people leave the municipality per year and this deteriorates further the negative natural population growth. The municipality is making efforts, in view of the fact that in 2008 migration was only 38 people, but in the years after the crisis started it is not been able to slow down the growth of the negative migration.

For the purpose of forecasting income it is assumed that during the forecast period unemployment will follow national trends and the forecast of income structure is prepared realistically.

5.1.2. Forecast of population growth

Introduction

In 2011 the population in the service area was 144,946 people for the three municipalities. Compared to 2004 the population has decreased by 8%. The scenarios elaborated use strictly official data from national censuses (2001, 2011). No adjustments have been made for possible omissions in the census, as the NSI reports show low levels of uncalculated population.

Consumption of water services by the population in the project area is characterized with a very small but sustainable increase during the last years. There is no strongly expressed seasonality, therefore the average annual amounts, which are necessary for the financial calculations, can be used directly, without adjustment for seasonality. Three scenarios have been developed for the future population of the region– optimistic, realistic and pessimistic. All scenarios use strictly official Census data (2001, 2011). No adjustments have been made for possible undercounts as the reports of NSI indicate low levels of unaccounted people.

The optimistic scenario (lowest negative growth) assumes that population development will follow recent historical trends with respect both to natural and mechanical changes. However, the scenario assumes that the loss of population will be lower than in the other two scenarios. The forecast indicates a trend, which is related to the forecasted Optimistic development of NSI at National and District level until 2060. The methodology describes the links between District, Municipality and each settlement level forecast.

The realistic scenario (slow negative growth) assumes that population development will follow the same historical trends as in the optimistic one, but assumes that the loss of population will be slower, because of the stable age structure, which is now identical to the national average. Migration abroad is also likely to decline, although it still may be expected some internal migration from villages to towns. However, internal migration is a dynamic phenomenon at the regional level which may change dramatically in a very short period. Scenario allows slow but steady regional economic growth, creating opportunities for new jobs and attracting skilled and well-educated young people, supported by favourable regional policies as key conditions for the successful development of the regional economy.

The pessimistic scenario (high negative growth) assumes that population development will follow the same historical trends as in the previous scenario, but assumes that the loss of population will be according to the Pessimistic forecast of NSI for population growth until 2060.

Methodology

Ideally, population projections at regional level need to be prepared by using a cohort-component procedure. Unlike simple extrapolation techniques, such as discounting methods and regression, which project future population without disaggregating it, or identifying the causes for past trends, cohort-component procedures deal separately with the three major components of population change – fertility, mortality and migration. The method is based on the traditional demographic accounting principle:

Population (at the end of the period)	=	Population (at the beginning of the period)	+	Births	-	Deaths	+ / -	Migration

Unfortunately, there is no possibility to establish age-gender cohorts at individual settlement level, because such information is not reported by the national statistics. However, NSI and Eurostat use the cohort-component procedure in the preparation of aggregated forecasts at NUTS III level (districts).

The projection model used by these institutions is characterised by the following features:

- Fertility: age-specific fertility rates applied to the female population; breakdown of births into boys and girls in fixed proportions (51.5% boys, 48.5% girls);
- Mortality: age- and sex-specific death rates applied to population;
- Migration: net migration by age and sex (international and internal migration).

For each of the regional population projections scenarios, assumptions have been formulated in terms of key summary measures for each component of population change. The key summary measures are as follows:

- Fertility: cohort total fertility rate, total fertility rate, mean age at childbearing;
- Mortality: life expectancy at birth, for men and women separately;
- Migration: measuring the intensity of moving to another region.

These key summary measures are subsequently translated into numerical values for each year of the projection period. The regional population projections are conceptually a straightforward generalisation of the national population projections: the only difference is that, while in the national projections the population is just classified by age and sex, in the regional projections there is an additional dimension of population breakdown, namely region of residence.

To ensure full consistency between the national and regional scenario, the regional projection model checks, for each type of event, whether the regional numbers add up to the national number from the national scenario. If not, the regional numbers of events are proportionally adjusted to the national levels.

The results of this procedure are summarised in regional projection tables for each district in three scenarios (pessimistic, realistic and optimistic). Table 5-7 indicates the relevant values for the district in the pessimistic and realistic scenarios and Table 5-8 calculates the annual population changes, which reflect all major demographic components – births, deaths and migration.

Table 5-7 Regional demographic projections 2015 – 2040, number of people

Scenario/District	2011	2015	2020	2025	2030	2035	2040
Pazardzhik District optimistic	275,548	266,534	257,903	249,515	241,396	233,602	226,057
Pazardzhik District realistic	275,548	266,197	256,581	245 915	237,105	227,613	218,343
Pazardzhik District pessimistic	275,548	265,859	255,259	244,118	232,813	221,623	210,628

Source: http://www.nsi.bg/otrasal.php?otr=19

Table 5-8 Projected demographic changes (growth rate per year in %)

Scenario/District	2011	2015	2020	2025	2030	2035	2040
Pazardzhik District optimistic	base	-0.81%	-0.65%	--0.65%	--0.65%	--0.81%	--0.81%
Pazardzhik District realistic	base	--0.81%	--0.69%	--0.71%	--0.79%	--0.82%	--0.81%
Pazardzhik District pessimistic	base	--0.81%	--0.9%	--0.93%	--0.96%	--1.24%	--0.81%

Source: http://www.nsi.bg/otrasal.php?otr=19 and own calculations

In order to account for local level differences, sensitivity coefficients have been obtained at settlement level by deriving a ratio between the 2001-2011 change in population at settlement and district level. These coefficients indicate how individual settlements change demographically with respect to the region and are later used to adjust the above regional projections for each settlement.

$$\text{Sensitivity coefficient at settlement level} = \frac{\text{Yearly change in population (settlement level) 2001-2011}}{\text{Yearly change in population (district level) 2001-2011}}$$

If any obvious inconsistencies (e.g. growth rate much higher or lower than expected) exist between NSI / Eurostat projections and 2011 Census data, these are adjusted to reflect the most recent data. All adjustments are clearly indicated in the report.

Summary results

On the basis of the proposed methodology, the following results have been obtained for population changes in the designated territory of WSSC in the available scenarios. Population decline of 19083 people is envisaged for the designated territory for the realistic scenario at the end of the forecast period and a decline of 8719 people for the optimistic scenario. The decline in the pessimistic scenario is 49126 people.

In the small municipalities Septemvri and Lesichevo population is decreasing at a more rapid rate of about 19.5% for the forecast period and about 11.5% for Pazardzhik municipality.

Table 5-9 Population projections for designated territory at the municipal level

Scenario	Realistic			Optimistic		Pessimistic	
Year	2012	2025	2038	2025	2038	2025	2038
Pazardzhik District	271,227	245,915	219 341	249,515	229,106	244,118	215,293
Pazardzhik Municipality	114,142	106,671	101,066	110,412	109,947	95,626	71,326
Population of the city of Pazardzhik	71,556	66,873	63,358	70,951	70,652	55,257	41,216
Rural population	42,586	39,799	37,707	40,510	39,295	34,410	25,666
Lesichevo Municipality	5,346	4,826	4,305	4,928	4,737	4,822	4,252
Septemvri Municipality	25,498	23,020	20,532	23,506	21,583	22,997	20,282

The realistic scenario will be used as a foundation for all further calculations about future investments in the water and wastewater networks as it is based on assumptions, which are most likely to happen in the service area during the reference period of the Regional master plan. The pessimistic scenario is necessary only for potential risk assessment of proposed investments in order to prove their viability in unfavourable conditions.

Detailed results

The detailed results on settlement level are presented in table 5-10 in descending population order. These are provided for the realistic scenario only, as the numbers are used for determination of future water demand and affordability calculations. At the end of the reference period only the town of Bratsigovo in the served area will have population over 2,000 people.

Table 5-10 Population projections for the designated territory at settlement level

Settlement	2012	2015	2016	2021	2028	2038
Pazardzhik Municipality	114,142	112,262	111,640	108,764	105,203	101,066
Urban population	71,556	70,377	69,987	68,185	65,952	63,358
Rural population	42,586	41,885	41,653	40,580	39,251	37,707
City of Pazardzhik	71,556	70,377	69,987	68,185	65,952	63,358
Village of Aleko Konstantinovo	2,698	2,655	2,640	2,576	2,492	2,394
Village of Apriltsi	523	514	511	498	482	463
Village of Bratanitsa	2,081	2,046	2,035	1,983	1,918	1,842
Village of Velichkovo	1,014	997	992	966	935	898
Village of Gelemenovo	691	680	676	658	637	612
Village of Glavinitsa	2,269	2,231	2,219	2,162	2,091	2,009
Village of Govedare	1,624	1,598	1,589	1,548	1,497	1,438
Village of Debrashtitsa	905	890	885	862	834	801
Village of Dobrovnitsa	1,372	1,349	1,342	1,307	1,264	1,215
Village of Dragor	1,414	1,390	1,383	1,347	1,303	1,252
Village of Zvanichevo	1,888	1,857	1,846	1,799	1,740	1,672
Village of Ivalyko	2,824	2,778	2,762	2,691	2,603	2,501
Village of Krali Marko	189	186	185	180	174	167
Village of Lyahovo	389	382	380	370	358	344

Settlement	2012	2015	2016	2021	2028	2038
Village of Malko Konare	4,327	4,256	4,233	4,124	3,989	3,832
Village of Miryantsi	565	555	552	538	520	500
Village of Mokrishte	1,840	1,810	1,800	1,753	1,696	1,629
Village of Ovchepoltsi	966	950	945	921	891	856
Village of Ognianovo	2,339	2,301	2,288	2,229	2,156	2,071
Village of Patelenitsa	1,221	1,201	1,194	1,163	1,125	1,081
Village of Pishtigovo	1,031	1,014	1,008	982	950	913
Village of Rosen	513	505	502	489	473	454
Village of Saraya	1,348	1,326	1,318	1,285	1,242	1,194
Village of Sbor	248	243	242	236	228	219
Village of Sinitovo	1,939	1,907	1,896	1,847	1,787	1,716
Village of Topoli Dol	266	262	261	254	246	236
Village of Hadzhievo	1,021	1,004	999	973	941	904
Village of Tsar Assen	279	275	273	266	257	247
Village of Tsrancha	1,100	1,082	1,076	1,049	1,014	974
Village of Chernogorovo	2,190	2,154	2,142	2,087	2,019	1,939
Village of Yunatsite	1,513	1,488	1,480	1,442	1,395	1,340
Lesichevo Municipality	**5,346**	**5,222**	**5,173**	**4,980**	**4,692**	**4,305**
Urban population						
Rural population	*5,346*	*5,222*	*5,173*	*4,980*	*4,692*	*4,305*
Village of Borimechkovo	562	549	544	524	494	453
Village of Dinkata	1,151	1,124	1,113	1,072	1,010	927
Village of Kalugerovo	1,151	1,124	1,113	1,072	1,010	927
Village of Lesichovo	819	800	792	762	718	659
Village of Pamidovo	374	365	362	348	328	301
Village of Tserovo	901	880	871	839	790	725
Village of Sharkovo	389	380	377	363	342	314
Septemvri Municipality	**25,498**	**24,907**	**24,674**	**23,751**	**22,380**	**20,532**
Urban population	10,963	10,709	10,609	10,212	9,622	8,828
Rural population	14,535	14,198	14,066	13,539	12,758	11,705
Town of Vetren	**3,184**	**3,110**	**3,081**	**2,966**	**2,795**	**2,564**
Town of Septemvri	**7,779**	**7,598**	**7,527**	**7,246**	**6,828**	**6,264**
Village of Boshulya	807	788	781	751	708	650
Village of Varvara	2,037	1,990	1,972	1,898	1,788	1,641
Village of Vetren Dol	1,435	1,402	1,389	1,337	1,260	1,156
Village of Vinogradets	1,464	1,430	1,417	1,364	1,285	1,179
Village of Gorno Varshilo	42	41	40	39	36	33
Village of Dolno Varshilo	5	5	5	5	4	4
Village of Zlokuchene	850	830	823	792	746	685
Village of Karabunar	1,334	1,303	1,290	1,242	1,170	1,074
Village of Kovachevo	2,374	2,319	2,298	2,212	2,084	1,912
Village of Lozen	1,007	984	975	938	884	811
Village of Semchinovo	1,921	1,876	1,859	1,789	1,686	1,547
Village of Simeonovest	888	867	859	827	779	715
Village of Slavovitsa	372	363	360	346	326	299

The proposed population projections should not be considered as precise forecasts. They show the probable demographic development on the basis of justified and realistic assumptions about fertility, mortality, migration, economic development and unified methodology for regional predictions, applicable across the EU.

5.1.3. FORECAST OF BUSINESS DEVELOPMENT

Business development of the region is the subject of strategic documents such as the Municipal Development Plan 2007-2013 of Pazardzhik Municipality, the Development Strategy 2005-2015 of Pazardzhik District and the updated document for implementation of the strategy for development of Pazardshik District for the period 2011-2013. These documents analyse various industries and sectors and their prospects for development. They also define the medium-term objectives and priorities of the government policy for regional development of the district/municipality, as well as its compliance with the other structural policies.

Septemvri Municipality has available official data on the Strategy and Municipal Development Plan of the municipality for the period 2007-2013. Both documents point out to the fact that the poor quality of water services is one of the obstacles for a better development of the region. The program for the implementation of the Development Plan outlines measures for improvement of the water supply and sewerage infrastructure; however, they have never been implemented and are subject to investments planned in this document.

Lesichevo Municipality has available Municipal Development Plan 2007-2013, which correctly reports the not very optimistic forecast for the development of the business in the region and that objectivity is maintained in the forecasts of the consumption of water services and population growth.

This document (regional master plan for water supply and sewerage) considers business development only for the purpose of proper planning of the development of infrastructure, providing access of the business to water services.

The method for determining business growth and forecasting business development is based on available data for local budget revenue of the respective municipality. It measures the business activity in the area of the municipality, because it reflects indirectly the level of property and non-property taxes paid as well as the development of the economy as a whole. On the other hand, the Regional Master Plan considers business development for the purpose of determining the need for development of the infrastructure providing access to water services and the development of the water consumption of the business consumers.

From this point of view, economic growth in the municipality can be horizontal, i.e. there are no new subjects, however the existing ones are expanding and respectively generating higher revenue in the municipal budget. This development gives an idea of the level of consumption of existing commercial customers and could explain the reduction in their consumption or a certain growth that does not involve new investments and could be analysed based on analysed consumed quantities consumed and the methodology used to estimate the consumption of water services.

The official data presented by Pazardzhik Municipality is presented in the following table:

Table 5-11 Revenue growth in Pazardzhik Municipality

Indicator	2009	2010	2011
Total revenue, BNG million	59.04	53.26	54.98
Total revenue, EUR million	30.187	27.231	28.111
Average annual real growth of revenue for the period		-9.79%	3.23%
Local revenue, BGN million	21.5	20.19	20.5
Local revenue, EUR million	10.993	10.323	10.481
Local revenue growth		-6.09%	1.54%

**Source: Reports on the implementation of the budgets of Pazardzhik Municipality*

The data indicate that the municipality maintains a sustainable level of its own revenues, despite the fact that the reporting period covers only crisis years. The decrease in the total revenues is almost entirely due to the reduced revenues from the central budget.

Table 5-12 Revenue growth in Lesichevo Municipality

Indicator	2007	2008	2009	2010	2011	2012*
Total revenue, BNG million	4.081	4.226	4.817	3.635	3.654	5.447
Total revenue, EUR million	2.087	2.161	2.463	1.859	1.868	2.785
Average annual real growth of revenue for the period		3.55%	13.98%	-24.54%	0.52%	49.07%
Local revenue, BGN million	0.79	1.002	1.206	0.759	0.842	1.08
Local revenue, EUR million	0.404	0.512	0.617	0.388	0.431	0.552
Local revenue growth		26.84%	20.36%	-37.06%	10.94%	28.27%

The results indicate that Lesichevo Municipality has a stable trend of the local revenues, except for the year 2010. A significant growth is observed until 2009, which changes rapidly in 2010. Because the data cover the period of influence of the economic crisis, we can make the assumption that the rate may be slightly more optimistic, i.e. there won't be any negative average revenue growth but rather a slight positive growth.. Since local tax revenue is an indication of the development of business in the territory of a municipality, the conclusion is that no rapid development is expected, which is taken into account in the estimated consumption of water services by the industry.

Septemvri Municipality has not provided any official data and there is no such data available from other sources, therefore the conclusions for its development are based only on the reference documents listed above.

Regarding the projections of the consumption of water services, a significant influence is exerted by the municipal plans in terms of business development in new territories that need additional infrastructure for water supply and waste water.

In this regard, on the one hand, in the context of the revised document for the implementation of the Strategy for Development of Pazardzhik Municipality, a general strategic objective is formulated for providing rapid and sustainable economic growth and achieving an average annual increase in GDP by 8% up to the national average. To achieve this objective, priorities have been defined to create a more favorable environment for the development of the industry, high-tech manufacturing and biotechnology, to make tourism one of the leading sectors of the regional economy, to improve the competitiveness of agricultural production, to ensure balanced and multi-functional use of forest resources and the forest fund, to introduce cost-effective and environmentally friendly models for the production of freshwater fish and aquatic animals, and to use rationally ores, rocks, minerals, clay and inert materials. The implementation of the above mentioned priorities will be achieved through the implementation of a series of measures directly related to them. Some of these are directly related to the economic development and include the following: creation of joint ventures for direct export orientation, development of biotechnology industries based on the existing potential, development of private family hotels, development of transport and technical infrastructure designed to service the tourism, development of alternative forms of tourism, construction of a new tourist center in the area, creation of new plantations, rehabilitation and construction of new irrigation facilities, increase of the area of forest plantations, setting up of enterprises for the processing of fish etc.

On the other hand, at local level, the Municipal Development Plan of Pazardzhik Municipality has formulated the following priorities for economic development: "Development of industrial production - branch structure of the municipal economy." The implementation includes as sub-priorities the development of small and medium-size enterprises, the creation of regional clusters and networks, and tourism development.

The goal of development of small and medium-size enterprises will be achieved through the creation of a regional business center for training and services, development of a business incubator, a center of excellence and high-tech park, implementation of measures to encourage investment and promote the launch of new businesses.

The creation of regional clusters will be done through the creation of consulting centers and units, the implementation of training programs and qualification, establishment of networks of scientific and technical departments providing services to clusters.

Tourism development will be achieved through provision of support for the cultural, spiritual, hunting, scientific and ecotourism. This will be achieved through the implementation of measures for the restoration and conservation of the cultural and historical heritage, the construction of cultural and tourist center, reconstruction and modernization of the sports facilities in Pazardzhik - stadiums, gyms, playgrounds for active sports. Of particular importance will be the construction and organization of new sites for hunting, cultural, rural and ecotourism, development of recreation and appropriate development of the supporting technical and social infrastructure.

The main direction of development of Lesichevo municipality includes the development of agriculture and the food industry.

Septemvri municipality also places priority on agriculture and food industry as leading branches on its territory, but also includes the development of tourism in the area.

Pazardzhik municipality will not implement investment projects under Priority Axis 1 of OP "Environment 2007-2013", despite the fact that it has been approved as a beneficiary under procedure BG161PO005/10/1.11/03/19 "Preparation and implementation of projects for improving and developing infrastructure for potable water and wastewater in agglomerations with over 10,000 PE" with the project DIR-51011119-16-35 "Extension of WWTP for removal of biogenic elements for nitrogen and phosphorus, rehabilitation and extension of water supply and sewerage network of the city of Pazardzhik" with a grant in the amount of BGN 49,822,725. The status of the project is "on hold" and its implementation will not start during the current programming period.

Pazardzhik municipality will not implement investment projects under Priority Axis 2 of OP "Environment 2007-2013" either, despite the preparation and preliminary consultations with the Ministry of Environment and Water on the project "Regional system for waste management - Pazardzhik region" whose total investment implementation costs are expected to amount to BGN 35,013,618. The reason is that the financial resources under priority axis 2 of OP "Environment 2007-2013" /OPE/ are exhausted. Some funding is envisaged for Pazardzhik region by PUDOOS for the construction of a landfill for waste discharge, adjoining infrastructure and treatment plant. Application for funding for the envisaged facilities for waste treatment will start from the new programming period of OP "Environment 2014-2020". It will be necessary to renegotiate the conditions to be met by applicants, which will be announced in early 2014. Respectively it will be necessary to prepare, process and compile the necessary documentation.

The more significant and active projects in the municipality in 2013 are implemented mainly by the use of grants: under OP "Regional Development" 2007 – 2013 of MRDPW (European Regional Development Fund) – project "Reinforcement of the riverbed of Telki Dere River and prevention of the risk of flooding in the village of Gelemenovo", "Building three centers of a mixed type and one protected house in Pazardzhik Municipality", "Sustainable Integrated Development of the city of Pazardzhik - development of an integrated plan for urban restoration and development", etc., under OP "Technical Assistance" (ERDF) – project "Construction and operation of a regional information center in Pazardzhik municipality", under the Program for rural Development 2007-2013 (European Agricultural Fund for rural Development), and a number of projects funded by OP "Human Resources Development" (European Social Fund) and OP "Administrative capacity" 2007-2013, where Pazardzhik municipality is a beneficiary or partner.

5.1.4. FORECAST OF HOUSEHOLD INCOME

Introduction

Income projections have a central role in the planning of future water and wastewater systems as they are the basis for macro-affordability assessments and are determinative of the maximum value of investments. In addition, incomes are important for the overall attractiveness of the region and influence directly internal in-migration.

