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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 – National Profile

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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now available and some of the institutional detail pertaining to a specific country or case study community may now be out of date.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 and Acronyms

B&H	Bosnia and Herzegovina
BOD	Biological Oxygen Demand
DW	Directorate for Waters
EC	European Commission
ESC	Environmental Steering Committee (Inter-Entity)
EU	European Union
FBiH	Federation of Bosnia and Herzegovina
GB&H	Government of Bosnia and Herzegovina
GDP	Gross Domestic Product
GWh	Gigawatthour
KM	Convertible Mark
MoAFW	Ministry of Agriculture, Forestry and Water Management (RS)
MoAWF	Ministry of Agriculture, Water and Forestry (FBiH)
MoPPE	Ministry for Physical Planning and Environment (FBiH)
MW	Megawatt
PCWA	Public Company for Watershed Area
PE	Population Equivalent
RBB	River Basin Body
RS	Republika Srpska
UFW	Unaccounted for Water
WEC	Water Engineering Company
WMI	Water Management Institute
WSC	Water Steering Committee (Inter-Entity)
W&WWU	Water and Wastewater Utility
WWTP	Wastewater Treatment Plant

1 Introduction

"This report is, first of all, a compilation of information and data that describing the institutions and conditions that shape and characterize the provision of municipal water and wastewater service in **B&H.** The purpose of this compilation is to provide background and inspiration for proposals to reform both the current system of water and wastewater tariffs and effluent charges and coincident proposals to adjust or modify the legal and regulatory system within which the tariffs and effluent charges function in **B&H.** Indeed, some chapters include brief analyses suggesting such reforms and Chapter 9 concludes this report with preliminary proposals for reforms in the institutional setting and design of these tariffs and charges. The aim of the these proposals is to improve the management of water and wastewater resources used in the municipalities of **B&H** generally and, including protection of water resources from nutrient loading and toxic substance originating from municipal systems."

1.1 Relevant Country Background

The Socialist Republic of Bosnia and Herzegovina declared its independence in March 1992, in the course of the disintegration of the former Federal Republic of Yugoslavia. The results of referendum were internationally recognized on 6 April 1992. This consequently resulted in the war (1992), which continued for more than three and a half years.

The war lasted until 21 November 1995 when the conflicting parties met in Dayton, Ohio, USA and initialed the Bosnian Peace Agreement, which was later signed in Paris on 14 December 1995, ending the war. The Dayton Peace Accords, as they later became known, contained a general framework agreement for peace in Bosnia and Herzegovina. They establish two highly autonomous Entities in Bosnia and Herzegovina (the Federation of Bosnia and Herzegovina (FB&H) and the Republika Srpska (RS)), while maintaining Bosnia's currently recognized borders.

In March 1999, the enclave of Brcko was given the status of a "State District" of Bosnia and Herzegovina, following arbitration by the international community. However, it remains a part of the State of Bosnia and Herzegovina.

The Federation of Bosnia and Herzegovina is further along the road to economic recovery than is the Republika Srpska. This is primarily a consequence of an uneven distribution of foreign aid flowing into the region: such aid has been withheld from the Republika Srpska following its reluctance to comply with the Dayton Agreement. Nevertheless, in both Entities there continues to be very high unemployment and insufficient primary industry to maintain a sustainable economy. Attempts to pinpoint areas with the potential for significant industrial development have so far been futile.

However, unemployment is falling slowly. There is growth in the small business sector, which may extend into larger enterprises as experience is gained. The World Bank is predicting a real growth in gross domestic product (GDP), and slow but steady progress is expected as a result of privatization.

Unfortunately, the present infrastructure and the base of skills are insufficient to run the country. This is a significant factor in determining the rate of legislative development and economic recovery.

1.2 Characteristics of River Basins

Territory of B&H extends over the area between 42^0 26' and 45^0 15' northern latitude and 15^0 45' and 19^0 41' eastern longitude. In the hydro-geographical sense, B&H water streams belong to the Black Sea and Adriatic Sea catchment areas of 51,129 km^2, which is the total area of B&H, 38,719 km^2 or 75.7% belongs to the Blacks Sea, that is, Sava river catchment area, while 12,410 km^2 or 24.3% belongs to the Adriatic sea catchment area.

Four rivers, Una, Vrbas, Bosna and Drina flow to the Sava River, which drains into the Danube. The importance of the rivers is acknowledged in irrigation, hydropower, fishing, water supply, recreation etc.

The rivers are characterized by high gradients and relatively high runoff (22 l/s/km^2). All these rivers flow through mountainous areas in upper parts, while in downstream sections close to the river mouths or confluence they flow through plains where they are liable to flooding.

The characteristics of the major river basins are summarized in Table 1

Table 1 Hydrological Characteristics of Major River Basins

Basin	Area (km^2) BiH	Population in 1991	Mean flow (m^3/s)	Minimum flow (m^3/s)
Sava (immediate basin)	5 506	635 353	63	1.5
Una-Sana (in B&H)	9 130	620 373	240	41.9
Vrbas	6 386	514 038	132	26.3
Bosna	10 457	1 820 080	163	24.2
Drina (in BiH)	7 420	422 422	124	24.1
Sava catchment	38 719	4 012 266	722	118

Due to the discharge of mainly untreated wastewater, the river water quality is generally very low. The most polluted rivers are Vrbas, Bosna and the lowest part of Sana. Only the most upstream sections of the Una and Drina maintain high water quality.

Una-Sana River Basin

The Una with the Sana is the river with a mean flow (MQ) of 240 m^3/s. The quality of the water in the river is quite high. The population in the river basin is 620,000. The biggest municipalities are **Prijedor** (population 112,000), Bihac (71,000), Sanski Most (60,000) and Krupa (58,000). The biggest polluters are a pulp mill in **Prijedor**, a coal mine in **Ljubija** and metal and meat industries in Bihac.

There is a potential to construct 19 hydropower plants with the total power capacity of 390 Megawatt (MW) and the annual production of 1,560 Gigawatthour GWh. Only one plant, "Slapovi na Uni", has been constructed. The Una river basin is the least developed river basin in terms of hydropower (1.7%).

Vrbas River Basin

The Vrbas river basin is in the central part of the Dinaric area. The population in the basin is 514,000, and the population density is the second highest (after the Bosna river basin) in BiH. The most populated municipalities are **Banja Luka** (195,000), **Jajce** (45,000), and **Bugojno** (47,000).

The river Vrbas falls from its main source, karst springs, at the elevation of 590 meters to its confluence into the Sava at 83 meters above the sea level. The Vrbas is polluted along the whole course, but the water quality in the lowest part, downstream of Banja Luka, is below the lowest class. The biggest water users and polluters, pulp and viscose industries, are located in Banja Luka. The leather industry in Bugojno and electro-chemical industry in Jajce are other major polluters.

Three hydropower plants: "Jajce II" and **"Bocac"** on Vrbas river, and "Jajce I" on Pliva river have been constructed with the total power of 189 MW and annual production of 694 GWh. The construction rate (28.5%) is relatively high in BiH.

Bosna River Basin

The area of the Bosna river basin (MQ 163 m^3/s) 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** (municipality - 103,000).

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 main industrial polluters are:

- metal industry in Sarajevo, Zenica, Vares and Ilijas;
- leather industry in Visoko;
- polyurethane and coke industry in Tuzla;
- pulp mill in Maglaj;
- food industry in Sarajevo; and
- thermal power plants in Kakanj and Tuzla.

Despite heavy pollution, many big towns and industrial plants have to rely on raw water supply from the river. The water demand for water supply is the highest in the Bosna river basin area (8 m^3/s in 1991).

Only one hydropower plant, **Bogatici**, has been constructed in a tributary (Zeljeznica) with the production of 0.7 GWh (2.9% of the potential).

Drina River Basin

The Drina river basin covers 19,900 km^2 (MQ 401 m^3/s), out of which only 7,200 km^2 belongs to BiH (MQ 124 m^3/s). The population in the basin is 420,000. The biggest municipalities are **Zvornik** (81,000), **Srbinje (Foca)** (41,000) and **Gorazde** (38,000).

The Drina lies on the border between BiH and the Federal Republic of Yugoslavia. The altitude at the source is 945 meters and at the mouth to the river Sava 74 m. The water quality upstream of **Srbinje (Foca**) is within the criteria of the first class, whereas in the other sections it falls into Class II. The amount of water intake for water supply was 1.1 m^3/s in 1991, covering only 43% of the population (the lowest among all main basins). The pollution is limited to the vicinity of bigger towns: **Srbinje (Foca)** (pulp and paper industry), **Visegrad**, **Gorazde** (chemical factory), **Zvornik** (aluminum industry) and the river mouth of Lim (pollution from Montenegro).

The Drina has the highest hydropower potential in BiH. However only six plants have been constructed with the total capacity of 610 MW (33% of the overall potential within BiH) and 2,640 GWh (37%).

Sava River Basin

The Sava River (MQ 1,216 m^3/s at Brcko) is a border river between BiH and the Republic of Croatia. The rivers Una-Sana, Vrbas, Bosna and Drina are tributaries of Sava. The immediate catchment area of the Sava in the BiH territory is 5,500 km^2, while the population totals 635,000. The biggest municipalities are **Bijeljina** (97,000) and **Brcko** (87,000).

The main polluters in the Sava river basin are food industries in **Brcko**, **Bijeljina**, **Nova Topola** and **Gradiska**. The Sava river basin is affected by flooding, especially after the war, due to inoperative flood control facilities and lack of regular maintenance. The Sava was navigable along the border before the war.

Figure 1 River Basins in Bosnia and Herzegovina

2 Administrative Units

2.1 State Level

Constitution of Bosnia and Herzegovina

Article III of the Constitution defines the responsibilities of and the relations between the institutions of B&H and its two constituent Entities: the Federation of B&H (FB&H) and Republika Srpska (RS).

The water sector is not expressly mentioned in the Constitution, neither in the competencies of the State of B&H, nor in those of the Entities. However, according to Article III.3c, "functions and powers not expressly assigned…to the institutions of B&H shall be those of Entities". Thus, the water sector belongs to the Entities. Moreover, Article III.2c of the Constitution entrusts the Entities with the responsibility for a "safe and secure environment for all persons in their respective jurisdiction".

2.2 Entity Level (F B&H and RS)

Constitution of F B&H

The Constitution was voted on by the Constituent Assembly of the FB&H on March 30 1994, and has since been amended three times: on July 23, 1994 (amendment I), on June 5, 1996 (amendments II to XXIV), and on May 8, 1997 (amendments XXV and XXVI).

The Constitution establishes the sharing of competencies between the Federation and the constituent 10 cantons as follows:

- exclusive competencies of the Federation are the general economic, energetic, fiscal and land use policies (Art III.1, b, f and I);
- joint competencies of the Federation and the cantons are, e.g., health, environmental policies, tourism, and use of natural resources (Art III.2): in these fields, the powers of the Federation and the cantons can be executed "jointly or separately, or by the Cantons as co-coordinated by the Federation Government" (Art III.3.1); and cantons have all responsibilities not expressly granted to the Federation (Art III.4.1); matters likely to concern the water sector are public services, local land use, local energy production facilities, and cantonal tourism.

Each canton may confer some of its responsibilities, for example tourism and local business, to the municipalities in its territory (Art V.2)

Constitution of the Republic of Srpska

The Constitution was voted on by the Assembly of Serbian People of BiH on February 28, 1992. Afterwards the basic text was amended several times, between May and December 1992 (amendments I to XXV) and on November 11, 1994 (amendments XXVI to XLIII). The Constitution contains, as usual, provisions related to fundamental political, economic and social rights, stipulations concerning the organization of Entity institutions and the division of competencies between the RS and Municipalities, as well as responsibilities of RS judicial power.

2.3 Cantonal Level

Constitutions of Cantons

In all cantonal constitutions, joint responsibilities of the Federation and the cantons include local land use, health, tourism and environmental protection.

Regarding the water sector, some cantonal constitutions grant certain competencies to municipalities, e.g. to "construct and maintain water supply facility…take measures ensuring health and hygiene…manage local public goods in local use".

2.4 Brcko District

In accordance with final decisions of Arbitrage Tribunal for Brčko District, related to conflict on inter-entity boundaries in Brčko area, from 5th March 1999 and Annex on Arbitrage Decision from 18th August 1999, and by prescription of Supervisor, the Brčko District was established.

The Government is composed of 10 Departments, of which environmentally related are:

i) Department for communal affairs and
ii) Department for agriculture, water management and forestry
iii) Department for communal affairs is composed from three sub-department:
   - water and wastewater
   - electrical energy
   - waste collection

2.5 Municipality in F B&H and RS

Arguably the most important subdivisions of FBiH and RS are the "municipalities". The municipality is a true geo-political subdivision, with defined borders and a defined governing body. A "Municipal Council" (or Parliament) governs municipalities. The voters of the municipality elect the members of the parliaments. They also have an executive body headed by a mayor.

Municipalities are very important to the water and wastewater sector because they essentially own and control the Water Utilities. The municipality has responsibility for the provision of public services to all the people within its borders, and the responsibility for the provision of water and wastewater services to all citizens within the municipal borders presumably now lies with the Water Utilities. However, the Water Utilities rarely provide such services to outlying communities. When the lines between FBiH and RS were drawn at Dayton, they resulted in a situation in which many municipalities lie partly in FBiH and partly in RS.

