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ASSESSMENT AND DEVELOPMENT OF MUNICIPAL WATER AND WASTEWATER TARIFFS AND EFFLUENT CHARGES IN THE DANUBE RIVER BASIN.

Volume 2: Country-Specific Issues and Proposed Tariff and Charge Reforms: Bosnia i Herzegovina – Case Study

WORKING FOR THE DANUBE AND ITS PEOPLE

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PREFACE

The Danube Regional Project (DRP) consists of several components and numerous activities, one of which was "Assessment and Development of Municipal Water and Wastewater Tariffs and Effluent Charges in the Danube River Basin" (A grouping of activities 1.6 and 1.7 of Project Component 1). This work often took the shorthand name "Tariffs and Effluent Charges Project" and Phase I of this work was undertaken by a team of country, regional, and international consultants. Phase I of the UNDP/GEF DRP ended in mid-2004 and many of the results of Phase I the Tariffs and Effluent Charges Project are reported in two volumes.

Volume 1 is entitled *An Overview of Tariff and Effluent Charge Reform Issues and Proposals*. Volume 1 builds on all other project outputs. It reviews the methodology and tools developed and applied by the Project team; introduces some of the economic theory and international experience germane to design and performance of tariffs and charges; describes general conditions, tariff regimes, and effluent charges currently applicable to municipal water and wastewater systems in the region; and describes and develops in a structured way a initial series of tariff, effluent charge and related institutional reform proposals.

Volume 2 is entitled *Country-Specific Issues and Proposed Tariff and Charge Reforms*. It consists of country reports for each of the seven countries examined most extensively by our project. Each country report, in turn, consists of three documents: a case study, a national profile, and a brief introduction and summary document. The principle author(s) of the seven country reports were the country consultants of the Project Team.

The authors of the Volume 2 components prepared these documents in 2003 and early 2004. The documents are as up to date as the authors could make them, usually including some discussion of anticipated changes or legislation under development. Still, the reader should be advised that an extended review process may have meant that new data are now available and some of the institutional detail pertaining to a specific country or case study community may now be out of date.

All documents in electronic version – Volume 1 and Volume 2 - may be read or printed from the DRP web site (www.undp-drp.org), from the page Activities / Policies / Tariffs and Charges / Final Reports Phase 1.

We want to thank the authors of these country-specific documents for their professional care and personal devotion to the Tariffs and Effluent Charges Project. It has been a pleasure to work with, and learn from, them throughout the course of the Project.

One purpose of the Tariffs and Effluent Charges Project was to promote a structured discussion that would encourage further consideration, testing, and adoption of various tariff and effluent charge reform proposals. As leaders and coordinators of the Project, the interested reader is welcome to contact either of us with questions or suggestions regarding the discussion and proposals included in either volume of the Project reports. We will forward questions or issues better addressed by the authors of these country-specific documents directly to them.

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ABBREVIATIONS

ASTEC Model	Accounts Simulation for Tariffs and Effluent Charges Model
B&H	Bosnia and Herzegovina
BOD	Biological Oxygen Demand
DW	Directorate for Waters
EIB	European Investment Bank
EBRD	European Bank for reconstruction and Development
EU	European Union
FB&H	Federation of Bosnia and Herzegovina
KM	Convertible Mark
MA	Municipality Assembly
MB	Management Board
MoAFW	Ministry of Agriculture, Forestry and Water Management
MWWU	Municipal Water and Wastewater Utility
MWWU Doboj	Municipal Water and Wastewater Utility of Doboj
MU	Management Unit
O&M	Operate and Maintenance
RS	Republic of Srpska
SFOR	Stabilization Forces
SU	Service User
UFW	Unaccounted For Water
WB	World Bank
WMI	Water Management Institute
W&WW	Water and Wastewater

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1 Introduction

This Case Study is part of the project entitled "Assessment and Development of Water and Wastewater Tariffs and Effluent Charge Designs for Nutrient reduction in the Danube River Basin". "Municipal Water and Wastewater utility Doboj"(MWWU Doboj) in Doboj town was selected for investigation in the case study.

The main objective of this case study is to strengthen the financial capacity of the MWWU Doboj, and indirectly of other MWWUs as well, to the extent required to achieve the financial sustainability and operational efficiency through tariff reform. Beside that the proper selection and implementation of reform of water and wastewater tariffs can result in the improvement of the protection of water resources in the Danube region of B&H.

1.1 The Case Study Site

A number of wastewater utilities were pre-selected and site visited in order to assess their physical conditions, the existing institutional capacities, and financial capacities, before actually selecting MWWU Doboj for case study examination.

The Municipality of Doboj is composed of the town Doboj with its surroundings and 70 villages. The population of Doboj (urban part) is 28,000. Before the war (1992-1995) Doboj was a very important node in railway and road network.

The public utility "Water and Wastewater" Doboj in its present form was established in 1990. The performance of the utility was badly hampered because of the war. Since then the situation is gradually improving but there is still need to improve especially:

- the financial performance,
- protection of water sources,
- efficiency of water distribution (high amount of leakages in distribution network (50%),
-
- and wastewater collection and treatment (drainpipes are blockage, the wastewater overflows during the precipitations, higher town zones are not connected to the sewage system, non-rehabilitated sewage channel in water source Luke, unproper function of the pump station, there is no measuring of sewage flow rate,
- there is no wastewater treatment in Doboj).

MWWU Doboj takes care of the production, supply and distribution of drinking water and the collection of wastewater within its field of activities. The utility would perform these duties so that safe and good quality water is supplied to all the customers at affordable price and with smallest possible disturbance in supply. While performing its work the utility would respect all laws and by-laws of the Republic of Srpska.

1.2 The Process of the Study and Structure of the Report

First the general operating conditions of MWWU Doboj were assessed, including regulatory, management and financial aspects. These conditions will be described at length in Chapters 2, 3 and 4. Another report, the "National Profile for Municipal Water and Wastewater Management in Bosnia and Herzegovina", also part of the present project, provides further details on the more general state and federal level conditions and regulations.

The investment needs of MWWU Doboj were then listed, prioritized and phased to implementation stages of short term priority investments, sustainable investments, and upgrade investments into a

higher level of service. These phases also represent the urgency of the identified investments. The investments are described in Chapter 5.

In Chapter 6 scenarios are defined for the purpose of modeling with the ASTEC Model (Accounts Simulation for Tariffs and Effluent Charges Model), partly based on the investment priorities of Chapter 5, but also assessing other features, such as the requirement to recover costs and the availability of grant financing for the investments.

Chapter 7 presents the results of the scenarios, supplemented with an analysis of the tariff and current account consequences, while Chapter 8 examines how the economic burden falling on service users changes through the scenarios.

Finally, in Chapter 9 policy recommendations are offered, as a way of concluding the case study.

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2 Current Operating Conditions of the Management Unit

2.1 Geographical Setting

The area of the Bosna river basin covers the central part of Bosnia, which is the most populated and industrialized area in BiH. The river basin area is 10,500 $km^{2,}$ and the population is 1,820,000 and the population density 180 persons/km^2. The biggest cities are Sarajevo (510,000), Zenica (146,000), Tuzla (132,000) and **Doboj** (about 80,000, of which the urban area has 28,000).

The biggest industries and mines as well as the biggest settlements are located in this basin, and their wastewater discharges have seriously affected the water quality. The river is polluted downstream of Sarajevo, which is located close to the source "Vrelo Bosne" at the altitude of 494 meters. Three quarters of the total industrial effluent is discharged into the Bosna and its tributaries.

The Municipality of Doboj is centrally located in the Republic of Srpska. It is bordered to the north by the municipalities of Derventa and Modriča and by the FB&H in South and East. The Municipality of Doboj is composed of the town of Doboj with its surroundings and 70 villages. The town of Doboj is a relatively small urban area located on the West bank of the Bosna River.

The economy of the municipality has been badly stricken by the effects of the war. The lime factory is out of production and so are companies such as Trudbenik (compressor and pneumatic tools) and Hemoproduct (aluminum sulphate and pipes). The unemployment rate is high and the average income of families is very low (cca 300-400 KM/month).

2.2 Infrastructure

2.2.1 Water Supply

2.2.1.1 Water Sources

Existing water supply system of Doboj is projected to use two sources located closed the river Bosna: groundwater source "LUKE" and groundwater source "RUDANKA". These wells are also used at present.

Groundwater source **"LUKE"**: Water was pumping from the next wells:

- 5 sapped wells (ø 2000 mm; depth 8 - 9 m);
- 3 sapped wells (ø 1000 mm; depth 11 -13 m);
- 3 boring - hole well (ø 350 mm; depth 10 -15 m);
- 2 technological well (ø3500 mm; depth 8 - 10 m);

1 sapped " recharge " well (ø 1000 mm; depth 9 m). Maximum the wells capacity during a dry seasons is 6,000 m^3/day.

Groundwater source **"RUDANKA"** is located at North of the town close to the bank of river Bosna in the village Rudanka. Water used to be pumped from 7 wells (diameter 350 mm; depth 9 - 13 m). Two of these wells are now out of use because they do not have sufficient capacity. Maximum capacity for this source during dry season is 4,000 m^3/day.

Total capacity for both sources in rainy season is about 14,000 m^3/day. From the both of these sources, water was pumped from wells to collective tanks and then pumped with secondary pumps into the distribution network. Water was disinfected- cleared with gas - chlor before the tank.

2.2.1.2 Environmental Performance of Water Sources

The source LUKE is in the middle of the housing and industrial area, which is only partially connected to the sewer system. The occupants of the houses not connected rely on septic tanks and soak pits in their sewage disposal. These are partly located in the protective exclusion area of the well field. Secondly, there is an open sewer channel, mainly today for storm water, discharging into the river Bosna, also near LUKE well field, at a distance of 300m. This channel has not been rehabilitated and is prominent danger for the well's field. The most critical threat to the sustainability of this source constitutes the main road between Sarajevo city and Bosanski Samac city, where traffic is time to time really heavy and loads of hazardous materials are transported daily on the road. There are also other industrial activities located directly on the exclusion zone. The water supply seems in great jeopardy, especially from accident risk.

2.2.1.3 Distribution System

Main pipelines

Three main pressured pipelines:

Luke I, ø 350, length 1600 m, iron, installed 1960.

Luke II, ø 225, length 1600 m PVC, installed 1996.

Rudanka I, ø 250, length 6500 m asbestos-cement, installed 1968.

Booster-pump station

Booster – pump station, or the second, the third and the fourth height pump station are connected with height reservoirs of the zone of the low pressure. All pump stations and installations are old, but still in function.

Distribution network

Total length of water supply distribution network is 120 km. Distribution network is made from different type of materials during the years. Distribution system is old and partly out of function. That is the reason for 50% of leakages. Distribution network damages are daily. It is estimating that 15-20% of distribution network requires urgent reconstruction.

Reservoirs

All 4-height zones have reservoirs. All reservoirs are old and damaged during the last war. Three reservoirs are in function. They are equipped with devices for level controlling. This system is high priority for rehabilitation.

Environmental performance of distribution system

The high amount of leakages presents twofold environmental problems:

- Leakage, together with infiltrated surface water, increases fluidization and disturbances of the soil, contributing to landslides and share,
- In areas where pressure fluctuation in the distribution pressure is high, exfiltration increases fluidization of soil and infiltration during low-or no-pressure situation, resulting in contamination of the distribution system.

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2.2.2 Sewerage System

2.2.2.1 General Review

The sewage system in Doboj is combined system (storm water and wastewater) that collects the wastewater from households and wastewater from central part of the town to the disposal site several kilometers downstream. The whole sewage system is gravitational, and divided into two separate zones with separate discharges. Upper zone collects wastewaters from second pressure zone of water supply system, while lower zone collects wastewater from town's center. Although the terrain is very suitable for gravitational sewage network, the wastewater from the highest regions of the town (especially water distribution zones three and four) is not discharging into the sewage system. The sewage from those settlement areas is collecting into the septic tanks, and infiltrates into the ground. There is only one pump station in the town, used only when water level in river Bosna is too high for gravitational discharge.