Household income projections are dependent on the current household income levels and the predicted economic growth of the region. The “Guidelines for cost benefit analysis of water and wastewater projects supported by the Cohesion fund in 2007-2013” provide the following definition: “It is recommended considering household’s disposable income growth as equal to GDP growth. As a result, current data collected, split by income decile, will be projected using a growth rate equal to the GDP growth”. The proposed approach is adopted in the regional master plan and included as part of the applied methodology.

Methodology

The average household income in the designated territory is determined at district level. The following approximation procedure has been applied to derive a common income value:

- Determination of the average household income level in 2011 for Pazardzhik District;
- Establishment of income projections for the district using real GDP growth, indicated in Table 5-2 Identical GDP growth rates have been used for all districts and the analyses have demonstrated no significant differences at regional and national level;
- Projected income is distributed in decile groups on the basis of NSI reported distribution statistics;
- Income per capita is calculated on the basis of 2.7 people per household throughout the whole reference period, despite the observed historical tendency for smaller households. This indicator is relatively stable and changes are slow and insignificant.
- The average income of the population in the service area of the Water Operator is determined based on the ratio of urban / rural population, where the income of the rural population is decreased to 80% of the average income.

Summary results

Forecasts for household income within the designated territory are presented in the table below Real income is projected to increase up to BGN 21,402 by 2038, but will still be below the national average of BGN 22,531.

Table 5-13 Household income projections, BGN/year

Average household income	2011	2015	2020	2025	2030	2038
Bulgaria	9,587	11,029	13,302	15,647	18,404	22,531
Pazardzhik District	8,599	9,892	11,930	14,033	16,507	21,402
Service area of ViK Pazardzhik	7,867	8,732	10,271	12,082	14,211	18,426

Projected income in the project area is additionally split into decile groups on the basis of income distribution statistics at national level (Section 2.3). Although income of the lower three deciles is likely to evolve at a slower pace than the average income, which is indexed fully to GDP growth, existing statistical data do not provide such justification[27]. Consequently, real GDP growth is used for the projections across all income deciles.

Table 5-14 Income distribution in decile groups for the service area BGN/year

Nr of Decile group	% of average	2011	2015	2020	2025	2030	2038
1	39.0%	3,070	3,407	4,008	4,714	5,545	7,190
2	57.9%	4,554	5,055	5,946	6,994	8,227	10,667
3	61.8%	4,858	5,393	6,344	7,462	8,777	11,380
4	69.5%	5,466	6,067	7,136	8,394	9,874	12,802
5	76.4%	6,009	6,670	7,846	9,229	10,856	14,076
6	90.2%	7,098	8,925	10,765	12,662	14,894	19,311

[27] Only 2-year time-series exist at the present moment (2009-2010) and income changes appear to be random across deciles. No correlation can be isolated for such a short time period. In addition time-series are both in the pre-crisis and crisis periods, making them incomparable.

Nr of Decile group	% of average	2011	2015	2020	2025	2030	2038
7	104.4%	8,209	10,322	12,449	14,644	17,225	22,333
8	120.7%	9,491	11,934	14,394	16,931	19,915	25,822
9	138.8%	10,920	13,730	16,561	19,480	22,913	29,709
10	205.5%	16,168	20,330	24,521	28,843	33,926	43,988

The data for household income by delice group and the average income for the first three decile groups is used in determining the social affordability of tariffs presented in section 5.4.

5.2. WATER DEMAND PROJECTIONS

This subchapter gives the result of the water demand projections carried out on the territory of ViK EOOD – Pazardzhik in liquidation. It is based on information and methodologies described in previous chapters:

- First, the current situation concerning the water demand in the considered area, which is described in Chapter 3.
- Second, the methodology to establish the projections and the assumptions made which are presented in section 4.1.1.

5.2.1. SUMMARY OF WATER DEMAND PROJECTION AT THE WSSC LEVEL

Based on the existing situation presented in Chapter 3, and based on the socio economic projections carried-out in chapter 5.1, water demand projections are carried out for the years 2016 (first year of operation for investments implemented in the short-term program), 2021 (beginning of the medium-term program), 2029 (beginning of the long-term program) and 2038 (end of the long-term program).

The table presented below is a summary of the water demand projection at the WSSC territory level. It is therefore an aggregation of the data for the 54 settlements serviced by the WSSC.

Table 5-15 Water demand projection at the WSSC level

WSSC Code: V25

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	147,659	143,094	139,022	133,801	127,132
1.1	*Permanent*	number	146,434	141,869	137,797	132,576	125,907
1.2	*Temporary*	number	1,225	1,225	1,225	1,225	1,225
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	147,659	143,094	139,022	133,801	127,132
4	Specific Domestic Consumption	l/c/d	96	101	105	111	120
5	Domestic Water Demand	m^3 / year	5,057,645	5,154,977	5,255,387	5,388,966	5,568,382
6	Non-Domestic Water Demand	m^3 / year	1,152,079	1,221,204	1,278,055	1,324,111	1,404,709

N°	Parameters	Unit	2011	2016	2021	2028	2038
7	Total Water Demand excluding NRW	m³ / year	6,209,724	6,376,180	6,533,442	6,713,077	6,973,091
8	Non-Revenue Water (NRW)	m³ / year	10,504,436	5,845,223	3,474,667	3,057,812	2,318,627
9	NRW percentage	% of 10	63%	49%	34%	31%	25%
10	**Total Water Demand (including NRW)**	**m³ / year**	**16,714,160**	**12,221,403**	**10,008,109**	**9,770,889**	**9,291,718**

Notes:

1. For the years 2011 and 2016 the data includes the quantities for the village of Akandzhievo because it is currently receiving water from ViK EOOD Pazardzhik in liquidation. It is envisaged that during the period 2016-2021 the necessary pipelines and facilities will be built for water supply of the village of Akandzhievo from ViK Belovo EOOD and therefore the data for the remaining years (2021, 2028 and 2038) don't' include the quantities for the village of Akandzhievo.

2. The village of Dolno Varshilo (located in the municipality of Septemvri) is not served by ViK EOOD Pazardzhik in liquidation and there is no data.

5.2.2. WATER DEMAND PROJECTION AT WATER SUPPLY ZONE LEVEL

Using the same principle as the one used to prepare the detailed water demand projection for the whole WSSC territory, detailed water demand projections are carried out for each settlement with over 2000 inhabitants. The results of those projections for the respective twelve settlements on the territory of ViK EOOD Pazardzhik in liquidation are presented in the tables below.

Table 5-16 Water demand projection for the city of Pazardzhik

Code of the Water Supply Zone: V25_WS_101

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	71,979	69,987	68,185	65,952	63,358
1.1	*Permanent*	number	71,979	69,987	68,185	65,952	63,358
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	71,979	69,987	68,185	65,952	63,358
4	Specific Domestic Consumption	l/c/d	94	99	104	111	120
5	Domestic Water Demand	m³ / year	2,481,483	2,533,665	2,586,173	2,660,921	2,775,080
6	Non-Domestic Water Demand	m³ / year	736,639	780,837	817,669	847,135	898,700
7	Total Water Demand excluding NRW	m³ / year	3,218,122	3,314,502	3,403,842	3,508,056	3,673,780
8	Non-Revenue Water (NRW)	m³ / year	4,644,116	2,943,327	1,832,838	1,613,194	1,224,593
9	NRW percentage	% of 10	59%	47%	35%	32%	25%

N°	Parameters	Unit	2011	2016	2021	2028	2038
10	**Total Water Demand (including NRW)**	m^3 / year	**7,862,238**	**6,257,829**	**5,236,680**	**5,121,250**	**4,898,373**

Table 5-17 Water demand projection for the village of Aleko Konstantinovo

Code of the Water Supply Zone: V25_WS_113

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,714	2,640	2,576	2,492	2,394
1.1	*Permanent*	number	2,714	2,640	2,576	2,492	2,394
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	2,714	2,640	2,576	2,492	2,394
4	Specific Domestic Consumption	l/c/d	73	81	90	102	120
5	Domestic Water Demand	m³ / year	72,065	78,532	84,856	93,231	104,857
6	Non-Domestic Water Demand	m³ / year	8,852	9,383	9,826	10,180	10,799
7	Total Water Demand excluding NRW	m³ / year	80,917	87,915	94,681	103,411	115,657
8	Non-Revenue Water (NRW)	m³ / year	111,859	76,451	50,982	47,554	38,552
9	NRW percentage	% of 10	58%	47%	35%	32%	25%
10	**Total Water Demand (including NRW)**	m³ / year	**192,776**	**164,366**	**145,663**	**150,965**	**154,209**

Table 5-18 Water demand projection for the village of Bratanitsa

Code of the Water Supply Zone: V25_WS_111

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,093	2,035	1,983	1,918	1,842
1.1	*Permanent*	number	2,093	2,035	1,983	1,918	1,842
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	2,093	2,035	1,983	1,918	1,842
4	Specific Domestic Consumption	l/c/d	76	84	92	104	120
5	Domestic Water Demand	m³ / year	58,083	62,521	66,817	72,608	80,680
6	Non-Domestic Water Demand	m³ / year	2,940	3,116	3,263	3,381	3,587
7	Total Water Demand excluding NRW	m³ / year	61,023	65,638	70,081	75,989	84,266
8	Non-Revenue Water (NRW)	m³ / year	127,544	69,196	37,736	34,944	28,089
9	NRW percentage	% of 10	68%	51%	35%	32%	25%
10	**Total Water Demand (including NRW)**	m³ / year	**188,567**	**134,833**	**107,817**	**110,932**	**112,355**

Table 5-19 Water demand projection for the village of Chernogorovo

Code of the Water Supply Zone: V25_WS_103

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,203	2,142	2,087	2,019	1,939
1.1	*Permanent*	number	2,203	2,142	2,087	2,019	1,939
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	2,203	2,142	2,087	2,019	1,939
4	Specific Domestic Consumption	l/c/d	88	94	100	108	120
5	Domestic Water Demand	m³ / year	70,783	73,452	76,076	79,706	84,928
6	Non-Domestic Water Demand	m³ / year	6,138	6,506	6,813	7,059	7,488
7	Total Water Demand excluding NRW	m³ / year	76,921	79,958	82,889	86,765	92,417
8	Non-Revenue Water (NRW)	m³ / year	147,799	81,200	44,633	39,899	30,806
9	NRW percentage	% of 10	66%	50%	35%	32%	25%
10	**Total Water Demand (including NRW)**	m³ / year	**224,720**	**161,158**	**127,522**	**126,664**	**123,222**

Table 5-20 Water demand projection for the village of Glavinitsa

Code of the Water Supply Zone: V25_WS_101

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,282	2,219	2,162	2,091	2,009
1.1	*Permanent*	number	2,282	2,219	2,162	2,091	2,009
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	2,282	2,219	2,162	2,091	2,009
4	Specific Domestic Consumption	l/c/d	89	95	101	109	120
5	Domestic Water Demand	m³ / year	74,189	76,780	79,328	82,843	87,994
6	Non-Domestic Water Demand	m³ / year	76,564	81,158	84,986	88,049	93,408
7	Total Water Demand excluding NRW	m³ / year	150,753	157,938	164,314	170,891	181,402
8	Non-Revenue Water (NRW)	m³ / year	217,554	140,251	88,477	78,585	60,467
9	NRW percentage	% of 10	59%	47%	35%	32%	25%
10	**Total Water Demand (including NRW)**	m³ / year	**368,307**	**298,189**	**252,790**	**249,476**	**241,870**

Table 5-21 Water demand projection for the village of Ivaylo

Code of the Water Supply Zone: V25_WS_101

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,841	2,762	2,691	2,603	2,501
1.1	*Permanent*	number	2,841	2,762	2,691	2,603	2,501
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	2,841	2,762	2,691	2,603	2,501
4	Specific Domestic Consumption	l/c/d	96	100	105	111	120
5	Domestic Water Demand	m³ / year	99,099	100,905	102,755	105,414	109,544
6	Non-Domestic Water Demand	m³ / year	8,569	9,083	9,512	9,854	10,454
7	Total Water Demand excluding NRW	m³ / year	107,668	109,988	112,267	115,268	119,998
8	Non-Revenue Water (NRW)	m³ / year	155,377	97,671	60,451	53,006	39,999
9	NRW percentage	% of 10	59%	47%	35%	32%	25%
10	**Total Water Demand (including NRW)**	m³ / year	**263,045**	**207,659**	**172,718**	**168,274**	**159,997**

Table 5-22 Water demand projection for the village of Malo Konare

Code of the Water Supply Zone: V25_WS_102

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	4,353	4,233	4,124	3,989	3,832
1.1	*Permanent*	number	4,353	4,233	4,124	3,989	3,832
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	4,353	4,233	4,124	3,989	3,832
4	Specific Domestic Consumption	l/c/d	87	93	99	108	120
5	Domestic Water Demand	m³ / year	137,493	143,277	148,916	156,673	167,842
6	Non-Domestic Water Demand	m³ / year	9,630	10,208	10,689	11,075	11,749
7	Total Water Demand excluding NRW	m³ / year	147,123	153,485	159,605	167,747	179,590
8	Non-Revenue Water (NRW)	m³ / year	120,399	102,335	85,941	77,139	59,863
9	NRW percentage	% of 10	45%	40%	35%	32%	25%
10	**Total Water Demand (including NRW)**	m³ / year	**267,522**	**255,820**	**245,546**	**244,887**	**239,454**

Table 5-23 Water demand projection for the village of Ognyanovo

Code of the Water Supply Zone: V25_WS_116

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,353	2,288	2,229	2,156	2,071
1.1	*Permanent*	number	2,353	2,288	2,229	2,156	2,071
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	2,353	2,288	2,229	2,156	2,071
4	Specific Domestic Consumption	l/c/d	103	106	109	114	120
5	Domestic Water Demand	m³ / year	88,526	88,698	88,961	89,500	90,710
6	Non-Domestic Water Demand	m³ / year	61,805	65,513	68,604	71,076	75,402
7	Total Water Demand excluding NRW	m³ / year	150,331	154,211	157,564	160,576	166,112
8	Non-Revenue Water (NRW)	m³ / year	150,322	113,979	84,842	73,841	55,371
9	NRW percentage	% of 10	50%	42%	35%	32%	25%
10	**Total Water Demand (including NRW)**	m³ / year	**300,653**	**268,190**	**242,406**	**234,417**	**221,483**

Table 5-24 Water demand projection for the town of Septemvri

Code of the Water Supply Zone: V25_WS_502

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	7,869	7,527	7,246	6,828	6,264
1.1	*Permanent*	number	7,869	7,527	7,246	6,828	6,264
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	7,869	7,527	7,246	6,828	6,264
4	Specific Domestic Consumption	l/c/d	98	102	106	112	120
5	Domestic Water Demand	m³ / year	281,466	280,427	280,735	278,757	274,363
6	Non-Domestic Water Demand	m³ / year	43,287	45,884	48,049	49,780	52,810
7	Total Water Demand excluding NRW	m³ / year	324,753	326,312	328,783	328,537	327,173
8	Non-Revenue Water (NRW)	m³ / year	489,614	295,958	177,037	151,079	109,058
9	NRW percentage	% of 10	60%	48%	35%	32%	25%
10	**Total Water Demand (including NRW)**	m³ / year	**814,367**	**622,269**	**505,821**	**479,616**	**436,231**

Table 5-25 Water demand projection for the town of Vetren

Code of the Water Supply Zone: V25_WS_501

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	3,221	3,081	2,966	2,795	2,564
1.1	*Permanent*	number	3,221	3,081	2,966	2,795	2,564
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	3,221	3,081	2,966	2,795	2,564
4	Specific Domestic Consumption	l/c/d	92	97	102	110	120
5	Domestic Water Demand	m³ / year	108,250	109,360	110,877	111,870	112,303
6	Non-Domestic Water Demand	m³ / year	12,445	13,192	13,814	14,312	15,183
7	Total Water Demand excluding NRW	m³ / year	120,695	122,552	124,691	126,182	127,486
8	Non-Revenue Water (NRW)	m³ / year	433,099	159,845	67,141	58,025	42,495
9	NRW percentage	% of 10	78%	57%	35%	32%	25%
10	**Total Water Demand (including NRW)**	m³ / year	**553,794**	**282,397**	**191,832**	**184,207**	**169,981**

Table 5-26 Water demand projection for the village of Kovachevo

Code of the Water Supply Zone: V25_WS_504

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,402	2,298	2,212	2,084	1,912
1.1	*Permanent*	number	2,402	2,298	2,212	2,084	1,912
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	2,402	2,298	2,212	2,084	1,912
4	Specific Domestic Consumption	l/c/d	78	86	94	104	120
5	Domestic Water Demand	m³ / year	68,512	72,047	75,609	79,488	83,746
6	Non-Domestic Water Demand	m³ / year	3,616	3,833	4,014	4,158	4,412
7	Total Water Demand excluding NRW	m³ / year	72,128	75,880	79,622	83,646	88,157
8	Non-Revenue Water (NRW)	m³ / year	60,349	51,173	42,874	38,465	29,386
9	NRW percentage	% of 10	46%	40%	35%	32%	25%
10	**Total Water Demand (including NRW)**	m³ / year	**132,477**	**127,053**	**122,496**	**122,111**	**117,543**

Table 5-27 Water demand projection for the town of Varvara

Code of the Water Supply Zone: V25_WS_505

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,061	1,972	1,898	1,788	1,641
1.1	*Permanent*	number	2,061	1,972	1,898	1,788	1,641
1.2	*Temporary*	number	0	0	0	0	0
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	2,061	1,972	1,898	1,788	1,641
4	Specific Domestic Consumption	l/c/d	95	100	104	111	120
5	Domestic Water Demand	m³ / year	71,481	71,724	72,237	72,277	71,876
6	Non-Domestic Water Demand	m³ / year	7,356	7,797	8,165	8,459	8,974
7	Total Water Demand excluding NRW	m³ / year	78,837	79,521	80,402	80,736	80,850
8	Non-Revenue Water (NRW)	m³ / year	429,570	118,030	43,293	37,127	26,950
9	NRW percentage	% of 10	84%	60%	35%	32%	25%
10	**Total Water Demand (including NRW)**	m³ / year	**508,407**	**197,552**	**123,695**	**117,863**	**107,800**

The water demand forecast for all settlements on the territory of ViK EOOD Pazardzhik in liquidation with less than 2000 inhabitants is presented in the table below. In this case, this is a summary of the data for all 54 settlements on the territory of the Water Operator.

Table 5-28 Water demand projection for settlements with population below 2000 inhabitants

WSSC Code: V25

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	41,288	39,910	38,663	37,086	34,805
1.1	*Permanent*	number	40,063	38,685	37,438	35,861	33,580
1.2	*Temporary*	number	1,225	1,225	1,225	1,225	1,225
2	Water Supply Connection rate	% of total	100%	100%	100%	100%	100%
3	Population Served	number	41,288	39,910	38,663	37,086	34,805
4	Specific Domestic Consumption	l/c/d	98	102	106	112	120
5	Domestic Water Demand	m³ / year	1,446,215	1,463,588	1,482,048	1,505,679	1,524,459
6	Non-Domestic Water Demand	m³ / year	174,238	184,692	192,652	199,594	211,743
7	Total Water Demand excluding NRW	m³ / year	1,620,453	1,648,280	1,674,700	1,705,273	1,736,202
8	Non-Revenue Water (NRW)	m³ / year	3,416,835	1,595,808	858,422	754,954	572,998
9	NRW percentage	% of 10	64%	49%	34%	31%	25%

N°	Parameters	Unit	2011	2016	2021	2028	2038
10	**Total Water Demand (including NRW)**	**м³ / year**	**5,037,288**	**3,244,089**	**2,533,122**	**2,460,227**	**2,309,200**

Notes:

1. For the years 2011 and 2016 the data includes the quantities for the village of Akandzhievo because it is currently receiving water from ViK EOOD Pazardzhik in liquidation. It is envisaged that during the period 2016-2021 the necessary pipelines and facilities will be built for water supply of the village of Akandzhievo from ViK Belovo EOOD and therefore the data for the remaining years (2021, 2028 and 2038) don't' include the quantities for the village of Akandzhievo.

2. The village of Dolno Varshilo (located in the municipality of Septemvri) is not served by ViK EOOD Pazardzhik in liquidation and there is no data.

5.3. Projected wastewater flow

This subchapter gives the result of the wastewater flow projections carried out on the territory of ViK EOOD Pazardzhik. It is based on information and methodologies described in previous chapters:

- First, the current situation concerning wastewater flow in the considered area, which is described in Chapter 3.
- Second, the methodology to establish the projections and the assumptions made which are presented in section 4.1.1.

In accordance with the Terms of Reference, the pollution load rate is set at 60 grams of BOD_5 per person per day. The "Population Equivalent (PE_{60})" of a settlement is therefore the ratio of the pollution load (BOD_5) produced at the settlement level in one year to the individual pollution load produced by one person in the same time.

5.3.1. Summary of wastewater flow projection at the WSSC level

Based on the existing situation presented in Chapter 3, and based on the socio-economic projections carried out in chapter 5.1, wastewater flow projections are carried out for the years 2016 (first year of operation for investments implemented in the short-term program), 2021 (beginning of the medium-term program), 2028 (beginning of the long-term program) and 2038 (end of the long-term program).

The table presented below is a summary of the wastewater flow projection at the WSSC territory level. It is therefore an aggregation of the data for all 54 settlements served by the water operator.