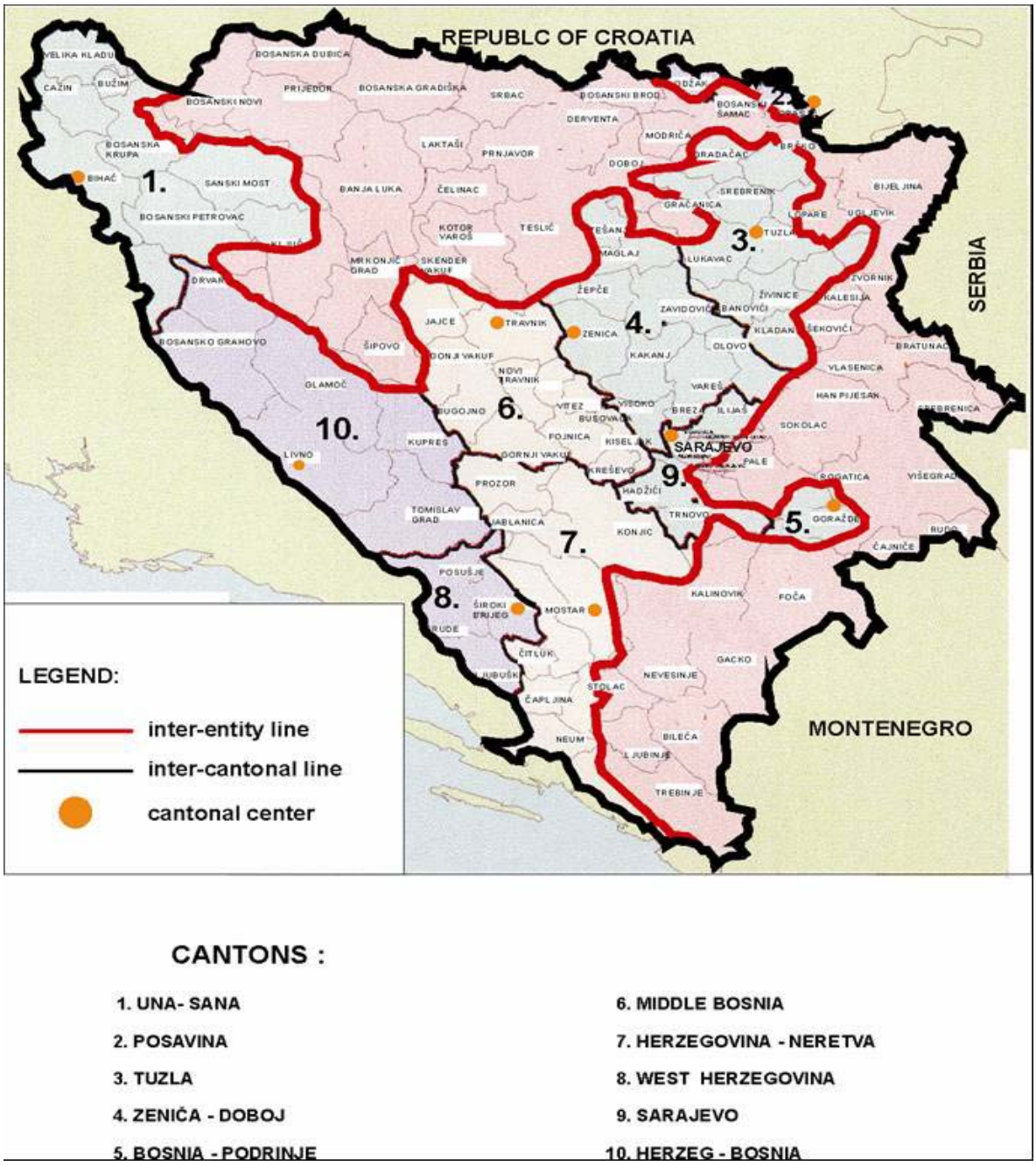

Figure 2 Administrative Units Map of Bosnia and Herzegovina

3 Legislation Framework

List of applicable laws and other legal instruments related to the water and environment in Bosnia and Herzegovina

3.1 State Level

Constitution of BiH
Law on the Ministries and Civil Service of B&H (Official Gazette of the B&H 5/03)
Law on Free Access to the Information in B&H ("Official Gazette of the B&H", No. 28/00)

3.2 Federation of B&H

Constitutions of FB&H (Official Gazette of the FB&H, No. 1/94, 13/97, 16/02, 22/02, 52/02, 60/02, 18/03, 63/03)
Law on Ministries and Other Administrative Bodies of FB&H (Official Gazette of the FB&H 19/03)
Law on Free Access to the Information in the Federation B&H ("Official Gazette of F B&H", No. 32/01)

Law on Concession (Official Gazette of the B&H, No. 32/02)
Law on Administrative Dispute (Official Gazette of the B&H, No. 19/02)
Law on Administrative Procedure (Official Gazette of the B&H, No. 29/02)

Law on Public Companies (Official Gazette of the R B&H, No. 4/92, 21/92, 13/94)
Environmental Framework Law (Official Gazette of the F B&H, No. 33/03)
Law on Water Protection (Official Gazette of the F B&H, No. 33/03)
Law on Waste Management (Official Gazette of the F B&H, No. 33/03)
Law on Nature Protection (Official Gazette of the F B&H, No. 33/03)
Law on Air Protection (Official Gazette of the F B&H, No. 33/03)
Law on Fund for Environmental Protection (Official Gazette of the F B&H, No. 33/03)
Water Law (Official Gazette of the F B&H, No. 18/98)

Law on Agriculture (Official Gazette of the F B&H, No. 2/98)
Law on Physical Planning (Official Gazette of the F B&H, No. 52/02)
Law on Construction (Official Gazette of the F B&H, No. 55/02)
Law on construction land (Official Gazette of the F B&H, No. 25/03)
Law on Forests (Official Gazette of the F B&H, No. 20/02; 29/03)
Law on Mining – Proposal
Law on Public Utility Services (Official Gazette of the SR B&H, No. 20/90))
Law on Collecting, Producing and Trafficking Raw and Waste Materials (Official Gazette of the F B&H, No. 35/98)

3.3 Cantons

Constitutions of cantons

Water and environmental legislation of the cantons

1. Canton Una-sana
- Law on forests («Official Gazette», No. 5/97)
- Law on Agriculture Land («Official Gazette», No. 5/97)
- Law on Physical Planning («Official Gazette», No. 9/02)
- Law on Concessions («Official Gazette», No. 10/03)

2. Canton Posavina
- Law on Physical Planning («Official Gazette», No. 5/99; 7/00)
- Law on Agriculture Land
- Law on Environmental Protection («Official Gazette», No. 4/00)
- Water law («Official Gazette», No. 2/00)
- Law on Agriculture Land («Official Gazette», No. 2/00)

3. Canton Tuzla
- Law on Environmental Protection («Official Gazette», No. 6/98; 15/00)
- Law on Nature Protection («Official Gazette», No. 10/99)
- Water law («Official Gazette», No. 15/99; 9/03)
- Law on Forests («Official Gazette», No. 10/99; 7/02)
- Law on Agriculture Land («Official Gazette», No. 11/00)
- Law on Air Protection («Official Gazette», No. 6/00)
- Law on Waste («Official Gazette», No. 17/00)
- Law on Physical Planning («Official Gazette», No. 16/00; 10/02)
- Law on Construction («Official Gazette», No. 10/02)
- Law on Concessions («Official Gazette», No. 9/01)

4. Canton Zenica - Doboj
- Law on Environmental Protection («Official Gazette», No. 1/00)
- Water law («Official Gazette», No. 8/00)
- Law on exploration and use of mineral raw materials («Official Gazette», No. 13/00)
- Law on Concessions («Official Gazette», No. 5/03)

5. Canton Bosansko - Podrinjski
- Law on Physical Planning («Official Gazette», No. 17/00)
- Law on Concessions («Official Gazette», No. 5/03)

6. Canton Central Bosnia
- Water law («Official Gazette», No. 14/02)
- Law on Air Quality («Official Gazette», No. 11/00)
- Law on Noisy Protection («Official Gazette», No. 11/00)
- Law on Concessions («Official Gazette», No. 12/00; 13/03)

7. Canton Herzegovina - Neretva
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- Law on Concessions («Official Gazette», No. 2/03)

8. Canton West Herzegovina
- Law on Environmental Protection («Official Gazette», No. 5/00)
- Law on Physical Planning («Official Gazette», No. 4/99; 10/03)
- Law on mining («Official Gazette», No. 2/99
- Law on construction («Official Gazette», No. 4/99; 15/01)
- Law on Concessions («Official Gazette», No. 7/01; 7/03)

9. Canton Sarajevo
- Water law («Official Gazette», No. 16/00)
- Law on Forests («Official Gazette», No. 4/99)
- Law on Noisy Protection («Official Gazette», No. 10/99)
- Law on Air Quality («Official Gazette», No. 10/99)
- Law on Physical Planning («Official Gazette», No. 13/99)
- Law on communal cleaning («Official Gazette», No. 11/97)
- Law on Concessions («Official Gazette», No. 21/03)

10. Canton Herzegovina - Bosnia
- Law on Agriculture Land («Official Gazette», No. 10/98)
- Law on Physical Planning («Official Gazette», No. 14/98)
- Law on Forests («Official Gazette», No. 4/98; 13/98; 15/99)
- Law on Construction («Official Gazette», No. 14/98)
- Law on mining («Official Gazette», No. 12/01)
- Law on Concessions («Official Gazette», No. 14/03)

3.4 Republic of Srpska

Constitution of Republic Srpska (Official Gazette of the RS, No. 6/92, 8/92, 15/92, 19/92, 21/92, 28/94, 8/96, 13/96, 15/96, 16/96 and 21/96
Law on Ministries of RS (Official Gazette of RS, No. 70/02)
Law on Free Access to the Information in RS (Official Gazette of RS, No. 20/01)

Law on Concession (Official Gazette of the RS, No. 25/02)
Law on Administrative Dispute (Official Gazette of the B&H, No. 12/94)
Law on Administrative Procedure (Official Gazette of the B&H, No. 13/02)

Law on State Enterprises (Official Gazette of the RS, No.3/95)
Environmental Framework Law (Official Gazette of RS, No. 53/02)
Law on Water Protection (Official Gazette of RS, No. 53/02)
Law on Waste Management (Official Gazette of RS, No. 53/02)
Law on Nature Protection (Official Gazette of the RS, No. 50&02)
Law on Air Protection (Official Gazette of RS, No. 53/02)
Law on Fund for Environmental Protection (Official Gazette of RS, No. 51/02)
Water Law (Official Gazette of RS, No. 10/98; 51/01)

Law on Agriculture (Official Gazette of RS, No. 13/97)
Law on physical planning (Official Gazette of RS, No. 84/02)
Law on construction land (Official Gazette of RS, No. 86/03 ili 41-03)
Law on forest (Official Gazette of RS, No. 66/03)
Law on communal activities (Official Gazette of RS, No. 11/95; 51/02)

3.5 District Brcko

Statute of District Brcko (Official Gazette of the B&H, No. 9/00, 23/00)
Law on Administrative Dispute (Official Gazette of the DB, No. 4/00, 1/00)
Law on Administrative Procedure (Official Gazette of the DB, No. 3/00, 9/02)
Law on Physical Planning (Official Gazette of the DB, No. 9/03, 23/03)

Regulations which are overtaken from Socialistic Republic of B&H and ex Yugoslavia and still in force in F BH

1. Law on Hydro- Meteorological Activities of Entire Country's Interest (Official Gazette of SFRJ, No. 10/88)
2. Law on Hydro- Meteorological Activities of Republic Interest (Official Gazette of SR B&H, No. 10/76)
3. Decree on Water Classification in inter-Republic Water Streams, inter-State Waters and Yugoslavia Coastal Seawaters (Official Gazette of SFRY, No. 6/78).
4. Decree on Water Classification and Yugoslavia Coastal Seawaters within the Border of SR B&H (Official Gazette of SR B&H, No. 19/80).
5. Decree on Water Categorization (Official Gazette of SR B&H, No. 42/67).
6. Regulation on Hazardous Substances that do not Need to be Imported into Water (Official Gazette of SFRJ, No. 3/66, 7/66)
7. Decision on Maximum Permitted Concentration of Radionuclide and Hazardous Matters, in inter-Republic Water Streams, inter-states Waters and Waters of Coastal Sea (Official Gazette of SFRY, No. 8/78).
8. Regulation on Hygienic Accuracy Potable Water (Official Gazette of SFRY, No. 33/87; 23/91).

4 Institutional Framework

4.1 Institutional Framework in the Federation of Bosnia and Herzegovina

Water resources management and water protection are primarily under the jurisdiction of the Federation Ministry of Agriculture, Water Management and Forestry (MoAWF), but the Federation Ministry for Physical Planning and Environment (MoPPE) is involved in other environmental aspects of water and wastewater facilities. The main responsibilities for water management (regulatory functions in general and management of flood control and environmental protection in particular) are at the Federation level and with the Public Company for Watershed Areas (PCWAs).

The responsibilities of the authorities are not shared according to the functions, but are mainly divided according to the ownership or "Federal and/or cantonal importance". The ownership of some water facilities remains unclear in the Law. The Federation and cantonal water sector organizations and institutions defined in the Water Law are not completely operational because only a fraction of plans, decrees, by-laws and statutory acts for the implementation of the Water Law have been enacted. Cantonal water authorities are still embryonic.

The main functions and tasks of the MoAWF are:

- definition of rules for the preparation of Federation water strategies and policies;
- issuing water management requirements, agreements, and permits;
- setting of standards and regulations;
- maintaining of compliance with laws and regulations through licensing and inspections;
- overall control of Public Companies for Watershed Areas; and
- proposals to Parliament/Government of procedures for awarding concessions.

There are six professionals working for water management in the MoAWF.