The main sewage pipeline goes from industrial zone in the south, to discharge point approximately 3.5 km downstream, toward north. Most of the wastewater generated in industrial zone is collecting with this pipeline. On the south of the industrial zone is settlement area with scattered houses. This settlement is not connected on sewage system. The wastewater is collecting in the septic tanks, with infiltration in the ground, which endangers the potable water sources.

The total length of the combined sewage network in Doboj is approximately 80 km, with 80% of the population connected to the sewage network.

The wastewater is discharged into the river Bosna, without any kind of treatment. The "Bosanka" and "Trudbenik" factories, as well as town's hospital have wastewater treatment plants (mechanical treatment, aerator and settling basin), but they are not in function.

2.2.2.2 The Sewage Network

In Doboj, the question of ownership and responsibilities for sewage network is partially unsolved and unclear. According to the Plancenter final report of "Development of water services in the town of Doboj" from February 2000, only 5% of sewage network is responsibility of MWWU Doboj, and the rest of 95% is responsibility of the Doboj municipality, which allocated their duty to the municipal enterprise "Dobojinvest". This situation makes the maintenance of the sewage network difficult. None of the mentioned companies have money for maintenance. The fact that MWWU Doboj has some departments and staff for sewage maintenance, the responsibility for sewage system is it's duty. But however, the MWWU Doboj can charge low prices for wastewater collecting, which is not enough for any kind of maintenance and development of sewage system capacities.

2.2.2.3 Wastewater Pump Stations

The sewage system has only one pump station. The pump station was constructed with the purpose to pump wastewater to the river Bosna during high water levels in river. The location of the pump station is near the discharge points of both gravitational systems. It is manually controlled pump, so the wastewater from connections is directed to the pump station using the water gate.

2.2.2.4 Functioning and Maintenance of the Sewage System

The pump station is controlled manually only during the high water level in river Bosna, so the most of the time pump station is not controlled.

The unclear question of ownership and responsibilities over sewage network makes maintenance difficult, and there are not enough available capacities. There are only three workers on maintaining the sewage network. There is no vacuum cistern or equipment for flushing. The program for systematical flushing and cleaning of sewage network was never planned or proposed.

2.2.2.5 Critical Technical Problems in the Sewage System

- Unclear question of ownership and responsibilities for sewage network;
- The drainpipes are blocked, and the wastewater overflows during precipitation. The manholes are half-filled with sand and sludge. There is no systematic maintenance of the sewage system.
- The map of the sewage system is old (the map has not been updated since 1967), the data on sewage network are inadequate. Information on breaks, blockages and reparations does not exist in map form.
- Inadequate capacity of sewage network in some town areas. The overflow is often. Tool, material and equipment for maintenance and rehabilitation do not exist.
- Higher town zones are not connected to the sewage system. During precipitation this fact causes safety problems (land-slides) and health threat (wastewater overflows) in lower regions.
- Accumulation sewerage holes in some urban zones are in the area of potable water sources. This represent serious treat to Doboj's water supply.
- Non-rehabilitated sewage channel in water source Luke.
- The rehabilitation and maintenance are necessary for proper functioning of the pump station.
- No one has a responsibility to collect wastewater samples from sewage network. Without continuous sampling, the data on wastewater quality is not reliable.
- There is no measuring of sewage flow rate, or data on sewage flow.
-

After discussion with in MWWU Doboj financial manager addressed problems in ownership issue and that MWWU Doboj does not want to rehabilitate something that is belong to other legal entity. In their "Plan of activities for 2003" utility planned the following investments from own assets:

- rehabilitation of pipelines in the street "Miloš Obilić" length 250m with household's connection KM 46,250
- changing of the water meters Ø ½ -100 mm KM 30,000
- changing of the valves KM 30,000

2.3 Ownership of Assets

The official name of MWWU Doboj indicates the fact that the ownership of water utilities belongs to the RS. The ownership is determined by the RS legislation which transformed the so called social ownership, dominant in the ex-Yugoslavia, into RS ownership. Although all public companies are State companies, some of them operate "in the interest of " one or more municipalities. The division between companies "of State interest" and "of municipal interest" is based on the amount of company capital, and on the field and geographical territory of company activities. In companies of municipal interest, the members of the governing bodies, representing the owner, are elected by the Municipal Assembly.

During the process of transformation cca 60-65% of utility's capital was allocated to the state, but it is not defined if it is state on high level (RS) or lower level (Municipality). 35-40% of the utility's capital was privatized through internal shares and vouchers.

As it was mentioned earlier, MWWU Doboj owns only 5% of the sewage infrastructure, while 95% is owned by one of the municipal enterprises, in essence, it is owned by the municipality.

2.4 Relationship Between the Municipality and the MWWU

There are several potential (and many existing) problems with this excessive municipal control that can adversely impact on the ability of the utility to operate effectively. The following is a sampling of some of the problems observed.

The water utility currently does not have adequate degree of autonomy. The system operates under fairly strict control of the municipality, and this control is frequently exercised in ways that are contrary to the viability of the utility. A common problem seems to be the ignorance (by the Director and the Management Board) of the duties and responsibilities set out in the Statute. Municipal officials sometimes interfere in the utilities' operations.

The relations between the municipality (Municipality Assembly - MA) and MWWU Doboj are presented in Figure 1.1. The MA has appointed a Management Board (MB) and Supervisory Board (SB) for MWWU Doboj. MB consist of three members, two appointed by the MA and one by MWWU Doboj.

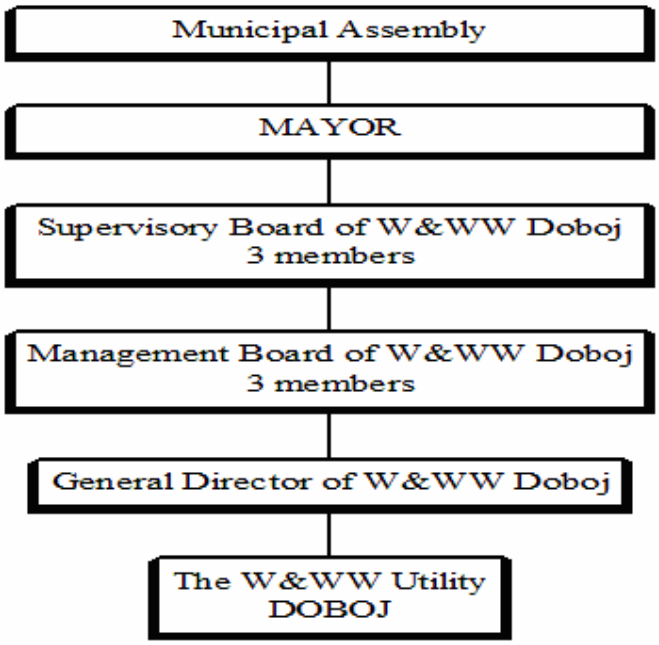

Figure 1 Organization of Relations Between Municipality and MWWU Doboj

The MB appoints the Chairman of the Management Board and Chairman of the Supervisory Board. The Management Board reports to the Supervisory Board, which further reports to the Mayor. The budget, water tariffs, investments among other matters are presented by the Management Board, approved by the Supervisory Board and ratified by the Municipal Assembly. The Management Board has also appointed the Director.

The relations between MWWU Doboj and Doboj Municipality are regulated on the basis of mutual Performance Agreement prepared in 1989, when the department of communal services (Public Utility "Progress"), then responsible for water supply and sewerage, street cleaning, solid waste management and funeral services, was split into separate "companies". According to this agreement MWWU Doboj is responsible for water and wastewater services only in the town of Doboj and has a relative independence in its actions. MWWU Doboj does not receive any subsidies from the municipality.

2.5 Organization of the MWWU

The functions of the utility are presented below according to the organization chart shown in figure below:

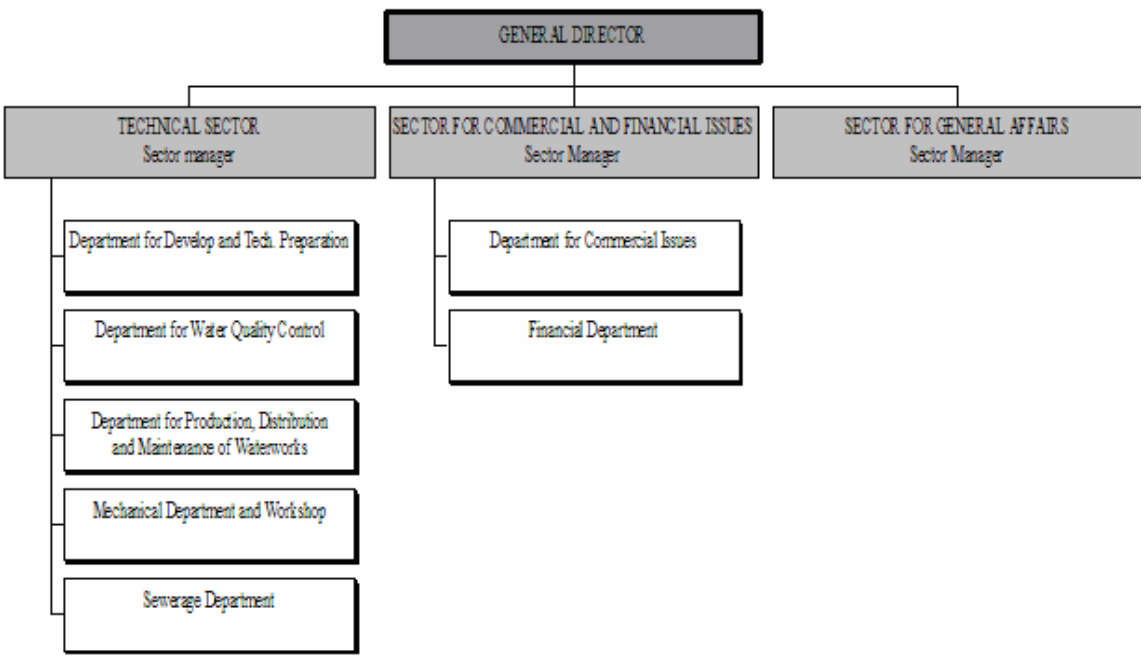

Figure 2 Organization Chart of MWWU Doboj

Technical Sector

The functions of the five departments of the Technical Sector are:

Planning and development:

- Research and planning of new civil works and rehabilitation of facilities and network;
- Control of house connections for water supply and sewerage collection; and
- Development of data collection and management information systems.

Quality control:

- Frequent sampling from well fields and distribution network;
- Sample analysis; and
- Monitoring the water quality development in watercourse.

Construction, operation and maintenance of the water supply system:

- Water supply and distribution;
- Operation at and maintenance of well fields, pumping station and water reservoirs;
- Rehabilitation and new civil works at well fields, pumping stations and water reservoirs;

- Maintenance of the workshop for water meter calibration and services for repairs and replacement;
- Maintenance of the registration book and lists for registered and repaired damages; and
- Currying out continuous leak detection on the Doboj network.

Sewerage

- Operation and maintenance of the re-pumping station for wastewater;
- Operation and maintenance of the network for wastewaters collection;
- Rehabilitation and civil works at the re-pumping station for wastewater;
- Rehabilitation, civil works and design for new house connections on the network for wastewater collection;
- Maintenance of the registration book and lists for registered and repaired damages; and
- Carrying out continuous detection of damages in Doboj network.

Workshop

- Organization and carrying out of routine repair and maintenance of MWWU mobile units;
- Mechanical works, repair and maintenance of mechanical and electrical equipment for water supply and wastewater collection; and
- Facilitating transportation services and excavation for MWWU activities.

Commercial Sector

The functions of the two departments of the Commercial Sector are:
Commercial:

- Maintenance and revision of the list of customers and the customer database;
- Development of relations between customers and management;
- Billing
- Revenue collection; and
- Collection of debts.

Financial

- Bookkeeping services;
- Water tariff settings; and
- Contacts with financial institutions.