Table 5-29 Wastewater flow projections at the WSSC level

WSSC Code: V25

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	147,239	142,709	139,022	133,801	127,132
1.1.	Permanent	number	146,014	141,484	137,797	132,576	125,907
1.2.	Temporary	number	1,225	1,225	1,225	1,225	1,225
2	Wastewater connection rate	% of total	52%	55%	86%	86%	100%
3	Population served	number	77,237	78,071	120,214	114,575	127,132
4	Domestic wastewater	m^3 / year	2,411,542	2,556,457	4,072,676	4,147,374	5,011,543
5	Non-Domestic wastewater	m^3 / year	680,566	747,851	1,061,339	1,102,018	1,264,238
6	Total wastewater generated	m^3 / year	3,092,108	3,304,308	5,134,016	5,249,392	6,275,782
7	Infiltration	m^3 / year	2,911,460	2,241,979	2,007,137	1,617,964	1,392,228
8	Infiltration percentage	% of 9	48%	40%	28%	24%	18%
9	**Total wastewater collected**	**m^3 / year**	6,003,568	5,546,287	7,141,152	6,867,356	7,668,010
10	Actual pollution load collected (Population Equivalent)	PE_{60}	83,452	84,900	129,906	124,639	138,678
11	Potential pollution load generated (Population Equivalent)	PE_{60}	153,454	149,539	148,715	143,865	138,678

Note: The village of Dolno Varshilo (located on the territory of Septemvri municipality) is not served by ViK EOOD Pazardzhik in liquidation and there is no data available for it.

5.3.2. WASTEWATER FLOW PROJECTION AT THE AGGLOMERATION LEVEL

Using the same model as the wastewater flow projection for the whole WSSC territory, detailed wastewater flow projections are carried out for each agglomeration (above 2,000 P.E.). The results of those projections for all 12 agglomerations on the territory of ViK EOOD Pazardzhik in liquidation are presented in the tables below.

Table 5-30 Wastewater flow projection for Aleko Konstantinovo agglomeration

Agglomeration Code: BGAG00254_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,714	2,640	2,576	2,492	2,394
1.1.	Permanent	number	2,714	2,640	2,576	2,492	2,394
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	0%	0%	90%	100%	100%
3	Population served	number	0	0	2,318	2,492	2,394

N°	Parameters	Unit	2011	2016	2021	2028	2038
4	Domestic wastewater	m³ / year	0	0	68,733	83,908	94,371
5	Non-Domestic wastewater	m³ / year	0	0	7,959	9,162	9,719
6	Total wastewater generated	m³ / year	0	0	76,692	93,070	104,091
7	Infiltration	m³ / year	0	0	4,036	8,293	18,369
8	Infiltration percentage	% of 9	0%	0%	5%	8%	15%
9	**Total wastewater collected**	**m³ / year**	0	0	80,728	101,363	122,460
10	Actual pollution load collected (Population Equivalent)	PE_{60}	0	0	2,391	2,576	2,483
11	Potential pollution load generated (Population Equivalent)	PE_{60}	2,714	2,640	2,649	2,576	2,483

Table 5-31 Wastewater flow projection for Bratanitsa agglomeration

Agglomeration Code: BGAG06149_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,093	2,035	1,983	1,918	1,842
1.1.	Permanent	number	2,093	2,035	1,983	1,918	1,842
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	0%	0%	90%	100%	100%
3	Population served	number	0	0	1,785	1,918	1,842
4	Domestic wastewater	m³ / year	0	0	54,122	65,347	72,612
5	Non-Domestic wastewater	m³ / year	0	0	2,643	3,043	3,228
6	Total wastewater generated	m³ / year	0	0	56,765	68,390	75,840
7	Infiltration	m³ / year	0	0	2,988	6,094	13,383
8	Infiltration percentage	% of 9	0%	0%	5%	8%	15%
9	**Total wastewater collected**	**m³ / year**	0	0	59,753	74,484	89,223
10	Actual pollution load collected (Population Equivalent)	PE_{60}	0	0	1,809	1,946	1,871
11	Potential pollution load generated (Population Equivalent)	PE_{60}	2,093	2,035	2,007	1,946	1,871

Table 5-32 Wastewater flow projection for Chernogorovo agglomerationAgglomeration Code: BGAG81089_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,203	2,142	2,087	2,019	1,939
1.1.	Permanent	number	2,203	2,142	2,087	2,019	1,939
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	0%	0%	90%	100%	100%
3	Population served	number	0	0	1,878	2,019	1,939
4	Domestic wastewater	m³ / year	0	0	61,622	71,735	76,435
5	Non-Domestic wastewater	m³ / year	0	0	5,519	6,353	6,740
6	Total wastewater generated	m³ / year	0	0	67,140	78,088	83,175

N°	Parameters	Unit	2011	2016	2021	2028	2038
7	Infiltration	m³ / year	0	0	3,534	6,958	14,678
8	Infiltration percentage	% of 9	0%	0%	5%	8%	15%
9	**Total wastewater collected**	**m³ / year**	0	0	70,674	85,046	97,853
10	Actual pollution load collected (Population Equivalent)	PE_{60}	0	0	1,929	2,077	2,001
11	Potential pollution load generated (Population Equivalent)	PE_{60}	2,203	2,142	2,137	2,077	2,001

Table 5-33 Wastewater flow projection for Glavnitsa agglomeration

Agglomeration Code: BGAG15028_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,282	2,219	2,162	2,091	2,009
1.1.	Permanent	number	2,282	2,219	2,162	2,091	2,009
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	0%	0%	90%	100%	100%
3	Population served	number	0	0	1,946	2,091	2,009
4	Domestic wastewater	m³ / year	0	0	64,255	74,558	79,195
5	Non-Domestic wastewater	m³ / year	0	0	68,839	79,244	84,067
6	Total wastewater generated	m³ / year	0	0	133,094	153,802	163,262
7	Infiltration	m³ / year	0	0	7,005	13,705	28,811
8	Infiltration percentage	% of 9	0%	0%	5%	8%	15%
9	**Total wastewater collected**	**m³ / year**	0	0	140,099	167,507	192,073
10	Actual pollution load collected (Population Equivalent)	PE_{60}	0	0	2,574	2,815	2,777
11	Potential pollution load generated (Population Equivalent)	PE_{60}	2,282	2,219	2,791	2,815	2,777

Table 5-34 Wastewater flow projection for Ivaylo agglomeration

Agglomeration Code: BGAG15028_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,841	2,762	2,691	2,603	2,501
1.1.	Permanent	number	2,841	2,762	2,691	2,603	2,501
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	35%	35%	90%	95%	100%
3	Population served	number	994	967	2,422	2,473	2,501
4	Domestic wastewater	m³ / year	31,216	31,785	83,232	90,129	98,589
5	Non-Domestic wastewater	m³ / year	2,699	2,861	7,704	8,425	9,409
6	Total wastewater generated	m³ / year	33,915	34,646	90,936	98,554	107,998
7	Infiltration	m³ / year	43,165	44,095	22,734	24,639	27,000
8	Infiltration percentage	% of 9	56%	56%	20%	20%	20%
9	**Total wastewater**	**m³ / year**	77,081	78,741	113,670	123,193	134,998

N°	Parameters	Unit	2011	2016	2021	2028	2038
	collected						
10	Actual pollution load collected (Population Equivalent)	PE_{60}	1,019	993	2,492	2,550	2,587
11	Potential pollution load generated (Population Equivalent)	PE_{60}	2,866	2,788	2,761	2,680	2,587

Table 5-35 Wastewater flow projection for Malo Konare agglomeration

Agglomeration Code: BGAG46749_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	4,353	4,233	4,124	3,989	3,832
1.1.	Permanent	number	4,353	4,233	4,124	3,989	3,832
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	0%	0%	90%	100%	100%
3	Population served	number	0	0	3,712	3,989	3,832
4	Domestic wastewater	m³ / year	0	0	120,622	141,006	151,057
5	Non-Domestic wastewater	m³ / year	0	0	8,658	9,967	10,574
6	Total wastewater generated	m³ / year	0	0	129,280	150,973	161,631
7	Infiltration	m³ / year	0	0	6,804	13,453	28,523
8	Infiltration percentage	% of 9	0%	0%	5%	8%	15%
9	**Total wastewater collected**	**m³ / year**	0	0	136,084	164,426	190,154
10	Actual pollution load collected (Population Equivalent)	PE_{60}	0	0	3,791	4,080	3,929
11	Potential pollution load generated (Population Equivalent)	PE_{60}	4,353	4,233	4,203	4,080	3,929

Table 5-36 Wastewater flow projection for Ognyanovo agglomeration

Agglomeration Code: BGAG53335_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,353	2,288	2,229	2,156	2,071
1.1.	Permanent	number	2,353	2,288	2,229	2,156	2,071
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	0%	0%	90%	100%	100%
3	Population served	number	0	0	2,006	2,156	2,071
4	Domestic wastewater	m³ / year	0	0	72,058	80,550	81,639
5	Non-Domestic wastewater	m³ / year	0	0	55,569	63,968	67,862
6	Total wastewater generated	m³ / year	0	0	127,627	144,518	149,501
7	Infiltration	m³ / year	0	0	6,717	12,878	26,382
8	Infiltration percentage	% of 9	0%	0%	5%	8%	15%
9	**Total wastewater**	**m³ /**	0	0	134,344	157,396	175,883

N°	Parameters	Unit	2011	2016	2021	2028	2038
	collected	**year**					
10	Actual pollution load collected (Population Equivalent)	PE_{60}	0	0	2,514	2,740	2,691
11	Potential pollution load generated (Population Equivalent)	PE_{60}	2,353	2,288	2,736	2,740	2,691

Table 5-37 Wastewater flow projection for Pazardzhik agglomeration

Agglomeration Code: BGAG55155_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	71,979	69,987	68,185	65,952	63,358
1.1.	Permanent	number	71,979	69,987	68,185	65,952	63,358
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	95%	98%	100%	100%	100%
3	Population served	number	68,380	68,587	68,185	65,952	63,358
4	Domestic wastewater	m³ / year	2,121,668	2,234,692	2,327,556	2,394,829	2,497,572
5	Non-Domestic wastewater	m³ / year	629,826	688,699	735,902	762,421	808,830
6	Total wastewater generated	m³ / year	2,751,495	2,923,391	3,063,458	3,157,251	3,306,402
7	Infiltration	m³ / year	2,539,841	1,948,927	1,682,745	1,295,282	826,600
8	Infiltration percentage	% of 9	48%	40%	35%	29%	20%
9	**Total wastewater collected**	**m³ / year**	5,291,336	4,872,318	4,746,203	4,452,533	4,133,002
10	Actual pollution load collected (Population Equivalent)	PE_{60}	74,132	74,877	74,906	72,915	70,745
11	Potential pollution load generated (Population Equivalent)	PE_{60}	77,731	76,276	74,906	72,915	70,745

Table 5-38 Wastewater flow projection for Kovachevo agglomeration

Agglomeration Code: BGAG37491_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,402	2,298	2,212	2,084	1,912
1.1.	Permanent	number	2,402	2,298	2,212	2,084	1,912
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	0%	0%	90%	100%	100%
3	Population served	number	0	0	1,991	2,084	1,912
4	Domestic wastewater	m³ / year	0	0	61,243	71,539	75,371
5	Non-Domestic wastewater	m³ / year	0	0	3,251	3,743	3,970
6	Total wastewater generated	m³ / year	0	0	64,494	75,281	79,341
7	Infiltration	m³ / year	0	0	3,394	6,708	14,001
8	Infiltration percentage	% of 9	0%	0%	5%	8%	15%
9	**Total wastewater**	**m³ /**	0	0	67,888	81,990	93,343

	collected	**year**					
10	Actual pollution load collected (Population Equivalent)	PE_{60}	0	0	2,020	2,118	1,948
11	Potential pollution load generated (Population Equivalent)	PE_{60}	2,402	2,298	2,242	2,118	1,948

Table 5-39 Wastewater flow projection for Septemvri agglomeration

Agglomeration Code: BGAG66264_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	7,869	7,527	7,246	6,828	6,264
1.1.	Permanent	number	7,869	7,527	7,246	6,828	6,264
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	87%	100%	100%	100%	100%
3	Population served	number	6,846	7,527	7,246	6,828	6,264
4	Domestic wastewater	m³ / year	220,388	252,385	252,661	250,881	246,927
5	Non-Domestic wastewater	m³ / year	33,894	41,296	43,244	44,802	47,529
6	Total wastewater generated	m³ / year	254,282	293,681	295,905	295,683	294,456
7	Infiltration	m³ / year	275,472	195,787	162,539	121,306	73,614
8	Infiltration percentage	% of 9	52%	40%	35%	29%	20%
9	**Total wastewater collected**	**m³ / year**	529,753	489,468	458,445	416,989	368,070
10	Actual pollution load collected (Population Equivalent)	PE_{60}	7,156	7,904	7,641	7,237	6,698
11	Potential pollution load generated (Population Equivalent)	PE_{60}	8,179	7,904	7,641	7,237	6,698

Table 5-40 Wastewater flow projection for Varvara agglomeration

Agglomeration Code: BGAG10104_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	2,061	1,972	1,898	1,788	1,641
1.1.	Permanent	number	2,061	1,972	1,898	1,788	1,641
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	0%	0%	90%	100%	100%
3	Population served	number	0	0	1,708	1,788	1,641
4	Domestic wastewater	m³ / year	0	0	58,512	65,049	64,688
5	Non-Domestic wastewater	m³ / year	0	0	6,614	7,613	8,077
6	Total wastewater generated	m³ / year	0	0	65,126	72,662	72,765
7	Infiltration	m³ / year	0	0	3,428	6,475	12,841
8	Infiltration percentage	% of 9	0%	0%	5%	8%	15%
9	**Total wastewater collected**	**m³ / year**	0	0	68,553	79,137	85,606

10	Actual pollution load collected (Population Equivalent)	PE_{60}	0	0	1,769	1,858	1,715
11	Potential pollution load generated (Population Equivalent)	PE_{60}	2,061	1,972	1,958	1,858	1,715

Table 5-41 Wastewater flow projection for Vetren agglomeration

Agglomeration Code: BGAG10820_00

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	3,221	3,081	2,966	2,795	2,564
1.1.	Permanent	number	3,221	3,081	2,966	2,795	2,564
1.2.	Temporary	number	0	0	0	0	0
2	Wastewater connection rate	% of total	0%	0%	90%	100%	100%
3	Population served	number	0	0	2,669	2,795	2,564
4	Domestic wastewater	m³ / year	0	0	89,810	100,683	101,073
5	Non-Domestic wastewater	m³ / year	0	0	11,189	12,881	13,665
6	Total wastewater generated	m³ / year	0	0	100,999	113,564	114,737
7	Infiltration	m³ / year	0	0	5,316	10,120	20,248
8	Infiltration percentage	% of 9	0%	0%	5%	8%	15%
9	**Total wastewater collected**	**m³ / year**	0	0	106,315	123,683	134,985
10	Actual pollution load collected (Population Equivalent)	PE_{60}	0	0	2,772	2,913	2,689
11	Potential pollution load generated (Population Equivalent)	PE_{60}	3,221	3,081	3,068	2,913	2,689

The wastewater flow forecast for all settlements with less than 2000 inhabitants on the service territory served by the water operator is presented in the table below. In this case, this is a summary of the data for all 54 served by the Water Operator.

Table 5-42 Wastewater flow projection for settlements with less than 2000 inhabitants

WSSC Code: V25

N°	Parameters	Unit	2011	2016	2021	2028	2038
1	Population	number	40,868	39,525	38,663	37,086	34,805
1.1.	Permanent	number	39,643	38,300	37,438	35,861	33,580
1.2.	Temporary	number	1,225	1,225	1,225	1,225	1,225
2	Wastewater connection rate	% of total	2%	3%	58%	49%	100%
3	Population served	number	1,016	990	22,348	17,990	34,805
4	Domestic wastewater	m³ / year	38,270	37,595	758,250	657,160	1,372,013
5	Non-Domestic wastewater	m³ / year	14,147	14,996	104,248	90,396	190,569
6	Total wastewater generated	m³ / year	52,416	52,591	862,498	747,556	1,562,582

N°	Parameters	Unit	2011	2016	2021	2028	2038
7	Infiltration	m³ / year	52,982	53,169	95,897	92,053	287,777
8	Infiltration percentage	% of 9	50%	50%	10%	11%	16%
9	**Total wastewater collected**	**m³ / year**	105,399	105,760	958,395	839,609	1,850,359
10	Actual pollution load collected (Population Equivalent)	PE_{60}	1,145	1,127	23,300	18,815	36,545
11	Potential pollution load generated (Population Equivalent)	PE_{60}	40,997	39,662	39,615	37,912	36,545

5.3.3. SUMMARY OF DESIGN WASTEWATER FLOW AND LOAD

For all the agglomeration above 2000 inhabitants, the year with the highest “total wastewater collected” is defined as the “*design year wastewater flow*”. It is selected among the milestones 2011, 2016, 2021, 2028 and 2038. Similarly, the year with the highest “actual pollution load collected” is defined as the “*design year pollution load*”.

Following the results of the option analysis presented in Chapter 4, a Wastewater Zone (WWZ) is defined as a group of agglomerations/settlements discharging wastewater to the same WWTP. The parameters for each agglomeration as well as the aggregated data for each wastewater zone (if any) are presented in the table below.

Table 5-43 Summary of Design wastewater flow and load

WSSC Code: V25						
Aggl / WWZ Code*	Agglomerations/ Wastewater Zones**	Design year wastewater flow	Average daily dry weather flow	Design year pollution load BOD5	Pollution load during the design year	Maximum pollution load
-	-	-	m^3/day	-	kg/day	PE_{60}
55155_00	Pazardzhik	2011	14,497	2011	4,664	77,731
00254_00	Aleko Konstantinovo	2038	336	2011	163	2,714
15028_00	Glavinitsa	2038	526	2011	137	2,282
32010_00	Ivaylo	2038	370	2011	172	2,866
53335_00	Ognyanovo	2038	482	2028	164	2,740
	Golemenovo	2038	144	2038	48	799
	Saraya	2038	158	2011	81	1,356
	Dragor	2038	162	2011	85	1,422
	Mokrishte	2038	215	2011	111	1,851
	Dobrovnitsa	2038	161	2011	83	1,380
	Miryantsi	2021	91	2011	36	592
	Sinitovo	2028	247	2011	117	1,954
	Hadzhievo	2038	123	2011	62	1,027
V25-WW-1	Pazardzhik			2011	5,893	98,223
46749_00	Malo Konare	2038	521	2011	261	4,353
81089_00	Chernogorovo	2038	268	2011	132	2,203

WSSC Code: V25						
Aggl / WWZ Code*	Agglomerations/ Wastewater Zones**	Design year wastewater flow	Average daily dry weather flow	Design year pollution load BOD5	Pollution load during the design year	Maximum pollution load
-	-	-	m^3/day	-	kg/day	PE_{60}
	Pishtigovo	2038	126	2011	62	1,037
	Krali Marko	2038	22	2011	11	190
V25-WW-2	Malko Konare			2011	467	7,783
	Patalenitsa	2038	216	2011	100	1,670
	Tsrancha	2038	170	2011	79	1,314
	Debrashtitsa	2038	161	2011	64	1,065
V25-WW-3	Patalenitsa			2011	243	4,049
6149_00	Bratanitsa	2038	244	2011	126	2,093
	Lyahovo	2038	45	2011	23	391
	Zvanichevo	2038	221	2011	114	1,899
V25-WW-4	Bratanitsa			2011	263	4,383
	Yunatsite	2038	200	2011	91	1,522
	Velichkovo	2021	237	2011	74	1,235
V25-WW-5	Yunatsite			2011	165	2,757
66264_00	Septemvri	2011	1,451	2016	474	7,904
10104_00	Varvara	2038	235	2016	118	1,972
	Vetren Dol	2038	370	2016	83	1,389
	Semchinovo	2038	213	2016	112	1,859
	Simeonovets	2038	106	2016	49	823
V25-WW-6	Septemvri			2016	837	13,947
37491_00	Kovachevo	2038	256	2011	144	2,402
	Lozen	2038	119	2011	61	1,019
	Zlokuchene	2038	95	2011	52	860
V25-WW-7	Kovachevo			2011	257	4,281
	Vinogradets	2038	159	2011	81	1,349
	Karabunar	2038	147	2011	89	1,481
	Boshulya	2038	86	2011	49	816
V25-WW-8	Vinogradets			2011	219	3,646
V25-WW-9 / 10820_00	Vetren	2038	370	2011	193	3,221

*In its complete form, the agglomeration code is BGAG_10104_00, BGAG_66264_00. The WWZ Code is: V25-WW-1, V25-WW-2, etc.

**The name of the wastewater zone corresponds to the largest agglomeration/settlement and the connected agglomerations/settlements are given in brackets.

5.4. MACRO AFFORDABILITY ASSESSMENT

5.4.1. AFFORDABLE TARIFFS AND PRICES

Macro-affordability assessment is required in order to determine the viability of proposed investments in water and wastewater systems and to establish realistic limits on the maximum investment values. Macro-affordability is dependent on multiple variables – type and timing of investments, projected operation and maintenance costs, established and expected depreciation policies, sources of financing for the investment (loans, grants, etc.). All these components are integral part of tariff formation and thus influence affordability. Affordability calculations are only applied to domestic consumption as industrial consumers are able to calculate any water tariffs in their products or services cost formation.

The calculation of maximum tariffs uses the following major assumptions:

- Actual projected domestic water consumption is used throughout the period instead of legislative requirements for minimal consumption of 2.8 m^3 per member of households. In most of the cases, actual water demand is higher than the artificial threshold and thus the approach does not contradict with legislative requirements;
- Affordability constraint is established on the basis of expected income growth throughout the reference period and the real increase in GDP is used to determine income levels;
- As indicated by statistical data, household size is relatively stable for the last decade and is kept at a constant level of 2.7 people per household;
- Affordable tariffs are calculated in two scenarios (at 4% of the average and the first three decile groups household income).