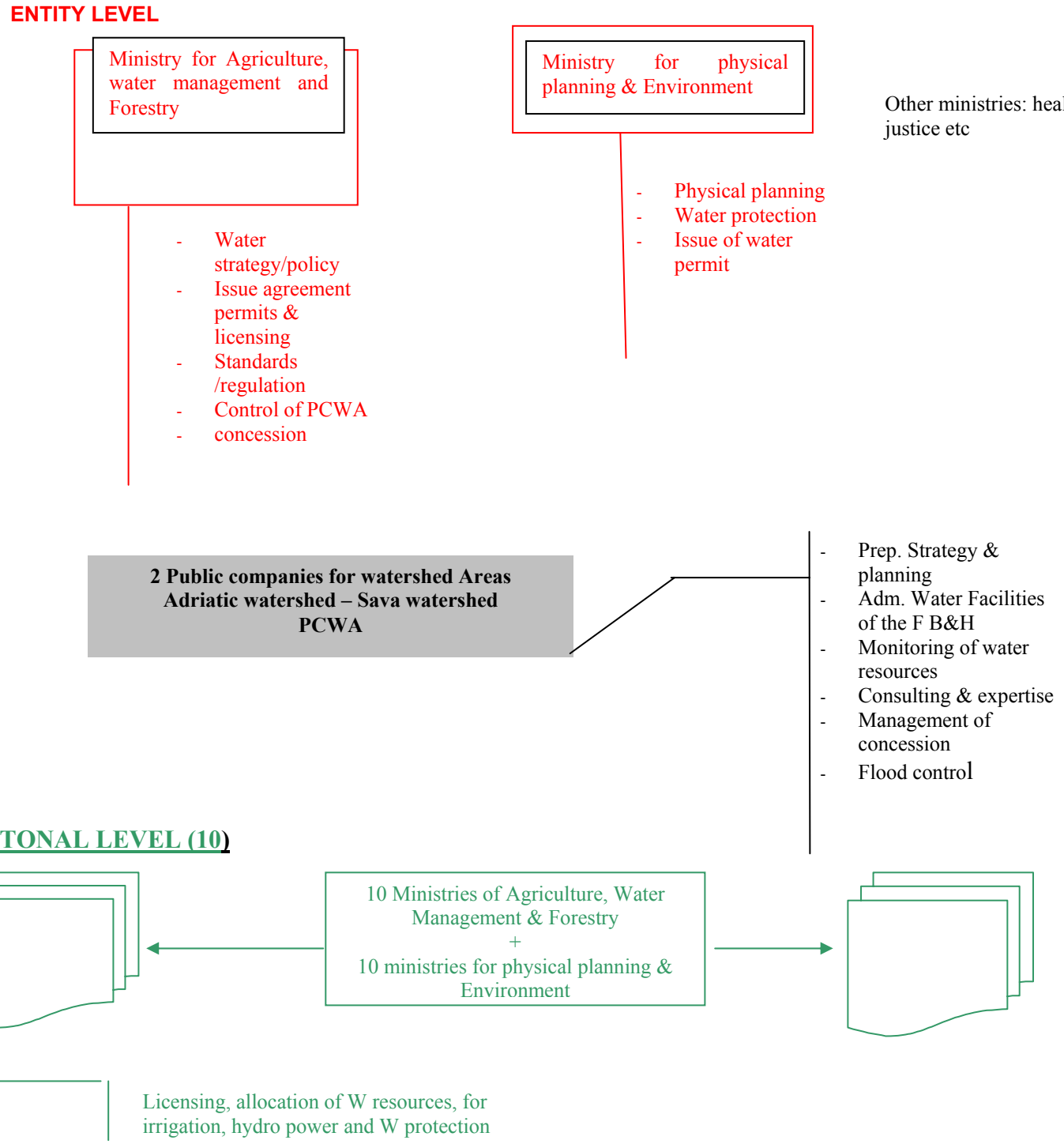
There are two Public Companies for Watershed Areas (PCWAs) in the Federation executing water management in their respective watersheds. One, located in Sarajevo, is competent for the watershed of the Sava River while the other, located in Mostar, is in charge of the watershed of the Adriatic Sea. The Water Law entrusts the PCWAs with the following main responsibilities:

- preparation of all strategic decisions and planning (watershed and basin long-term plans, all regulations, decrees and by-laws necessary for the application of the Water Law);
- administration of principal (owned by the Federation) water facilities;
- management and monitoring of all water resources;
- investment, exploitation and maintenance of various (non-specified) water facilities;
- research, expertise and consulting;
- management of concession matters, e.g., procurement and bid evaluation;
- ownership of public property; and
- flood control.

The PCWAs are engaged in commercial activities through a Business Association of Public Water Management Companies of the Federation of Bosnia and Herzegovina. Its activities and assignments include, inter alia, participation in the execution and co-ordination of water management development works at watershed area, participation in and co-ordination of investigation works, co-ordination and maintenance of flood protection systems on regional water streams, regional water supply systems and water treatment plants, and pricing, i.e., defining with the agreement of the Federation Government the rates and amounts of water fees.

The distribution of General and Special Water Fees in the Water Law indicates the true respective power of the institutions: 70% of the collected water fees (100% of concessions) are directed to PCWAs, 10% to the Federation Ministry of Finance and 20% to the Cantons. Financial management lacks transparency and external auditing.

FEDERATION B&H
SIMPLIFIED INSTITUTIONAL ARRANGEMENTS



4.2 Institutional Framework in the Republika Srpska

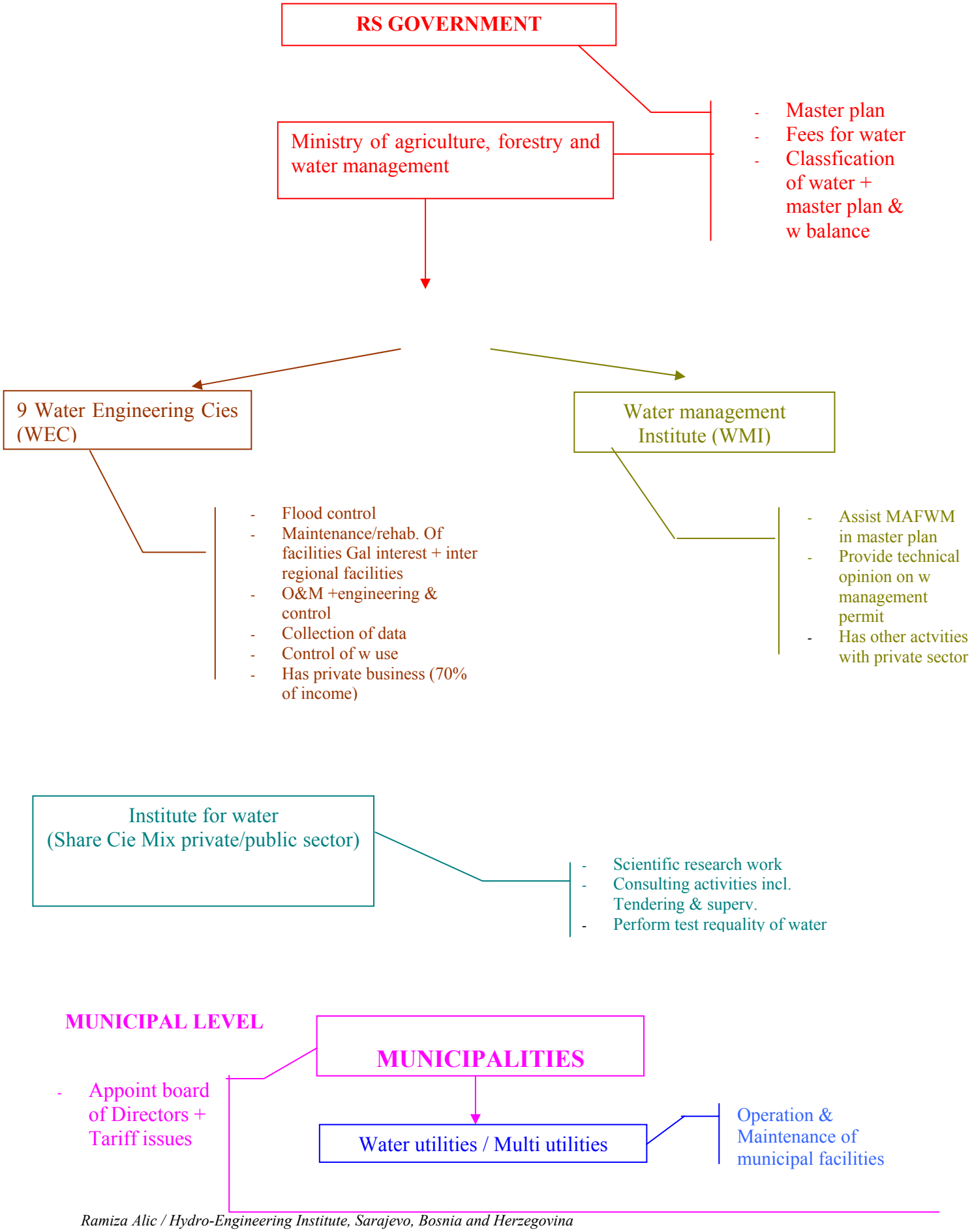
The water sector management in the RS is highly centralized. The Ministry of Agriculture, Forestry and Water Management (MoAFW) is the main authority in charge of administrative and technical matters in water management. The Ministry, inter alia, issues most water management guidelines, approvals, and permits, is in charge of the enforcement of Water Law and other laws related to water management, prepares various plans (such as long-term plan for water management development and water protection plan), organizes, through the Directorate for Waters, the application of long-term, medium-term and annual plans for development of water management, defines conditions for wastewater discharge, defines conditions (staff, equipment etc.) for companies authorized to control surface and groundwater quality, and proposes to the Government the basis of and rates for the general and specific water management fees and a method for their calculation.

The financial resources for water management are largely distributed through the Directorate for Waters (DW) and its subordinate Water Engineering Companies (WEC). The DW is subordinated to the MoAFW. This is likely to result in situations with conflict of interest. The WECs have administrative competencies that, although of limited nature, involve exercise of public power.

The Water Management Institute (WMI) has the competence to prepare guidelines for various water management undertakings, in other words the WMI may authoritatively confirm the project plans. Besides preparing the guidelines, the WMI is engaged in other consultant activities in the private sector. On the other hand, through submitting expert opinions, the WMI has in practice a decisive role in water management licensing. The administrative duties of the WMI are incompatible with its commercial interests.

General water fee is an earmarked income tax (1.5% of the gross salary) to be shared between the government (80%) and municipality (20%). Special water fees are collected to the Water Management Fund of the MoAFW. Revenues generated through general and special water fees are high with limited justification in terms of the needs of and use for the water sector. Democratic control of the allocation of funds is diminished by earmarking the tax revenues for the needs of one particular field of administration.

REPUBLICA SRPSKA
Simplified Institutional arrangements



4.3 Inter-Entity Steering Committees

The Constitution requires under Article III 5 b that the Entities begin negotiations with a view to including in the responsibilities of the institutions of Bosnia and Herzegovina matters not included under their responsibilities within six months of its entry into force. The Entities have then the possibility to transfer part or the whole of their responsibility for, e.g., water resources and other environmental matters to the state level. This could ensure the unity of the relevant actions that could be undertaken at a larger scale and avoid inconsistencies. This article could have been the legal basis for the definition of a water resources or environmental programme at state level. However, the Entities have not yet started any negotiation to include these matters in the responsibility of the state and at present are not willing to transfer their responsibility to the state.

Article III 4 of the Constitution provides for the possibility of co-ordination between the Entities. The Presidency may decide to facilitate inter-Entity co-ordination on matters not within the responsibilities of Bosnia and Herzegovina, with the full agreement of both Entities. In practice, the Presidency has not decided to facilitate inter-Entity co-ordination for the adoption of a water resources or environmental programme for Bosnia and Herzegovina.

There are two relevant steering committees; the Water Steering Committee (WSC) and Environmental Steering Committee (ESC). Both of them were established in mid 1998. There are some overlapping duties referred to in the Memoranda of understanding on the establishment of these steering committees. However, the co-chairmen of both committees have resolved to work closely together in order to co-ordinate their actions.

WSC is in charge of co-operation between the competent ministries of the Entities in water matters, aiming to eliminate eventual conflicts in water management. ESC deals with all issues related to the environment, coordinating between the competent ministries of the Entities.

5 Management Units

5.1 Water and Wastewater Utilities

5.1.1 General Situation

Water production and supply such as sewerage services, considered by the Water Law as activity demanding technical and technological unity, can be given exclusively to a public company. Municipal service suppliers must ensure permanent service, good functioning of facilities and agreed service quality, healthy and hygienic accuracy.

Water and wastewater services are now generally provided in municipalities either by a "Water and Wastewater Utility", a company that usually provides only water and sewerage services, or as part of a public utilities company in the municipality. In earlier years and in smaller towns, water and sewerage were included along with many other municipal services, such as street maintenance, central heating, care of parks and cemeteries, solid waste collection and other services. Some municipalities still operate that way. All these services were provided by a public company under the municipality called a communal services company.

W&WWU have during the past decade experienced a number of changes in their working environment which have weakened their performance capability drastically. Even before the war (1992 – 1995) there was a serious disrepair of municipal services caused by strictly controlled and non-cost recovering pricing that did not allow proper investment and maintenance. The situation was compounded by serious operational deficiencies and outdated managerial practices. The sector was highly centralized and was operated in accordance with socialistic principles. The four-year war led to significant destruction and deterioration of facilities. It also caused major disruptions in operation and maintenance of utility systems, from both neglect and from extensive dislocation of population, including management and operators of the utilities. In some of the utilities practically none of the present management or staff has experience from a "normally" operating utility. To great extent utility know-how, maps and records are lost. Continuing poor financial situation in the country is effectively hampering efforts to improve water and wastewater services.

5.1.2 Legislative Framework

Water production and supply, considered by the Water Law as activity demanding technical and technological unity, can be given exclusively to a public company.

Federation of Bosnia and Herzegovina and Republika Srpska have its own laws that impact the delivery of water and wastewater services, affecting most aspects of technical, administrative and financial matters.

The cantons in the F B&H also have their own governments, and they also impact on the activities of most W&WWUs.

The Law on Utility Activities regulates "utility activities of special social interest", such as:

- water production and distribution by water network, up to the user's measuring instrument including the instrument
- purification and evacuation of wastewater
- cleaning of public transport infrastructures and
- storm water drainage

The municipal activities can be performed by a public municipal company, some other company, the local community or an individual worker.

The user of municipal services has to pay a fixed price for the service. If he neglects paying for the service for two consecutive months, the service can be cut if this does not threaten other users. Disputes between users and the service provider are to be resolved in court.

The Municipal Assembly defines the method of service pricing, but the service provider defines the price of the service.

5.1.3 Characteristics of Reviewed Utilities

This review and assessment of water utilities in this Section is mainly based on findings from the pilot components of the Project carried out with the water utilities of the 10 municipalities (Čajniče, Banja Luka, Srbac, Bijeljina, Konjic, Zenica, Tuzla, Gradačac, Orašje and Čelić) included in the proposed *Institutional Strengthening of Ten Selected Pilot Vodovods, 1999/2000,* tentatively to be financed by USAID. The Konjic W&WWU does not belong to the Sava watershed area.