Sector for General Affairs

The functions of the Sector for General Affairs are:

- Accessory services to other departments; and
- Managing the restaurant for the Utility's personnel.

2.6 Management and Administration

Every utility operates under a Management Board and the Director, who are elected for four-year periods.

MWWU Doboj has a Management Board with three members, one of them being an employee of the utility. MWWU Doboj has also a Supervisory Board comprising three members elected by the Municipal Assembly. A company employee cannot be a member of this board. The Supervisory Board controls the company.

In Doboj, all significant decisions of the board are subject to review and approval of the Municipal Assembly. With the approval of its appointing body, the Management Board passes:

- the company's Statute;
- long and medium-term development programme;
- investment plans and programme;
- annual operational and business programme;
- reports on business and annual statement of accounts; and
- decisions on the profit apportioning.

Independently, the Management Board:

- passes the company's general acts;
- passes a programme for the modernization of the company;
- passes the company's business policy;
- considers and adopts the Director's reports on the condition and protection of workers' rights; and
- the Rule Book on its own work.

The Management Board, on behalf of the owner, concludes a contract on mutual rights and responsibilities with the Director who independently makes decisions within his jurisdiction. The Director:

- represents the company, is responsible for the legality of work;
- organizes and manages the operation and business;
- puts forward the outline of the business policy;
- puts forward programme for operation and development of the Company;
- puts forward acts to be approved by the Management Board;
- executes decisions of the Management Board;
- signs a collective agreement;
- puts forward general acts of the company;
- appoints and dismisses persons with special jurisdictions and responsibilities in the company and informs the Management Board accordingly;
- decides on individual rights, duties and responsibilities of employees or worker related to the work of the company in compliance with the Law and the collective agreement;
- and performs other jobs in accordance with the Law, general acts and decisions of the Management Board.

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The internal organization and staff of the company is defined in detail in the Rule Book on the Organization and Systematization of the Jobs and Working Tasks. Job descriptions and detailed competence requirements are defined for each manager and worker. The Rule Book of MWWU Doboj was updated in March 1999 (replacing the previous book from 1996).

2.7 Personnel Issues

A serious problem is caused by the high number of inexperienced and non-qualified staff, as well as the high age of personnel. In Doboj about 90% of the staff left the company before the war in the 1990's, many of the new employees are not qualified for their positions.

Table 1 Service Connections and Staff

Town	Number of utility staff	Population served by water supply	Number of connections	Employees per 1,000 people served
Doboj	84	28,000	4,243	2.7

2.8 Availability of Information and Reporting

Access to information regarding the financial and operative performance of the MWWU has proven difficult. This is largely due to poor organization of data or, partly, complete lack of it.

Limitations of time and incomplete responses prevent a clear understanding of the extent to which data gathering, availability of information and reporting is practiced. The information obtained indicates room for considerable improvement. In many of the interviews, directors could not provide answers to requests for data. This seems a clear indication of significant problems with data collection and reporting procedures.

2.9 Service Users

Water supply and collection wastewater services are providing by the MWWU to Doboj city and its surrounding (villages): Lipac, Svjetlača, Plane, Miljkovac, Velika Bukovica, Mala Bukovica, Čaire i Pločnik. Not all of the inhabitants have access to drinking water, and even less of them are on the wastewater network. Within the city of Doboj all of the population (28,000 people) receive water service, and the wastewater of 85% of the population (23,800) is collected. Outside of Doboj a share of the consumers have their own systems of water supply and they do not use MWWU Doboj services or do not have access to it.

The water distribution system is divided in four zones. About 80% of consumers are in first zone, 10 % in the second and altogether 10% in the third and fourth zone. Consumers in the first zone have water service 24 hours a day. In the other zones water supply is irregular, with consumers in the third and fourth zone receiving water only for a few hours daily.

The categories of service users (SUs) defined for purposes of ASTEC modeling are in Table 2. SUs have been differentiated based on a number of criteria:

- Legal form: household; legal entity (within that industrial facilities, private shops and public institutions)
- Consumed service: water; water and sewage as composite services (i.e. consumption of one service is related to consumption of the other service); water and sewage as independent services (i.e. consumption of the two services is not related, e.g. a company may decide to self supply one service, and purchase only the other one, therefore service levels are independent from each other in the longer time horizon)
- Housing type: individual; multi-family building
- SFOR

There is a fixed tariff for water consumption only, it is computed based upon the size of the water meter at the connection, in fact, it is called a water meter charge. The water meter charge varies from user to user, and since there is no data available by SU categories on its level, the figures in the table are estimates. The SFOR does not pay a fixed charge, but needs to pay an increased variable tariff after its consumption.

Monthly charges for water meter by size of water meter are the following:

Ø 15 mm - KM 1.05 (EUR 0.54)
Ø 20 mm – KM 1.05 (EUR 0.54)
Ø 25 mm – KM 2.63 (EUR 1.35)
Ø 30 mm – KM 3.68 (EUR 1.89)
Ø 40 mm – KM 4.70 (EUR 2.41)
Ø 50 mm – KM 19.48 (EUR 9.99)
Ø80 mm – KM 21.59 (EUR 11.07)
Ø 100 mm – KM 27.38 (EUR 14.04)

Variable tariffs include any related fees and charges, such as the water management fee (for more detail see the next section).

From the perspective of MWWU Doboj there are actually a lower number of accounts for the households of multi-family buildings, as many buildings have only one account and the building associate or house board collects the payments from the apartments. For purposes of modeling, however, the number of apartments was used. As metering is not available for all apartments in these buildings, the incentive for careful use of water is limited, and these households actually use more water than the households in individual homes.

Table 2 Main Features of Service Users

Name of the SU category	Number of accounts	The service *	Annual water use per account (m^3/year)	Fixed annual water tariff (KM/year)	Variable water tariff (KM/m^3)	Annual wastewater discharge per account (m^3/year)	Variable wastewater tariff (KM/m^3)
Individual houses with sewage	1 567	WSc	176	13.86	0.2935	176	0.132
Individual houses without sewage	2 296	W	167	13.86	0.2935		
Multi-family buildings	3 160	WSc	301	13.86	0.2935	291	0.132
Industry with sewage	224	WSi	819	198	1.0735	772	0.462
Industry without sewage	63	W	819	198	1.0735		
Small private shops with sewage	715	WSc	140	40	1.0735	136	0.462
Small private shops without sewage	140	W	140	40	1.0735		
SFOR	1	W	96 000		2.1235		
Public institutions	29	WSc	9 138	600	1.0735	8 724	0.462

* W = water only, WSc = both water and sewage, as composite services, WSi = both water and sewage, but as independent services

Billed water by categories in year 2002 is shown in Table 3. The figures here do not exactly match annual consumption times the number of accounts from Table 2, as some of the information there is more recent.

Table 3 Billed Water in 2002 (m^3)

Industry and institution	SFOR	Private shops	House Board – multi-family building	Individual houses	TOTAL
586,000	86,000	128,000	981,000	726,000	2,507,000

Source: Financial department of MWWU Doboj

Produced water in 2002 was 5,028,200 m^3, and billed water in m^3 was 2,507,560. On the base above data total leakages in distribution network in 2002 were 49.86%, which is a major cause for financial problems.

2.10 Water Management Fees

According to the Water Law the Ministry of Agriculture, Forestry and Water Management is entitled to collect water fees from water users and polluters. There are two types of water fees:

- general water fee, which is like a normal tax based on the salaries and wages paid by the employer; and
- specific water fee based on water abstraction and pollution

MWWU Doboj is paying the specific water management fees for water exploitation activities in amount of 0.035 KM/m^3 or 0.018 EUR/m^3;

The specific water management fee that MWWU Doboj pays (on the base of the utility's Price list) is 0.02 KM/m^3.

The obligors of specific water fee for water protection are (Water Law, Art. 92):

- legal persons, citizens (self-employed), and households that discharge their wastewater directly or through a public or private wastewater system into a watercourse, impounding water reservoir or groundwater;
- legal persons, citizens (self-employed), and households that within their activities, emit harmful substances into the atmosphere or in agricultural, forestry and/or construction site; and
- legal persons, citizens and owners of motor-vehicles and trailers, locomotives and wagons, and motor-ships.

The Decision determines water protection fee for *1 population equivalent* (p.e.), based on the average 24 hour discharge of wastewater, according to the number of population. This varies from 0.51 EUR per p.e. for less than 10,000 p.e. to 7,538 EUR plus 0.00248 EUR per p.e. for more than 2,000,000 p.e. (Water Law, Art. 4). Doboj has 21,250 p.e. and pays 1 KM/p.e.

Water management fee is revenue within the Ministry for Agriculture, Forestry and Water Management.

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3 Current Regulatory Conditions

Most of the relevant information can be found in the National Profile, including economic regulation. In this chapter a description of the central and local institutions is provided.

3.1 Water Sector Institutional Framework - Central Level Institutions

General Remarks

The authorities and institutions in charge of water management and their respective competencies are prescribed in the Water Law (March 20, 1998). The Water Law also assigns duties to other authorities not primarily in charge of water management but with responsibilities connected with the water sector.

This summary focuses on the statutory duties of said authorities and institutions as prescribed in the Law. These duties can be categorized as follows:

- Exercise of statutory powers - involve issuance of generally binding water management regulations
- Policy-making; administrative functions; financing; - are primarily internal matters for the administration, and may only indirectly affect outside subjects
- Regulatory functions - have a direct effect on the rights and obligations of natural and legal persons in each individual case,
- Operative functions - consist of practical executive work,
- Commercial activities - exercise of commercial functions extends the operations of an administrative authority to the private sector.

Water sector authorities and institutions are:

- ***RS National Assembly***
- ***RS Government***
- ***Ministry of Agriculture, Forestry and Water Management***

The Ministry of Agriculture, Forestry and Water Management (MoAFW) is the main authority in charge of administrative and technical duties regarding water management. According to the Water Law, the MoAFW is among other responsible for:

- defines provisions relative to harmful and hazardous substances and sanitary-technical conditions for wastewater;
- proposes programme for systematic water and wastewater control and provisions relative to the control methods;
- defines conditions (staff, equipment etc.) for companies authorized to control surface and groundwater quality;
- proposes to the Government the basis of and rates for the general water management fee, and a method for their calculation;
- proposes to the Government the basis of and rates for the specific water management fees;
- defines instructions for the method and time limit for payment of specific water fees;
- establishes inventory of existing water management facilities, financed by grants, taxes or public contributions;

- ***Ministry of Health and Social Protection***
- ***Ministry of Urbanism, Communal Planning and Ecology***
- ***Other Ministries***

Directorate for Waters (DW) The Directorate for Waters (DW), established under the MoAFW, is in charge of implementing the long-term, medium-term and annual plans for water management development. For this purpose, the DW stipulates contracts with the Water Management Institute (planning, design, research) and the Water Engineering Companies (flood protection, construction, maintenance).

The DW is in charge of the allocation of major resources for the water sector. Particular attention should be given to the transparency in the distribution of resources and to the accountability of the DW for its use of the public revenues.

- ***Water Engineering Companies***
- ***Water Management Institute***

The Water Management Institute (WMI) is subordinated the MoAFW. The WMI has its main office in Srspko Sarajevo and branch offices in Trebinje, Bijeljina and Banja Luka.

- ***Institute for Water***
- ***RS Hydro-Meteorological Institute***

3.2 Water Sector Institutional Framework - Local Level Institutions

Municipal Water Management Authorities

The Water Law assigns certain licensing and enforcement competencies to the municipality.

In addition, the municipal authorities have the competence to:

- approve measures of flood protection for areas not covered by the master plan for flood protection;
- decide on anti-erosion measures;
- approve general regulations for the utilization and maintenance of rural water supply systems;
- grant permissions for a third party to connect to a rural water supply system constructed by others;
- provide materials and other conditions for maintenance, reconstruction and further development of water works facilities for which the DW is not responsible; and
- in the event of water shortage, temporarily limit or discontinue the water usage.