Table 5-44 Affordability thresholds and prices

Indicators	2015	2020	2025	2030	2035	2038
Household size in the WSSC territory	2.70	2.70	2.70	2.70	2.70	2.70
Projected water consumption, m3/capita/month	2.98	3.17	3.37	3.57	3.65	3.65
Average household income, WSSC Pazardzhik, EUR (constant 2011 values)	4,465	5,252	6,177	7,266	8,547	9,421
Maximum affordable price per m3 (4% of the average income of the poorest three decile groups), EUR	0.94	1.05	1.16	1.29	1.48	1.63

Based on the data in chapter 5.1.4 concerning the level of affordability for the population in the served area and the relations found between all consumers groups, an assessment of the investments was prepared.

ViK EOOD Pazardzhik in liquidation applies a uniform tariff for households and industry, both for water supply and for sewerage, not applying a coefficient for the degree of pollution. There is a differentiated tariff only for treatment, which takes into account the degree of pollution by the industry.

An assumption has been made for the whole forecast period that the tariff covers all operating and maintenance costs. The differences in the new investments are related to the different percentage of depreciation included in the operating costs.

Industry's consumption of water services is 19.06% for water and 36.73% for sewerage. These figures show that the biggest consumer group is the population and its development will have the most significant influence on the forecasted level of investment affordability.

In the next chapter, the necessary investments will be compared with the financial opportunities for payment and based on this analysis decisions will be taken on the sources of funding.

5.4.2. EXISTING REVENUE AND EXPENDITURE

According to the official records of ViK EOOD Pazardzhik in liquidation for the quantities and revenues from the provision of water services in 2011[28], the revenue from invoiced amounts was BGN 6.827 million (EUR 3.490 million).

Detailed presentation of the operating expenses for 2011 is provided in the table below, using official data from the approved business plan of the Company:

Table 5-45 Operating revenue and expenditure, EUR thousand

Category	2011
Operating Expenses	
Materials, incl.:	888.11
…. electricity	620.20
…..chemicals	80.27
External services	596.68
Remunerations	516.92
Social security contributions	266.38
Others	887.09
Current maintenance	608.95
Depreciation	260.25
Total expenses	4024.38
Operating revenue – incl. financing	4229.61
Profit/Loss	205.23

It is evident from the data that the company has generated a small profit, which is almost entirely due to the revenue from financing and other services, not to the balanced operating revenue and expenses.

Reported depreciation is EUR 260.25 thousand in 2011. No depreciation is added for the newly acquired assets for WWTP because they are owned by the municipality. According to the Business Plan of the Company, an analysis could be made that new depreciable assets were acquired in the previous period and the financing was provided specifically for them.

[28] The last reporting period for which the company has provided official information.

Maintenance costs are reported separately in the business plan of the company and are about 15% of the total expenses.

Costs are expected to remain relatively constant if no investment activities are implemented ("without the project" scenario) in the short run (next 5 years). Costs in current prices will increase due to the projected inflation but no significant changes are expected in constant 2011 prices. One notable exception is the cost for personnel, which will be influenced by real GDP growth. Fuel and electricity prices might increase with higher rates as compared to inflation given the trends observed in the first half of 2012 but historical data do not provide sufficient evidence for such an assumption.

5.4.3. AFFORDABLE INVESTMENT PROGRAMS

Calculations of affordability are made for the proposed investment program for the reference period of 28 years. The recommended investment program is discussed in detail in Section 6 of the Regional Master Plan and includes all possible measures for the water sector in the area of ViK EOOD Pazardzhik - in liquidation, however they need to be compared with the affordability criterion. The standard unit prices, together with the criteria for prioritization and the total investment costs for each program are described in Section 4 of the Regional Master Plan. The investment elements, for which affordability is examined, are described in detail in the above sections.

The short-term investment program is focused on the completion of the sewerage distribution network, in view of the level of connection to sewerage in the served area, and respectively the completion of the main collectors to take wastewater to the existing WWTP.

Affordability estimates require the establishment of incremental operation and maintenance costs that will influence tariff formation and the ability-to-pay for water and wastewater services. Incremental operation and maintenance costs are calculated on the basis of the assumptions, listed in detail in Chapter 4, while a summary is provided below:

- Water supply – annual maintenance and operation costs as follows: Equipment and machinery (3% of construction costs). Water mains (0.15%). Distribution network (0.5%). Civil works (0.5%). Electricity (0.11 €/kWh);
- Wastewater discharge – annual maintenance and operation costs as follows: Equipment and machinery (3% of construction costs). Main collectors (0.20%). Secondary sewerage network (0.6%). Civil works (0.6%). Electricity (0.11 €/kWh);
- Wastewater treatment plants – annual maintenance and operation costs of 4.5% (all inclusive).

In addition, the following distribution of construction investment costs has been assumed in order to derive a realistic estimate of incremental operation and maintenance costs.

Table 5-46 Distribution of construction investment costs

	Pipes	Civil works	Mechanical and electrical
Wells	-	70%	30%
DWTP	-	55%	45%
Water mains	100%	-	-

	Pipes	Civil works	Mechanical and electrical
Distribution networks	100%	-	-
Reservoirs and tanks	-	85%	15%
Pumping stations	-	60%	40%
WWTP	-	55%	45%
Mains collectors	100%	-	-
Sewerage network	100%	-	-
WW Pumping station	-	60%	40%

The methodology of affordability calculations involves several subsequent steps as follows:

- Determination of the maximum possible revenues given the projected consumption and the upper limit of tariffs in the different scenarios. This calculation does not include level of revenue collection as water operators are not allowed to account for this category when proposing tariffs in front of the Regulatory body. Revenues from institutional and industrial clients are also included in order to fully simulate the income cash flow within the operator despite the fact that they are not affected by affordability calculations

- Projections for the existing operation and maintenance costs and depreciations ("without the project" scenario). After a statistical analysis for price changes against the average inflation, all operation and maintenance costs are held at their current level in constant 2011 prices except for personnel costs which increase in line with the real GDP growth;

- Projections for the incremental costs of new investments ("with the project" scenario) for each of the investment periods. The above assumptions have been used to calculate operation and maintenance costs for new investments. Due to the larger share of investments in water supply systems in the medium- and long-term, existing costs have been reduced because of efficiency improvements and reduction of losses;

- Projections for the incremental depreciations as a result of the new investments ("with the project" scenario) for each of the investment periods. The following assumptions have been used: 50 years useful life for pipes; 45 years useful life for civil works; 10 years useful life for mechanical and electrical equipment. 30 years useful life for all other infrastructure elements. All assets which reach the end of their useful life are replaced and depreciations are calculated on the replacement value. Different scenarios can be assumed for depreciations – equal depreciations for each of the years in the reference period, increasing depreciations, partial depreciations (as required by the rules of current Operational Programme). Linear depreciation is used for the territory of Pazardzhik.

- Accounting for the sources of financing – EU and national grant funding, municipal co-financing, loans from national or international financing institutions. Only one scenario is calculated - 100% grant, because neither the operator nor the municipalities have any financial ability to repay loans.

- Determining the difference between overall revenues and overall operation and maintenance costs (without including depreciation for the new assets). In case the difference is a positive number, investments are considered affordable as the operator will generate enough revenues from affordable tariffs to cover all operation and maintenance costs (including replacement of assets with shorter life span). If the established difference is negative, then investments are not affordable and an investment limit is provided for each of the periods.

- The extent of possible coverage of depreciation is the final step in determining the affordability, if there is such possibility, i.e. if investments are affordable without the inclusion of depreciation for new assets. The total amount of all necessary expenses for depreciation is compared with the difference between total revenue and total costs. This ratio indicates the degree of inclusion of depreciation that can be covered by the affordable level of income set at 4% threshold of the average income of the first three decile groups.

In all cases, the investment is considered affordable if the revenues generated at the proposed tariffs are sufficient to cover full O&M costs, partial depreciations (at least 50%) and 10% of project co-financing.

The maximum possible revenues are indicated below. All presented information takes into account the actual water consumption on the basis of declining population and projected income trends.

Table 5-47 Maximum level of revenues at the affordability thresholds

Revenue item	2016	2021	2028	2038
Domestic revenues at tariffs set to 4% of the average income of the first three decile groups, EUR	4,068,964	4,497,368	5,197,021	6,877,117
Public and industrial revenues at tariffs set to 4% of the average income of the first three decile groups, EUR	1,363,477	1,557,828	1,880,633	2,476,332
Total revenues at tariffs set to 4% of the average income of the first three decile groups, EUR	5,432,441	6,055,196	7,077,654	9,353,449

Existing operation and maintenance costs are calculated on the basis of the historical figures from 2010 and analysed and corrected data from the Business Plan of the company. The table below is indicative of the situation in which no investments will be implemented for the reference period ("without the project" scenario).

Table 5-48 Current and projected O&M costs ("without-the-project" scenario). EUR th.

Type of cost	2016	2021	2028	2038
Materials, including	888.11	888.11	888.11	888.11
Electricity	620.20	620.20	620.20	620.20
Chemicals	80.27	80.27	80.27	80.27
External services	596.68	596.68	596.68	596.68
Salaries	585.69	688.92	864.71	1,158.18
Social security	295.57	345.89	434.16	581.50
Other costs	887.09	799.15	799.15	799.15
Current maintenance	608.95	608.95	608.95	608.95
Depreciation	260.25	260.25	260.25	260.25
Total O&M cost	**4,122.34**	**4,187.95**	**4,452.01**	**4,892.81**

Incremental O&M costs are calculated for the new investment. In practice, these are newly arising costs, which accumulate over the current costs presented in the previous table and they together should be covered by the new tariffs for the services. In the affordability analysis of the investment we examine the possible degree of coverage of these total costs. CAPEX depreciation costs include only incremental depreciations resulting only from new investments and do not account for existing depreciations. Existing depreciations, including on-going investments, are equal and included in both "without the project"and "with the project"scenarios. Periodic maintenance costs are calculated in the operating costs on the basis of the assumptions listed in Chapter 4 of the Regional Master Plan.

Table 5-49 Incremental O&M ("with the project" scenario), EUR

Type of cost	2016	2021	2028	2038
Incremental O&M Cost	0	812,468	963,229	1,146,926
Incremental CAPEX - depreciation (100%)	0	7,476,648	9,410,057	11,155,496

Regarding depreciation, we have calculated the ability of the water operator to cover all or part of its value. The amount of incremental depreciation is compared to the difference between total revenues and total costs but without including depreciation for the new assets. The ratio between these two values is the percentage of possible coverage of depreciation costs for new assets by the generated revenues, using a 4% threshold of the income of the first three decile groups.

Table 5-50 Determining the level of coverage of incremental depreciation costs

Indicators	2016	2021	2028	2038
Total revenue – Total costs (excluding depreciation for the new assets)	1,912,795	1,566,653	2,171,967	3,761,454
Ability to cover incremental depreciation, in %		21.0%	23.1%	33.7%

Partial loan financing can be considered as a separate scenario. However, currently we have elaborated only one scenario – full grant financing. The ground for this is provided by the analysis of ViK EOOD Pazardzhik, which is in unstable financial position and, since it is in liquidation, is not able to repay loans. Despite the stable own revenue of Pazardzhik municipality, it also could not afford to pay back any more loans for liabilities undertaken under other projects. Moreover, it should provide funds for Lesichevo municipality, which does not have the opportunity to repay loans. Septemvri municipality has not provided data on its budget, however based on the assumption that the situation is similar, we conclude that grant financing is the most plausible option for the implementation of the investment programs. Of course, before the beginning of each program, detailed and updated analysis of the options for repayment of loans should be developed on a project-by-project basis.

It has to be noted that the assumption of using municipal loan payments in tariff formation is not realistic at the current moment because it does not represent an expenditure of the water company and consequently it cannot be justified before the Regulatory authority.

We can conclude from these results that all investment programs are affordable for financing, if including an annual average of 22.0% of the full amount of depreciation for the new assets, and setting a threshold of 4% of the average income of the population in the three poorest decile groups.

6. SHORT, MEDIUM AND LONG-TERM INVESTMENT PROGRAMME TO MEET WATER AND WASTEWATER DEVELOPMENT TARGETS

6.1. INVESTMENT PROGRAMME OVERVIEW

6.1.1. GENERAL APPROACH

This chapter presents the short, medium and long-term investment programmes, including all investment measures necessary (i) to achieve full compliance with EU and national regulations and (ii) to meet the targets defined in the national water strategy. The proposed investment programmes take into consideration the results of all Chapters described above. The main tasks performed in the chapters above and in this chapter are as follows:

- Comparison of the existing situation with national targets and strategies;
- Identification of all investment measures which are necessary to meet the targets and to remediate current deficiencies;
- Calculation of the investment costs;
- Evaluation of various options and the identification the least costly, most affordable solution;
- Grouping of all identified investment measures in short-term, medium-term and long-term investment phases;
- Prioritization of the identified investment measures in each phase;
- Description of the outcomes and benefits expected from the investment measures;
- Assurance of the financial viability of the proposed programmes, the verification of the sustainability of the programmes and the assessment of the risks related to the programme implementations.

Reference is made to Chapter 4.1.3. “General Methodology for Phasing and Prioritization” for a detailed description of the methodology and to Chapter 4.1.2 “Unit Costs”.

6.1.2. SUMMARY OF THE INVESTMENT PROGRAMME

A summary of investment costs for all investment phases is presented in the table below. The costs of the short-term investment programme have been estimated at € 384 million, the costs for the medium-term investment programme at € 105.1 million and the long-term investment programme at € 92.7 million. The overall investment costs for the entire programming period are about € 581.8 million.

Table 6-1 Investment costs for all phases (in €)

Investment Component	Short-term	Medium-term	Long-term	Total
Water Supply	101 888 700	34 842 100	33 153 000	169 883 800
Wastewater	210 305 200	50 627 000	42 193 700	303 125 900
Total Construction Costs	312 193 900	85 469 100	75 346 700	473 009 700
Studies and Supervision	40 585 200	11 111 000	9 795 100	61 491 300
Contingencies	31 219 400	8 546 900	7 534 700	47 301 000
Total Investment Costs	383 998 500	105 127 000	92 676 500	**581 802 000**

Additionally, 1% is envisaged for feasibility studies, 4% for design, 5% for supervision, 3% for project management and 10% for contingencies – or total costs of EUR 108.8 million.

At the current and projected levels of income for the population in the first three decile groups, it is possible for all investment programs to be implemented in full, if included depreciation for new assets is reduced to an average of 22.0% of their full value. This level is different for the three programs and is indicated in the following sections.

As indicated in Chapter 5.4, in order to determine the affordability of the investments, affordability level of 4% of the income of the poorest decile groups is used. Using a threshold of 4% of the average income of the population, the cost of depreciation of new assets can be covered at 90%.

The approach used brings certain risks due to declining and aging population, slower economic development and the possible reluctance of the consumers to pay higher tariffs.The main problematic points are indicated for each period of the investment program below.

Besides the investment programme described below, the Consultant recommends carrying out several studies or programme, as follows:

<u>Institutional studies</u>

A set of institutional studies (and analysis of the effectiveness of territorial services) should be conducted after the publication of the new Water Act which is currently in being prepared. These studies, which should integrate local, district and national levels, must contain:

- analysis of services in terms of human and technical management
- analysis of the effectiveness of territorial services
- analysis on the possible merging of different WSSCs (publics, private)
- analysis of results of settlement exchanges between diffrents WSSC
- analysis of budget results regarding the actual rule applied by the Bulgarian Regulator and the recommended European rules

These studies are not included in the investment program and cannot be quantified at this stage. The Consultant proposes this type of study because ambitious technical investment programmes can only be effective if it is consistent with a high level of service.

<u>NRW reduction programme</u>

The operators must have a policy management and meter replacement, based on age (recommended maximum between 10 and 14 years), the efficiency of the counting (meter size should be suitable for the pattern of consumption of the subscriber) and the quality of the installation and monitoring. The same policy should be conducted at the level of the metering points on the external water supply system (the age of replacement depends on the material). This is an important recommendation but is not integrated since it is not possible to quantify and since this programme should be financed by the operators

Sludge management study

The Consultant recommends scoping alternatives for sludge management in future feasibility and design studies but also to initiate a specific study on actions to conduct at the national level with several pilot sites.

This action study includes several components:

- Analysis and proposed regulatory changes regarding Bulgarian sludge management
- Assessment of the industrial situation on the pilot sites
- Assessment of the existing management of sludge on the pilot sites
- Determination of potential agricultural uses on the pilot sites
- Prospective actions with potential users
- Socio-economic actions and communications to educate the public concerned
- Design educational courses
- Assistance in the implementation of contracts between operators and end users of sanitation sludge

The Consultant recommends integrating the reuse of treated water from WWTP to this sludge management approach.

Non-domestic wastewater management programme

The Consultant recommends the implementation of a comprehensive study, which may include the following:

- General study at national level:
    - Analysis and review of European legislation
    - Analysis and assessment of the Bulgarian legislation
    - Proposition of ammendments
- General principles to implement at the local level:

    Establish a specific contract between the WSSC and each wastewater sector stakeholders, which may include the following:

    - Descriptions of industrial processes and the nature of the effluent
    - Establishment of a point of continuous flow monitoring with periodic return data to the WSSC and to the corresponding public authorities (municipality, town council etc…)
    - Implementation of a tracking point pollution control with periodic return data to the WSSC and to the corresponding public authorities (choice of parameters depending on the nature of the effluent, the minimum COD, BOD_5, TSS, N, P)

- o Discharge authorization with a description of the permitted effluent quality
- o Implementation of treatment before discharge to the wastewater collection system with tight monitoring and periodic return data to the WSSC and to the corresponding public authorities, if necessary

6.2. SHORT-TERM INVESTMENT PROGRAMME

6.2.1. INVESTMENT COSTS

The investment costs presented in the tables below are net costs excluding VAT, constant price base 2011 in Euro.

6.2.1.1. *Water supply*

The main problems of the external water supply systems are as follows:

- 50% of the water sources do not have renewed permits for water use.
- SPZ are not established in accordance with Ordinance 3 dated 16.10.2000.
- The water from some sources does not comply with Ordinance № 9 dated 16.03.2001 on the quality of water intended for drinking purposes - nitrate pollution of water sources from WSZ Ivaylo - 3 TW.
- The facilities for disinfection with chlorine gas are dangerous both for the life of the operator of the chlorination station and the others in case of a massive failure in the installation.
- Not all installations supply the disinfectant proportionally to the passing water quantity. The quantity of input disinfectant is not calculated automatically in accordance with the amount of residual chlorine.
- In systems where the pumping installations push the water disinfected in the pumping stations themselves directly into the distribution network, in practice part of the settlement is supplied with non-disinfected water. It is necessary to build tanks with a capacity of at least 30-minute maximum hourly load in order to ensure adequate contact time for disinfection.
- 80% of the reservoirs and pumping stations were built in the period 1940-1988. The equipment and fittings are worn out and technically outdated. The pumps are classified as low-performing with high consumption of electricity (12% of the existing pumps are with very low energy efficiency).
- Risk of disrupting the continuity of water supply and deteriorating water quality due to obsolescence of transmission pipelines /the main pipelines are made of asbestos cement and steel, mainly in the period from 1929 to about the 1977, are and a highly worn out and not good for use. Leakage from compromised connections, corroded and deformed pipes generate large losses of water/.
- Compromised parts of TW and creating problems in their operation.

- Lack of volumes to provide a reserve for the hours of maximum consumption and storage of PP stock.

The short-term programme includes investment measures aiming at:

- The distribution networks of the settlements are built mainly of old asbestos cement, steel and Mannesmann pipes (for Pazardzhok - 87%, for Septemvri - 99%, for all villages - 92%). These pipes are obsolete and in poor condition. This is the cause of failures and loss of water in the networks, ranging from 20 to 84%.
- The total number of failures for 2011 is 1 per km.
- In most of the villages there are water distribution branches with small diameters (below ∅ 80), which do not meet the standard requirements.
- The water supply connections in non-rehabilitated water supply branches are made mainly of galvanized pipes with expired service life and in poor condition (corrosion). The total number of connections is 43,785, of which 90% are in such condition.
- The water supplied to the distribution networks of the 6 settlements is not measures.

The short temr program includes investment measures with the purpose of:

- Removing the main deficiencies related to the quality and quantity of water. Water supply from sources that comply with Ordinance № 9 dated 16.03.2001 on the quality of water for drinking purposes.
- Increasing the energy efficiency.

The estimated costs for the short-term program - part Water Supply amount to EUR 102 million and include the following investment components:

- Installation of new external water mains to the villages Ivaylo, Dragor and Saraya in order to cover their consumption with treated water from Luda Yana dam.
- Reconstruction of the main external water supply pipelines - pushers and gravity, generating huge losses.
- Rehabilitation of water reservoirs, generating large losses of drinking water and building new ones to cover the hours of maximum consumption and storage of PP stock.
- In some cases where the pumping stations are located in or close to the settlement, the disinfectant is put in the pusher of the pumps and the water is supplied directly to the distribution network. No contact time is provided for the disinfectant to have its effect on the water. It is necessary to build reservoirs with a volume ensuring 30-minute retention time at maximum hourly load, where the disinfection could be done, and once the water has been already treated, it could be supplied to the distribution network.
- Rehabilitation of water sources /re-captation of catchments and duplication of TW for WSS Lyahovo - Bratanitsa / .
- Rehabilitation of 475,672 km distribution pipelines parallel to the sewer branches scheduled for construction in the short-term program period.