Service Areas

The actual "service areas" of most W&WWU include the central city of the municipality that controls it, and parts of one or several populated areas within the municipality. Some provide services to communities outside their municipality. Those populated areas may be contiguous or several kilometers away. They may be served by a single water system, or by several systems.

Table 2 Total Population and Population Served by Water and Wastewater Systems[1]

Municipality	Population					
	Total Municipality	Central Town plus Others[2]	Served by Piped Water		Served by Sewers	
			Pop'n	Percent[3]	Pop'n	Percent[4]
Konjic	35 000	23 000	14 000	60%	7 000	30%
Caijnice	7 000	5 000	4 500	90%	3 600	72%
Zenica	145 000	100 000	91 000	91%	77 000	77%
Banja Luka	280 000	250 000	240 000	96%	132 000	53%
Srbac	24 000	13 300	11 000	83%	4 000	30%
Tuzla	150 000	140 000	130 000	93%	60 000	43%
Gradacac	45 000	16 000	15 000	94%	6 000	38%
Orasje	28 000	6 000	5 500	92%	5 000	83%
Bijeljina	120 000	84 000	75 000	89%	No sewers	0%
Celic	18 000	7 600	6 000	79%	200m of sewers	<5%
Total	**852 000**	**644 900**	**502 000**	**78%-59%[5]**	**299 600**	**46%-35%[6]**

[1] Data are rounded, and represent the best estimate available on the basis of field interviews, data reported earlier by the 8 of 10 vodovods which attended the USAID Workshops for which they provided information, and follow-up phone calls to try to resolve contradictions or questionable data.

[2] Includes the estimated total population of the central town of the municipality (the principal town or municipal center), plus that of the other populated areas served by the vodovod's water systems.

[3] Percent of the estimated population of the central town and surrounding communities it purports to serve.

[4] Percent of the estimated population of the central town and surrounding communities it purports to serve.

[5] While the utilities serve 78% of their central town and nearby populated areas, they serve only 59% of the population of all the municipalities.

Type and Adequacy of Sources and Collecting Sewers

Springs and wells serve as the only sources for seven of the W&WWU and they are significant sources for two others. Sources appear to be adequate to meet current needs in eight of the W&WWU, but are seriously deficient in two (which only operates about 12 hours per day).

Sewers are also generally old, and generally given little maintenance until a blockage occurs. Very few W&WWU have the equipment or capacity to deal with serious blockages. The alternatives were to hire – at quite a high cost – a truck with a high-pressure pump, or to physically excavate, break into the pipe, manually remove the blockage, then rebuild the sewer and refill the excavation. Bijeljina and Celic have no sewers, four systems are at least partly combined (meaning they carry storm water flows as well as sewage), and Cajnice has an antiquated system built largely of stones.

[6]The estimated total sewered population amounts to 46% of the population of the central town and surrounding populated areas, and only 35% of the total population of the ten municipalities.

Table 3 Summary Description of Sector Facilities

Municipality	Water Facilities			Wastewater Facilities		
	Sources of Water	Treatment/ Chlorination	Comments	Collection System	Treatment	Comments
Konjic	Springs	None Chlorination	5 systems 8 pump sta., HP zones	Yes Separate 9 km	None	To River Neretva
Cajnice	Springs Gravity fed	None Chlorination	Excess capacity	Yes (Old) Separate Stone Sewer	None	To River Drina
Zenica	Springs 2/3 WTP 1/3	Rapid sand Chlorination		Yes Separate (Mostly)	None	To River Bosna
Banja Luka	9 wells 4/10 Surcharged WTP 6/10	Rapid Sand Chlorination	Wells surcharged by river water	Yes 50% Combined	None	To River Vrbas
Srbac	2 wells	None Chlorination		Yes Built 1980 Separate	None	To River Sava
Tuzla	5 springs 7 wells	None Chlorination	Sources inadequate for needs	Yes Partly Combined	None	To River
Gradacac	WTP served by lake behind dam	Rapid Sand Chlorination	3 reservoirs multiple repumping	Yes Mostly Separate	Yes **(See Note A)**	To River
Orasje	3 wells 1 new, 2 old	None Chlorination	Includes PS and hydropneumatic tk	Yes Combined	None	To River Sava
Bijeljina	8 wells plus 7 wells in clusters	None Chlorination	Booster PS Elevated Storage	None	None	
Celic	Deep wells Dug wells	None Chlorination	Two (soon 3 Separate systems	None (only 200 meters)	None	

Note A: A new activated sludge wastewater treatment plant was built with USAID assistance, and was completed in autumn 1998. It operated for about 3 months and was ordered shut down by the municipality to save on energy costs. It has not operated since about the beginning of 1999.

Management

Most of the W&WWU suffer from the lack of programs designed to assist those in key responsible positions in becoming effective managers, and by being forced to operate and manage their work in a restrictive environment, lacking autonomy and control over basic decision making.

Administration

W&WWU administrative capacity suffers from a lack of logical organization of their functions, unclear identification of duties and responsibilities of departments and employees, poor systems for reporting, and a serious lack of adequate office equipment and supplies.

Mapping

Mapping capabilities varied considerably. Few had good quality maps of their overall facilities, and most of those had been prepared some time ago by others. These were often one-of-a-kind maps that could not be reproduced, and were out of date. Many directors complained that they had no idea where their water pipes and valves were (covered over by decades of paving programs), and were unable to isolate much of their system in case of main breaks.

Staffing Levels

Many W&WWU officials reported that their current staffs are from 30% to 50% lower than pre-war levels, and therefore consider themselves understaffed. However, analysis indicates that almost all W&WWU are more heavily staffed than those of efficient western utilities (which often have four employees or less per thousand connections).

Personnel affairs are frequently assigned to a department called "legal and other services". Human resource development (HRD), under the direction of a trained professional, in terms of evaluations, incentives, training, goal-setting or other HRD functions, does not appear to be a high priority activity among the W&WWU.

Customer Relations

Almost universally, the W&WWU' programs for dealing with customers are aimed at reacting to complaints. Very few utilities take any positive actions to improve customer relations through the program of preparing and inserting small informational pamphlets in their customers' bills, every other billing period, and setting up a dedicated phone line for customers to contact the utility. Some also have a program that offers to send specialists to customer's houses or apartments to repair leaks inside their dwellings.

Separation of Services

Unless the W&WWU operated solely as a water and/or wastewater entity, the activities and costs were not separated from all other public services. Five of the ten pilot W&WWUs were part of a municipal entity that provided other services such as solid waste collection. Generally, the water and wastewater revenues and costs were not reported separately when they were combined with other services. Thus, donors and lending agencies that need to review the W&WWU financials cannot determine the ability of the W&WWU to maintain the investments donated or repay monies borrowed.

Uniform Chart of Accounts

The W&WWU' water and wastewater activities do not have a separate uniform chart of accounts. The chart of accounts currently used by the W&WWUs is an adaptation of the accounts used by all public entities in either the FBiH or RS. There is no uniform chart of accounts that separate water and wastewater functions from all other public service functions

Budgeting

Current practice among the pilot program W&WWUs studied does not include the establishment of budgets by department, with a comparison to actual by department. The budgets as referenced by several W&WWUs are part of a business plan, which could be expanded into a more comprehensive document serving as both an operational planning and management tool as well as a document for capital improvement management and planning.

Rate Structures

Most W&WWUs have rate structures that need to be changed in order to cover costs.

A common practice for most W&WWUs is that charged a volume rate that was uniform for all water sold. None of the W&WWUs used a declining rate structure (reduced costs per cubic meter for larger

amounts of water used by a given class of customer). On the other hand, none used an inclining rate structure, either (increased costs per cubic meter for larger amounts of water used by a given class of customer). Several W&WWUs used a form of inclining rate structure in which larger users, such as industrial customers, are charged a higher (but still uniform within their class) rate per cubic meter than the smaller users such as residential customers.

Almost all W&WWUs in the pilot program metered most of the consumption of large commercial/industrial customers. For residential customers, if the W&WWU did not have working meters for residential homes or apartment buildings, the amounts charged were based on estimates. The bills were based on either an estimate of use based on historical usage (before the war), a lump sum per person estimated at the connection, or an amount based on an estimated per capita consumption (often very low) for an estimated number of persons at that connection.

Summary of W&WWU Expenses

An approximate comparison of expenditures in 1998 for major items for nine of the ten W&WWU is presented in Table 4

Table 4 Summary of 1998 Expenditures of Selected Vodovods (KM 1,000)

Type of Expenditure	Gradacac		Bijeljina		Zenica		Srbac		Konjic	
	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%
Materials	296	17	320	20	505	9	56	12	148	19
Electricity	275	16	120	7	137	2	70	15	12	2
Spare parts, stores	19	1	19	1	159	3	12	3	1	0
Depreciation	340	19	180	11	2 050	38	63	14	400	52
Personnel	490	28	406	25	1 200	22	150	33	180	23
Transportation	90	5	13	1	1	0	1	0	0	0
Maintenance, repair	166	9	65	4	465	8	5	1	0.5	0
Rent	0	0	0	0	1	0	4	1	6	1
Taxes	4	1	125	8	4	1	5	1	0	0
Miscellaneous	77	4	59	4	930	17	89	20	28	3
Capital investments	0	0	302	19	0	0	0	0	0	0
TOTAL	**1 757**	**100**	**1 609**	**100**	**5 452**	**100**	**455**	**100**	**775**	**100**

Type of Expenditure	Banja Luka		Tuzla		Orasje		Celic		Average % of Cost Items
	Cost	%	Cost	%	Cost	%	Cost	%	
Materials	306	5	652	9	24	6	50	14	**10**
Electricity	630	11	1 313	17	90	24	27	7	**11**
Spare parts, stores	40	1	11	0	1	0	3	1	**1**
Depreciation	1 244	22	2 800	35	82	22	12	3	**29**
Personnel	1 500	26	2 200	28	100	27	58	16	**26**
Transportation	5	0	4	0	2	1	8	2	**0.5**
Maintenance, repair	97	2	106	1	5	2	0.1	0	**3.5**
Rent	0	0	100	1	0	0	0	0	**0.5**
Taxes	0	0	29	0	1	0	1	0	**0.5**
Miscellaneous	1 912	33	605	8	67	18	140	39	**16**
Capital investments	0	0	74	1	0	0	64	18	**1**
TOTAL	**5 734**	**100**	**7 894**	**100**	**372**	**100**	**363**	**100**	**100**

Notes:
1. "Taxes" does not include major new taxes imposed effective 1 January 1999
2. "Personnel" includes wages and benefits
3. "Miscellaneous" includes advertising, insurance, entertainment, telephone, interest, and other costs.
4. In Zenica, Miscellaneous includes DM 561,000 in accounts receivable that were written off in 1998.
5. In Banja Luka, the large amount under "Miscellaneous" may represent a re-assessment charge.

Overview of Collection Problems

Collection rates range from 10% to 82%, with an average of about 40%. The collection rate is determined by dividing the annual collections by annual revenue billed.

Most W&WWUs did have a specific payment period that they adopted, but the date due was not noted on the customer's bill. In most W&WWUs, the customers' bills display only the current amount due. Previous amounts owed were not presented on current bills issued by most of the W&WWUs, so customers could not tell the total amount they owed.

Collection rates from public customers are significantly lower than those from other customers. All W&WWUs in the pilot study do not shut-off multi-family buildings for non-payment because the customers that do pay would be punished because of those who do not.

Profitability Ratios

The profitability ratios measure the W&WWU financial success as it relates to revenues and expenses **Table** 5, presents the ratios used to determine the pilot W&WWU's ability to generate enough revenue to cover their expenses. The two ratios used to measure profitability are the Operating Margin and the Assets to Net Worth Ratio. Profitability is important because profits are currently the only source, outside of international donations, of meeting the W&WWUs' needs

Table 5 Profitability Ratios, 1998

	Konjic	Zenica	Banja Luka	Srbac	Tuzla	Gradacac	Orasje	Bijeljina
Operating Margin	-97%	-13%	-14%	0%	-16%	0%	-2%	0%
Net Worth	9	46	33	1	72	7	2	8
Assets/Net Worth	0.9	0.8	0.9	0.9	0.9	0.9	0.95	0.9

Conclusion on Profitability Ratios

The results of the data from Table 5. indicate that none of the W&WWUs are profitable, and most are seriously in the red. The situation is compounded because the data are based on *billed* revenues, so the losses are even worse than indicated. On the other hand, the Assets to Net Worth Ratios are all close to the optimum level of 1.0, an indicator of zero debt. This is understandable since the W&WWU's have never been in a position to borrow money for their capital investment programs

5.2 Ownership of Facilities

According Federal WL (Art. 19 and 22) Water supply facilities which are used for the water supply for the territory of the Federation and of other countries (sources, water intakes or impounding reservoirs, pump stations, water treatment plants and main transport pipelines up to the distribution reservoirs on the Federation territory) and water management facilities used for water supply of the area covering two or more cantons (sources, water intakes or impounding reservoirs, pump stations, water treatment plants and a main transport pipelines up to the distribution reservoirs) are of importance to the Federation.

Water supply facilities are the property of the cantons, unless otherwise defined by the cantonal water law.

Water supply facilities are managed by legal persons registered for performing public utility services relating to the water supply, if the rights and obligation are not delegated to another legal person.

Water supply facilities being constructed by other legal persons and citizens are of their importance and are the property of those legal persons and citizens who operate them.

In RS the ownership is determined by the RS legislation that 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 Municipal Assembly elects the members of the governing bodies, representing the owner.

6 Service User

6.1 Classification of Users

Most Water Utilities classified customers in following categories:

- **Residential** – all consumers in individual houses and in multi-family building.
- I**ndustry** – special users of services that are using water in production process in larger quantity.
- **Institutions –** hospitals, schools, churches, retirement homes, museums, army, building of administrations etc.
- **Commercia**l – Handcrafts company, usually smaller users,
- **Whole sale customer** - customer that buy a water in large quontity from other water utility and selling water to customers.

6.2 Population Served

Share of supply from public sources

In F B&H 56% of population are supplied with public water supply system.

- cities with population over 100.000 have 80% supply coverage
- towns with population between 10.000 and 100.000 have 59% supply coverage
- municipalities with population below 10.000 have 43 % supply coverage.

In RS 48% of population are supplied with public water supply system.