In addition to the RS legislation, the utilities are governed by local level regulations. They include in Doboj:

- Decision on Organizing Public Company MWWU Doboj, (City Council); and
- Statute of the Basic State Public Utility Doboj (Management Board).

The Statute defines the name of the company, main office, scope of activities and the internal organization of the company, obligation for preparation and passing of annual, middle-term and long-term programme for work and development, and the establishment of a long-term development strategy of the company; company management (bodies, responsibilities, meetings and process of making a decisions, incl. Management Board, Director, possible other boards).

The primary activities of MWWU Doboj, according to the Statute, are:

- production and distribution of water, and
- treatment and collection of sewage (wastewater and storm water).

The secondary activities cover a wide range of tasks, such as project preparation and supervision, O&M, rehabilitation and construction of relevant facilities, supervision and control of the development of rural water undertakings, etc.

4 Current Financial Conditions of the Management Unit

4.1 Financial Management: Accounting Practices

The MWWU follows its Accounting laws of RS.

The accounting laws specify the use of an existing, standard chart of accounts that are very general for all public entities, and the laws set strict requirements for the use of account numbers. These official charts of accounts, because they were designed for use by all public organizations, are considered inadequate, and not sufficiently transparent, for use by modern water and wastewater utilities.

Recording of Expenditures

Almost all of the operating and non-operating expenditures are first recorded in interim accounts. Later, only twice a year, costs (as lump sums) are transferred into income statement accounts. As a consequence, the income statement is not capable of being used to indicate the performance of the MWWU Doboj on a monthly basis.

Recording of Revenue

MWWU Doboj records both water and wastewater sales in a single account, and the recording system does not differentiate income by customer type.

Cost-Center Accounting

The MWWU Doboj like other MWWUs in RS have not cost-center based accounting systems. One consequence of this is that tariffs cannot be based on the equivalent costs of providing water and wastewater services.

Management Accounting

In accordance with existing accounting laws of the RS, balance sheets, income statements, cash flow statements and other relevant financial reports are submitted twice a year to the Agency for Payment Operations. In many cases, these reports are the only source of extensive financial information available to the members of the board of directors and to senior management of the MWWU Doboj. Management of the MWWU Doboj gets reports on more frequent basis only on accounts receivable.

Compensation system

MWWU Doboj is using compensation system because has no sufficient cash. Compensation system is actually transaction with water bills. For example: Army owed the MWWU Doboj for water service, the MWWU Doboj owed the Company for electricity for electric service, and the company for electricity owed the government for taxes.

Budget

Such as most water and wastewater utilities in RS and MWWU Doboj does not prepare budget by department (cost centre). Some format of inventory of revenue and expenditure exists but it could not be used like comprehensive document serving in operational planning and like management tool.

4.2 Tariff Setting, Billing and Collection of Revenues

Water and wastewater tariffs are proposed by the MWWU on the base of calculation of financial department in the MWWU. Recommended water and wastewater tariffs would be ratified by the Executive Council of Municipality.

About 80% of users are households. Delivery of bills and water meter reading is quarterly. Payment of bills is, however, monthly. The reason for this frequency is on the one hand the hope for improved payment, on the other, liquidity problems of the MWWU.

Water meters of industry and institutions are both read and billed monthly.

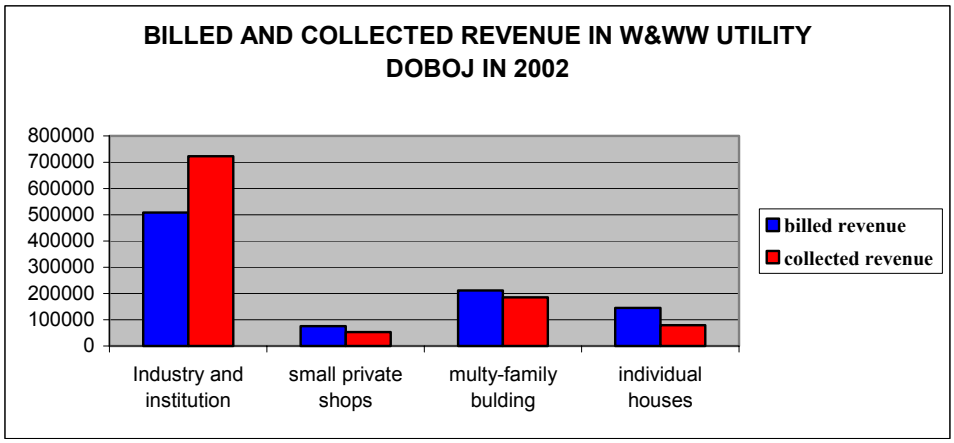
Billed and collected revenue by categories in 2002 is shown in Table 4 and Figure 3 below (including collected account receivable from previous periods from industry and institution – this is the reason for more collection than billing for industry in 2002):

Table 4 Billed and Collected Revenue in 2002 (EUR/year)

Category	Billed Revenue	Collected Revenue	Ratio of Collected and Billed Revenue
Industry and institution	508,421	722,598	142.13%
small private shops	76,316	52,601	68.93%
multi-family building	211,178	184,785	87.50%
individual houses	145,231	79,229	54.55%
TOTAL	1,170,397	1,039,213	88.79%

Source: Financial department of MWWU Doboj

Figure 3 Billed and Collected Revenue in 2002 (EUR/year)



According to the data from above tables collect rate in MWWU Doboj is 88.79%, but this collection rate is not actual because it includes collected account receivables (from industry and institutions) from previous periods, while some of the current period bills will only be collected in the next period. The above issues have been discussed with the financial manager of the Doboj MWWU and it has been suggested to him that these revenues are separately recorded, which is not the case at present.

4.3 Financial Results

Review of financial result of MWWU Doboj in 2002 in KM and EUR is presented in Table below:

Table 5 Financial Balance at MWWU Doboj in 2002

in KM			in EUR	
Operating revenue	1,967,307		Operating revenue	1,008,875
Other revenue	310,541		Other revenue	159,251
Total revenue	2,277,848		Total revenue	1,168,127
Operating expenditure	2,396,736		Operating expenditure	1,229,095
Other expenditure	17,506		Other expenditure	8,977
Total Expenditure	2,414,242		Total Expenditure	1,238,072
Balance (Loss)	136,394		Balance (Loss)	69,945

Source: Income Statement 2002 of MWWU Doboj

4.4 MWWU Operating Costs

The main operating costs are summarized in Table 6.

Table 6 Main Operating Costs of the Doboj MWWU (EUR)

Cost Category	Cost	Ratio of Total Cost	Ratio of O&M and Amortization
Material	111,069	11.95%	
Fuel	21,223	2.28%	
Electricity	154,504	16.63%	
Personnel	530,770	57.12%	
Administration	103,689	11.16%	
Other	7,983	0.86%	
O&M Costs	929,237	100.00%	75.06%
Amortization	308,836		24.94%
Total Expenditures	1,238,074		100.00%

Personnel costs make up the majority of O&M costs. Considering that supposedly MWWU Doboj is over employed, there is substantial room for cost savings through more rational use of human resources.

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4.5 Balance Sheet

Review of assets and liabilities in MWWU Doboj on December 31, 2002 is presented below.

Table 7 Assets and Liabilities of MWWU Doboj as of 31 Dec, 2002

			in KM		in EUR
ASSETS					
Non - current assets			10,946,440		5,613,559
Intangible assets			2,397,352		1,229,411
Tangible assets			8,549,088		4,384,148
of which	Buildings	8,332,046		4,272,844	
	Equipment	217,042		111,304	
Current assets			811,055		474,369
Stocks			119,962		119,962
Debtors			566,807		290,671
	Trade debtors	559,942		287,150	
	other debtors	6,865		3,521	
Cash in hand and at banks			124,286		63,736
			11,757,495		6,087,928
LIABILITIES					
Capital			11,005,841		5,644,021
Creditors			751,654		385,463
Long-term		5,039		2584	
Short-term		746,615		382879	
			11,757,495		6,029,484
			1 EUR = 1.95 KM		

5 Future Operating Conditions and Development Options of the Management Unit

5.1 Plans and Goals for Water and Wastewater Services

The source of this information is primarily the Project "Institutional strengthening water sector in Republic Srpska" – Plancenter Ltd in association with Institution for water sector of Republic Srpska, February 2000.

5.1.1 Water

5.1.1.1 Water Production

The basic long-term goal related to water supply is providing water to the whole urban population inside of the service area. The water supply system would be extended in the future and include certain urban zones that are according to urban development plans.

Planned the growth of population which will be provided with water from public system is shown in Table below:

Table 8 Expected Change in Urban Population Served by Drinking Water

Parameter	1999	2005	2010	2015
Urban population	28,000	33,000	33,000	33,000
Connected to the water supply system	21,000	26,500	28,000	30,000
% of population included in services	75	80	85	91

It is expected that water production per capita (586 l/c/d in 1999) will decrease to 360 l/c/d by 2005 and 240 l/c/d by 2015. At the same time UFW will also decrease substantially.

One of the reasons for decrease of consumption in category of household might be accurate metering in case that all consumers are supplied with meters. It is assumed that accurate metering will motivate consumers on costs savings, consequently on water savings.

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Table 9 Estimated Water Production by Scenario with Expected Growth of Population

	1999		2005		2010		2015	
	l/c/d	m^3/d	l/c/d	m^3/d	l/c/d	m^3/d	l/c/d	m^3/d
Household	235	4935	150	3975	130	3640	130	3900
Industry	72	1512	50	1325	40	1120	30	900
Commercial	36	756	30	795	25	700	20	600
Public sector	48	1008	30	795	30	840	20	600
UFW*	195	4095	100	2650	70	1960	40	1200
TOTAL	586	12306	360	9540	295	8260	240	7200

* Unaccounted For Water – Losses during distribution

5.1.2 Wastewater

5.1.2.1 Quantity of Wastewater

The main long- term objective related to the wastewater in Doboj is collection of wastewater from whole urban residence and industries.

Table 10 Plan for Residence Connected to Sewerage System by Scenario with Expected Growth of Population

Parameter	1999	2005	2010	2015	EU level
Urban residence	28,000	33,000	33,000	33,000	35,000
Connected on water supply	21,000	26,500	28,000	30,000	35,000
Connected on sewerage	17,000	22,000	24,000	27,000	33,000
% of residence serviced with sewage	80	83	85	89	94

Today the quantity of wastewater is estimated on the basis of wastewater concentration. The level of infiltration is expected to decrease to 50% of all wastewater discharge after reconstruction of the sewerage system.

Table 11 Plan for Future Discharge of Wastewater by Scenario with Expected Growth of Population

Sewerage	1999		2005		2010		2015		EU Level	
	l/c/d	m^3/d	l/c/d	m^3/d	l/c/d	m^3/d	l/c/d	m^3/d	l/c/d	m^3/d
Wastewater	70	1,190	95	2,090	110	2,640	120	3,240	120	3,960
Infiltration	430	7,310	405	8,910	250	6,000	120	3,240	120	3,960
TOTAL	500	8,500	500	11,000	360	8,640	240	6,480	240	7,920

5.1.2.2 Quality of Wastewater

The data about wastewater quality was not available. Wastewater quality is estimated on the basis of measurements in similar locations. The following data is used related to specific load:

- BOD_7 60g /c/d
- Total of phosphorus 2g/c/d
- Total nitrogen 12g/c/d

Table 12 Expected Load of Wastewater Pollutants by Scenario with Assumed Growth of Population

Parameter	1999 kg/d	2005 kg/d	2010 kg/d	2015 kg/d	EU Level kg/d
BOD_7	1,020	1,360	1,440	1,620	1,980
Total of phosphorus	34	44	48	54	66
Total nitrogen	204	264	288	324	396

5.1.2.3 Wastewater Treatment

Wastewater treatment plant exists neither in Doboj city nor in the whole catchments of the Bosna river.

Extension of the coverage of wastewater collection to the entire town and treating all wastewater before discharge are the major challenges of MWWU Doboj in the long-term. According to the financial analysis the least cost solution for the upgrading of the sewage collection is the construction of a new separate sewerage system. The existing combined network should be rehabilitated to serve for stormwater drainage. The proposed option is also environmentally best.