The following results will be achieved with the implementation of the planned activities for the villages of Ravnogor, Zhrebichko and resort complex "Atoluka:

- Supply of high quality water to 5 619 consumers;
- Reduction of water losses in the pushers of the main water supply pipeline systems – Vetren, Pazardzhik - increasing the energy efficiency of the systems and reducing the energy costs.
- Reduction of the number of failures in the distribution networks and reduction of the water losses along them.
- Ensuring maximum hourly consumption for the villages Zvanichevo and Sinitevo
- Termination of the leakage from tower basin Sinitovo, PR Ovchepoltsi and restoration of the waterproofing of PR G. Varshilo and PR Varvara.
- Replacement of pumps, commissioned in 1985-1986, which have low efficiency and relatively high energy costs.
- Ensuring the necessary water quantity for meeting the demand by consumers from the existing water sources after their rehabilitation.

A summary of the short-term investment costs for water supply is presented in the table below. A detailed list of all investment measures is presented in Table 6.2.1.4.

Table 6-2 Short-term investments for water supply (in €)

Category of work	Water abstraction	DWTP	External Water mains	Distribution networks	Reservoirs and tanks	Pumping stations	Miscellaneous	Total WS Short-term construction costs
Code	WS_1	WS_2	WS_3	WS_4_1	WS_4_2	WS_4_3	WS_5	S-T
Construction cost per category	80,500	908,700	8,823,400	90,516,100	1,034,800	492,400	32,800	101,888,700
Pazardzhik Municipality	70,600	615,200	7,751,800	31,613,700	884,900	231,200	12,800	41,180,200
Septemvri Municipality	9,900	207,100	548,200	18,119,100	150,000	193,500	20,000	19,247,800
Lesichovo Municipality	0	86,300	523,500	0	0	67,700	0	677,500
City of Pazardzhik (Pazardzhik)	0	0	0	3,712,700	0	0	0	3,712,700
village of Malo konare (Pazardzhik)	0	0	0	8,509,800	0	0	0	8,509,800
village of Ivalylo (Pazardzhik)	0	0	0	2,355,900	0	0	0	2,355,900
village of Aleko Konstantinovo (Pazardzhik)	0	0	0	2,865,700	0	0	0	2,865,700
village of Ognyanovo	0	0	0	3,513,900	0	0	0	3,513,900

Category of work	Water abstraction	DWTP	External Water mains	Distribution networks	Reservoirs and tanks	Pumping stations	Miscellaneous	Total WS Short-term construction costs
Code	WS_1	WS_2	WS_3	WS_4_1	WS_4_2	WS_4_3	WS_5	S-T
(Pazardzhik)								
village of Glavinitsa (Pazardzhik)	0	0	0	2,576,300	0	0	0	2,576,300
village of Chernogorovo (Pazardzhik)	0	0	0	4,636,600	0	0	0	4,636,600
village of Bratanitsa (Pazardzhik)	0	0	0	2,350,200	0	0	0	2,350,200
Town of Septemvri (Semtemvri)	0	0	0	0	0	0	0	0
Town of Vetren (Semtemvri)	0	0	0	4,012,000	0	0	0	4,012,000
village of Kovachevo (Semtemvri)	0	0	0	2,819,400	0	0	0	2,819,400
village of Varvara (Semtemvri)	0	0	0	3,430,700	0	0	0	3,430,700

6.2.1.2. *Wastewater*

The analyses, based on the studies of the wastewater collection, disposal and treatment infrastructure in Chapter 3 lead to the following conclusions concerning the current state of the structures and facilities:

Settlements with population over 2,000 P.E.

Pazardzhik

- ✓ Minimum and negative slopes in the sewerage network, high groundwater level.
- ✓ Lowered capacity of the sewage network (up to 30 times), banked-up and pressure-driven water during rain, insufficient number of stormwater overflows;
- ✓ The sewerage network of the city is built of concrete and reinforced concrete pipes - over 98% and is at the end of its life span (100% of the pipes are over 35 years old.). Part of the sewers and manholes are filled with debris and pieces of stone and concrete;
- ✓ The minimum slopes of the whole sewerage leads to sediment deposition in dry weather. Mixed water with decaying sludge during rainy weather goes directly to the WWTP or the rivers, which is confirmed by the sampling in rainy weather at the inlet of the WWTP.
- ✓ Most of the pipes have an additionally reduced cross-section, and there are some regions with 40 to 60% clogging of the sewer profile.

Ivaylo

- ✓ Domestic wastewater is discharged in the passing correction of the drainage sewer in the settlement;

- ✓ The coverage of sewage network is 35%.

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- ✓ In some places the slopes of the sewers are negative or below the minimum;
- ✓ Lack of executive drawings and information about the levels of the sewerage network.
- ✓ Lack of stormwater overflows for network unloading;
- ✓ The sewerage system of the city is nearing the end of its life span (100% of the pipes are over 35 years old), it is made of concrete pipes that are sealed with grout. The connections between pipes are a prerequisite for infiltration and exfiltration from and into the sewers. In some places they are misplaced and collapsed. There is infiltration in the street sewers – both due to the obsolete water supply network and the high level of groundwater during rain and melting snow;
- ✓ Part of the sewers and manholes are filled with debris and pieces of stone and concrete, which impedes the free movement of wastewater.

<u>Aleko Konstantinvo, Glavinitsa, Ognianovo, Chernogorovo Malo Konare Bratanitsa, Kovachevo, Varvara and Vetren have no sewerage network</u>

<u>For the settlements with population below 2000 P.E. in the municipalities of Pazardzhik, Septemvri and Lesichovo</u>

- Only Velichkovo (57%), Miryantsi (15%) and Sinitievo (15%) have a partial sewerage network, the other settlements have no sewerage network.

The short-term program includes investment measures described in detail in Chapter 4.3, aiming at:

- Construction of WWTP and inlet collectors (to WWTP) to ensure compliance with the Urban Waste Water Treatment Directive;
- Rehabilitation of the connected sewerage networks to reduce the infiltration and remove other major flaws, which would ensure efficient operation of the WWTP.
- Preliminary studies of the settlements without sewerage network;

Estimated costs for the short-term program - part Sewerage amounts to € 210 million and includes the following components:

- Construction of sewerage network in residential neighborhoods without a sewerage system that are connected to the water supply system.
- Reconstruction and rehabilitation of the existing sewer collectors with insufficient hydraulic capacity and small depth. This will prevent the network from overloading and will reduce the risk of flooding;
- Reconstruction and rehabilitation of the sewer collectors with high infiltration - these are mostly collectors with a small pipe length ~ 1 m (respectively - a large number of connections), and long operation period;
- Reconstruction and rehabilitation of the existing sewer collectors with a reverse slope or damaged structure;
- Construction of stormwater overflows;
- Construction of new main sewers in order to connect new neighbourhoods to WWTP;

- Construction of CPS for connecting settlements to the WWTP.
- Construction of a sewerage network and WWTP for agglomerations with over 2000 P.E. in order to ensure compliance with the Directive on urban wastewater treatment;
- Studies for sewerage zoning of small settlements, which are not connected to WWTP;
- Total reconstruction and completion of the sewerage network of the city of Pazardzhik - 28.5 km, village of Ivaylo - 11.5 km, and for the remaining agglomerations - described in detail in section 4.3.

The following results will be achieved by carrying out the envisaged activities:

- Preventing the contamination of groundwater and minimizing the risk to human health. Reducing the risk of discharging wastewater without treatment into the rivers and other water bodies;
- Increasing the level of connectivity of the population to the sewerage network from 90% to 100% for newly constructed networks.
- Improving the level of water supply and sewerage services for the population and environmental status of the settlements;
- Reducing the infiltration, continuous operation of the WWTP, reducing the operational costs for treatment of the over-diluted wastewater;
- Protecting the networks from overloading, reducing the risk of flooding and pollution of the soil and groundwater;
- Treatment of wastewater from agglomerations of over 2,000 PE.

A summary of the short-term investment costs for waste water is presented in the table below.

Table 6-3 Short-term Investments for Wastewater (€)

Category of work	WWTP	Main collectors	Sewerage network	Sewerage pumping stations	Other	**Sewerage** Total Short-term construction costs
Code	WW_1	WW_2	WW_3_1	WW_3_2	WW_4	S-T
Construction cost per category	16,518,700	52,298,400	140,731,900	444,100	312,100	210,305,200
Glavnitsa	0	0	4,867,900	0	0	4,867,900
Aleko Konstantinovo	0	0	1,074,700	51,100	0	1,125,800
Ognyanovo	0	0	7,151,000	73,900	0	7,224,900
Golemanovo (WW-1 Pazardzhik)	0	564,500	2,811,000	0	0	3,375,500
Saraya (WW-1 Pazardzhik	0	407,700	2,955,900	0	0	3,363,600
Dragor (WW-1	0	878,200	2,050,800	0	0	2,929,000

Category of work	WWTP	Main collectors	Sewerage network	Sewerage pumping stations	Other	**Sewerage** Total Short-term construction costs
Code	WW_1	WW_2	WW_3_1	WW_3_2	WW_4	S-T
Pazardzhik)						
Mokrishte (WW-1 Pazardzhik)	0	0	2,796,800	30,500	0	2,827,300
Dobrovnitsa(WW-1 Pazardzhik)	0	0	5,068,500	30,500	0	5,099,000
Miryantsi (WW-1 Pazardzhik)	0	0	1,993,600	50,500	0	2,044,100
Sinitievo (WW-1 Pazardzhik)	0	0	3,973,300	34,800	0	4,008,100
Hadznievo (WW-1 Pazardzhik)	0	0	3,721,200	53,000	0	3,774,200
Malo Konare	3,108,000	721,300	15,214,700	0	0	19,044,000
Chernogorovo	0	627,300	7,292,900	0	0	7,920,200
Pishtingovo (WW-2 Malo Konare)	0	1,097,700	5,386,500	0	0	6,484,200
Krali Marko (WW-2 Malo Konare)	0	313,600	1,447,600	0	0	1,761,200
Patalenitsa(WW-3 Patalenitsa a)	2,302,600	1,944,500	5,793,400	0	0	10,040,500
Tsrancha (WW-3 Patalenitsa a)	0	156,800	3,925,500	0	0	4,082,300
Debrashtitsa (WW-3 Patalenitsa)	0	109,800	3,118,800	0	0	3,228,600
Bratanitsa	2,387,900	658,600	3,954,700	0	0	7,001,200
Lyahovo (WW-4 Bratanitsa)	0	235,200	2,187,600	0	0	2,422,800
Zvanichevo (WW-4 Bratanitsa)	0	564,500	3,753,600	0	0	4,318,100
Yunatsite (WW-5 Yunatsite)	1,958,900	156,800	4,424,500	0	0	6,540,200
Velichkovo (WW-5 Yunatsite)	0	815,400	2,368,600	0	0	3,184,000
Varvara	0	0	6,271,300	0	0	6,271,300
Semchinovo (WW-6 Septemvri)	0	1,254,500	3,051,100	0	0	4,305,600
Simionovets (WW-6 Septemvri)	0	642,900	2,960,000	0	0	3,602,900
Vetren Dol (WW-6 Septemvri)	0	0	5,675,800	59,900	0	5,735,700
Zlokuchene (WW-	0	0	1,632,200	59,900	0	1,692,100

Category of work	WWTP	Main collectors	Sewerage network	Sewerage pumping stations	Other	Sewerage Total Short-term construction costs
Code	WW_1	WW_2	WW_3_1	WW_3_2	WW_4	S-T
7 Kovachevo)						
Kovachenvo	2,131,200	533,200	931,500	0	0	3,595,900
Lozen (WW-7 Kovachevo)	0	658,600	725,000	0	0	1,383,600
Vinogradets (WW-8 Vinogradets)	2,194,400	940,900	1,657,600	0	0	4,792,900
Karabunar (WW-8 Vinogradets)	0	407,700	6,240,600	0	0	6,648,300
Boshulia (WW-8 Vinogradets)	0	627,300	3,078,000	0	0	3,705,300
Vetren	2,073,100	1,821,800	6,334,000	0	0	10,228,900
Septemvri	0	0	0	0	0	0
Ivaylo	0	0	4,078,700	0	0	4,078,700
ViK Pazardzhik (Pazardzhik)	0	0	0	0	109,800	109,800
ViK Pazardzhik (Septemvri)	0	0	0	0	35,300	35,300
ViK Pazardzhik (Lesichovo)	0	0	0	0	91,000	91,000
Pazardzhik	362,600	36,159,600	763,000	0	76,000	37,361,200

6.2.1.3. *Overall short-term Investment Costs*

A summary of the short-term investment costs, at the level of the WSSC, for water supply and wastewater is presented below. The table includes the costs for all investment measures identified for the short-term investment phase (irrespective of the priorities). The overall short-term investment costs amount to about € 384 million.

Table 6-4 Overall short-term investments for water supply

Code	Category of Work	Total Cost
WS_1	Water abstraction	80,500 €
WS_2	DWTP	908,700 €
WS_3	External water mains	8,823,400 €
WS_4_1	Distribution Network	90,516,100 €
WS_4_2	Reservoirs and tanks	1,034,800 €
WS_4_3	Pumping stations	492,400 €
WS_5	Miscellaneous	32,800 €
WS construction cost		**101 888,700 €**

Feasibility studies	1%
Design	4%

Construction supervision	5%
Project management	3%
Studies and supervision cost	**13 245,500 €**

Contingencies	10%
Contingency cost	**10 188,900 €**

Total investment costs	**125 323,100 €**

Table 6-5 Overall short-term investments for wastewater

Code	Category of Work	Total Cost
WW_1	WWTP	16,518,700 €
WW_2	Main collectors	52,298,400 €
WW_3_1	Sewerage network	140,731,900 €
WW_3_2	WW Pumping station	444,100 €
WW_4	Miscellaneous	312,100 €
WW construction cost		**210,305,200 €**

Feasibility studies	1%
Design	4%
Construction supervision	5%
Project management	3%
Studies and supervision cost	**27,339,700 €**

Contingencies	10%
Contingency cost	**21,030,500 €**

Total price	**258,675,400 €**

6.2.2. SHORT-TERM INVESTMENT PROGRAM

The table below presents a list of all identified investment components. They are grouped on the basis of investment measures. The table also lists the investment costs for each investment measure, the population in the respective water supply zone (or population equivalent for the sewerage components) and the efficiency of the investment. Reference is made to Chapter 4.1.4. "General Methodology for Phasing and Prioritization". The table shows that the components comprise all necessary measures to comply with EU and national legislation as well as measures for efficiency improvement.

Table 6-6 Short-term investment program

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
1	10	WS	WS Pazardzhik	Chlorination – disinfection of the water of WS Pazardzhik	52,800	78,060	0.7	High quality water supply for the population	80
2	9	WS	WS Pazardzhik	Replacement of a pusher from PS to PR, city of Pazardzhik 5,971 m	3,593,543	76,201	47.2	Ensuring efficiency and reducing the losses	80
3	49	WW	Pazardzhik	Reconstruction and construction of sewerage network 23,171 m	37,361,200	71,979	519.1	98% coverage with sewerage network, reducing infiltration, network unloading, increasing the capacity of the network.	78
4	83	WS	From Luda Yana dam, section from inspection shaft to Golemenovo	Chlorination in the direction of Gelemenovo, Ivaylo, Saraya, Dragor, Sbor, Apriltsi	51,800	21,149	2.4	High quality water supply for the population	66
5	17	WS	From Luda Yana dam, section from inspection shaft to Golemenovo	Reduction of the pressure /RV/	12,800	7,089	1.8	Reducing the pressure	58
6	1	WS	From Luda Yana dam, section from inspection shaft to Golemenovo	Gravity water main from IS 4 to PR Sbor, PR Gelemenovo and PR Ivaylo 15 810 m	2,355,145	7,089	332.2	High quality water supply for the population	58
7	33	WS	Pazardzhik Municipality	Reconstruction of water supply network for settlements with population below 2,000 P.E.-168,917 m	31,613,700	23,999	1,317.3	Reducing the losses to 60 %	57
8	13	WS	From Luda Yana dam, section from inspection shaft to Golemenovo	New pressure reservoir Ivaylo	359,671	5,619	64.0	Ensuring PP reserve and maximum hourly consumption	57

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
9	2	WS	From Luda Yana dam, section from inspection shaft to Golemenovo	Gravity water main from PR to the villages Dragor, Saraya and Ivaylo 6,340 m	1,144,751	5,619	203.7	High quality water supply for the population	57
10	50	WW	Aleko Konstantinovo	Construction of internal sewerage network - 13 822 m, CPS, pusher 300 m	1,125,800	2,714	414.8	90% coverage with sewerage network, treatment of waste water	54
11	51	WW	ViK Pazardzhik (Lesichovo)	Feasibility studies	91,000	5,408	16.8	Studies for sewerage zoning for the small settlements, which are not connected to WWTP	52
12	52	WW	Bratanitsa	Construction of internal sewerage network 11 m inlet collector 2,100 m, WWTP	7,001,200	2,093	3,345.1	90% coverage with sewerage network, treatment of waste water	51
13	53	WW	Ivaylo	Construction of internal sewerage network – 11,450 m	4,078,700	2,841	1,435.7	90% coverage with sewerage network, treatment of waste water	49
14	25	WS	Pazardzhik	Reconstruction of water supply network -15,640 m	3,712,700	71,979	51.6	Rehabilitation along the sewage routes, reduction of losses, termination of illegal connections.	49
15	54	WW	ViK Pazardzhik (Pazardzhik)	Feasibility studies	109,800	5,826	18.8	Studies for sewerage zoning for the small settlements, which are not connected to WWTP	48
16	55	WW	Glavinitsa	Construction of internal sewerage network 13,662m	4,867,900	2,282	2,133.2	90% coverage with sewerage network, treatment of waste water	47

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
17	56	WW	Malo Konare	Construction of internal sewerage network 42 706 m, inlet collector 2,300m, WWTP	19,044,000	4,353	4,374.9	90% coverage with sewerage network, treatment of waste water	47
18	57	WW	Vetren	Construction of internal sewerage network 17,780m, inlet collector 1,000m, WWTP	10,228,900	3,221	3,175.7	90% coverage with sewerage network, treatment of waste water	47
19	58	WW	Miryantsi (WW-1 Pazardzhik)	Construction of internal sewerage network 4 860m , CPS, pusher 1 700 m	2,044,100	568	3,598.8	90% coverage with sewerage network, treatment of waste water	47
20	59	WW	Ognyanovo	Construction of internal sewerage network 18,338м, CPS, pusher 4,630 m	7,224,900	2,353	3,070.5	90% coverage with sewerage network, treatment of waste water	47
21	60	WW	Pishtingovo (WW-2 Malo Konare)	Construction of internal sewerage network 15,120m, inlet collector 3,500m	6,484,200	1,037	6,252.8	90% coverage with sewerage network, treatment of waste water	47
22	61	WW	Varvara	Construction of internal sewerage network 17,604m, inlet collector 4,809m	6,271,300	2,061	3,042.8	90% coverage with sewerage network, treatment of waste water	47
23	62	WW	Chernogorovo	Construction of internal sewerage network 20,470m , inlet collector 2 000m	7,920,200	2,203	3,595.2	90% coverage with sewerage network, treatment of waste water	47
24	4	WS	From Luda Yana dam to Borimechkovo	Replacement of a pusher to PR Borimechkovo 4,890 m..	523,474	569	920.0	Ensuring efficiency and reducing the losses	47
25	63	WW	ViK Pazardzhik (Septemvri)	Feasibility studies	35,300	1,019	34.6	Studies for sewerage zoning for the small settlements, which are not connected to WWTP	46

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
26	11	WS	Pazardzhik Municipality	Chlorination	518,451	42,838	12.1	High quality water supply for the population	45
27	64	WW	Mokrishte (WW-1 Pazardzhik)	Construction of internal sewerage network 7,452m , CPS, pusher 1,640m	2,827,300	1,851	1,527.4	90% coverage with sewerage network, treatment of waste water	43
28	65	WW	WW-8 Vinogradets (Vinogradets, Karabunar, Boshulya)	Construction of internal sewerage network 47,934m , inlet collector 6,300m	15,146,500	3,646	4,154.3	90% coverage with sewerage network, treatment of waste water	43
29	66	WW	Kovachevo	Construction of internal sewerage network 14,694m, inlet collector 1,700m, WWTP	3,595,900	2,402	1,497.0	90% coverage with sewerage network, treatment of waste water	39
30	67	WW	Lozen (WW-7 Kovachevo)	Construction of internal sewerage network 9,636m, inlet collector 2,100m	1,383,600	1,019	1,357.8	90% coverage with sewerage network, treatment of waste water	39
31	39	WS	WS Vetren	Chlorination – disinfection of water, WS Vetren	52,800	12,368	4.3	High quality water supply for the population	39
32	68	WW	Sinitievo (WW-1 Pazardzhik)	Construction of internal sewerage network 10,568m, CPS, 2,100m pusher	4,008,100	1,950	2,055.4	90% coverage with sewerage network, treatment of waste water	38
33	69	WW	Semchinovo (WW-6 Septemvri)	Construction of internal sewerage network 8,388m, inlet collector 4,000m	4,305,600	1,943	2,216.0	90% coverage with sewerage network, treatment of waste water	38
34	70	WW	Dragor (WW-1 Pazardzhik)	Construction of internal sewerage network 5,756m , inlet collector 2,800m	2,929,000	1,422	2,059.8	90% coverage with sewerage network, treatment of waste water	38