In urban areas water supply coverage is 87 % and 52% of population rely on village water supply systems, their own wells or on possible springs or surface water sources. The low average coverage of urban water supply in the RS is partly explained by a few towns where the coverage is very low.

Water used by business and industry

According to the pre war data business and industries where used about 147 l/cp/day (35%), and average water consumption for households was 420 l/cp/day. i.e., 134 l/cp/day (32%), and 139 l/cp/day (33%) where water losses.

As industry capacities where mostly destroyed during the war it is estimated that industry water consumption is much less at present.

7 Product Quantity and Quality

7.1 Water Production

Water supply in the Federation of B&H area is mainly based on the use of groundwater (in 1985 about 89%). In areas where groundwater supply is insufficient to satisfy water demand, surface water is also used. It is abstracted from a lake or a river and treated before distribution.

The last available data on water production is based on research of Hydro-engineering institute in 1999. Data shows that water production in 51 water utilities (out of total 106) has been 275,320,532 m^3/year.

Half of the water utilities have no meters on their sources. Where no meters exist, they estimate the flow based on pump nameplate capacity data and hours of operation, or other systems as appropriate. Despite the deficiencies in source metering, estimates of water produced are probably within about 80% accuracy.

7.2 Water Processing

The quality of treated water is affected by economizing on the use of chemicals (virtually all water chemicals have to be imported) and the poor condition of surface water treatment plants (most of them are old and in need of rehabilitation). Disinfections are often the only applied treatment. However, disinfections at the source may not be sufficient to ensure the hygienic quality of water at the consumer's tap because of high leakage in the distribution system.

The quality control of water is sometimes difficult because of the lack of laboratory equipment and material. Bacteriological tests of water received were performed by hospitals, a veterinary institute, and some health institutes.

7.3 Water Distribution

Water distribution is in many places based on gravity, but most systems involve pumping stations. Pumps, where used, are often inefficient, resulting in high-energy use and high operation costs. Because of the insufficient storage capacity, pumping stations often operate 24 hours a day. Due to the lack of maintenance during the war, the pumping stations and other distribution facilities have been deteriorated.

Water losses are between 50 and 70% of total water production. Water losses can be broken down to three categories: leakage, unrecorded and unbilled. Physical leakage represents approximately 30% of total production.

Water distribution networks are generally old and in bad condition.

7.4 Water Consumption

The last available data on water consumption is based on research of hydro-engineering institute in 1999. 51 water utilities served 1,557,429 consumers. Those consumers consumed totally 90,388,894 m^3/year.

In Study "Institutional Strengthening of Water Sector in F B&H" (Final Report, Authors: Plancenter Ltd. Finland, BCEOM, France and Hydro-Engineering Institute, Sarajevo, April 1999.) the required investments in water supply within the next 30 years are estimated to include:

- new water meters to be installed to all customers within 5 years;
- 50% of all groundwater plants to be provided with filtration unit within 10 years in order to ensure potable water of high quality in all circumstances;
- all surface water treatment plants to be renovated within 10 years;
- 50% of all existing distribution systems to be reconstructed within 15 years and the remaining 50% within 30 years in order to reduce physical leakage and to maintain the systems operational; and
- distribution systems to be extended to cover all urban population and 80% of rural population within 20 years.

7.5 Wastewater Production and Collection

Most municipalities in the B&H have sewer systems but they only discharge the collected sewage directly to a surface water channel or a river. Almost all municipal sewer systems are gravity systems with no pumping stations.

Before the war (1992 – 1995) average daily production of wastewater in B&H was 29.85 m^3s^{-1} , out of which the largest part generates from industries (79,7%). The largest concentrated pollution sources were placed within river basins that belong to Danube River Basin- about 90% of the total pollution load in B&H. As it could be expected due to concentration of population and industry, the highest production is situated in Bosna river basin (flow 68,8%, suspended solids 56,5% and organic loading 35,0%). Emission of the total organic pollution was high enough in Vrbas river basin (2,604,725 population equivalent (PE)), Una river basin (1,656,608 PE) and nearby Sava river basin (973,033 PE).

The relation between settlements and industry in organic pollution emission differed from one river basin to the other. Within the river basins of Bosna, Drina, Sava and particularly Una and Vrbas the participation of industrial wastewater was dominant.

Overall emission of organic pollution, then nitrogen and phosphorus generating out of diffused sources in B&H amounts 5.6 tons of BOD_5 per day< 25.2 tons of nitrogen per day and 1.6 tons of phosphorus per day (average per dry year). The highest emission originates within Bosna river basin (20%).

Current observations and changes in quality of surface, underground waters and sources have not been systematized yet, and have been carried out from case to case, for have not yet regulated by law.

7.6 Wastewater Processing

The service level in wastewater services in the Federation is far from the European level: connection rates are 35% against the European average of 75%. The most dramatic difference is in wastewater treatment: only seven municipalities in the B&H have a wastewater treatment plant. Pollution from municipal wastewater is significant.

Current situation regarding of population connected to sewage system with wastewater treatment plant (WWTP) is more difficult than before the war. Population connected to sewage system with wastewater treatment plant in B&H is 1.2% in relation to total population in B&H (about 4,200,000 inhabitants).

Table 6 Wastewater Treatment Plants

Town	Operation before the war	Approximately population connected on WWTP	Operation during the war	Current operation	Approximately population connected on WWTP after the war
Bos. Grahovo	0	-	0	0	-
Čelinac	x	3 400	0	x	5 500
Gradačac	x	10 000	0	x	10 000
Grude	0	-	0	x	2 000
Ljubuški	x	2 000	x	x	2 000
Neum	x	1 000	0	x	1 000
Odžak	0	-	0	0	-
Sarajevo	x	454 000	0	0	-
Široko Brijeg	0	-	0	0	-
Trebinje	x	12 000	x	x	12 200
Trnovo	x	2 200	0	0	-
Srebrenik	0	-	0	x	18 000
Total	**7**	**484 600**	**2**	**7**	**50 500**

In Study "Institutional Strengthening of Water Sector in F B&H" (Final Report, Authors: Plancenter Ltd. Finland, BCEOM, France and Hydro-Engineering Institute, Sarajevo, April 1999.) the required investments in wastewater collection and treatment within the next 30 years are estimated and include:

- purchase of urgent maintenance equipment within 5 years;
- construction of sewer collectors in order to collect sewage to one discharge point within 10 years;
- **construction of wastewater treatment plants within 15 years;**
- 50% of all existing sewerage systems to be reconstructed within 15 years and the remaining 50% within 30 years; and
- sewerage systems to be extended to cover all urban population within 20 years

7.7 Wastewater Effluent

Current status of water quality is very hard to assess. Namely, assessments can be raw enough, as necessary monitoring is very slowly setting by. There is not enough number of quantified observations to be relevant in determination of surface water status.

In 1996 proposed Program of identification zero state water quality after the war was not realized for lack of financial means. Recent setting up monitoring at the streams has small and unsatisfactory number of data to enable presentation of current water quality status assessment in general.

Current status of streams water quality now is still better than before the war. It can be stated that there exists an improving trend in general status of surface water quality.

At the other side, although industrial sources pollution is reduced, negative trend in water pollution generates from sewage waters, due to the fact that most of municipal sewage treatment plants are out of operation.

Monitoring of discharged water quality and quantity, either permanent or periodic, was not legal obligation and was not carried out. Such examinations, so called "self monitoring", were done by user itself, irregularly and occasionally, if was done at all.

7.8 Description of Present Standards and Pollution Thresholds for Water Pollutants in FB&H

The current standards and pollution thresholds in FB&H are set by the Water Law and the corresponding secondary legislation.

According to the Article 121. of the Water Law, water protection is carried out by banning, limiting and preventing hazardous and harmful substances to be discharged into water, as well as by regulating and undertaking other measures aimed to maintain and improve water quality.

By the Water Law, hazardous substances are those matters, energy and the other constituents that have such physical, chemical and biological composition, quantity and other properties that can endanger people's lives and health, survival of flora and fauna and environmental situation (Article 121. of the Water Law). Harmful substances are those matters that can cause changes of chemical, physical and biological properties of water, resulting in a restricting or preventing water usage for beneficial purposes.

The FB&H authorities are responsible to enact a by-law defining substances that are considered hazardous or harmful.

It is forbidden to discharge the hazardous and harmful substances into water or on the land from where the pollution may reach the water (Article 122. of the Water Law).

Legal and physical entities, which discharge hazardous or harmful substances that might pollute water during their activities, are required to treat the water partially or completely prior to the discharge, in accordance with the water permission.

To prevent deterioration of water quality and protect the environment as a whole, limiting values for hazardous and harmful matters are issued:

- for technological waters prior to their discharge into the public sewage system or other recipient, and
- for waters that are, after being treated, discharged from the public sewage system into a natural recipient.

The Minister of agriculture, water management and forestry is responsible to enact a by-law setting the limiting values (Article 124. of the Water Law). This by-law has not been enacted so far.

Water protection is carried out in accordance with the water management master plan and the water protection plan against pollution.

The water protection plan against pollution particularly focuses on the required investigations and water quality testing, water protection measures, including measures in the case of accidental water pollution. The FB&H Government is responsible to prepare this plan (Article 125. of the Water Law).

For legal entities that discharge wastewater or other waste substances into water, public water facilities, construction site, agricultural or other land and into atmosphere and thereby pollute water, authorized laboratories, upon a request of a legal entity, perform measuring of wastewater and other hazardous and harmful substances. The Minister of agriculture, water management and forestry is responsible to enact a by-law defining the conditions that must be fulfilled by an authorized laboratory, as well as the content and the procedure of issuing the authorization (Article 132. of the Water Law).

7.9 Description of the Formula by Which Person-Equivalent Pollutant Load is Calculated for Industrial Installations

Until the regulation from Article 124. of the Water Law is enacted, the regulations that have been used in FB&H before the enforcement of the Water Law are still in force. One of those regulations is the Decision on the Maximum Concentration Levels of Radio Nuclide and Hazardous Substances in Inter-Republic Water Streams, Inter-State Water Streams and Waters of the Coastal Sea (Official Gazette of SFRY, No. 8/78). This decision is an FB&H by-law, and is enforced in FB&H according to the Water Law.

A systematic monitoring of water quality generated from point sources has been performed for industrial effluents only. Municipal wastewater examination is not carried out at all. The exceptions are the discharge points from municipal wastewater treatment plants, where the user is required to make systematic water quality analyses of the effluent.

The by-law entitled the "Regulation on types, methods and range of measurements and testing of used and discharged wastewater and excavated material from the rivers" (hereinafter called the Regulation on wastewater testing) sets the organization and manner, range and type of measurements of industrial wastewaters, and defines methods of measurement to determine the effluent quality. According to this Regulation, the following activities have to be undertaken in order to define and control water quality:

- Questionnaires for all plants producing wastewaters have to be filled out,
- Pollution load for the wastewater discharge have to be measured,
- Pollution load expressed in Population Equivalents (PE) has to be calculated, following the methodology given in the Regulation on Wastewater Testing.

The determination of PE has to be carried out once in two years at each wastewater outlet (Article 13. of the Regulation on Wastewater Testing).

Measuring and testing of physical and chemical characteristic of the effluent is performed according to the “Methods for measuring and testing of physical and chemical characteristic of wastewater effluent, calculation of Population Equivalent and calculation of coefficient of water pollution for particular water polluters” (hereinafter called the Methods of testing wastewater effluent). Those Methods are an integral part of the Regulation on Wastewater Testing (Article 12. of the Regulation on Wastewater Testing).

If after the calculation of PE in a particular industry, there are some subsequent changes in the technological process and increase or decrease in PE, the industry is required to provide the new calculation of PE immediately (Article 13. of the Regulation on Wastewater Testing).

An enterprise or other legal entity that either produces small amounts of wastewater in its technological process or discharges only sanitary wastewater (a smaller water polluter) in sewer network or recipient is exempted from the previous rule. The duty of this entity is to determine the coefficient of water pollution according to the table for the determination of the coefficient of water pollution given in the Methods. That value of PE has to be presented in a monthly report on PE (Article 14. of the Regulation on Wastewater Testing).

Enterprises and other legal entities that use water (or discharge wastewater) are required to provide the “Public Water Management Enterprise” with data important for the use of water and discharge of wastewater, and to include the data in the “Questionnaire for users and polluters of water”, (Article 19. of the Regulation on Wastewater Testing).

Entities required to keep the records on the quantity of discharged wastewater, which are defined in Article 13 of the Regulation on Wastewater Testing, have to provide the PCWAs with a study on the results of the wastewater testing and calculation of PE, within 15 days from the day of the receipt of the study (Article 22. of the Regulation on Wastewater Testing).

The PCWA has the authority under Article 26. of the Regulation on Wastewater Testing to check the results provided by the study.

Methods for the Calculation of PE and Calculation of the Coefficient of Water Pollution for Particular Water Polluters

The formula for the calculation of PE is given as follows:

$$PE = \{E_{SS}; E_{OS}\} + E_{tox} + R_T, \quad (1)$$

where the notation is:

$$E_{SS} = \frac{T_{SS}}{55} \quad (PE) \quad (2)$$

$$E_{OS} = \frac{T_{OS}}{40} \cdot K \quad (PE) \quad (3)$$

$$K = \frac{1}{1{,}7 \cdot n} \quad \sum_{i=1}^{n}\left(\frac{COD}{BOD_5}\right)_i \quad (4)$$

$$E_{tox} = \frac{1000}{48hLC50} q \quad (PE) \quad (5)$$

$$R_T = \frac{\overline{q} \cdot T_{max} \cdot 10^4}{1{,}56 \cdot T_D} \quad (6)$$

E_{ss}	harmfulness equivalent due to suspended solids (PE)
E_{os}	harmfulness equivalent due to organic substances (PE)
E_{tox}	harmfulness equivalent due to toxic substances (PE)
R_T	parameter of thermal pollution (PE)
T_{SS}	daily organic wastewater suspended solid load (g/day)
T_{OS}	daily organic wastewater load expressed as BOD_5 (g/day)
K	the ratio of HOD/BOD_5
$\sum_{i=1}^{n}\left(\frac{COD}{BOD_5}\right)_i$	sum of ratios COD and BOD_5 in mg/L for all tested samples
48hLC50	lethal concentration (volume %) of wastewater that kills 50 % of the test organisms in 48 hours
n	number of samples
$\overline{q}$	wastewater flow (m^3/sec)
q	wastewater flow (m^3/day)
T_{max}	maximum temperature of wastewater (^oC)
T_D	maximum permitted temperature of wastewater (T_D= 30ºC)

Correction factors K and R_T are not used in formulae (1) to (6) when:

for K	when K < 1
for R_T	when the maximum temperature of wastewater is < 30 ºC

In expression (1), either the value for E_{SS} or E_{OS} is applied, taking the one that is higher. The measurements are to be done during the average normal production process with respect to the quantity and quality of wastewater, and are to last 48 hours. PE is calculated for both days of measurement separately and the higher of two calculated values is reported as the basis for the collection of the wastewater discharge fees.