The selection of the location of the proposed wastewater treatment plant will be based on environmental impacts on, e.g. groundwater abstraction, and future land use of the town.

The proposed wastewater treatment plant (to be constructed 2010-2015) shall comply with the requirements of the EU.

5.2 Investments

The investment needs of MWWU Doboj are listed, prioritized, phased to implementation stages and justified in detail in the Project "Institutional strengthening of the water sector in the Republic of Srpska – Pilot Component".

The Investment program was divided in to short-, medium-, and long-term Investment programs according to the urgency of the identified investment need. Further prioritization was prepared inside each individual program according to the estimated impact of the investments on the economy and service level of the utility.

In order to prioritize the required short-, medium- and long-term investments an investment strategy is presented in Table 13**.** The prioritization criteria comprise five main groups:

- Reduction of operation costs;
- Increment of revenue;
- Improvement of sustainability of services;
- Improvement of service level; and
- Reductions of environmental pollution.

Table 13 Prioritization of Investment Needs

INVESTMENT	Category	Priority / Term		
		Short	Medium	Long
Water production facilities				
Protection measures at well field Luke	IS	1		
Pumps, internal piping and EA-installations of wells	RO	2		
Construction of overflow dam	ISL	2		
Data collection and automation system	RO	1	1	2
Improvement of pumping at both well fields	ISL		2	
Hardness removal plants	ISL			3
Planning a new well field	IS/ISL			3
Water distribution system				
Replacement of the most leaking pips	RO/IR	1	1	
Further rehabilitation of the other network	IR		2	2
Cleaning and inspection of network	RO		1	1
Replacement of house connections	RO/IR	1		
Replacement of household taps and valves	RO/IR	1		
Replacement/installation of new line valves	RO	1	1	2
Refurbishment of water meter workshop	IR	2		
Customer water meters and spare parts	IR	1		
Additional leakage detection equipment	RO	2		
Renovation of water reservoirs	ISL	3		
Procurement of repair material	RO/IR	1		
Extension of network	IR	4	2	2
Wastewater collection system				
Procurement of cleaning equipment	RO	2		
Sewer cleaning, inspection and infiltration study	ISL/RO	2		
Making most urgent repair for sewers	ISL	1		
Design and construction of separate sewer system	RO		1	
Extension of the separate sewer system	IR			1
Wastewater Treatment Plant				
Construction of wastewater treatment plant	REP			1

Source: Project "Institutional strengthening of the water sector in the Republic of Srpska – Pilot Component"

CATEGORY

RO = Reduction of operation costs

IR = Increment of revenue

IS = Improvement of sustainability

ISL = Improvement of service level

REP = Reductions of environmental Pollution

PRIORITY LEVEL

1 = highest priority

2 = high priority

3 = medium priority

4 = low priority

The proposed financing plan for the investments is shown in Table 14**.** The financing arrangements of the project are still at a preliminary stage.

Table 14 Proposed financing plan for the investments (1000 EUR)

Financing source	Short-term	Medium-term	Long-term	TOTAL	%
Loan finance		1,795	5,641	7,436	28
Government grant					
Foreign grant	6,084		4,103	10,187	38
Municipal equity	1,501			1,501	6
Internal financing		6,176	1,706	7,882	28
TOTAL	7,585	7,971	11,446	27,002	100

The project financing is based on an assumption that 30% of the costs is covered with long-term loans which would be equivalent to EUR 7.436 million. The loan term used in the projections is 15 years including a grace of 5 years for the principal repayment. The fixed interest rate used in financial projections is 7% per year. A commitment fee of 1% is also applied. In reality, the loan interest would most probably be floating following the market rate development. The potential sources of loan finance are such agencies like World Bank/International Bank for Reconstruction and Development (WB/IBRD), European Bank for Reconstruction and Development (EBRD) and European Investment Bank (EIB) through their specific programmes for environmental infrastructure development.

Grant financing is assumed to be 38% of the costs and to be received from foreign donors (such is EU) at an amount of EUR 10.187 million. The replacement of household taps and valves as well as 50% of replacement of house connections are assumed to be financed by Municipal equity. The amount of EUR 1.501 million is not including financial projections of the MWWU. The availability of own finance is based on tariffs that are assumed to be affordable to customers.

Financing assumptions and conditions during scenario modelling in Chapter 6 will be simpler: investments will be either fully financed from loan or 80% from grant and 20% from loan. 80% of grant financing may be an extreme assumption, our goal with this figure is to establish one end of a wide range of financing and related tariff consequences.

Table 15 through Table 16 include the estimated short, medium and long term investments costs. The period of amortization for buildings was assumed to be 30 years, and for mechanical and electrical installations 15 years.

Table 15 Estimated Short Term Investment Costs (Km)

SHORT-TERM INVESTMENTS	unit	no.	LOCAL INVESTMENTS	FOREIGN INVESTMENTS	TOTAL
Investments for water production:					
Protection of LUKE sources	unit	1	2,621,808	44,800	2,666,608
Rehabilitation of wells on LUKE and RUDANKA sources	peace	8	292,000	329,600	621,600
Construction of dam	unit	1	1,140,000	0	1,140,000
Installation of the system of data collection	unit	1	115,500	94,600	210,100
Total short -term investments for water production			4,169,308	469,000	4,638,308
Investments for water distribution:					
change of pipeline	peace	17	608,439	542,064	1,150,503
change of household's connection	%	60	1,402,500	1,402,500	2,805,000
change of taps and valves in households	peace	60	472,500	1,149,750	1,622,250
change of the most damaged valves	peace	30	300,000	261,600	561,600
rehabilitation of calibration space for water meter	unit	1	67,500	432,220	499,720
purchasing of new water meter and spare parts	unit	1	16,500	115,060	131,560
purchasing of akusto-corelator	unit	1	5,000	60,000	65,000
adapting of the height reservoirs	peace	3	499,400	330,000	829,400
purchasing of the rehabilitation's material	unit	1	80,000	100,000	180,000
Total short -term investments for water distribution			3,451,839	4,393,194	7,845,033
Investments for wastewater collection:					
purchasing of equipment for cleaning	unit	1	150,000	530,000	680,000
cleaning of sewerage					
cleaning of sewerage	unit	1	800,000	300,000	1,100,000
rehabilitation of the most critical point of sewerage	unit	1	150,000	123,000	273,000
Total short -term investments wastewater collection			1,100,000	953,000	2,053,000
General investments					
purchasing of the new vehicle	peace	5		150,000	150,000
purchasing of communication system	unit	1		15,000	15,000
purchasing of computers and network	unit	1		45,000	45,000
system of information managing + software	unit	1	20,000	25,000	45,000
Total general investments			20,000	235,000	255,000
TOTAL SHORT - TERM INVESTMENTS			8,741,147	6,050,194	14,791,341

Source: Project “Institutional strengthening of the water sector in the Republic of Srpska – Pilot Component”

Table 16 Estimated Sustainable Investment Costs (Km)

MEDIUM -TERM INVESTMENTS	unit	no.	LOCAL INVESTMENTS	FOREIGN INVESTMENTS	TOTAL
1. Investments for water production:					
Improving of pumping from both sources (LUKA & RUDANKA)	unit	1	192,500	660,625	853,125
Telemetric and data collection	unit	1	135,000	205,450	340,450
Total medium -term investments for water production			327,500	866,075	1,193,575
2. Investments for water distribution:					
change of pipeline	peace	7	363,275	323,625	686,900
rehabilitation of others pipeline	%	6	183,267	163,275	346,542
cleaning, control and planning of the rehabilitation	unit	1	207,360	29,952	237,312
change of valves	peace	50	1,008,877	734,577	1,743,454
Total medium -term investments for water distribution			1,762,779	1,251,429	3,014,208
3. Investments for wastewater collection:					
designing and construction of the new separately system of sewage	unit	1	5,263,500	5,818,200	11,081,700
Total medium -term investments wastewater collection			5,263,500	5,818,200	11,081,700
4. General investments					
purchasing of the 5 tone track	peace	1		90,000	90,000
purchasing of the tractor to dig	peace	1		150,000	150,000
computer	unit	1		25,000	25,000
computer software	unit	1	40,000	265,000	265,000
Total general investments			40,000	265,000	305,000
TOTAL MEDIUM - TERM INVESTMENTS			7,393,779	8,200,704	15,594,483

Source: Project “Institutional strengthening of the water sector in the Republic of Srpska – Pilot Component”

Table 17 Estimated Upgrade Investment Costs (Km)

LONG-TERM INVESTMENTS	unit	no.	LOCAL INVESTMENTS	FOREIGN INVESTMENTS	TOTAL
1. Investments for water production:					
Improving of water quality, water softening plant	unit	2	3,543,400	1,260,240	4,803,640
automatically system	unit	1	100,000	200,300	300,300
Total long -term investments for water production			3,643,400	1,460,540	5,103,940
2. Investments for water distribution:					
construction of the new network	unit	1	421,113	382,830	803,943
rehabilitation pipelines	%	8	215,359	195,781	411,140
cleaning , control and planning of rehabilitation	unit	1	207,360	29,952	237,312
new linear valves	peace	15	150,000	130,800	280,800
Total long -term investments for water distribution			993,832	739,363	1,733,195
3. Investments for wastewater collection:					
designing and construction of the wastewater treatment plant	unit	1	4,916,000	3,406,000	8,322,000
construction of the new wastewater network for connecting all houses	unit	1	3,410,000	3,751,000	7,161,000
Total long -term investments wastewater collection			8,326,000	7,157,000	15,483,000
TOTAL LONG - TERM INVESTMENTS			12,963,232	9,356,903	22,320,135

Source: Project “Institutional strengthening of the water sector in the Republic of Srpska – Pilot Component”

Table 18 Summary Table for Investments

	LOCAL INVESTMENTS	FOREIGN INVESTMENTS	TOTAL
1. Total short -term investments	8,741,147	6,050,194	14,791,341
2. Total sustainable investments	7,393,779	8,200,704	15,594,483
3. Total upgrade investments	12,963,232	9,356,903	22,320,135
TOTAL INVESTMENTS	29,098,158	23,607,801	52,705,959

Source: Project "Institutional strengthening of the water sector in the Republic of Srpska – Pilot Component"

6 Scenario Descriptions

Scenarios have been constructed around the notion of "progression" – a development from baseline conditions through medium term sustainability to upgrade of the infrastructure. In this chapter we provide a description of the scenarios as well as the description of data used in the scenarios, or reference to such data if they appeared in earlier chapters.

Altogether nine scenarios have been constructed and modeled. Most attention was given to baseline scenarios, as the first priority of MWWU Doboj is to achieve a balance of revenues and expenditures in the short run, only after this can medium and long term investments be considered. Features of the scenarios will be described in this chapter, ending with a table which includes the most important characteristics in a concise way, making comparison of scenarios easier.

In the modeled scenarios two component tariffs are used (a fixed and a variable tariff), since this is also the structure used at present by the MWWU Doboj for water services, therefore the resistance towards a two component tariff is lower in Doboj than in many other settlements, and returning to a simple variable tariff may considerably lower the efficiency of the tariff regime. In cost recovering scenarios the tariffs are structured so that fixed tariffs will recover fixed costs, and variable tariffs recover variable costs, for every single service user category. The economic efficiency properties of this pricing regime are described in detail in Volume 1 of the project report.

Each scenario received a code for easier identification, such as B1- which is the Simple Baseline scenario.

6.1 Baseline Scenarios

Within the set of baseline scenarios first a progression from present tariffs to cost recovering tariffs is being modeled (B1 through B3), while in B4 and B5 short term, priority investments will be introduced. To indicate the presence of *priority* investments, the letter P is attached to the codes of these scenarios; B4P and B5P. These investments alone are not sufficient for sustainable operations, but they are key to stabilizing the water service of the MWWU by replacing some of the least reliable pieces of infrastructure, reducing leakage and improving the protection of the water base.