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
35	71	WW	Zlokuchene (WW-7 Kovachevo)	Construction of internal sewerage network 3,861m, CPS, pusher 2,280m	1,692,100	860	1,967.6	90% coverage with sewerage network, treatment of waste water	38
36	72	WW	Saraya (WW-1 Pazardzhik)	Construction of internal sewerage network 8,294m, inlet collector 1,300m	3,363,600	1,356	2,480.5	90% coverage with sewerage network, treatment of waste water	38
37	75	WW	Dobrovnitsa (WW-1 Pazardzhik)	Construction of internal sewerage network 13,392m, CPS, pusher 3,400m	5,099,000	1,380	3,694.9	90% coverage with sewerage network, treatment of waste water	37
38	76	WW	Vetren dol (WW-6 Septemvri)	Construction of internal sewerage network 15,210m, CPS, pusher 2,280m	5,735,700	1,452	3,950.2	90% coverage with sewerage network, treatment of waste water	37
39	77	WW	Hadzhievo (WW-1 Pazardzhik)	Construction of internal sewerage network 9,828m, CPS, pusher 1,700m	3,774,200	1,027	3,675.0	90% coverage with sewerage network, treatment of waste water	37
40	78	WW	Simionovets (WW-6 Septemvri)	Construction of internal sewerage network 8,307m, inlet collector 2,050m	3,602,900	898	4,012.1	90% coverage with sewerage network, treatment of waste water	37
41	79	WW	Golemanovo (WW-1 Pazardzhik)	Construction of internal sewerage network 7,987m, inlet collector 1,800m	3,375,500	695	4,856.8	90% coverage with sewerage network, treatment of waste water	37
42	80	WW	Lyahovo (WW-4 Bratanitsa)	Construction of internal sewerage network 6,138m, inlet collector 750m	2,422,800	391	6,196.4	90% coverage with sewerage network, treatment of waste water	37
43	81	WW	Krali Marko (WW-2 Malo Konare)	Construction of internal sewerage network 4,061m, inlet collector 1,000m	1,761,200	190	9,269.5	90% coverage with sewerage network, treatment of waste water	36

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
44	41	WS	WS Vetren	Replacement of pumps in PS II,III	193,591	3,639	53.2	Ensuring efficiency and sustainability of water supply	34
45	5	WS	WS Vetren	Replacement of pusher from PS III to PR I.z. and from PS to PR Gorno Varshilo 4,140 m.	480,015	3,639	131.9	Ensuring efficiency and reducing the losses	34
46	43	WS	WS Semchinovo - Simeonovets	Re-captation of catchments	9,900	2,841	3.5	High quality water supply for the population	34
47	3	WS	WS Semchinovo - Simeonovets	Replacement of gravity water main from the catchments to PR of the villages	68,170	2,841	24.0	Ensuring efficiency and reducing the losses	34
48	24	WS	VS Patalenitsa Tsrancha	Re-captation of catchments	5,400	2,335	2.3	High quality water supply for the population	33
49	21	WS	WS Sinitovo	Replacement of pumps in PS.	20,004	1,950	10.3	Ensuring efficiency and sustainability of water supply	33
50	14	WS	WS Sinitovo	New suction reservoir	154,656	1,950	79.3	Ensuring PP reserve and maximum hourly consumption	33
51	20	WS	WS Zvanichevo	Replacement of pumps in PS	20,004	1,899	10.5	Ensuring efficiency and sustainability of water supply	33
52	15	WS	WS Zvanichevo	New suction reservoir	172,305	1,899	90.7	Ensuring PP reserve and maximum hourly consumption	33
53	19	WS	WS Govedare	Replacement of pumps in TW and PS	35,736	1,634	21.9	Ensuring efficiency and sustainability of water supply	33
54	16	WS	WS Yunatsite	Rehabilitation of PS II, new pumps and replacement of pumps in TW	119,702	1,522	78.6	Ensuring efficiency and sustainability of water supply	33

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
55	18	WS	WS Hadzhievo	Replacement of pumps in TW	35,736	1,027	34.8	Ensuring efficiency and sustainability of water supply	33
56	23	WS	WS Debarshtitsa	Re-captation of catchments	5,170	910	5.7	Supplying the population with water with quantity indicators	33
57	45	WS	From Luda Yana dam to Borimechkovo	Replacement of pumps in PS I and II Borimechkovo	132,290	569	232.5	Ensuring efficiency and sustainability of water supply	33
58	8	WS	WS Debrashtitsa	Replacement of gravity water main from catchments to PR Debrashtitsa 3,209 m	396,721	910	436.0	Ensuring efficiency and reducing the losses	31
59	82	WW	Zvanichevo (WW-4 Bratanitsa)	Construction of internal sewerage network 10,645м, inlet collector 1,800м	4,318,100	1,899	2,273.9	90% coverage with sewerage network, treatment of waste water	30
60	85	WS	Septemvri Municipality	Chlorination	154,240	13,426	11.5	High quality water supply for the population	30
61	37	WS	Septemvri Municipality	Reconstruction of water supply network for settlement with population below 2,000 P.E. -97,512 m	18,119,100	10,236	1,770.1	Reducing the losses to 60 %	30
62	36	WS	Vetren	Reconstruction of water supply network -20,683м	4,012,000	3,221	1,245.6	Rehabilitation along the sewage routes, reduction of losses, termination of illegal connections.	27
63	40	WS	WS Vetren	Rehabilitation of PR G. Varshilo, Varvara, Vinogradets and Vetren I.z.	103,206	6,805	15.2	Reducing the losses, sustainability of water supply	26
64	86	WS	Lesichovo Municipality	Chlorination	71,840	5,408	13.3		26

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
65	35	WS	Varvara	Reconstruction of water supply network -17,665м	3,430,700	2,061	1,664.6	Rehabilitation along the sewage routes, reduction of losses, termination of illegal connections.	25
66	12	WS	From Luda Yana dam, section from inspection shaft to Gelemenovo	Overall repair PR Ovchepoltsi	97,120	2,992	32.5	Reducing the losses, sustainability of water supply	25
67	22	WS	WS Lyahovo Bratanitsa	Doubling and equipment of TW	60,000	2,484	24.2	High quality water supply for the population	24
68	6	WS	WS Lyahovo Bratanitsa	Replacement of a pusher from PS II to PR 917m	126,215	2,484	50.8	Ensuring efficiency and reducing the losses	24
69	7	WS	WS Patalenitsa Tsrancha	Replacement of a pusher from PS II to PR 1,250m	162,477	2,335	69.6	Ensuring efficiency and reducing the losses	24
70	84	WS	WS Sinitovo	Overall repair of KV Sinitovo	16,219	1,950	8.3	Ensuring PP reserve and maximum hourly consumption	24
71	44	WS	From Luda Yana dam to Borimechkovo	Rehabilitation of PR Lesichovo and Borimechkovo	46,748	1,397	33.5	Reducing the losses, sustainability of water supply	24
72	42	WS	Dolno Varshilo	Research and study works for the water supply of the villages	20,000	250	80.0	Water supply for the population	24
73	73	WW	WW-3 Patalenitsa (Patalenitsa, Debarshtitsa, Tsrancha)	Construction of internal sewerage network 36,027м, inlet collector 7,050м, WWTP	17,351,400	3,245	5,347.1	90% coverage with sewerage network, treatment of waste water	20
74	74	WW	WW-5 Yunatsite (Velichkovo, Yunatsite)	Construction of internal sewerage network 12,420м, inlet collector 3,100м,WWTP	9,724,200	2,542	3,825.4	90% coverage with sewerage network, treatment of waste water	20

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
75	26	WS	Ivaylo	Reconstruction of water supply network - 12,255	2,355,900	2,841	829.3	Rehabilitation along the sewage routes, reduction of losses, termination of illegal connections.	19
76	28	WS	Al. Konstantinovo	Reconstruction of water supply network -15,223м	2,865,700	2,714	1,055.9	Rehabilitation along the sewage routes, reduction of losses, termination of illegal connections.	18
77	27	WS	Glavinitsa	Reconstruction of water supply network -13,054м	2,576,300	2,282	1,129.0	Rehabilitation along the sewage routes, reduction of losses, termination of illegal connections.	17
78	29	WS	Bratanitsa	Reconstruction of water supply network -12,432м	2,350,200	2,093	1,122.9	Rehabilitation along the sewage routes, reduction of losses, termination of illegal connections.	17
79	34	WS	Kovachevo	Reconstruction of water supply network -13,565м	2,819,400	2,402	1,173.8	Rehabilitation along the sewage routes, reduction of losses, termination of illegal connections.	17
80	32	WS	Chernogorovo	Reconstruction of water supply network -24,362	4,636,600	2,203	2,104.7	Rehabilitation along the sewage routes, reduction of losses, termination of illegal connections.	17

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
81	30	WS	Malo Konare	Reconstruction of water supply network -45,219	8,509,800	4,353	1,954.9	Rehabilitation along the sewage routes, reduction of losses, termination of illegal connections.	17
82	31	WS	Ognyanovo	Reconstruction of water supply network-18,146м	3,513,900	2,353	1,493.4	Rehabilitation along the sewage routes, reduction of losses, termination of illegal connections.	17

** Population in 2011 according to NSI data.*

*** According to the methodology of the Consultant (Please see Appendix 4-7)*

6.2.3. Financial And economic conclusions

Based on the results of the affordability analysis in section 5.4 we can make the conclusion that the proposed investment components in the short-term investment program are affordable at the tariffs corresponding to 4% of the income of the poorest households or the first three decile groups.

The degree of coverage of depreciation costs for the new assets is 18.4% for the period of the short-term program.

In order to cover the operating and maintenance costs and depreciation as a result of the investments made, the tariffs will reach levels in the range of EUR 1.07/m3 in 2021, while the current value is EUR 0.83/m3. Taking into consideration that, under the Bulgarian law, this rate is determined on the basis of 4% of the average income of the population while the affordable rates for the forecast period are determined on the basis of 4% of the average income of the first three decile groups, this difference was not significant.

There is no need to undertake special measures for targeted financial support of the lowest income population.

6.3. Medium-term investment programme

6.3.1. Investment costs

The investment costs presented in the tables below are net costs excluding VAT, constant price base 2011 in Euro.

6.3.1.1. *Water supply*

The medium-term programme includes investment measures aiming at:

- Increasing the efficiency – reducing the non-revenue water (Water Losses), energy efficiency.
- Rehabilitation and expansion of water supply systems, ensuring sustainability - rehabilitation and adaptation of the infrastructure.

The estimated costs for the medium-term programme – Water Supply, amount to EUR **35** and include the following investment components**:**

- Reconstruction of transmission pipes /highly worn out and generating large losses /in the main water supply systems - 40 and 60% of the external water pipes of all settlements.
- Installation of new external water pipes in order to cover consumption with treated water from Luda Yana dam.

- Construction of a reservoir for the village of Chernogorovo, rehabilitation of PR for the city of Pazardzhik, new additional space for the village of Apriltsi and commissioning of ЧВ at PS II uprise Septemvri.
- Replacement of pumps and fittings in the pump stations and re-equipment of water resources in order to optimize the operation of the pumps, increase the energy efficiency of the system and reduce energy costs.
- Rehabilitation of reservoirs that need repair and replacement of fittings and pipes - 9 reservoirs and KV Ognianovo.
- Insufficient operating system for monitoring, control and management of the condition of the water supply system.

Rehabilitation of 77.411 km distribution pipelines and construction of 11.036 km (in Pazardzhik) new distribution branches in the settlements.The following results will be achieved with the implementation of the planned activities:

- Reducing the losses of water in the inlet water mains.
- Reducing the losses of water in the distribution networks and in the building connections. Improving fire prevention (installation of new fire hydrants, according to the regulatory requirements). Improving the security of water supply to customers.
- The introduction of SCADA System will reduce the cost of electricity, water losses and will optimize the working time of the different operators in the system.

A summary of the medium-term investment costs for water supply is presented in the table below. A detailed list of all investment measures is provided in the table in section 6.3.1.4.

Table 6-7 Medium-term investments for water supply (€)

Category of work	Water abstraction	DWTP	External Water mains	Distribution networks	Reservoirs and tanks	Pumping stations	Miscellaneous	Total WS Medium term construction costs
Code	WS_1	WS_2	WS_3	WS_4_1	WS_4_2	WS_4_3	WS_5	M-T
Construction cost per category	60,000	0	12,636,400	21,132,300	769,200	405,100	19,200	35,022,200
Pazardzhik Municipality	60,000	0	6,448,800	2,912,300	650,800	225,700	12,800	10,310,400
Septremvri Municipality	0	0	2,940,000	217,000	118,400	179,400	6,400	3,461,200
Lesichovo Municipality	0	0	3,247,600	1,767,900	0	0	0	5,015,500
City of Pazardzhik	0	0	0	7,530,400	0	0	0	7,530,400

Category of work	Water abstraction	DWTP	External Water mains	Distribution networks	Reservoirs and tanks	Pumping stations	Miscellaneous	Total WS Medium term construction costs
Code	WS_1	WS_2	WS_3	WS_4_1	WS_4_2	WS_4_3	WS_5	M-T
(Pazardzhik)								
Village of Malo Konare (Pazardzhik)	0	0	0	973,100	0	0	0	973,100
Village of Ivaylo (Pazardzhik)	0	0	0	214,400	0	0	0	214,400
Village of Aleko Konstantinovo (Pazardzhik)	0	0	0	750,000	0	0	0	750,000
Village of Ognyanovo (Pazardzhik)	0	0	0	381,400	0	0	0	381,400
Village of Glavinitsa (Pazardzhik)	0	0	0	298,600	0	0	0	298,600
Village of Chernogorovo (Pazardzhik)	0	0	0	500,800	0	0	0	500,800
Village of Bratanitsa (Pazardzhik)	0	0	0	284,600	0	0	0	284,600
Town of Septemvri (Septemvri)	0	0	0	4,227,900	0	0	0	4,227,900
Town of Vetren (Septemvri)	0	0	0	424,400	0	0	0	424,400
Village of Kovachevo (Septemvri)	0	0	0	288,200	0	0	0	288,200
Village of Varvara (Septemvri)	0	0	0	361,300	0	0	0	361,300

6.3.1.2. Sewerage

The medium-term programme includes investment measures aiming at

- Rehabilitation of the connected sewerage networks in order to reduce the infiltration and to eliminate other major deficiencies, which will ensure efficient WWTP operation.

The estimated costs for the medium-term programme – Waste Water, amount to EUR **50,627,000** and include the following investment components**:**

- Rehabilitation of new sewerage network for settlements forming agglomerations with population over 2000 P.E., detailed breakdown of the technical specification is provided in section 4.3.;
- Construction of CPS Spartak 2 in the city of Pazardzhik
- Construction of sewerage networks in the settlements with population below 2000 PE.
- Application of the conclusions and recommendations of the study on sewerage zoning.

The following results will be achieved by carrying out the envisaged activities:

- Increasing the level of connection of the population to the sewerage network from 0% to 45%-50% in settlements without sewerage network;
- Improving the level of WSS services to the population and the environmental condition of the settlements;
- Reducing the infiltration, permanent mode of WWTP operation, reducing the operating costs for treatment of over-diluted waste water;
- Protecting the networks from overloading, reducing the risk of flooding and pollution of soil and groundwater;
- Terminating or reducing the risk of including wastewater without treatment into the soil, rivers and other water bodies. Preventing the pollution of groundwater and minimizing the risk to human health.

A summary of the medium-term investment costs for wastewater is presented in the table below.

Table 6-8 Medium-term Investments for Wastewater (€)

Category of work	WWTP	Mains collectors	Sewerage network	WW Pumping station	Miscellaneous	Total WW Medium term construction costs
Code	WW_1	WW_2	WW_3_1	WW_3_2	WW_4	M-T
Total per category	0	23,627,200	18,436,800	171,600	8,391,400	50,627,000

Category of work	WWTP	Mains collectors	Sewerage network	WW Pumping station	Miscellaneous	Total WW Medium term construction costs
Glavinitsa	0	0	540,900	0	0	540,900
Aleko Konstantinovo	0	0	547,200	0	0	547,200
Ognyanovo	0	0	717,400	0	0	717,400
Malo Konare	0	0	1,692,800	0	0	1,692,800
Chernogorovo	0	0	810,000	0	0	810,000
Bratanitsa	0	0	441,300	0	0	441,300
Varvara	0	0	696,700	0	0	696,700
Kovachevo	0	0	101,300	0	0	101,300
Vetren	0	0	703,300	0	0	703,300
Septemvri	0	11,636,300	3,035,900	0	100,000	14,772,200
Ivaylo	0	0	0	15,300	0	15,300
ViK Pazardzhik (Pazardzhik)	0	0	0	0	3,587,400	3,587,400
ViK Pazardzhik (Septvemvri)	0	0	0	0	1,055,000	1,055,000
ViK Pazardzhik (Lesichovo)	0	0	0	0	3,237,000	3,237,000
Pazardzhik	0	11,990,900	9,150,000	156,300	412,000	21,709,200

6.3.1.3. *Overall Medium-term Investment Costs*

A summary of the short-term investment costs, at the level of the WSSC, for water supply and wastewater is presented below. The table includes the costs for all investment measures identified for the medium-term investment phase (irrespective of the priorities). The overall medium-term investment costs amount to about € 105.3 million.

Table 6-9 Overall medium-term investments for water supply

Code	Category of work	Total Cost
WS_1	Water abstraction	60,000 €
WS_2	DWTP	- €
WS_3	Water mains	12,636,400 €
WS_4_1	Distribution network	21,132 300 €
WS_4_2	Reservoirs and tanks	769,200 €
WS_4_3	Pumping stations	405,100 €
WS_5	Miscellaneous	19,200 €
WS Construction Cost		**35,022,200 €**

Feasibility studies	1%
Design	4%

Construction supervision	5%
Project management	3%
Studies and supervision cost	**4,552,900 €**

Contingencies	10%
Contingency cost	**3,502,200 €**

Total investment costs	**43 077,300 €**

Table 6-10 Overall medium-term investments for wastewater

Code	Category of Work	Total Cost
WW_1	WWTP	- €
WW_2	Main collectors	23,627,200 €
WW_3_1	Sewerage network	18,436,800 €
WW_3_2	WW Pumping station	171,600 €
WW_4	Miscellaneous	8,391,400 €
WW construction cost		**50,627,000 €**

Feasibility studies	1%
Design	4%
Construction supervision	5%
Project management	3%
Studies and supervision cost	**6,581,500 €**

Contingencies	10%
Contingency cost	**5,062,700 €**

Total investment costs	**62,271,200 €**

6.3.2. MEDIUM-TERM INVESTMENT PROGRAMME

The table below shows a list of all identified investment components. They are grouped on the basis of the investment measures. Further, the table indicates the investment costs for each investment measure, the population in the respective Water Supply Zone (or Population Equivalent for wastewater components) and the expected impact of the investment. Reference is made to Chapter 4.1.4. “General Methodology for Phasing and Prioritization”. The table reveals that the components cover all measures necessary to achieve compliance with EU and national legislation as well as measures for efficiency improvement.

Table 6-11 Medium Term Investment Program

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
1	42	WW	Pazardzhik	Reconstruction and construction of sewerage network 30,385 m; CPS Spartak -2, Rehabilitation of CPS	21,709,200	71,979	301.6	100% coverage with sewerage network, reducing infiltration, network unloading, increasing the efficiency of CPS	63
2	20	WS	WS Pazardzhik	Replacement of pumping aggregates PS Mokrishte	156,938	77,590	2.0	Improving the quality of the service, ensuring efficiency and sustainability	58
3	19	WS	From Luda Yana dam section from inspection shaft to Chernogorovo	Reduction of pressure /RV/	12,800	5,467	2.3	Reducing the pressure	57
4	3	WS	From Luda Yana dam section from inspection shaft to Chernogorovo	Gravity water pipe from Inspection Shaft Svoboda to PR Ovchepoltsi, PS Tsar Assen and PR Rosen – 12 635 m	2,001,442	5,467	366.1	Supplying gravity water to the population	57
5	5	WS	From Luda Yana dam section from inspection shaft to Chernogorovo	Gravity water pipe from PR to Chernogorovo and Krali Marko and Pishtigovo – 8,340 m	1,174,195	3,430	342.3	Supplying gravity water to the population	56
6	4	WS	From Luda Yana dam section from inspection shaft to Chernogorovo	Gravity water pipe from IS Rosen to PR Topoli dol and PR Chernogorovo – 13 420 m	1,710,301	3,698	462.5	Supplying gravity water to the population	54

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
7	38	WS	From Luda Yana dam section from inspection shaft to Borimechkovo	Reduction of pressure /RV/	6,400	3,646	1.8	Reducing the pressure	54
8	43	WW	Septemvri	Construction of internal sewerage network 16 008m	14,772,200	7,869	1,877.3	Reducing the infiltration, unloading the network and increasing its capacity.	51
9	22	WS	Pazardzhik	Reconstruction of water supply network -28,560m	7,530,400	71,979	104.6	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	49
10	44	WW	ViK Pazardzhik (Lesichovo)	Increasing the rate of connection of the population to the sewerage network	3,237,000	5,408	598.6	Terminating or reducing the discharge of untreated wastewater in the soil, rivers or other water bodies. Preventing the pollution of ground water and minimizing the risk to human health.	44
11	45	WW	ViK Pazardzhik (Pazardzhik)	Increasing the rate of connection of the population to the sewerage network	3,587,400	5,826	615.8	Terminating or reducing the discharge of untreated wastewater in the soil, rivers or other water bodies. Preventing the pollution of ground water and minimizing the risk to human health.	44

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
12	46	WW	ViK Pazardzhik (Septemvri)	Increasing the rate of connection of the population to the sewerage network	1,055,000	1,019	1,035.3	Terminating or reducing the discharge of untreated wastewater in the soil, rivers or other water bodies. Preventing the pollution of ground water and minimizing the risk to human health.	40
13	47	WW	Aleko Konstantinovo	Construction of internal sewerage network - 1 536 m	547,200	2,714	201.6	100% coverage with sewerage network	39
14	48	WW	Varvara	Construction of internal sewerage network 1 956m	696,700	2,061	338.0	100% coverage with sewerage network	39
15	14	WS	WS Simeonovets	Replacement of pusher from TW to PS II 2,781 m.	389,014	12,368	31.5	Ensuring efficiency and reducing the losses	39
16	35	WS	Septemvri Municipality	Reconstruction of water supply network – settlements below 2,000 inhabitants-1,103m	217,000	10,236	21.2	Reducing the losses to 60 %	38
17	1	WS	WS Septemvri	Gravity water pipe from ЧВ to the town 2,250 m.	426,564	8,729	48.9	Sustainability of water supply	36
18	30	WS	Pazardzhik Municipality	Reconstruction of water supply network for settlements with population below 2,000 inhabitants-8,638m	2,912,300	23,999	121.4	Reducing the losses to 60 %	35
19	36	WS	Lesichovo Municipality	Reconstruction of water supply network for settlements with population below 2,000 inhabitants-9,315 m	1,767,900	5,408	326.9	Reducing the losses	35