In case the production of the plant during the measurement was lower than the actual capacity, PE is calculated applying linear extrapolation to the maximum capacity. For the production during the measurements higher than the actual capacity of the plant, the calculated PE is the one to be reported.

8 Economic Data

8.1 Pricing/Tariffs

According to the Federal Law on Municipal activities (Official Gazette of Socialist Republic of B&H No. 20, July 26, 1990) and Law on Municipal activities of RS (Official Gazette of RS, No. 11/95), the Municipal Assembly defines the method of service pricing, but the service provider defines the price of the service.

The water utilities used several different rate structures, which were quite diverse. Some water utilities charged a lump sum fee per person per month for all residential customers and a uniform metered rate for commercial and industrial customers. Another water utilities had different charges per cubic meter sold for each classification of customer plus a monthly customer charge that increased based on the size of the meter serving the customer. Most of the water utilities had one thing in common: revenues from their existing tariff rates would not cover annual expenses even if all bills were paid.

Rate Structures

Most water utilities have rate structures that need to be changed and rates that need to be increased, in order to cover costs. Several water utilities had alternative rate structures, whereby, if a meter replacement program was in effect, the rate structure had two components:

1) A fixed customer or meter charge, and
2) A volume related charge.

The customer charges varied, based on the size of the meter or type of service. Other water utilities charged a volume rate that was uniform for all water sold (a common practice for most water utilities).

Several water utilities used a form of inclining rate structure in which larger users, such as industrial customers, are charged a higher (but still uniform within their class) rate per cubic meter than the smaller users such as residential customers.

Almost all water utilities metered most of the consumption of large commercial/industrial customers. For residential customers, if the water utility did not have working meters for residential homes or apartment buildings, the amounts charged were based on estimates. The bills were based on either an estimate of use based on historical usage (before the war), a lump sum per person estimated at the connection, or an amount based on an estimated per capita consumption (often very low) for an estimated number of persons at that connection.

Ancillary Service Charges

Most of the water utilities were charging a connection fee. No other fees for special services were noted. Special services are those services that incur additional costs to provide but that benefit or punish only the few customers for whom such services apply. Examples include fire protection, turn-on/turn-off fees and late payment charges.

Water and wastewater prices by different Service Users in some Water Utilities are shown in Table 7 and Table 8 (in KM).

Table 7 Water Prices by Different Service Users in Some Water Utilities

Municipality	Water Prices - 2001 year				
	Household	**Industry**	**Institution**	**Commercial**	**Special users**
Banja Luka	0.25 KM/m^3	1.60 KM/m^3	0.70 KM/m^3	1.6 KM/m^3	
Bihac	0.60 KM/m^3	0.90 KM/m^3	0.90 KM/m^3		
Capljina	0.30 KM/m^3	0.60 KM/m^3			
Celic	0.95 KM/m^3 Lump sum: 5 KM/household	0.95 KM/m^3			
Citluk	0.80 KM/m^3	1.80 KM/m^3			
Doboj	0.30 KM/m^3 Included sewerage services	1.16 KM/m^3 Included sewerage services			
Gradacac	0.8 KM/m^3 Lump sum: 3.5 m^3/member	1.5 KM/m^3			
Grude	0.5 KM/m^3	1 KM/m^3			
Ljubuski	0.73 KM/m^3	1.21 KM/m^3			
Maglaj	0.45 KM/m^3 Lump sum 3 KM/member	1.86 KM/m^3			
Mostar-E	0.5 KM/m^3	1.12 KM/m^3			0.9 KM/m^3
Mostar-W	0.4 KM/m^3	0.8 KM/m^3			0.7 KM/m^3
Neum	0.55 KM/m^3	0.85 KM/m^3			
Pale	0.70 KM/m^3	1.7 KM/m^3			
Sarajevo	0.7 KM/m^3	2.6 KM/m^3			
Srbinje	0.2 KM/m^3 Lump sum 1.00 KM/member	0.61 KM/m^3			
Tuzla	0.80 KM/m^3	1.5 KM/m^3	1 KM/m^3	1.2 KM/m^3	
Vares					
Zenica	0.3 KM/m^3	0.8 KM/m^3			
Zivinice	4.5 KM/mo./member	0.8 KM/m^3	0.8 KM/m^3		

Banovici	0.47 KM/m^3	1.1 KM/m^3			
Busovaca	0.6 KM/m^3	1.2 KM/m^3			
Donji Vakuf	0.1 KM/m^3	0.3 KM/m^3	0.2 KM/m^3	0.1 KM/m^3	
Gorazde	0.6 KM/m^3	1.8 KM/m^3 i 1.36 KM/m^3			
Gradiška	0.237 KM/m^3	1.131 KM/m^3			
Gracanica	0.5 KM/m^3	2 KM/m^3	1.00 KM/m^3		
Jajce	0.45 KM/m^3	0.45 KM/m^3			
Kalesija	0.70 KM/m^3	2 KM/m^3			
Konjic	0.45 KM/m^3 Lump sum: 3 KM/person	0.9 KM/m^3	0.9 KM/m^3	1.3 KM/m^3	
Kladanj	0.70 KM/m^3				1.40 KM/m^3 (state companies) 1.45 KM/m^3 (private companies) 0.70 KM/m^3 (schools)
Lopare	0.22 KM/m^3 Lump sum: 1.78 KM/member	1.45 KM/m^3	1.12 KM/m^3		
Posusje	0.8 KM/m^3	1.6 KM/m^3		1.2 KM/m^3	
Orasje	10 KM /mo/household	1.3 KM/m^3			
Prijedor	2.60 KM/mo./member	1.7 KM/m^3	1.7 KM/m^3		
Prozor	0.83 KM/m^3	1.66 KM/m^3			
Samac	0.35 KM/m^3 4 KM / mo/household	0.53 KM/m^3			
Sokolac	0.45 KM/m^3	1.66 KM/m^3			
Srebrenik	Up to 15 m^3 0.77 KM/m^3 Over 15 m^3 1.30 KM/m^3	3.025 KM/m^3	1.3 KM/m^3	3.025 KM/m^3	3.87 KM/m^3
Tomislavgrad	0.58 KM/m^3 Lump sum 3.5 m^3/member	0.96 KM/m^3			SFOR
Usora	1 KM/m^3	2 KM/m^3			
Zavidovici	0.35 KM up to 12 m^3/mo.	0.4 KM/m^3			

	0.7 KM from 12m^3 to 20 m^3 mo.				
	1.00 KM/m^3 over 20 m^3/mo.				
Zepce	0.5 KM/m^3	2 KM/m^3	1.00 KM/m^3		
Rogatica	0.3 KM/m^3	1.1 KM/m^3	0.55 KM/m^3 (ambulance) 0.30 KM/m^3 (schools)		
Han Pijesak	0.83 KM/m^3 2.5 KM/member	4.16 KM/m^3			
Bugojno	0.2 KM/m^3 1.5 KM/member	0.4 KM/m^3			
Bratunac	0.28 KM/m^3	1.19 KM/m^3			
Derventa	0.25 KM/m^3	0.80 KM/m^3			

Table 8 Wastewater Prices by Different Service Users in Some Water Utilities

Municipality	Wastewater Prices - 2001 year				
	Household	Industry	Institution	Commercial	Special users
Banja Luka	0.10 KM/m^3	0.80 KM/m^3	0.20 KM/m^3	0.80 KM/m^3	
Bihac	0.15 KM/m^3	0.20 KM/m^3			
Capljina	0.05 KM/m^3	0.10 KM/m^3			
Citluk	0.10 KM/m^3	0.20 KM/m^3			
Doboj	Included in water price	Included in water price			
Gradacac	0.20 KM/m^3	0.33 KM/m^3			
Ljubuski	0.36 KM/m^3	0.53 KM/m^3			
Maglaj	0.15 KM/m^3				
Mostar-W	0.24 KM/m^3	0.32 KM/m^3			
Pale	0.25 KM/m^3	0.85 KM/m^3			
Sarajevo	0.30 KM/m^3				
Tuzla	0.25 KM/m^3	0.50 KM/m^3	0.30 KM/m^3	0.60 KM/m^3	
Zenica	0.15 KM/m^3	0.50 KM/m^3			
Zivinice	0.20 KM/m^3				
Banovici	0.08 KM/m^3	0.50 KM/m^3			
Busovaca	0.30 KM/m^3	0.60 KM/m^3			
Donji Vakuf	0.05 KM/m^3	0.15 KM/m^3	0.10 KM/m^3	0.05 KM/m^3	
Gorazde	0.20 KM/m^3	0.60 KM/m^3 and 0.46 KM/m^3			
Gradiška	0.12 KM/m^3	0.57 KM/m^3			
Gracanica	0.02 KM/m^3				
Jajce	0.18 KM/m^3	0.18 KM/m^3			

Konjic	0.15 KM/m^3	0.30 KM/m^3	0.30 KM/m^3	0.30 KM/m^3	
Lopare	0.11 KM/m^3	0.73 KM/m^3	0.56 KM/m^3		
Orasje	Included in water price				
Prozor	0.08 KM/m^3	0.16 KM/m^3			
Samac	0.15 KM/m^3 40% from water price - lump sum	0.26 KM/m^3 40% from water price - lump sum			
Zavidovici	0.15 KM/m^3	0.15 KM/m^3			
Zepce	0.30 KM/m^3				
Rogatica	0.15 KM/m^3	0.55 KM/m^3	0.27 KM/m^3		
Bratunac	0.08 KM/m^3	0.28 KM/m^3			
Derventa	0.18 KM/m^3	0.40 KM/m^3			

Source: Hydro engineering Institute, Sarajevo 2001

8.2 Sales

Data about sales (billed based on metered water consumption) with various SU are available only for Republic Srpska in 1996 year in the 23 municipalities over 10.000 inhabitants.

Table 9 Water and Wastewater Sales in 23 Municipalities of RS 1996

Domestic water use in m^3/y		Industrial water use in m^3/y	
32 890 000		**12 640 000**	
Average Tariffs (KM/m^3) (1 EURO = 1.95 KM)			
Water	Wastewater	Water	Wastewater
0.210	**0.100**	**1.049**	**0.434**
Sales KM/y			
6 906 900	**2 960 100***	**13 259 360**	**4 937 184***

Source: Institutional strengthening of the water sector in the Republic of Srpska, Draft Final Report, February 2000, Plancenter LTd, ODP Zavod za vodoprivredu Srpsko Sarajevo RS

In Federation B&H are available data about water consumption in 1999 year in 37 municipalities with 1,073,034 consumers.

Table 10 Water Sales in 37 Municipalities of FBiH 1999

Water consumption in 37 municipalities	
73 096 609 m^3/y	
Tariffs (KM/m^3) (1 EURO = 1.95 KM)	
Domestic	Industry
0.28	**0.75**
Sales of water in KM/y	
20 467 050	**54 882 456**

Source: Hydro engineering Institute, Sarajevo 1999,

8.3 Costs or Purchased Inputs

According to available data on running costs in 1999 year in (including 51 water utilities out of totally 106 in B&H) total costs are KM 103,982,456 or EURO 53,324,336.

* Assumed that 90% wastewater was discharged.

8.4 Donations

Table 11 The Total Amount of Water and Sanitation Sector Reconstruction Project (Identified and Pledged-Fnanced Pojects) in B&H in KM

	Identified	Pledged/fin.	Covered %
Water supply	508 220 000	319 588 722	62.88
Wastewater	231 224 000	27 072 193	11.71
TOTAL	739 444 000	346 660 915	46.88

Donors' participation in financing is shown Table 12 and Table 13.

Table 12 Donor Participation in Water Financing (million KM)

Water supply	Amount in KM 1995 - 2000
EC	67 366 869
WB	31 930 020
USAID	61 019 938
ECHO	22 305 790
ICRC	30 562 518
Bilateral D	92 754 950
Others	13 648 637
Total	**319 588 722**

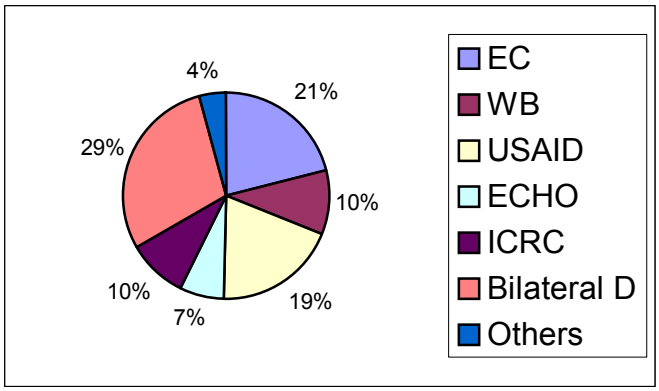
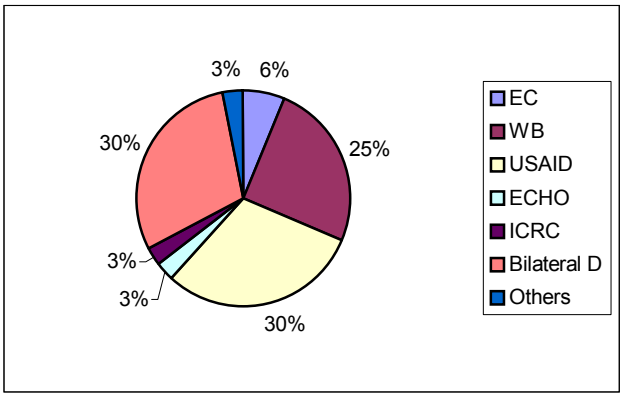


Table 13 Donof Participation in Wastewater Financing (million KM)

Wastewater	Amount in KM 1995 - 2000
EC	1 750 645
WB	6 711 650
USAID	8 215 545
ECHO	737 000
ICRC	760 751
Bilateral D	8 098 590
Others	798 010
Total	**27 072 191**



Source: B&H emergency water reconstruction program, November 2000, European Commission International Management Group

9 Infrastructure – Plant and Equipment

9.1 Production

Many of the facilities in the water and wastewater systems were constructed and financed under the then Government of Yugoslavia, and most of them date back more than 25 years. The facilities are generally relatively simple, in that most water systems consist of springs and wells.