B1 – Simple baseline

In this scenario only *actual expenditures* are included on the cost side, namely variable (operating) costs, fixed costs (e.g. management costs, maintenance costs), water tariffs and effluent charges. Amortization costs are excluded, since they do not represent an actual short-term payment obligation for the company. Costs have been allocated for modelling purposes through several steps: first distribution of costs between water and wastewater services, then separation of fixed and variable costs, and lastly distribution of costs among main service user categories. Costs within these categories are then distributed to actual SU groups in proportion to water consumption and wastewater discharge. Some of the costs are distributed to leaked water as well, which is then redistributed among service users based on their baseline consumption of water. This feature will gain importance in scenarios with reduced leakage.

Tariffs in this scenario are not required to cover costs, present day, two component tariffs are used for water services, and a simple variable tariff for wastewater services (see Table 2).

B2 – Baseline with cost recovery

Same as Scenario B1, but cost recovering tariffs are applied. Cost recovery takes place individually for each service user entity, for instance each household pays exactly as much as the cost behind its consumption. The Doboj MWWU will, nevertheless, not break even financially as it is not able to collect all of the bills, their revenue shortfall will be equal to non-paid bills. Similarly to B1, there is a two component tariff scheme. In B2, however, the fixed tariff should cover fixed costs, while the

variable tariff (commodity charge) should cover variable costs, therefore in addition to a change in overall payment (due to the requirement of cost recovery), payments will be restructured.

B3 – Baseline with cost recovery, tariffs of non-payers are covered by payers

Same as scenario B2, except that missing payments from non-payers are also recovered by payers through increased tariffs. Payers, in effect, have to carry a larger burden than what is justified by their consumption, so that the company can break even. An alternative to this strategy would be reduction of non-payment or a combination of reduced non-payment and increased tariffs. As the costs and achievements of such strategies have not been quantified, we decided not to model them.

B4P – Baseline with priority investments, 80% financed through grant

In this scenario on top of present fixed and operating costs, short term priority investments, with a value of 6.4 million KM, will be introduced in order to keep the water system in good operating conditions on the short run and to save some of the costs. No investments are carried out in the wastewater sector, all of the resources are dedicated to water services. The investments are financed 80% from grant, and 20% from a loan with a 15-year repayment period and 9% real interest rate. Detail on actual components of the priority investments can be found in Chapter 5.2.

As a result of the investments, not only will further deterioration of the service be postponed, but leakage will be reduced from 2.45 million m^3/year (51% of produced water) to 2 million m^3/year (46%). Moreover, the operating costs of water service will be reduced by 10%, as the need for emergency repairs will be lower.

Cost recovery is required similarly to B3, i.e. missing payments from non-payers are also recovered by payers, therefore the company itself reaches a revenue neutral status.

B5P – Baseline with priority investments, entirely financed from loan

Same as scenario B4P, except that all of the short term priority investments are financed from a commercial loan. The feasibility of this scenario is questionable, since commercial loans in general are difficult to obtain for Bosnian MWWUs due to the perceived high risk of non-payment. There are many more possibilities for financing investments at MWWUs, such as soft loans and equity, selecting specific combinations of these would alter the final results to some extent due to different costs of capital, but B4P and B5P results in a range of capital costs, and subsequent tariffs, which are already meaningful for decision makers.

6.2 Sustainable Scenarios

In case of sustainable scenarios a higher level of investments is carried out, than in baseline, in order to ensure reliable long term operation of the company. The change in assets has an influence on operating costs, as well.

S1 – Sustainable investments, financed 80% through grant.

In Scenario S1, in addition to short term priority investments, as described in Scenarios B4P and B5P, the rest of the planned short term and all of the planned medium term investments are also carried out. For a list of these investments, please refer to Chapter 5.2, Table 15 . It is assumed that 80% of all investments are financed through grant, while 20% is financed through commercial loan with 20 years repayment period. The sustainable scenario is additional to the baseline scenario. If sustainable investments are carried out within a few years after the baseline investments, then the repayment periods of the loans of the baseline and sustainable scenarios will overlap. This is exactly what has been modeled in S1, both of the loans are being repaid simultaneously, contributing to an increased financial burden for service users.

In the present scenario about 10.6 million KM is spent on water services in addition to the 6.4 million KM of the baseline priority investments. Much of the 10.6 million KM serves replacement and

rehabilitation of pipelines and replacement of valves. As a result leakage, in our estimate, will be reduced to 1.5 million m^3/year from 2 million m^3/year of the B4P and B5P scenarios. In Scenarios B4P and B5P 10% of water related operating expenditures were saved. In the present scenario an additional 10% of savings in water service operating costs are assumed, primarily because of a further improved infrastructure which needs even less emergency repair than under baseline priority investments.

About 13.3 million KM is spent on purchasing equipment for cleaning the wastewater network, execution of the cleaning, designing and constructing the new sewerage network – parts of the old network will be used for storm water collection. As a result of the new investments, the operating costs will increase by 0.02 KM/m^3 of wastewater. Rehabilitation of the existing sewage network is an important contribution to sustainability, as current overflows and leakage of the sewerage poses a hazard to water bases under Doboj, from which part of the city water supply is provided.

Cost recovery is required similarly to Scenarios B3, B4P, and B5P; missing payments from non-payers are also recovered by payers, therefore the company itself reaches a revenue neutral status.

S2 - Sustainable investments, entirely financed from loan

Same as S1, except that all investments are financed from a commercial loan.

6.3 Upgrade Scenarios

In these scenarios both the water and the wastewater infrastructure is upgraded, as described in Table 17 in Chapter 5.2. Water related investments primarily focus on a water softening plants and improvements of the distribution network. Wastewater investments will result in extension of sewage network to cover all households which have water services, while investments into the wastewater treatment plant (WWTP) will make it possible to achieve tertiary treatment.

The difference between the two modeled upgrade scenarios is the source of financing the investments.

U1 – Upgrade, 80% financed through grant

In this scenario 6.8 million KM is spent on water infrastructure. While some of the operating costs increase, others decrease, and the net effect is not clear. Consequently, no change in water service operating cost has been assumed compared to the sustainable scenario, which is equivalent to 20% decrease of operating costs compared to the baseline. Leakage, however, is assumed to decrease with another 0.5 million m^3/year, to 1 million m^3/year, indirectly contributing to lower unit costs of water provision.

15.5 million KM is invested into wastewater infrastructure. Out of this sum, about 600,000 KM is recovered through connect charges from newly connected households. Wastewater related operating costs increase by 0.35 KM/m^3, primarily due to treatment of effluents.

For both water and wastewater investments 80% grant financing, and 20% commercial loan has been assumed. The commercial loan is entered into the model with a 20 year repayment period and 9% real interest rate. The upgrade scenario is additional to the sustainable and baseline scenarios. If upgrade investments are carried out within a few years after the sustainable investments, then the repayment periods of the loans of the baseline, sustainable and upgrade scenarios will overlap. This is exactly what has been modeled in U1, all three categories of loans are being repaid simultaneously, contributing to an increased financial burden for service users.

Cost recovery is required similarly to Scenarios B3, B4P, B5P, S1 and S2; missing payments from non-payers are also recovered by payers, therefore the company itself reaches a revenue neutral status.

U2 - Sustainable investments, entirely financed from loan

Scenario U2 is the same as U1 in every respect, except that all investments are financed from a commercial loan instead of partial grant financing.

6.4 Overview of Scenario Features

To help review and determine which scenarios are directly comparable with one another, Table 19describes the most important scenario characteristics.

Table 19 Review of the Most Important Scenario Features

Scenario	Cost Basis	Cost Recovery Required	Non-Payment Covered by Payers, Marginal Cost Pricing	Cumulative Water Investments (million KM)	Cumulative Wastewater Investments (million KM)	Leakage (million m^3/year)	Change of Unit Water Operating Costs Compared to the Baseline	Change of Unit Wastewater Operating Costs Compared to the Baseline	Source of Investment Financing
B1	Baseline			-	-	2.4	-	-	-
B2	Baseline	✓		-	-	2.4	-	-	-
B3	Baseline	✓	✓	-	-	2.4	-	-	-
B4P	Baseline + Priority Investments	✓	✓	6.4	-	2.0	-10%	-	80% grant 20% loan
B5P	Baseline + Priority Investments	✓	✓	6.4	-	2.0	-10%	-	100% loan
S1	Sustainable	✓	✓	17.0	13.3	1.5	-20%	+0.02KM/m^3	80% grant 20% loan
S2	Sustainable	✓	✓	17.0	13.3	1.5	-20%	+0.02KM/m^3	100% loan
U1	Upgrade	✓	✓	23.9	28.8	1.0	-20%	+0.35KM/m^3	80% grant 20% loan
U2	Upgrade	✓	✓	23.9	28.8	1.0	-20%	+0.35KM/m^3	100% loan

7 Scenario Results

7.1 Tariffs

7.1.1 Water Tariffs

Table 20 and Table 21 provide an overview of how water tariffs change through the scenarios. All scenarios include two-part tariffs, and since cost recovery is required separately for fixed costs through fixed tariffs, and variable costs through variable tariffs, fixed and variable tariffs usually do not change to the same direction and degree as we switch from one scenario to another. For instance, if the fixed tariff increases, while the variable tariff decreases, the net effect on consumers is difficult to comprehend. Therefore, in order to ease comparison of scenarios, the average water price has been computed for each SU and each scenario by adding all tariffs per account and dividing the sum with total water consumption per account. The average water price derived this way is in Table 22.

While B1 included actual 2004 tariffs, tariffs in all other scenarios were required to recover costs. Except for B2, all costs are recovered by the MWWU. In B2 only those costs are recovered, which are associated with those SUs, which do pay their tariffs. As the requirement of cost recovery is imposed, households will face increased tariffs (both fixed and variable tariffs) compared to scenario B1, while all other users will have to pay less on average for a cubic meter of water. Essentially households, which are also the largest consumers of water in Doboj, are at present cross-financed by industrial water users, SFOR, small shops and public institutions. The extent and peculiarities of cross financing will be described in section 7.2.

In scenario B1 payments of variable tariff make up around 80% of all water service payments. Fixed costs in the baseline, however, represent around 40-45% of all costs, therefore in the cost recovering scenarios the ratio of fixed tariffs increases, and the ratio of variable tariffs decreases. When cost recovery is required (B2 and B3), the fixed tariffs increase for all SUs in absolute terms as well, except for industry. When short term priority investments are carried out (B4P, B5P), fixed costs will further increase. The increase is, obviously, larger in scenario B5P, in which grants do not support the investments. Operating costs and tariffs in B4P and B5P, however, decline, as the investments provide efficiency gains in operation and reduced leakage. For households, however, operating costs are still higher than they were originally in B1, as cross-subsidization ceased.

Going on to sustainable scenarios fixed tariffs will further grow, while variable tariffs will slightly decrease. The overall burden (measured here as average price of a m^3 of water) does not change much between B4P and S1, and between B5P and S2; increased fixed tariffs are counterbalanced by a decline in variable tariffs. S2 imposes a larger burden on consumers than S1, due to lack of investment grants. The average price of water in S2 is 60-160% higher for different groups of SUs, than in S1.

Progressing from sustainable to upgrade scenarios will result in an increase of 5-36% of the average price of water, depending on the exact scenario and the SU group. This increase is entirely due to higher fixed tariffs associated with upgrade investments.

Without presenting detailed results, we would like to mention that as variations of S2 and U2, we also ran two scenarios in which the fixed tariffs were held constant (same level as in B1) and cost recovery was achieved through changing the variable tariff only. The average price of water in these scenarios, let's call them S2* and U2*, was 50-70% higher than in their "peer" scenarios. The main reason for the large difference is that due to high variable tariffs, consumers will cut back on their consumption. As a result fixed costs will need to be distributed among less cubic meter of consumption, which will further increase prices. This spiral, eventually, results in low levels of consumption, loss of some of the economies of scale, and high unit prices. Cost recovery should, therefore, be achieved through

increase of both fixed and variable tariffs, at least as long as there is no shortage of water supply, capacity constraints of water infrastructure, or significant external costs associated with use of water.