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
20	2	WS	WS Vetren	Replacement of pusher from PS II to PSIII 4 230 m.	680,743	3,639	187.1	Ensuring efficiency and reducing the losses	34
21	40	WS	WS Vetren – Vetren Dol	Replacement of pumping aggregates in TW	34,542	3,513	9.8	Improving the quality of the service, ensuring efficiency and sustainability.	34
22	16	WS	From Luda Yana dam section from inspection shaft to Chernogorovo	New pressure reservoirs Chernogorovo, Apriltsi	309,968	3,430	90.4	Ensuring PP reserve and maximum hourly consumption	34
23	39	WS	WS Lozen - Kovachevo	Replacement of pumping aggregates PS Lozen and TW	144,856	3,421	42.3	Improving the quality of the service, ensuring efficiency and sustainability	34
24	34	WS	Vetren	Reconstruction of water supply network-2,222m	424,400	3,221	131.8	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	34
25	56	WS	WS Hadzhievo	Doubling TW Hadzievo	60,000	1,207	49.7	Supplying high quality water to the population	33
26	21	WS	WS Patalenitsa Tsrancha	Replacement of pumping aggregates PS	68,787	2,335	29.5	Improving the quality of the service, ensuring efficiency and sustainability	33
27	33	WS	Varvara	Reconstruction of water supply network -1,845m	361,300	2,061	175.3	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	33

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
28	13	WS	From Luda Yana dam section from inspection shaft to Bormiechkovo	Gravity water pipe from IS Karabunar to PR 1,720 m.	300,855	1,349	223.0	Supplying gravity water to the population	33
29	12	WS	From Luda Yana dam section from inspection shaft to Bormiechkovo	Gravity water pipe from IS Boshulia 1,720 m.	184,126	816	225.6	Supplying gravity water to the population	33
30	31	WS	Septemvri	Reconstruction of water supply network -18,596m	4,227,900	7,869	537.3	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	32
31	10	WS	WS Patalenitsa Tsrancha	Replacement of gravity water pipe from catchment to PR and pusher from TW to PS II 8,038 m	975,171	2,335	417.6	Ensuring efficiency and sustainability of water supply.	32
32	8	WS	From Luda Yana dam section from inspection shaft to Bormiechkovo	Gravity water pipe from IS Velichkovo and Pamidovo 4,370 m.	665,565	1,398	476.1	Supplying gravity water to the population	30
33	49	WW	Vetren	Construction of internal sewerage network- 1,975m	703,300	3,221	218.3	100% coverage with sewerage network	29
34	50	WW	Ivaylo	Rehabilitation of CPS Ivaylo	15,300	2,841	5.4	100% coverage with sewerage network	29
35	51	WW	Kovachevo	Construction of internal sewerage network 1,633 m	101,300	2,402	42.2	100% coverage with sewerage network	29

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
36	52	WW	Ognyanovo	Construction of internal sewerage network 2,038m	717,400	2,353	304.9	100% coverage with sewerage network	29
37	53	WW	Glavinitsa	Construction of internal sewerage network 1,518m	540,900	2,282	237.0	100% coverage with sewerage network	29
38	54	WW	Bratanitsa	Construction of internal sewerage network 1,233m	441,300	2,093	210.8	100% coverage with sewerage network, increasing the efficiency of CPS	29
39	55	WW	Malo Konare	Construction of internal sewerage network 4,745 m	1,692,800	4,353	388.9	100% coverage with sewerage network	29
40	6	WS	From Luda Yana dam section from inspection shaft to Bormiechkovo	Gravity water pipe from transm. reservoir to IS Velichkovo 8,393 m	2,031,015	10,074	201.6	Supplying gravity water to the population	29
41	56	WW	Chernogorovo	Construction of internal sewerage network 2,274 m	810,000	2,203	367.7	100% coverage with sewerage network	28
42	18	WS	Pazardzhik Municipality	Rehabilitation of 1 KB, 2 ЧВ and 7PR	62,849	9,040	7.0	Improving the quality of the service, ensuring sustainability.	27
43	17	WS	WS Pazardzhik	Rehabilitation of PR 36,000m3	250,879	5,739	43.7	Improving the quality of the service, ensuring sustainability.	26
44	37	WS	From Luda Yana dam section from inspection shaft to Bormiechkovo	Overall repair of PR Boshulia and PR Karabunar	48,208	2,165	22.3	Reducing the losses, sustainability of water supply	25

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
45	27	WS	Malo Konare	Reconstruction of water supply network -5,379m	973,100	4,353	223.5	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	25
46	11	WS	WS Lozen - Kovachevo	Replacement of pusher from TW to PR 5 877 m.	958,680	3,421	280.2	Ensuring efficiency and reducing the losses.	25
47	23	WS	Ivaylo	Reconstruction of water supply network -1,185m	214,400	2,841	75.5	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	25
48	25	WS	Al. Konstantinovo	Reconstruction of water supply network -1,906m	750,000	2,714	276.3	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	25
49	32	WS	Kovachevo	Reconstruction of water supply network -1,593m	288,200	2,402	120.0	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	24
50	28	WS	Ognyanovo	Reconstruction of water supply network -2,108 m	381,400	2,353	162.1	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	24

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
51	24	WS	Glavinitsa	Reconstruction of water supply network -1,657m	298,600	2,282	130.9	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	24
52	29	WS	Chernogorovo	Reconstruction of water supply network -2,768m	500,800	2,203	227.3	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	24
53	26	WS	Bratanitsa	Reconstruction of water supply network -1,573m	284,600	2,093	136.0	Rehabilitation along the routes of the sewerage, reducing the losses, terminating illegal connections.	24
54	7	WS	From Luda Yana dam section from inspection shaft to Bormiechkovo	Gravity water pipe from IS to PR Shtarkovo and Dinkata 4 221 m.	550,970	1,558	353.6	Supplying gravity water to the population	24
55	57	WS	WS Semchinovo - Simeonovets	Overall repair of w PR Semchinovo	70,143	1,943	36.1	Ensuring efficiency and reducing the losses.	24
56	9	WS	WS Pazardzhik	Replacement of gravity water pipe from the city of Pazardzhik to the village of Miriantsi 3,345 m.	434,789	568	765.5	Ensuring efficiency and sustainability of water supply	18

** Population in 2011 according to NSI data.*

*** According to the methodology of the Consultant (Please see Appendix 4-7)*

6.3.3. FINANCIAL AND ECONOMIC CONCLUSIONS

The medium-term program can be fully implemented under the constraint for the inclusion of depreciation for new assets specified in Chapter 5.4. The proposed investment components within the medium-term investment program are affordable for tariffs, corresponding to 4% of the income of the lowest income households or the first three decile groups.

The degree of coverage of depreciation costs for the new assets is 19.0% for the period of the medium-term program.

In order to cover the operating costs, maintenance costs, and the defined percentage of depreciation as a result of the investments made, the tariffs will reach levels in the range of EUR 1.30/m3 in 2028.

There is no need to take special measures to ensure targeted financial support for the lowest income population.

6.4. LONG-TERM INVESTMENT PROGRAMME

6.4.1. INVESTMENT COSTS

The investment costs presented in the tables below are net costs excluding VAT, constant price base 2011 in Euro.

6.4.1.1. *Water supply*

The long-term programme includes investment measures aiming at:

- Increasing the efficiency– reducing the non-revenue water, energy efficiency
- Rehabilitation and expansion of water supply systems ensuring sustainability – rehabilitation and adaptation of infrastructure.

The estimated costs for the long-term programme – Water Supply, amount to EUR **33 million** and include the following investment components**:**

- Reconstruction of the external water pipes made of asbestos cement and the steel pipes with expired service life.
- Installation of new external water pipes and rehabilitation of the existing pipes in connection with the coverage of the consumption of 4 villages in Lesichovo municipality with purified water from Luda Yana dam.
- Rehabilitation of 116.303 km water distribution pipes in the settlements.
- Replacement of obsolete pumping aggregates, fittings and pipes in the pumping stations and re-equipment of TW.

- Rehabilitation of water reservoirs and replacement of fittings and pipes.

The following results will be achieved with the implementation of the planned activities:

- Eliminating the risk for the health of the population as a result of using water pipes made of asbestos cement – over 90% of the water supply infrastructure will be replaced.
- Reducing the losses of water in the external water pipes up to 25%.
- Reducing the water losses in the distribution networks and water supply connections. Improving the fire prevention (installation of new fire hydrants according to the regulatory requirements). Improving the security of water supply to customers.
- Rehabilitation of the equipment.
- Ensuring volumes for storage of the reserve for maximum consumption and PP for all settlements.

A summary of the long-term investment costs for water supply is presented in the table below. A detailed list of all investment measures is provided in Table 6.4.1.4.

Table 6-12 Long-term investments for water supply (€)

Category of work	Water abstraction	DWTP	External Water mains	Distribution networks	Reservoirs and tanks	Pumping stations	Miscellaneous	Total WS Long term construction costs
Code	WS_1	WS_2	WS_3	WS_4_1	WS_4_2	WS_4_3	WS_5	L-T
Construction cost per category	0	0	9,725,200	20,838,300	897,000	1,182,900	509,600	33,153,000
Pazardzhik Municipality	0	0	2,178,700	5,986,000	418,900	767,800	0	9,351,400
Septemvri Municipality	0	0	7,546,500	2,321,300	70,200	415,100	0	10,353,100
Lesichovo Municipality	0	0	0	2,691,000	407,900	0	9,600	3,108,500
City of Pazardzhik (Pazardzhik)	0	0	0	4,439,100	0	0	0	4,439,100
Town of Septemvri (Septemvri)	0	0	0	5,400,800	0	0	0	5,400,800
ViK Pazardzhik	0	0	0	0	0	0	500,000	500,000

6.4.1.2. *Wastewater*

The long-term programme includes investment measures aiming at:

- Rehabilitation of connected sewerage networks in order to reduce infiltration and to eliminate other major deficiencies, which will lead to efficient WWTP operation.

- Further construction of sewerage networks and increasing population connection to sewerage.

The estimated costs for the long-term programme – Wastewater, amount to EUR 42,193,700 and include the following investment components**:**

- Reconstruction and completion of sewerage networks and main sewers.
- Implementation of the conclusions and recommendations of the studies on sewerage zoning.

The following results will be achieved by carrying out the envisaged activities:

- Increasing the rate of population connection to sewerage network from 90% to 100%, depending on the location.
- Improving the level of WSS services to the population and the environmental condition of the settlements.
- Reducing the infiltration, permanent mode of WWTP operation, reducing the operating costs for treatment of over-diluted waste water;
- Terminating or reducing the discharge of untreated wastewater into the soil, rivers and other water bodies. Preventing the pollution of groundwater and minimizing the risk to human health.

A summary of the long-term investment costs for wastewater is presented in the table below.

Table 6-13 Long-Term Investments for Wastewater (€)

Category of work	WWTP	Mains collectors	Sewerage network	WW Pumping station	Miscellaneous	Total WW Long- term construction costs
Code	WW_1	WW_2	WW_3_1	WW_3_2	WW_4	L-T
Construction cost per category	0	108,700	33,914,600	0	8,170,400	42,193,700
Golemanovo (WW-1 Pazardzhik)	0	0	312,200	0	0	312,200
Saraya (WW-1 Pazardzhik)	0	0	330,100	0	0	330,100
Dragor (WW-1 Pazardzhik)	0	0	228,000	0	0	228,000
Mokrishte (WW-1 Pazardzhik)	0	0	295,200	0	0	295,200
Dobrovnitsa(WW-1 Pazardzhik)	0	0	531,500	0	0	531,500
Miriantsi (WW-1 Pazardzhik)	0	0	295,200	0	0	295,200

Category of work	WWTP	Mains collectors	Sewerage network	WW Pumping station	Miscellaneous	Total WW Long- term construction costs
Code	WW_1	WW_2	WW_3_1	WW_3_2	WW_4	L-T
Sinitievo (WW-1 Pazardzhik)	0	0	461,000	0	0	461,000
Hadzhievo (WW-1 Pazardzhik)	0	0	390,300	0	0	390,300
Pishtingovo (WW-2 Malo Konare)	0	0	598,500	0	0	598,500
Krali Marko (WW-2 Malo Konare)	0	0	161,900	0	0	161,900
Patalenitsa (WW-3 Patalenitsa)	0	0	643,100	0	0	643,100
Tsranscha (WW-3 Patalenitsa)	0	0	435,700	0	0	435,700
Debrashtitsa (WW-3 Patalenitsa)	0	0	345,800	0	0	345,800
Liahovo (WW-4 Bratanitsa)	0	0	242,500	0	0	242,500
Zvanichevo (WW-4 Bratanitsa)	0	0	418,700	0	0	418,700
Yunatsite (WW-5 Yunatsite)	0	0	491,500	0	0	491,500
Velichkovo (WW-5 Yunatsite)	0	0	524,400	0	0	524,400
Semchinovo (WW-6 Septremvri)	0	0	338,900	0	0	338,900
Simionovets (WW-6 Septremvri)	0	0	329,000	0	0	329,000
Vetren Dol (WW-6 Septremvri)	0	0	602,300	0	0	602,300
Zlokuchene (WW-7 Kovachevo)	0	0	152,300	0	0	152,300
Lozen (WW-7 Kovachevo)	0	0	81,000	0	0	81,000
Vinogradets (WW-8 Vinogradets)	0	0	876,300	0	0	876,300
Karabunar (WW-8 Vinogradets)	0	0	694,600	0	0	694,600
Boshulia (WW-8 Vinogradets)	0	0	342,000	0	0	342,000

Category of work	WWTP	Mains collectors	Sewerage network	WW Pumping station	Miscellaneous	Total WW Long- term construction costs
Code	WW_1	WW_2	WW_3_1	WW_3_2	WW_4	L-T
Septemvri	0	108,700	7,799,100	0	242,000	8,149,800
ViK Pazardzhik (Pazardzhik)	0	0	0	0	3,469,700	3,469,700
ViK Pazardzhik (Septemvri)	0	0	0	0	1,004,900	1,004,900
ViK Pazardzhik (Lesichovo)	0	0	0	0	3,049,800	3,049,800
Pazardzhik	0	0	15,993,500	0	404,000	16,397,500

6.4.1.3. *Overall long-term investment costs*

A summary of the long-term investment costs, at the level of the WSSC, for water supply and sewerage is presented below. The table includes the costs for all investment measures identified for the long-term investment phase (irrespective of the priorities). The overall long-term investment costs amount to about EUR 75.3 million.

Table 6-14 Overall long-term investments for water supply

Code	Category of work	Total Cost
WS_1	Water abstraction	- €
WS_2	DWTP	- €
WS_3	Water mains	9,725,200 €
WS_4_1	Distribution network	20,838,300 €
WS_4_2	Reservoirs and tanks	897,000 €
WS_4_3	Pumping stations	1,182,900 €
WS_5	Miscellaneous	509,600 €
WS system Construction Cost		**33,153,000 €**

Feasibility studies	1%
Design	4%
Construction supervision	5%
Project management	3%
Studies and supervision cost	**4,309,900 €**

Contingencies	10%
Contingency cost	**3,315,300 €**

Total investment cost	**40,778,200 €**

Table 6-15 Overall long-term investments for wastewater

Code	Category of work	Total cost
WW_1	WWTP	- €
WW_2	Main collectors	108,700 €
WW_3_1	Sewerage network	33,914,600 €
WW_3_2	WW Pumping station	- €
WW_4	Miscellaneous	8,170,400 €
WW Construction Cost		**42,193,700 €**
Feasibility studies		1%
Design		4%
Construction supervision		5%
Project management		3%
Studies and supervision cost		**5,485,200 €**
Contingencies		10%
Contingency cost		**4,219,400 €**
Total investment cost		**51,898,300 €**

6.4.2. LONG-TERM INVESTMENT PROGRAMME

The table below shows a list of all identified investment components. They are grouped on the basis of the investment measures. Further, the table indicates the investment costs for each investment measure, the population in the respective Water Supply Zone (or Population Equivalent for wastewater components) and the expected impact of the investment. Reference is made to Chapter 4.1.4. “General Methodology for Phasing and Prioritization”. The table reveals that the components cover all measures necessary to achieve compliance with EU and national legislation as well as measures for efficiency improvement.

Table 6-16 Long-term investment program

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
1	40	WW	Pazarzhik	Reconstruction and construction of sewerage network – 30,327m	16,397,500	71,979	227.8	100% coverage with sewerage network, reducing the infiltration, increasing the capacity of the network	81
2	17	WS	WS Pazarzhik	Replacement of pumping aggregates in BPS Mokrishte	282,738	77,590	3.6	Improving the quality of the service, ensuring efficiency and sustainability.	58
3	16	WS	ViK	Construction of SKADA system	500,000	146,439	3.4	Improving the quality of the service, ensuring efficiency and reducing the losses	49
4	1	WS	WS Pazarzhik	Replacement of pushers from PS to the village of Mokrishte and from TW to ЧВ 5,109 m	1,325,098	77,590	17.1	Ensuring efficiency and reducing the losses на загубите	49
5	27	WS	Pazarzhik	Reconstruction of the water supply network-30,560	4,439,100	71,979	61.7	Reducing the losses, sustainability of water supply	49
6	10	WS	From Luda Yana dam to Borimechkovo	Gravity water pipe from IS Kalugerovo to PR Tserovo 12,270 m	1,935,170	2,308	838.5	Improving the quality of the service	48
7	42	WW	Zvanichevo (WW-4 Bratanitsa)	Construction of internal sewerage network -1,183m	418,700	1,899	220.5	90% coverage with sewerage network, treatment of water	39
8	65	WS	Septemvri Municipality	Reconstruction of water supply network for settlements with population below 2,000 inhabitants -12,568m	2,321,300	10,236	226.8	Ensuring efficiency and reducing the losses to 25 %	38

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
9	43	WW	WW-8 Vinogradets (Vinogradets, Karabunar, Boshulia)	Construction of internal sewerage network -5,326m	1,912,900	3,646	524.7	90% coverage with sewerage network, treatment of water r	36
10	6	WS	WS Vetren	Replacement of gravity pipe from PR Slavovotsa – 5,423m	658,838	418	1,576.2	Ensuring efficiency and reducing the losses to 25 %	36
11	35	WS	Pazarzhik Municipality	Reconstruction of water supply network for settlements with population below 2,000 inhabitants -32,453m	5,986,000	23,999	249.4	Ensuring efficiency and reducing the losses to 25 %	35
12	5	WS	WS Vetren	Replacement of pushers from PS III to PR h.z. 1,440 m	201,431	3,221	62.5	Ensuring efficiency and reducing the losses	35
13	46	WS	From Luda Yana dam to Borimechkovo	Reduction of pressure /RV/	9,600	5,408	1.8	Reducing the pressure	35
14	18	WS	WS Malo Konare	Replacement of pumping aggregates in PS	29,319	4,353	6.7	Improving the quality of the service, ensuring efficiency and sustainability.	34
15	14	WS	WS Varvara – Vetren Dol	Replacement of pusher from TW to PR – ,5300m	673,168	3,513	191.6	Ensuring efficiency and reducing the losses	34
16	42	WS	WS Varvara – Vetren Dol	Replacement of pumping aggregates in PS.	68,787	3,513	19.6	Improving the quality of the service, ensuring efficiency and sustainability.	34
17	13	WS	WS Simeonovets - Semchinovo	Replacement of pusher from TW to PR- 1,250 m	563,867	2,841	198.5	Ensuring efficiency and reducing the losses	34
18	43	WS	WS Semchinovo - Simeonovets	Replacement of pumping aggregates in PS in TW Hancheto	39,445	2,841	13.9	Improving the quality of the service, ensuring efficiency and sustainability.	34

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
19	21	WS	WS Al. Konstantinovo	Replacement of pumping aggregates in PS	27,577	2,714	10.2	Improving the quality of the service, ensuring efficiency and sustainability.	34
20	41	WW	Septemvri	Construction of internal sewerage network – 18,114m	8,149,800	7,869	1,035.7	Reducing the infiltration, unloading the network and increasing its capacity.	34
21	22	WS	WS Liahovo - Bratanitsa	Replacement of pumping aggregates in PS	64,187	2,484	25.8	Improving the quality of the service, ensuring efficiency and sustainability.	33
22	19	WS	WS Ognianovo	Replacement of pumping aggregates in PS	27,578	2,353	11.7	Improving the quality of the service, ensuring efficiency and sustainability.	33
23	11	WS	WS Patalenitsa - Tsrancha	Replacement of pusher from TW to PR – 3,330m	465,809	2,335	199.5	Ensuring efficiency and reducing the losses	33
24	23	WS	WS Patalenitsa - Tsrancha	Replacement of pumping aggregates in TW	259,523	2,335	111.1	Improving the quality of the service, ensuring efficiency and sustainability.	33
25	20	WS	WS Hadzhievo	Replacement of pumping aggregates in PS	16,652	1,027	16.2	Improving the quality of the service, ensuring efficiency and sustainability.	33
26	12	WS	WS Septemvri	Replacement of gravity water pipe – Septemvri to Zlokuchene – 1,845m	226,620	860	263.5	Ensuring efficiency and reducing the losses	33
27	44	WS	Septemvri Municipality	Rehabilitation of PR	70,200	18,549	3.8	Reducing the losses, sustainability of water supply	33