Half of the water systems have no meters on their sources.

9.2 Distribution

Most water utilities have some type of distribution storage, frequently coupled with booster pumps, as multi-pressure zones are common in this very mountainous country. Storage as a percentage of average daily water use is generally low, and there is limited use of elevated storage, largely because the hilly nature of most areas makes it unnecessary. Distribution piping is a weak link in the water systems of most water utilities. Much of the installed water mains consist of asbestos cement material and extensive use is made of galvanized iron for customer connections to the system. Leakage is believed to be high, and the number of repairs reported varied from 20 to 200 per month, depending on condition and total length of mains. Many MUs complained that they had no idea of where their valves are located, as records are poor and frequent repaving has occurred, without regard to raising the valve covers. The fairly high pressures resulting from the often-significant differences of elevation within systems exacerbates the problem of leakage and breaks.

During war years maintenance of networks was highly reduced, if any activities were done at all. Leakage was not prevented; water meters were not calibrated or at least basically maintained. That all leaded to present situation in which most of water utilities have more than 50% of distribution losses and many water meters out of function.

9.3 Collection of Wastewater for Treatment

F B&H

Most municipalities in the FB&H have sewer systems but they only discharge the collected sewage directly to a surface water channel or a river. Almost all municipal sewer systems are gravity systems with no pumping stations. This greatly facilitates maintenance but many of the municipalities lack the necessary sewer cleaning equipment and also vacuum trucks for emptying of septic tanks. Most sewer systems are combined systems (conveying both wastewater and stormwater drainage), and the most common pipe materials used are asbestos cement and concrete. In 1996, ten municipalities were identified as having no sewer system.

Overflow of sewage during flooding is a problem in about 65% of municipalities. About 80 km of sewers are badly damaged and need replacement, and about 850 km of sewers require desilting and cleaning.

Republic of Srpska

The total length of sewers in the RS is 1,254 km (2.6 m/capita), but there is only one wastewater treatment plant. The replacement value[7] of the fixed assets is estimated to be about KM 600 million.

Most of the combined sewerage systems have inadequate capacity to accommodate and discharge peak storm water flows, resulting in sewage discharges onto the streets. Networks as well as pumping stations (where they exist) are in bad condition. As a conclusion it can be estimated that the present value of fixed assets is much lower than the replacement value. Before the war in B&H were 122 industrial Wastewater Treatment Plant, but now is only little in function.

[7] Replacement value is the present construction costs of the fixed assets (pipeline, treatment plant etc.)

9.4 Processing and Discharge of Wastewater

Table 14 Industrial Wastewater Treatment Plants in B&H and Their Status in 1991

No.	Enterprise	Type of the Process	Evaluation of the Process
RIVER BOSNIA CATCHMENT AREA			
1	"FAMOS" - HRASNICA, METAL PLATTING	Oxidation of CN-, reduction of Cr6+, neutralization, sedimentation, filtration of sludge	Except Cr, other parameters are within Maximum Concentration Levels (MCL)
2	"UNIS" UTL PRETIS VOGOSCA	Oil removal, oxidation of CN-, reduction of Cr6+, neutralization, sedimentation of metals	High effects, effluent satisfactory
3	"UNIS" BICYCLE FACTORY, ILIDZA	Oxidation of CN-, reduction of Cr6+, neutralization, sedimentation of metals	Effluent not satisfactory
4	"UNIS" TAS VOGOSCA	Oil removal, oxidation of CN-, reduction of Cr6+, neutralization, sedimentation of metals	Effluent satisfactory
5	REPAIRS COMPANY, HADZICI, METAL PLATTING	Oxidation of CN-, reduction of Cr6+, neutralization, sedimentation, filtration	Effluent satisfactory

6	TECHNICAL-REPAIRS COMPANY, TRAVNIK	Oxidation of CN-, reduction of Cr6+, neutralization, sedimentation of metals, filtration of sludge	High effects of treatment, effluent satisfactory
7	"ENERGOINVEST" - "ENKER" MOTOR SPARK PLUGS FACTORY TESANJ	Oxidation of CN^-, sedimentation of metals, neutralization, filtration of sludge	Low pH, low effects, high concentrations of metals in the effluent
8	"ENERGOINVEST" LOW STRESS EQUIPMENT, DOBOJ	Oxidation of CN^-, reduction of Cr^{6+}, neutralization, sedimentation of metals, filtration of sludge	Low effects, high concentrations of metals in the effluent
9	"STROLIT" ODZAK	Oxidation of CN^-, reduction of Cr^{6+}, neutralization, sedimentation, filtration	Tests have not been made
RIVER VRBAS CATCHMENT AREA			
1	"UNIS" SPRING FACTORY, GORNJI VAKUF	Oxidation of CN^-, reduction of Cr^{6+}, neutralization, sedimentation, filtration of sludge	Effluent satisfactory
2	AIRPLANE FACTORY "KOSMOS", METAL PLATTING, BANJA LUKA	Oxidation of CN^-, reduction of Cr^{6+}, neutralization, sedimentation, filtration of sludge	High effects, pH from 1.9 to 9.9
3	"RUDI CAJAVEC", ELEKCTRO-MECHANICS, BANJA LUKA	Oxidation of CN^-, reduction of Cr^{6+}, neutralization, sedimentation, filtration of sludge	Considerable effects, but metals higher then MCL
RIVER SAVA CATCHMENT AREA			

1	"STANDARD" METAL INDUSTRY, BOSANSKA GRADISKA	Oxidation of CN^-, reduction of Cr^{6+}, neutralization, sedimentation, filtration of sludge	All parameters satisfactory except cuprum and nickel
2	FAMOS MOTOR PARTS GRADACAC	Oxidation of CN^-, reduction of Cr^{6+}, neutralization, sedimentation, filtration of sludge	low concentration of metals, high concentration of oils, suspended and organic matters very high
RIVER UNA CATCHMENT AREA			
1	"ENERGOINVEST" CABLE HEADS FACTORY BIHAC	Oxidation of CN^-, reduction of Cr^{6+}, neutralization, sedimentation	Effluent satisfactory
RIVER DRINA CATCHMENT AREA			
1	"UNIS-POBJEDA" GORAZDE	Oxidation of CN^-, reduction of Cr^{6+}, neutralization, sedimentation, sludge filtration	Low effects, high concentrations of Cu, Zn, Cr, low pH
2	"UNIS" METAL FURNITURE PARTS "FON", SEKOVICI	Oxidation of CN^-, reduction of Cr^{6+}, neutralization, sedimentation, sludge filtration	Small effects, effluent satisfactory

10 Economic Regulations or Limitations

10.1 Taxation

Government of the FB&H and RS has determined the taxes on sewerage service of 10% which is added on total price on the bill for used water.

Water consumers bills also consists a special water charges for water use and protection.

10.2 Special Water Charges in FB&H:[8]

Charges for water use.

- Special water fee for usage of water is to be accounted and paid in amount of KM 0.10 on basis that is 1 m^3 of used (billed) water;
- 1% of average production price of electricity in thermo-electric plant on the payment day for 1 kWh of produced electricity in thermo electric plant.
- 2% of average production price of electricity in hydro-electric plant on the payment day for 1 kWh of produced electricity in hydro-electric plant;

Water protection charges

- Charges for water protection are calculated and are being paid in the amount of KM 2.00 for unit of pollution (1PE).

Charges for extracted material from water streams

- A base for charge payment for exploited material from water streams is 1 m^3 of dug out material from water stream, regardless the quality of dug out material. Level of this charge is KM 1/m^3.

Out of the funds collected from water billing and special water charges to water management on the canton area, the funds belong to:

1. the Federation budget – allocated to water management – 10%
2. the canton – 20%
3. the Public company in charge of water area – 70%

10.3 General Water Management Charges in RS

By decision of the Government[9] the rate of 1,5% of general water management charge was determined from gross salary and/or gross earnings from copyright and patent rights.

From collected general payment water management charges, 80% is transferred into budget of RS, actually into budget of Ministry for Agriculture, Forestry and Water management, and 20% is being granted to community of city.

[8] Decision on rates and amounts of special water compensations– Official Gazette of Federation of B&H No. 46/98

[9] Official gazette RS No. 19/98 and 29/98

10.4 Special Water Charges in RS

Specific water management fees are paid for the following activities:

- for agriculture and processing of agricultural products: 0.01 KM/m^3
- for irrigation: 0.006 KM/m^3
- for fish farming in artificial reservoirs: 0.013 KM/m^3
- for industry, construction, mining, energy (except hydropower plants), forestry, water management, transport, hotel trade, commerce and tourism: 0.045 KM/m^3
- for financial, technical and professional services; for activities related to education, science, culture, information, social protection and health: 0.040 KM/m^3
- for water exploitation activities (public and other companies), municipal water supply companies: 0.035 KM/m^3
- for power generation (except thermal plants), besides the special fee for their own water consumption, also 0.00015 KM/kWh of produced energy; and
- producers of mineral drinking water pay 0.03 KM per liter of produced water.

Charges for water protection.

The Decision determines water protection fee for *1 population equivalent* (p.e.), based on the average 24 hours discharge of wastewater, according to the number of population. This varies from 1,0 KM per p.e. for less than 10,000 p.e. to 14,700 KM plus 0.00483 KM per p.e. for more than 2,000,000 p.e. (Art. 4).

Charges for material extracted from water stream

Charge for material extracted from water stream is determined 1.0 KM/m^3 for gravel and 1.5 KM/m^3 for sand.

Of the actually collected general water management fee (according to the Water Law RS, Art 100/2, 100/3):

1. 80% belongs to the RS budget revenue, allocated to the budget of the Ministry of Agriculture, Forestry, Water management (MoAFW) (20% of this sum must be invested in water development); while
2. The remaining 20% of the fee belongs to the municipal/town resources.

All specific water management fees are revenue of the Ministry (MoAFW) for the needs of the Directorate for Waters according to the Water Law of RS (Official Gazette RS No. 10/98).

11 Service Users

11.1 Customer Types

- **Residential** – all consumers in individual houses and in multi-family building.
- I**ndustry** – special users of services that are using water in production process in larger quantity.
- **Institutions** – hospitals, schools, churches, and retirement homes, museums, army, building of administrations etc.
- **Commercia**l – Handcrafts company, usually smaller users,
- **Whole customer** - customer that buys water in large quantity from other water utility and sells water to own customers.

11.2 Levels of Use

In Federation B&H data are available about water consumption in 1999 for 51 municipalities. 1,557,429 consumers consumed 90,388,894 m^3 per year or 159 l/cap/day.

11.3 Financial Conditions

Table 15 Financial Performance of Water Utilities

Number of Water utilities	Number of consumers	Water production m^3/year	Water billed m^3/year	Costs in KM	Income in KM
51	1 557 429	275 320 532	90 388 894	103 982 456	55 594 031

Source: Hydro engineering Institute, Sarajevo 1999.

11.3.1 Meter Reading and Billing Frequency

Currently all water utilities read meters and prepare bills on a monthly basis only for *commercial and industrial* customers. Most water utilities read meters and bill their *residential* customers on a quarterly, semi-annual or annual basis. Each water utilities have an established schedule for commercial/industrial customers and for residential customers. The frequency used by a water utility appears related to the number of residential customers and the number of meter readers available to accomplish the job.

11.3.2 Overview of Collection Problems

The most serious financial problem is inability to collect customer bills. Collection rates range from 10% to 82%, with an average of about 40%. The collection rate is determined by dividing the annual collections by annual revenue billed. These collection rates were calculated by the water utilities.

11.3.3 Collections from Multi-Family Buildings

All water utilities do not shut-off multi-family buildings for non-payment because the customers that do pay would be punished because of those who do not. They also believe that it is impracticable to install individual meters for each flat.

11.3.4 Collections from Public Customers

Collection rates from public customers are significantly lower than those from other customers. The largest category of accounts receivable was the military and/or hospitals. The water utilities appear unable to collect this money from the government, and they lack municipal and government support to collect the amounts owed. Several water utilities also maintain on their books large amounts owed since before the war, which probably are uncollectible.

12 Status of National Sector Reform

12.1 Current Efforts at Providing Direction for National Reform of the Sector

Background The first study of countrywide reform of the water and wastewater was commissioned by EU Phare, titled "Water Sector Institutional Strengthening in the Federation of Bosnia and Herzegovina". That study, prepared by Plancenter Ltd. (Finland), BCEOM (France), and HEIS (Sarajevo, BiH) was completed in April 1999. A companion study, "Institutional Strengthening of the Water Sector in the Republic of Srpska", was completed 2000. The Ministry of Foreign Affairs, Finland, is funding it and the lead consultant once again is Plancenter.

Summary Recommendations of the April 1999 Report The report sets forth two main reasons for implementing reforms: (1) to overcome massive problems in the sector which are estimated to require KM 6.9 billion in improvements, and (2) to allow the GBiH to become a member of the European Union (EU). The report cited seven key recommendations, paraphrased as follows:

- Delegate sector responsibilities to the cantonal level, to the extent feasible
- Establish River Basin Boards (and Bodies) (RBBs) to facilitate inter-cantonal co-ordination, and to conform to EU practices.
- Encourage delegation of sector tasks from the cantons to the RBBs so as to (a) integrate environmental and water matters, (b) permit co-ordination between cantons sharing river basins, and with counterpart RBBs in the RS, and (c) respond to EU-related obligations.
- Limit the responsibilities of the water management organizations (PCWAS) issues of ownership of water resources.
- Limit the role of Ministries in the sector to policy setting and financial issues.
- Adopt EU principles related to water management and administration, and
- **Establish the principle that water utilities (at the municipal level) should be owned by the municipalities, but should be autonomous and financially independent.**

Directions for the Companion Study for Republika Srpska The basic intent is to conduct a parallel study for Republika Srpska, with the goal of development and implementation of a new national sector policy that is essentially the same in both entities. Plancenter completed an Inception Report in August 1999 for the RS study. The report proposed four priorities for the study, paraphrased as follows:

- Define the role and responsibilities of the public sector in water management
- Organize water sector management activities of public enterprises on the basis of river basins
- Organize public enterprises responsible for water supply and wastewater services at the district level, and
- Establish a system for the administration of, and the assignment of responsibilities for (water sector activities) within the RS.