At the same time, while a two-part tariff is more efficient than a single variable tariff, some consumers, especially those which consume low volumes of water, will be worse off with the two part tariff, since they also have to pay the fixed charge despite their low consumption level. The two part tariff, like any other major change, should therefore be introduced with appropriate caution. Particular attention should be paid to the possibility of increased non-payment of tariffs.

Lastly, increase of tariffs may lower consumption more dramatically in multi-family buildings than what is indicated by the model at present, as these households may now have a stronger incentive to install individual meters.

Table 20 Fixed Water Tariffs by Scenario (KM/account/year)

Service Users	B1	B2	B3	B4P	B5P	S1	S2	U1	U2
Individual houses with sewage	14	70	86	100	146	119	233	118	257
Individual houses without sewage	14	58	71	83	121	102	198	112	245
Multi-family buildings	14	123	136	151	219	171	335	191	421
Industry with sewage	198	127	127	193	462	295	983	388	1482
Industry without sewage	198	127	127	193	462	295	983	388	1482
Small private shops with sewage	40	62	74	88	142	107	239	113	269
Small private shops w|o sewage	40	55	66	78	127	99	220	113	269
SFOR	-	22,153	22,153	34,427	82,135	54,880	181,741	77,135	291,277
Public institutions	600	2,965	2,965	3,784	7,092	4,941	12,985	5,237	14,515

Figures in the table are rounded to integer.

Table 21 Variable Water Tariffs by Scenario (KM/m^3)

Service Users	B1	B2	B3	B4P	B5P	S1	S2	U1	U2
Individual houses with sewage	0.29	0.49	0.70	0.56	0.56	0.43	0.43	0.42	0.42
Individual houses without sewage	0.29	0.55	0.79	0.62	0.62	0.46	0.46	0.42	0.42
Multi-family buildings	0.29	0.47	0.51	0.42	0.42	0.34	0.34	0.31	0.31
Industry with sewage	1.07	0.33	0.33	0.26	0.26	0.19	0.19	0.16	0.16
Industry without sewage	1.07	0.33	0.33	0.26	0.26	0.19	0.19	0.16	0.16
Small private shops with sewage	1.07	0.35	0.44	0.36	0.36	0.30	0.30	0.31	0.31
Small private shops w|o sewage	1.07	0.38	0.48	0.39	0.39	0.31	0.31	0.31	0.31
SFOR	2.12	0.18	0.18	0.13	0.13	0.08	0.08	0.06	0.06
Public institutions	1.07	0.31	0.31	0.26	0.26	0.21	0.21	0.22	0.22

Table 22 Average Water Price by Scenario (KM/m^3)

Service Users	B1	B2	B3	B4P	B5P	S1	S2	U1	U2
Individual houses with sewage	0.37	0.90	1.27	1.18	1.46	1.12	1.79	1.26	2.25
Individual houses without sewage	0.38	0.96	1.36	1.24	1.52	1.16	1.82	1.26	2.25
Multi-family buildings	0.34	0.89	0.97	0.92	1.15	0.90	1.43	0.97	1.77
Industry with sewage	1.32	0.44	0.44	0.41	0.63	0.41	0.91	0.43	1.18
Industry without sewage	1.32	0.44	0.44	0.41	0.63	0.41	0.91	0.43	1.18
Small private shops with sewage	1.36	0.64	0.80	0.77	1.03	0.78	1.38	0.95	1.85
Small private shops w|o sewage	1.36	0.67	0.84	0.80	1.06	0.79	1.39	0.96	1.86
SFOR	2.12	0.29	0.29	0.28	0.50	0.30	0.80	0.33	1.08
Public institutions	1.14	0.52	0.52	0.50	0.72	0.52	1.02	0.64	1.39

7.1.2 Wastewater Tariffs

Wastewater tariffs for each scenario are presented in ,Table 23 and ,Table 24, while the average price of wastewater service per cubic meter is in Table 25. Wastewater tariffs at present (scenario B1) are much lower than water tariffs: there is not a fixed wastewater tariff, while there is a fixed water tariff ("water meter charge"), and the variable wastewater tariff is lower for each SU than the respective variable water tariff. Even with these low tariffs, however, more wastewater revenue is collected than what is justified by present expenditures. Expenditures are low, because the infrastructure costs are sunk, there is not any repayment obligation of past wastewater investments, and operation of the sewage system is cheap, as not much is spent on network maintenance and the collected wastewater is not treated.

"Excess" wastewater revenues could be well used for building up a reserve for future wastewater infrastructure investments. Most of these tariffs, however, benefit the municipality and not the MWWU, since the municipality owns 95% of the wastewater network, and the utility owns only 5% of it. The municipality, on the other hand, under tight budgets, does not consider the option of saving wastewater revenues for future investments.

Since present wastewater tariffs are higher than expenditures, cost recovering baseline scenarios (B2, B3) actually lead to lower tariffs than current baseline (B1). The same is true for scenarios B4P and B5P, as priority investments are used solely for the water infrastructure, they do not increase the costs, and thus tariffs, of wastewater services. While households pay only 0.12 KM/m^3 more than the expenditures associated with their wastewater discharge, the same figure is 0.45 KM/m^3 for legal entities.

Within the sustainable scenarios there are wastewater investment costs related to network maintenance, rehabilitation and extension. As a result a considerable fixed tariff is introduced in scenarios S1 and S2, for some SUs reaching the level of the fixed water charge of the same scenario. The variable wastewater tariff also increases, although only by 0.02-0.04 KM/m^3, primarily due to operating costs related to network cleaning and maintenance after the investments are carried out.

In the upgrade scenarios two major changes can be observed. Wastewater service costs and tariffs escalate, and due to new connections formerly unconnected SUs will now have access to wastewater service, on top of their existing water connections. If all investments are carried out from commercial loan, then SUs need to pay a variable tariff of 0.36-0.47 KM/m^3 for wastewater, more than for a cubic meter of water. Moreover, fixed tariffs place an even greater burden on consumers. If fixed tariffs are divided for every cubic meter of consumption (and consumers are likely to carry out this simple calculation), then especially those consumers face very high tariffs, which consume low volumes. For the average household variable tariff payments make up only about 20% of all wastewater payments, and fixed tariffs seem to be prohibitively expensive. If 80% of investment costs are financed from grants, then a corresponding decrease in fixed tariffs takes place, and since fixed tariffs make up the bulk of the wastewater payments, this difference is imperative for SUs.

Similarly to water tariffs, two specific scenarios, S2* and U2*, were examined with constantly held fixed wastewater tariffs (i.e. zero fixed tariffs) and rising variable wastewater tariffs to achieve cost recovery. The average price of wastewater is more than 60% higher in S2* than in S2 (which does have a fixed and a variable tariff), while the difference between U2* and U2 is about 40%. Our main conclusions, with regards to the different results of a two part tariff and a single variable tariff, are the same as for water services in section 7.1.1 above.

From the perspective of wastewater services, cost recovering tariffs only make sense if the costs and revenues occur within the same accounting unit or cost center. At present, wastewater service costs are paid by MWWU Doboj, while revenues are collected for the municipality of Doboj. Outstanding questions of ownership and operation should certainly be resolved before a tariff reform is introduced.

Table 23 Fixed Wastewater Tariffs by Scenario (KM/account/year)

Service Users	B1	B2	B3	B4P	B5P	S1	S2	U1	U2
Individual houses with sewage		2.7	3.3	3.4	3.4	31	141	49	250
Individual houses without sewage								47	238
Multi-family buildings		4.6	5.0	4.9	4.9	43	197	75	396
Industry with sewage		13.1	13.1	13.1	13.1	231	1 099	210	1 116
Industry without sewage								210	1 116
Small private shops with sewage		3.9	4.6	4.6	4.6	36	160	54	273
Small private shops w|o sewage								54	273
SFOR									
Public institutions		142	142	142	142	1975	9440	2917	15722

Table 24 Variable Wastewater Tariffs by Scenario (KM/m^3)

Service Users	B1	B2	B3	B4P	B5P	S1	S2	U1	U2
Individual houses with sewage	0.13	0.01	0.01	0.01	0.01	0.04	0.04	0.47	0.47
Individual houses without sewage								0.47	0.47
Multi-family buildings	0.13	0.01	0.01	0.01	0.01	0.03	0.03	0.38	0.38
Industry with sewage	0.46	0.01	0.01	0.01	0.01	0.03	0.03	0.36	0.36
Industry without sewage								0.36	0.36
Small private shops with sewage	0.46	0.01	0.02	0.02	0.02	0.04	0.04	0.44	0.44
Small private shops w|o sewage								0.44	0.44
SFOR									
Public institutions	0.46	0.01	0.01	0.01	0.01	0.03	0.03	0.36	0.36

Table 25 Average Wastewater Price by Scenario (KM/m^3)

Service Users	B1	B2	B3	B4P	B5P	S1	S2	U1	U2
Individual houses with sewage	0.13	0.02	0.03	0.03	0.03	0.22	0.86	0.82	2.25
Individual houses without sewage								0.82	2.25
Multi-family buildings	0.13	0.02	0.03	0.03	0.03	0.18	0.70	0.65	1.81
Industry with sewage	0.46	0.01	0.01	0.01	0.01	0.16	0.65	0.61	1.70
Industry without sewage								0.61	1.70
Small private shops with sewage	0.46	0.03	0.04	0.04	0.04	0.21	0.79	0.75	2.05
Small private shops w|o sewage								0.75	2.05
SFOR									
Public institutions	0.46	0.02	0.02	0.02	0.02	0.16	0.65	0.60	1.69

7.2 Current Accounts

Table 25 depicts current accounts according to 2002 books and under different scenarios. The reported loss of MWWU Doboj in 2002 was 136 thousand KM, equivalent to 6% of revenues. Since past investment costs are sunk, no loan repayment is connected with them, and no major new investments are carried out, there are not any annual expenditures related to amortization. Therefore the balance computed without the consideration of amortization is also worth looking at. According to this balance the company is well in the positive, in fact, it collects revenues from which investments can be carried out. If wastewater tariffs were received by MWWU Doboj, and not the Municipality, then the current account balance would be even better.

According to our simulations, the balance of water and wastewater related expenditures and revenues in Scenario B1 is negative, at about 7% of revenues, without taking into account any amortization. The balance would be even worse in Scenario B2, in which case the tariffs should recover costs for each account, but non-payment reduces revenues. The main reason for this is that as cost recovery is required, the tariffs are restructured across SUs, and higher tariffs are set for households, which are bad payers, while lower tariffs are set for good payers (especially industry, SFOR, and public institutions). Small shops, which are also behind in payment, see lower tariffs, but this does not influence the overall financial balance very much.

In all the rest of the modeled scenarios complete cost recovery is required (even after consideration of non-payment), therefore the MWWU accounts are in balance.

Table 26 Current Account Balance

	Year 2002, without Costs of Amortization *	Year 2002, with Costs of Amortization *	Scenario B1 #	Scenario B2 #	All other scenarios #
Absolute value (1000 KM/year)	-136	464	-124	-202	0
As percent of revenues	-6%	20.4%	-6.8%	-11.5%	0

* Excluding revenues from wastewater services, which are received by the municipality.

Including revenues from wastewater services.

The financial balance of –124 thousand KM of Scenario B1 is presented in Table 27 by SU categories and services. Besides a negative overall balance, there is also cross financing between services and SUs. Cross financing benefits household consumers of water, in essence they pay much less than the level of their costs. All SUs pay more for wastewater service than the present low costs of the service. Even with overpayment for wastewater services, households still pay much less than the true costs for the two services together; annually on average they receive a subsidy of about 110 KM per household through lower than necessary tariffs. If the data used for modelling and the method of allocating costs among SUs is correct (but there are reservations about this), then the single biggest unjustified payment is made by SFOR, over 150 thousand KM/year more than actual costs behind the water they receive.