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
28	9	WS	From Luda Yana dam to Borimechkovo	Gravity water pipe from IS Lesichovo to PR Kalugerovo 9,288 m	1,387,665	3,472	399.7	Ensuring efficiency and reducing the losses	33
29	44	WW	Simionovets (WW 6 – Septemvri)	Construction of internal sewerage network -923m	329,000	898	366.4	90% coverage with sewerage network, treatment of water	32
30	45	WW	Hadzhievo (WW-1 Pazarzhik)	Construction of internal sewerage network -1,092m	390,300	1,027	380.0	90% coverage with sewerage network, treatment of water	32
31	66	WS	Lesichovo Municipality	Reconstruction of water supply network for settlements with population below 2,000 inhabitants -14,638m	2,691,000	5,408	497.6	Ensuring efficiency and reducing the losses to 25 %	32
32	46	WW	Vetren Dol (WW-6 Septemvri)	Construction of internal sewerage network -1,690m	602,300	1,452	414.8	90% coverage with sewerage network, treatment of water	31
33	67	WS	From Luda Yana dam to Borimechkovo	New pressure reservoirs – Pamidovo, Shtarkovo	337,643	772	437.4	Ensuring PP reserve and maximum hourly consumption	31
34	8	WS	From Luda Yana dam to Borimechkovo	Gravity water pipe from IS Velichkovo o PR Vinogradets – 9,030 m	1,845,947	3,646	506.3	Improving the quality of the service, ensuring efficiency and sustainability.	31
35	36	WS	Septemvri	Reconstruction of water supply network -26,085m	5,400,800	7,869	686.3	Ensuring efficiency and reducing the losses to 25 %	31
36	47	WW	Golemanovo (WW-1 Pazarzhik)	Construction of internal sewerage network -887m	312,200	695	449.2	90% coverage with sewerage network, treatment of water water	30
37	48	WW	Pishtingovo (WW-2 Malo Konare)	Construction of internal sewerage network -1,680m	598,500	1,037	577.1	90% coverage with sewerage network, treatment of water water	29

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
38	49	WW	Sinitievo (WW-1 Pazarzhik)	Construction of internal sewerage network -1,296 m	461,000	1,950	236.4	90% coverage with sewerage network, treatment of water water	29
39	50	WW	Semchinovo (WW-6 Septemvri)	Construction of internal sewerage network -932 m	338,900	1,943	174.4	90% coverage with sewerage network, treatment of water water	29
40	51	WW	Mokrishte (WW-1 Pazarzhik)	Construction of internal sewerage network -828 m	295,200	1,851	159.5	90% coverage with sewerage network, treatment of water water	29
41	25	WS	Pazarzhik Municipality	Rehabilitation of PR	189,212	12,622	15,0	Reducing the losses, sustainability of water supply	29
42	52	WW	Dragor (WW-1 Pazarzhik)	Construction of internal sewerage network -640m	228,000	1,422	160.3	90% coverage with sewerage network, treatment of water	29
43	53	WW	Saraya (WW-1 Pazarzhik)	Construction of internal sewerage network -922m	330,100	1,356	243.4	90% coverage with sewerage network, treatment of water	29
44	54	WW	Lozen (WW-7 Kovachevo)	Construction of internal sewerage network	81,000	1,019	79.5	90% coverage with sewerage network, treatment of water	28
45	55	WW	Zlokuchene (WW-7 Kovachevo)	Construction of internal sewerage network -429m	152,300	860	177.1	90% coverage with sewerage network, treatment of water	28
46	56	WW	Liahovo (WW-4 Bratanitsa)	Construction of internal sewerage network -682m	242,500	391	620.2	90% coverage with sewerage network, treatment of water	28
47	57	WW	WW-5 Yunatsite (Velichkovo, Yunatsite)	Construction of internal sewerage network – 2,852m	1,015,900	2,542	399.6	90% coverage with sewerage network, treatment of water	28
48	58	WW	Dobrovnitsa (WW-1 Pazarzhik)	Construction of internal sewerage network -540m	531,500	1,380	385.1	90% coverage with sewerage network, treatment of water	28

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
49	59	WW	WW-3 Patalenitsa (Patalenitsa, Debarshtitsa, Tsrancha)	Construction of internal sewerage network -4,003m	1,424,600	3,245	439.0	90% coverage with sewerage network, treatment of water	27
50	60	WW	Krali Marko (WW-2 Malo Konare)	Construction of internal sewerage network -451m	161,900	190	852.1	90% coverage with sewerage network, treatment of water	27
51	62	WW	ViK Pazarzhik (Septemvri)	Increasing the degree of connection of the population to the sewerage network.	1,004,900	1,019	986.2	Termination or reduction of the discharge of wastewater without treatment into the soil, rivers and other water bodies. Prevention of the pollution of groundwater and minimization of the risk to human health.	26
52	63	WW	ViK Pazarzhik (Lesichovo)	Increasing the degree of connection of the population to the sewerage network.	3,049,800	5,408	563.9	Termination or reduction of the discharge of wastewater without treatment into the soil, rivers and other water bodies. Prevention of the pollution of groundwater and minimization of the risk to human health.	26
53	64	WW	ViK Pazarzhik (Pazarzhik)	Increasing the degree of connection of the population to the sewerage network.	3,469,700	5,826	595.6	Termination or reduction of the discharge of wastewater without treatment into the soil, rivers and other water bodies. Prevention of the pollution of groundwater and minimization of the risk to human health.	26

Number in priority	Number of investment on the maps	Catetory (WS/S)	Name of WSZ/ Agglomeration	Description of component	Investment cost	Affected population*	Cost per capita / population equivalent	Total result	Points **
54	45	WS	WS Septemvri WS Vetren	Rehabilitation of PS and tube wells	263,694	13,977	18,9	Reducing the losses, sustainability of water supply	25
55	4	WS	WS Malo Konare	Replacement of pusher from PS to the village – 542 m	292,339	4,353	67.2	Ensuring efficiency and reducing the losses	25
56	26	WS	Pazarzhik Municipality	Rehabilitation of existing PS	60,240	4,189	14.4	Reducing the losses, sustainability of water supply	25
57	47	WS	Lesichovo Municipality	Rehabilitation of PR	43,200	4,011	10.8	Reducing the losses, sustainability of water supply	25
58	61	WW	Miriantsi (WW-1 Pazarzhik)	Construction of internal sewerage network – 540m	295,200	568	519.7	90% coverage with sewerage network, treatment of water water	25
59	2	WS	WS Al. Konstantinovo	Replacement of pusher from TW to the village – 1,098 m	208,163	2,714	76.7	Ensuring efficiency and reducing the losses	25
60	24	WS	From Luda Yana dam to Borimechkovo	New pressure reservoirs – Boshulia, Vinogradets	143,197	2,297	62.3	Ensuring PP reserve and maximum hourly consumption	24
61	15	WS	WS Sinitievo	Replacement of pusher from TW to the village – 700 m.	122,453	1,950	62.8	Ensuring efficiency and reducing the losses	24
62	3	WS	WS Zvanichevo	Replacement of pusher from TW to the village – 214 m	34,439	1,899	18.1	Ensuring efficiency and reducing the losses	24
63	7	WS	WS Yunatsite	Replacement of pusher from TW to the village – 407 m	65,499	1,522	43.0	Ensuring efficiency and reducing the losses	24
64	68	WS	WS Al. Konstantinovo	New extraction reservoir	205,498	2,714	75.7	Improving the quality of the service, ensuring efficiency and sustainability	20

** Population in 2011 according to NSI data.*

*** According to the methodology of the Consultant (Please see Appendix 4-7)*

6.4.3. FINANCIAL AND ECONOMIC CONCLUSIONS

Like the previous two programs, the long-term program can be fully implemented under the constraint for the inclusion of depreciation of new assets specified in Chapter 5.4. The proposed investment components within the medium-term investment program are affordable at tariffs corresponding to 4% of the income of the poorest households or the first three decile groups.

The degree of coverage of depreciation costs for the new assets is 25.3% for the period of the long-term program.

In order to cover operating costs, maintenance costs and the defined percentage of depreciation as a result of the investments made the tariffs will reach levels in the range of EUR 1.63 /m3 in 2038.

There is no need to take special measures to ensure targeted financial support for the lowest income population.

7. ENVIRONMENTAL ASSESSMENT

7.1. ENVIRONMENTAL ASSESSMENT PROCEDURE

Environmental Assessment (EA) of plans and programmes is a preventative tool to evaluate the potential significant impacts on the environment, resulting from the implementation of plans and programmes at national, regional and local levels. The assessment is carried out simultaneously with their development, i.e. the approach aims to integrate processes. EA execution is fully consistent with statutory national procedures for preparation and approval of plans/programmes and the authorities responsible for their endorsement should conform to EA statement.

EA gives a notion of the expected changes that will occur in the environment as a consequence of the performance of the investment intentions, set out in plans and programmes.

The goal is to provide a high level of environmental protection by determining the expected impact of the activities covered by the strategic planning.

The Environmental Assessment procedure is described in Appendix 7-1.

7.2. ENVIRONMENTAL ASSESSMENT OF THE REGIONAL WATER AND WASTEWATER MASTER PLAN OF THE DESIGNATED TERRITORY OF VIK EOOD - PAZARDZHIK.

For the present Regional Water and Wastewater Master Plan of the designated territory of ViK EOOD-Pazardzhik, information has been prepared for Evaluation of the need for Environmental Assessment in compliance with para. 2 of Art. 8 of the Ordinance on the terms, conditions and methods for carrying out an EA of plans and programmes.

Chapter 0 exposes the outcomes of the Study conducted on the territory ViK EOOD-Pazardzhik within the framework of the Regional Water and Wastewater Master Plans in Central Region of Bulgaria.

Chapter 3 presents the environmental features of the area, which may be affected by the implementation of the Regional Water and Wastewater Master Plan.

Since the territory falls within the scope of the protected areas under Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora and under Directive 79/409/EEC on the conservation of wild birds, the plan should undergo Compatibility Assessment (CA) procedure, pursuant to Art. 2, para. 2 of the Ordinance on the terms and conditions for carrying out a compatibility assessment of plans, programmes, projects and investment proposals with the subject and objectives of conservation of protected areas (SG. No 73/2007) of EPA.

The contracting authority of the plan i.e. the Ministry of Regional Development and Public Works submits a written request to the competent authority for Evaluation of the need for EA. This request contains all data on the implementation of the plan and the investment programme, the stages that EA undergoes and the period for which the programme is prepared. The request is accompanied by possible impact of the plan on the environment (CA), characteristics of the affected area and the expected effects on the environment, map of the affected territory, plans and tables, etc.

The Regional Water and Wastewater Master Plan of the designated territory of ViK EOOD-Pazardzhik is an environmentally sound plan, which includes all investment measures necessary for solving the problems of the designated territory, related to ensuring:

- Needed water quantity of good quality for all purposes
- High quality of living space and environment
- Prevention of conditions causing health risk situations
- Conditions for sustainable development of water ecosystem and the biodiversity in it.

It is guaranteed that all necessary requirements, related to impacts on protected territories, protected sites and protected areas are observed. (The proposed investment measures for wastewater treatment are favourable for the conservation of protected areas).

Chapter 4 presents all strategic options for the development of the water supply and sewerage systems as well as the technical, economic and environmental criteria for the selected options, which are included in the investment programmes.

Chapter 6 contains a detailed description of the proposed short-term, medium-term and long-term investment programmes, including all investment measures, required for fulfilling the objectives, set out in the national water strategy and for achieving full compliance with the European and national legislation.

In the implementation of investment measures in short-term, medium-term and long-term plan, a system of measures will be applied for reducing to the rational minimum the negative impact on environment.

Taking into account the proposed measures, the implementation of the individual sites, included in the investment programmes is not expected to exert any negative effects on the different environmental components during construction, operation and closure. None of the protected territories, sites and areas is negatively affected.

The following main goals will be achieved:

- Supplying good quality water for all purposes to the population in the area of the designated territory.
- Reducing drinking water losses in the system to 25%.

- Providing wastewater treatment consistent with the set requirements for water body protection, increasing self-purification capacity.
- Creating conditions for sustainable development of water ecosystem and biodiversity.
- Creating high living standard for the population in the area of the designated territory and preventing health risk.

The expected impacts of the implemention of the Regional Water and Wastewater Master Plan in the designated territory of ViK EOOD-Pazardzhik are as follows :

Expected impact on protected areas and protected zones:

Overall, the facilities envisaged for implementation in the Investment programme of the Regional Master Plan of VIK EOOD - Pazardzhik are not expected to have any negative impact and are compliant with the nature and purposes of the protected zones for conservation of natural habitats and wild flora and fauna and for conservation of wild birds.

For every investment intention envisaged in the Regional Master Plan the required EIA procedures and the CA (compatibility assessment) will be carried out during the preparation stage of the feasibility studies and all of the measures and conditions set in the respective Decisions of RIEW Pazardzhik will be complied with and enforced during its implementation.

During the implementation of the activities within the boundaries of the protected areas the regimes introduced with the order for their establishment, the Protected Areas Act and the Management Plan will be complied with.

Expected impact of Water Supply part of the Regional Master Plan:

Within the designated territory of ViK Pazardzhik, there is not surface water abstraction for drinking water supply. Surface water from the rivers and dams on the designated territory is only used for process water supply, irrigation, aquafarming and power production.Currently, drinking water supply within the boundaries of the designated territory relies on and groundwater. Water supply systems are not optimized. The large volume of abstracted water is due to the substantial volume of non-revenue water, caused by obsolete water supply facilities (large number of water leakages). By implementing the Regional Master Plan measures, such as rehabilitation of equipment, the percentage of non-revenue water will be reduced to 25%.

The deviations from the regulatory requirements for drinking water at some of the consumers are mainly caused by the obsolete parts of the water supply networks and treatment equipment. Regional Master Plan measures have been proposed in order to ensure drinking water quality in the whole designated territory. To optimize water abstraction, water use permits will be issued and Sanitary Protection Zone (SPZ) will be established for all water sources used for water supply in accordance with Ordinance 3 of 16.10.2000. To provide optimal disinfection and distribution of drinking water to the local population, the old and asbestos cement pipelines as well as the obsolete water treatment equipment will be reconstructed. Finally, high electricity consumption will be reduced through rehabilitation of water supply pumping stations.

As a first investment priority the Regional Master Plan includes appropriate measures to solve the problems with the drinking water quality in all of the settlements, where permanent and frequent deviations from the permissible levels are observed, regardless of the size of the settlement and the number of its population.

Expected impact of Sewerage part of the Regional Master Plan:

The designated territory of ViK EOOD Pazardzhik encompasses the Municipalities of Pazardzhik, Septemvri and Lesichovo, located in Pazardzhik District, part of South Central Planning Region. The territory covers a total area of 1,207 km$^{2.}$ Pazardzhik Municipality has an area of 636.8 km^2 and 32 settlements distributed in 31 mayoralties having a total population of 120,894 inhabitants (01.02.11.: the town of Pazardzhik – municipal centre (74,850 inhabitants). Septemvri Municipality has an area of 361.3km^2 with 15 settlements in 12 mayoralties and the town of Septemvri is the Municipal centre. Lesichovo Municipality covers 208.9 km^2 with 7 settlements in 6 mayoralties and Lesichovo is the Municipal centre. ViK EOOD Pazardzhik serves 54 settlements with 3 municipal centres.

Currently, only the Local WWTP of Pazardzhik is existing. It is to be provided with a stage for high level of nitrogen and phosphorus removal. The collector in the southern zone of the town will be built and the staged connection of wastewater from the nearby settlements will be implemented. (The village of Ivaylo has a partial sewerage system, the villages of Aleko Konstantinovo, Glavinitsa, Ognuanovo, Hadzhievo, for which investment propject have been elaborated under OPE as well as the option of future collection of domestic wastewater from the villages of Saraya, Dragor, Mokrishte, Sinitevo, Dobrovnitsa and Miryantsi.).

The existing wastewater networks in most of the settlements are in poor condition. A major part of the wastewater networks have reached the end of their service life. Sewer pipes are old, obsolete, demolished, clogged and feature small diameters and insufficient hydraulic capacity. Some sections of the sewer branches have reverse or low gradients. A large number of streets have no sewer branches. There are unauthorized discharges which are inconsistent with the European Directives.

The short-term, medium-term and long –term investment programmes, included in the Plan envisage:

- Extension and reconstruction of the sewerage network.
- Construction of modern WWTPs for
  - settlements with over 10,000 PE – Septemvri agglomeration (the town of Septemvri, Varvara and Vetrin Dol, while wastewater of Simeonovo and Seichinovo is proposed to be connected in the future.
  - settlements of between 2,000 PE and 10,000 PE within the designated territory, having partial sewerage systems. It is proposed to jointly treat in individual

WWTPS wastewater from the settlements i.e. the groups of Malo Konare, Patelenitsa, Bratanitsa and Yunatsite.

- Updating of Network Information Systems
- Supply of equipment for maintenance and operation of sewerage systems
- Construction of pre-treatment facilities for industrial companies, connected to the sewerage systems of the settlements.

By implementing the Regional Master Plan measures, the percentage of infiltration will decrease significantly, which will lead to optimization of wastewater system performance. Finally, high electricity consumption will be reduced through rehabilitation of wastewater pumping stations.

Conclusion:

Information has been prepared on the Evaluation of the need for Environmental Assessment of Draft Regional Water and Wastewater Master Plan of ViK EOOD Pazardzhik corresponding to the level of detail of the plan or programme and the methods used for the assessment. The information consists of:

- Description of the main objectives of the plan and the relation to other relevant plans and programmes;
- The current status of the components and factors and their eventual development without applying of the plan or programme;
- The environmental characteristics of territories that may be significantly affected,
- The existing environmental problems which are identified at different levels, and related to the plan, including those regarding to areas of specific environmental importance;
- The objectives for environmental protection at national and international level, regarding the plan and the way these objectives and all environmental considerations have been taken into account during the preparation of the plan;
- Possible significant impacts on the environment including components and factors and connections between them and measures envisaged to prevent, reduce and completely remove any adverse effects on the environment due to the implementation of the plan or programme.

Pursuant to Decision N-EO 58/2013 of MoEW concerning the RMP of ViK EOOD Pazardzhik no Environmental Assessment is required in the implementation of which no significant impact on the environment and human health is expected to occur. The Final RMP has taken into account all of the conditions set in the Decision.

During the preparation stage of the feasibility studies for the investment projects envisaged in the Regional Master Plan their Contracting authorities will prepare a Plan with measures to prevent, reduce or eliminate the negative environmental impacts during the implementation of the projects and will coordinate it with RIEW – Pazarzdhik.

Rigorous control will be conducted during the implementation of the Regional Master Plan of ViK EOOD Pazardzhik in order to ensure compliance with the measures set in the RBMP in the East Aegean Region from Chapter 7 Programme of Measures for Achieving the Objectives for Environmental Protection of the RBMP of EARBD.

8. PUBLIC CONSULATIONS

8.1. DRAFT REGIONAL MASTER PLAN DELIVERY

The Draft Regional Water and Wastewater Master Plan of the designated territory of ViK EOOD-Pazardzhik was submitted to the Ministry of Regional Development on 11th July, 2013 and delivered for public consultation on 30th August, 2013.

The respective request for the assessment of the need of Ecological Assessment was delivered to the Ministry of Regional Development for transmission to the Ministry of Environment and Water (MoEW) on 20th August, 2013.

8.2. ASSESSMENTS AND COMMENTS

8.2.1. GENERAL

Besides the Public Consultations to be conducted within the framework of the involved District Development Council(s) and Water Association or Municipal Council for Municipal Water and Sewage Service Companies for Regional Master Plan endorsement, several involved organisations reviewed the Regional Draft Master Plan and addressed their comments for consideration.

It is to be noted that final position of the Ministry of Environment and Water on the implementation of EA is necessary for the decision of Water Association or Municipal Council to be officially applicable.

8.2.2. COMMENTS FROM PUBLIC AUTHROTIES

The Ministry of Public Health also addressed general remarks on the Regional Master Plans by letter dated 2nd August, 2013. It was answered by letter of 21st August, 2013 for all the Regional Master Plans to be produced in the Central Region of Bulgaria.

The East Aegean Region Water Basin Directorate with headquarters in Plovdiv expressed its position by letter of 20th September, 2013: No objection on the Regional Master Plan.

Comments by the Ministry of Environment and Water have not been sent.

The Ministry of Environment and Water expressed its position on the request for assessment of the need of EA by letter EO-58 on 17th December 2013. Statement is that no EA needs to be completed on the territory of ViK EOOD-Pazardzhik.

8.3. PUBLIC CONSULTATIONS

8.3.1. DISTRICT DEVELOPMENT COUNCIL

The District Development Council deliberation about the Regional Water and Wastewater Master Plan of the designated territory of ViK EOOD - Pazardzhik took place on 1st October, 2013.

The District Council endorsed the Regional Master Plan.

8.3.2. WATER ASSOCIATIONS

The meeting with the Water Association in respect to the Regional Master Plan of the designated territory of ViK EOOD - Pazardzhik took place in the town of Pazardzhik at the building of Pazardzhik District on 14th November, 2013.

The meeting gathered by the members of the Water Association and the Project team.

The Water Association approved the Master Plan.

8.3.3. OUTCOME OF PUBLIC CONSULTATIONS

The Regional Water and Wastewater Master Plan of the designated territory of ViK EOOD-Pazardzhik is agreed by the involved authorities.