Table 27 Cross financing paid (+) or received (-) by SUs (KM/year) in Scenario B1

Average price of water	Water, by account on average (KM/year)	Water, all accounts together (KM/year)	Wastewater, by account on average (KM/year)	Wastewater, all accounts together (KM/year)	Both services, by account on average (KM/year)	Both services, all accounts together (KM/year)
Individual houses with sewage	-102	-159 413	13	21 117	-88	-138 296
Individual houses without sewage	-96	-220 889	0	0	-96	-220 889
Multi-family buildings	-163	-514 618	29	92 258	-134	-422 360
Industry with sewage	570	127 768	337	75 469	907	203 237
Industry without sewage	570	35 935	0	0	570	35 935
Small private shops with sewage	31	22 447	47	33 528	78	55 975
Small private shops w|o sewage	31	4 395	0	0	31	4 395
SFOR	151 088	151 088	0	0	151 088	151 088
Public institutions	3 309	95 971	3815	110 627	7 124	206 598
Total		-457 316		332 999		-124 318

8 Burden Indices

Before elaborating on the burden of increasing water and wastewater tariffs for households, let's observe the change in the average price of water and wastewater services in Table 28. Any of the modeled scenarios lead to increased tariffs for households, while most reforms lead to lower tariffs for industrial users, small shops, and public institutions. The only scenario in which all SUs (except for SFOR) must pay more on average for a cubic meter of water is U2, in which the service is not only sustainable, but also upgraded to a higher standard, and no grants support the related investments.

Table 28 Combined Average Price of Water and Wastewater Services by Scenario (KM/m^3)

Average price of water and wastewater together	B1	B2	B3	B4P	B5P	S1	S2	U1	U2
Individual houses with sewage	0.50	0.93	1.30	1.21	1.49	1.34	2.65	2.08	4.51
Individual houses without sewage	0.38	0.96	1.36	1.24	1.52	1.16	1.82	2.08	4.51
Multi-family buildings	0.47	0.91	0.99	0.95	1.18	1.08	2.13	1.62	3.58
Industry with sewage	1.78	0.45	0.45	0.43	0.64	0.57	1.56	1.04	2.88
Industry without sewage	1.32	0.44	0.44	0.41	0.63	0.41	0.91	1.04	2.88
Small private shops with sewage	1.82	0.67	0.84	0.81	1.07	0.99	2.17	1.71	3.90
Small private shops w|o sewage	1.36	0.67	0.84	0.80	1.06	0.79	1.39	1.71	3.90
SFOR	2.12	0.29	0.29	0.28	0.50	0.30	0.80	0.33	1.08
Public institutions	1.60	0.54	0.54	0.52	0.73	0.67	1.66	1.25	3.09

In 2000 in Doboj the average net salary was about 300 KM/person/month, while the minimal wage was about 100 KM/person/month. Considering the increase in salary between 2000 and 2003 in FBiH (for which there is statistics), the average salary in Doboj in 2004 must be around 400 KM/person/month, while the minimum salary must be about 120-130 KM/person/month. Statistics on household income, as opposed to personal income, is not available. Due to a high rate of unemployment (about 40% officially) we assume that the average household has 1.2 persons with regular income. "Low income households" therefore have a disposable income of 150 KM/month, or 1800 KM/year, while "average income households" have a disposable income of 480 KM/month, or 5760 KM/year. Water and wastewater expenditure has been computed for every household type and scenario by multiplying the level of consumption with the variable tariff and adding the fixed tariff to the product. The ratio of W&WW expenditure and household income is the burden index displayed in Table 29.

Low income households need to devote a large portion, between 3.5% and 7.8% of their income to pay the water and wastewater bill even in B1. Some of these households may actually have lower consumption than the average household, and therefore face a lower bill, but we do not know the prevalence of this. Other low income households probably have average or above average consumption, while they do not pay their bills. In fact, it is suspected that a fairly high share of non-paid household bills belong to low income households.

The burden that low income households experience heavily grows in all other, cost recovering scenarios. Since fixed tariffs make up more than 40%, for sustainable and upgrade scenarios even 50%-80% of all tariff payment, the scope of these households to reduce payment through lower

consumption is limited. Non-payment by these households will very likely increase if tariffs steeply rise.

At present average income households pay between 1.1% and 2.4% of their income for water and wastewater services. While the increase in tariff payments is substantial as we progress through scenarios, with the exception of S2, U1, and U2, most average income households would probably still be able and willing to pay their bills. Covering the full cost of upgraded water and wastewater services is clearly not affordable for the households of Doboj, and even with large investment grants the new tariffs would be on the brink of affordability for many households, due to a large increase in operating costs and obligation to repay some of the loans.

Table 29 Ratio of Water and Wastewater Expenditure and Household Income

	B1	B2	B3	B4P	B5P	S1	S2	U1	U2
Low income households									
Individual houses with sewage	4.9%	8.6%	10.9%	10.8%	13.4%	12.8%	25.2%	16.3%	35.2%
Individual houses without sewage	3.5%	7.4%	9.4%	9.2%	11.3%	9.4%	14.8%	15.5%	33.5%
Multi-family buildings	7.8%	15.0%	16.3%	15.8%	19.6%	18.1%	35.7%	25.5%	56.1%
Average income households									
Individual houses with sewage	1.5%	2.7%	3.4%	3.4%	4.2%	4.0%	7.9%	5.1%	11.0%
Individual houses without sewage	1.1%	2.3%	2.9%	2.9%	3.5%	2.9%	4.6%	4.8%	10.5%
Multi-family buildings	2.4%	4.7%	5.1%	4.9%	6.1%	5.7%	11.2%	8.0%	17.5%

9 Recommendations

In this chapter those recommendations will be detailed, which are especially relevant for MWWU Doboj. More detail on some of the case study recommendations and additional recommendations, which are more general to the water and wastewater sector in Bosnia, are described in the National Profile document.

Recommendations are grouped in a number of themes under the following headings. Most recommendations are, however, closely related to each other, reinforce one another, introducing them in a "bundle", together makes them more effective. Improved accounting information, for instance, is needed as a basis for setting cost recovering tariffs. Increased autonomy from municipal decision makers is also a necessary prerequisite for effective tariff reforms.

9.1 Accounting and Financial Analysis

MWWU Doboj, like most other water utilities in Bosnia, have a poor accounting system, which is not capable of supplying good quality and appropriately structured information for financial analysis. It has been difficult for us to acquire suitable financial data for modelling purposes, and data we received from the MWWU was often not coherent. Previous studies blamed the accounting regulations for such problems, and suggested that a change in the Accounting Law is needed, in order to provide more flexibility in setting up accounts, and producing real time financial data. While we share the view that the national accounting regulations need to be changed, and we include this recommendation in the National Profile of our project, we also recommend that even without a change in the accounting regulations, MWWU Doboj should improve its accounting system, by introducing a second, parallel system. The first accounting system would basically satisfy regulatory requirements, while the second system would produce useful data for financial analysis and management decisions. The parallel system should be structured around "cost centers", and include enough detail so that financial reports can be structured to accommodate the data needs of the management for tariff setting, investment decisions, etc.

9.2 Autonomy and Ownership

The management at MWWU Doboj is appointed by the Municipality, and management decisions are partly guided by the goals and interests of municipal decision makers, which are not necessarily in the best interest of the MWWU itself. Some of the otherwise desirable decisions that may be hindered because of municipal influence are the following:

- A change in the level and design of tariffs, especially household tariffs;
- Laying off some of the redundant employees in order to save costs;
- Channeling wastewater revenues towards future wastewater investments, as opposed to the general municipal budget.

In our view only through providing autonomy to the MWWU can real reforms be expected to take place. But why would the municipality grant autonomy to the MWWU, of which the municipality is the majority owner (although, as stated in section 2.3, the level of the state which has ownership in MWWU Doboj is not clearly defined)? There are at least two main reasons for this:

- Reforms will lead to better performance, and service users, the constituency of the Municipal Board, will be satisfied.
- A well performing utility may be sold at an attractive price, resulting in revenues of privatization (as long as the Municipality receives those revenues, and not the central government)

Autonomy can take several forms, from legal stipulation, through contractual guarantees to privatization. Involvement of a carefully selected private partner, either for operation, or as an investor, accompanied with proper incentives for improved operations, and guarantees for autonomous decision making seems like a wise alternative. The company in its present condition is probably not an attractive target for private partners, however, therefore implementation of the most fundamental reforms may be needed first.

Another related issue that needs to be resolved is ownership and operation of the wastewater infrastructure. At present 95% of the infrastructure is owned by the municipality, and 5% is owned by MWWU Doboj. Neither of them wants to take responsibility for maintaining and developing the wastewater network and the future WWTP, and it is unlikely that any major reform can be introduced for wastewater services before outstanding questions of ownership and operation are resolved.

9.3 Management Reform

Based on existing information there seems to be plenty of opportunity to improve the performance of MWWU Doboj, both financially and with regards to service level. Personnel costs make up 57% of all O&M costs while there is a claim that many of the employees are redundant and under trained. A reduced and partly replaced workforce would result in lower personnel costs and more effective operations. There are numerous other opportunities, including some investments, which will result in net cost savings at the company, or effective strategies to improve collection rates. Setting priorities among such cost-saving measures, carefully implementing them, and coordinating them with other issues, such as tariff reforms, is a challenging, but potentially greatly rewarding exercise for the company leadership. Starting with measures that stabilize the operations of the utility, e.g. besides ensuring improved or sustainable service, also reduce costs, seems to be a logical way to proceed.

The prerequisites for such a management reform include autonomy and proper accounting, and financial information, as discussed above, but also certain management and financial skills, which may not be readily available within the company. Such skills, however, can be imported into the company, either through a private partner, hiring a capable management, or through consultants.

9.4 Tariff Reform

MWWU Doboj seems to be financially viable in the short run, i.e. present revenues are more or less adequate to pay current expenses. There are no resources, however, for systematic maintenance, only emergency repairs are addressed, and the quality of the infrastructure deteriorates year after year. In order to stabilize the operations of the company, costs need to be cut (as described in the section above on management reform) and/or more revenues from tariffs need to be collected. Sustainable and upgrade investments will only be possible through substantially increased tariffs, especially from households consumers, even if the operations of the company are streamlined in order to take advantage of all reasonable cost saving possibilities. Our main conclusions regarding tariff changes are the following:

- Any tariff reform should be based on good accounting information and proper financial analysis, and accompanied with an explanation of the use of the revenues;
- In order to attain a fair and efficient tariff design, the tariffs of households will need to increase at a higher rate, than the tariffs of other consumer groups. In fact, the tariffs of some of the other SUs may stay constant or may even be reduced;
- Keeping a two part tariff, and increasing both the fixed and the variable component will result in an economically more efficient tariff regime, than if only the variable component was increased to cost recovering levels;
- A high fixed tariff (i.e. fixed tariff equaling fixed costs) in the sustainable and upgrade scenarios, however, may cause payment problems, increasing the level of outstanding bills.

Graduality is therefore important, and the role of investment grants is crucial for large developments, such as the WWTP.

– Wastewater tariffs at present are higher than needed to cover costs. Instead of lowering these tariffs, it is advisable to start creating a fund that will be used for future wastewater investments. This, nonetheless, is a sensitive issue, since wastewater revenues benefit the municipal budget under current arrangements, diverting them into a reserve or fund will be opposed by the Municipality.

10 References

WATER SECTOR INSTITUTION STRENGTHENING REPUBLIC OF SRPSKA -, Final Report, February 2000, Plancenter Ltd in association with ODP Zavod za Vodoprivredu Srpsko Sarajevo, Republic of Srpska.

WATER SECTOR INSTITUTION STRENGTHENING REPUBLIC OF SRPSKA – PILOT COMPONENT, Final Report, February 2000, Plancenter Ltd in association with ODP Zavod za Vodoprivredu Srpsko Sarajevo, Republic of Srpska.

FINANCIAL STATEMENTS of MWWU UTILITY DOBOJ

PLAN OF INSTITUTIONAL STRENGTHENING 10 PILOT WATER UTILITIES, Final Report, October 1999, CDM USA and Hydro – Engineering Institute Sarajevo