12.2 Comments on Current Programs for National Sector Reform

Overview of Recommendations and Type of Reforms Proposed The reforms are based on European models, which stress allocation of responsibilities in accordance with areas defined by river basins. As one of the country's goals is to become more closely associated with Europe, this is quite appropriate.

At this stage, it is also probably appropriate to treat the subject in the broadest of terms. The European model can be used to fill in the details later. The recommendations are a bit vague, however, on just what those ministerial responsibilities will be in "policy setting" and "financial issues". At the other end of the spectrum, there is quite a gap to be bridged between the current stifling control of sector utilities by the municipalities, and the recommendation that the utilities be "owned by the city", but also be "autonomous and financially independent".

Initial Reaction to the BiH Sector Reform Recommendations If implemented, the reforms would diminish the powers (and all the attributes that go with these powers) of some very important constituencies. These include some ministries, probably most municipalities, certainly the PCWAs[10] (two offices in FBiH and one in RS) and quite possibly some political parties. Most of these parties appear to benefit from the status quo. The PCWAs have been unenthusiastic from the start, as the reforms seriously diminish their role and the benefits they enjoy, and place them far from the very powerful position they had in pre-war days. Nevertheless, the donor community is well aware of the absolutely fundamental need for sector reform, and continues to be supportive of reform.

[10] The PCWAs (Vodoprivreda) are public water management enterprises. The Banja Luka organization is responsible for water management in Republica Srpska. The Mostar organization is responsible for water management for the drainage area of the Adriatic Sea, and the Sarajevo organization for the drainage area of the Sava River in the Federation. They receive most of the taxes the Government levies on the water utilities, and these funds are intended to be used for such tasks as water pollution control, water quality monitoring and flood protection. They are relatively small organizations and essentially are departments of the Ministry of Agriculture, Water Management and Forestry.

13 Recommendations for Institutional Strengthening of W&WW Utilities

Many of the problems found in the Water utilities relate to the lack of control they have over how they operate. Some form of *increased autonomy* is absolutely essential if basic institutional and financial strengthening efforts are to have a reasonable chance of success. One of the most critical problems is billing and collection of revenues. Achieving an *effective metering program* has to be a second priority. Most Water utilities have such weak programs of metering of either their sources or their customers, that they have no means of reliably estimating their water losses. In the few Water utilities that have reasonably reliable metering of sources and customers, unaccounted-for-water (UFW) rates appear to be in the order of 50%. It seems likely that conditions are considerably worse in those Water utilities with less effective metering. Uniformly, Water utilities personnel equate UFW with leakage, but with high rates of non-payment of bills, and the large number of non-functioning meters in many places, wastage is probably a major component of UFW, together with water diverted through illegal connections. Water utilities cannot effectively attack the problem of UFW until they develop the capability to more reliably determine its components. Accordingly, the third suggested priority program is to develop and implement programs of *demand management* to assist the Water utilities in reducing UFW levels. The fourth and final priority program is to develop and implement a means of improving the Water utilities' *shutoff capabilities*, both technically and administratively, to allow the Water utilities to more effectively cut off the supply of water to its non-paying users, with emphasis on industrial, commercial and public sector customers. A credible threat of loss of service will do more for the improvement of the rate of revenue collection than any other action. This need is directly tied to the first financial priority of increasing revenue collection, so it should be linked with that effort in determining overall priorities.

Priorities are the following:

13.1 Increase the Autonomy of the Water Utilities

It is proposed that the Prime Ministers of the two Entities allow willing Vodovods and municipalities to enter into a management agreement. The proposed management agreement will provide the degree of autonomy water utility need to perform effectively, while still protecting the rights of the municipality and the customers.

13.2 Implement an Effective Metering Program

It will be need to prepare guidelines for water utility for a comprehensive, effective metering program that will address such issues as the importance of an effective program and a description of the actions required, including: (1) the type of organization required, (2) the physical facilities and support, (3) staffing needs, (4) procurement of meters, (5) meter sizing and installation, (6) a description of typical activities of a meter department, (7) guidelines for testing large meters in place, and (8) guidelines for meter reading and recording of results.

13.3 Develop Demand Management and UFW Reduction Programs

It would be needed to develop guidelines for reducing UFW and adapt them to the needs of water utility. The guidelines for UFW would include: (1) definitions, components, goals and impacts of UFW, (2) the need to focus on larger water-using customers, and (3) recommendations for dealing with the components of UFW. It would be considered UFW through following components: (1) low estimates or under metering of sources, (2) low estimates or under metering of customers, (3) inaccurate or incomplete record keeping, (4) leaks from distribution piping, (5) leaks from building connection piping, (6) un-metered or under-estimated uses for fire fighting, line flushing, construction sites, street washing, water for public buildings and parks, and, and (7) so-called "administrative"

losses, which may include water theft (by dishonest water utility employees from the meter reading through the collections phases) and unauthorized use (illegal connections or re-connections).

13.4 Develop and Implement a Program to Facilitate Shutoffs

It would be needed to develop a Program to Physically Facilitate Shutoffs. Water utilities staff should make an inventory of all customer connections to determine either the location or absence of shutoff valves or other means of disconnecting the non-paying user, whether the valves or other means function, and whether the valves or other means of interruption can be protected against unauthorized reconnection by others.

13.5 Increase the Rate of Revenue Collections

One of the reasons for the low collection rates is the lack of a clear and formal payment policy that all customers are aware of, and the lack of enforcement actions against customers for non-payment. It would be needed to prepare action plan on:

13.5.1 Developing Policies on Payment of Bills for Services

The policy would considered such matters as: (1) the most reasonable number and types of customer categories, (2) relationship between billing frequency and due dates for payments, (3) consideration of rewards or penalties for early or late payment, (4) the magnitude of any penalties or interest charges for late payment, (5) shutting off or reducing the level of service for repeated non or late payments, (6) the use of the courts to enforce payment, (7) special problems of dealing with late or non-payment by customers in multi-family buildings, (8) effect of the extent of metering on the payment policy.

13.5.2 Developing Strategies for Billing Customers in Multi-Family Buildings

A single meter serves most multi-family apartment buildings in BiH. Past studies indicate per capita water usage in such buildings is from 10% to 20% higher than for people living in single-family homes.

It would be needed to develop a strategy for billing customers in multi-family buildings.

13.5.3 Evaluate the Effects of More Frequent Billing

The water utility bills their customers every three months.

It would be needed to develop a model to assist the water utility to determine such factors as: (1) the number of total days from the date the meter is read until the date the bill is due (this includes time for reading the meter, preparing the bill, delivering the bill and allowing the customer about 2-weeks [say] to pay the bill), (2) the cost of delays in billing beyond a reasonable period, (3) the cost of more frequent billing (cost of extra meter readers, billers and deliverers, extra equipment), (4) alternatives such as outsourcing of some of these services or installing automatic meter reading equipment, and such other factors as may be appropriate.

14 Recommendations for Financial Strengthening of W&WW Utilities

Critical financial related problems are the lack of a reliable and comprehensive system of accounting; the failure to generate realistic budgets and the failure to follow them when they are prepared; the heavy tax burdens levied on the water utilities billings (not just the collected revenues); and the relatively low user charges and the difficulty they have in increasing them.

14.1 Develop and Implement an Effective Accounting System

The accounting laws (for both entities) 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 water and wastewater utilities. It would be needed to prepare a Chart of Accounts for water utility that conforms to international and EU practices for water sector utilities, while still conforming to the account numbers established by BiH laws, by using a flexible coding structure, and through the adoption of cost-center accounting.

14.2 Develop and Implement an Effective Budget

Current practices among the BiH water utilities generally do not include the establishment of budgets by departments, or the comparison of budgeted to actual costs by departments.

It would be necessary to prepare procedures for water utility for a budgeting process for operating and capital costs to be based on department responsibilities. This would provide a more accurate estimate of the water utility's revenues and expenditures. Responsibility for development of their portions of the framework would be assigned to major department or sector managers.

It will be necessary to develop budget-reporting procedures for water utility that will include necessary reporting requirements and assign appropriate responsibilities for the budgeting process.

14.3 Establish More Realistic Tariff Rates

It will be necessary to prepare specific tariff models for water utility for both its water and wastewater services. The models will address such factors as: (1) the number and type of customer classifications, (2) the volume of water (wastewater) used by each classification over the most recent complete year, (3) data on the size and cost of customer meters to allow allocation of meter costs, (4) basic expense data for operation of the water and wastewater systems (and for recovery of capital costs, as appropriate), (5) possible cross-subsidies among or within customer classifications to allow lower charges for customers using limited amounts of water, and (6) other factors to be determined, some of which will be specific to water utility.

It will be necessary to prepare guidelines for water utility. The guidelines will include sections in the areas of Revenue Requirements, Cost-of-Service Allocation, and Rate Design. Under Revenue Requirements, the guidelines will compare existing revenues with needed revenues, as determined from the preparation of the budgets. Revenue requirements will include those to pay the operating costs, and those required paying for capital improvements. Under Cost-of-Service Allocations, the guidelines will determine the actual costs (operating and capital) required to provide water and

wastewater services to each of the customer categories. For B&H water utilities, the preferred water service cost allocation method probably will be the "Base-Extra Capacity" method, which evaluates costs separately for average and peak conditions. Under Rate Design, the guidelines will have separate sub-sections for water and wastewater. These sections will set forth directions for determination of the actual rates. Using the information from the other two sections, this section will determine the unit (usually per cubic meter) charges for water and wastewater, by customer category. The guidelines will present step-by-step procedures for the calculation of water and wastewater rates for water utility.

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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.

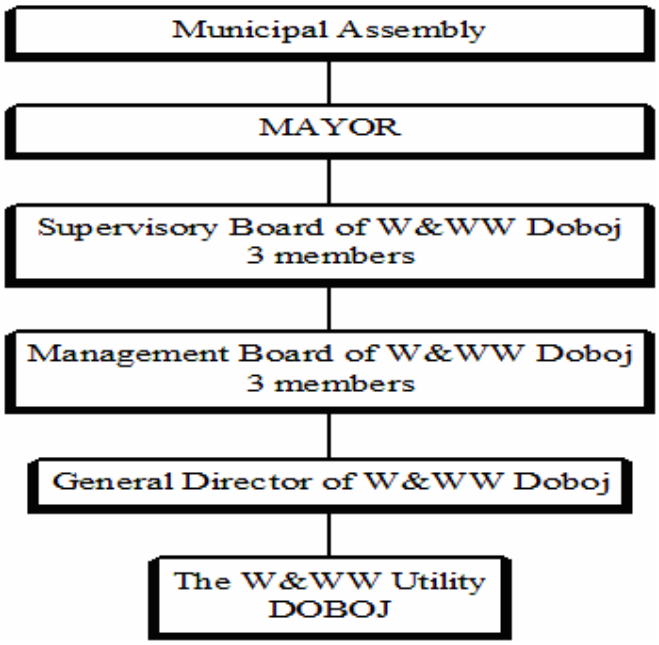

Figure 1 Organization of Relations Between Municipality and MWWU Doboj

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:

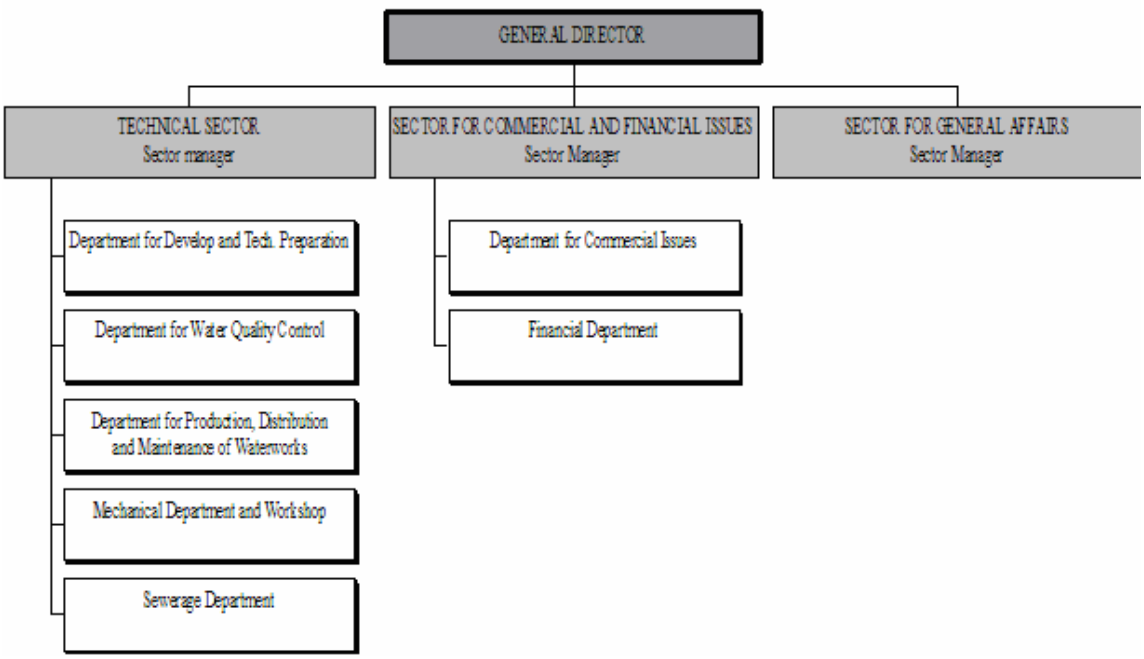

Figure 2 Organization Chart of MWWU Doboj

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.

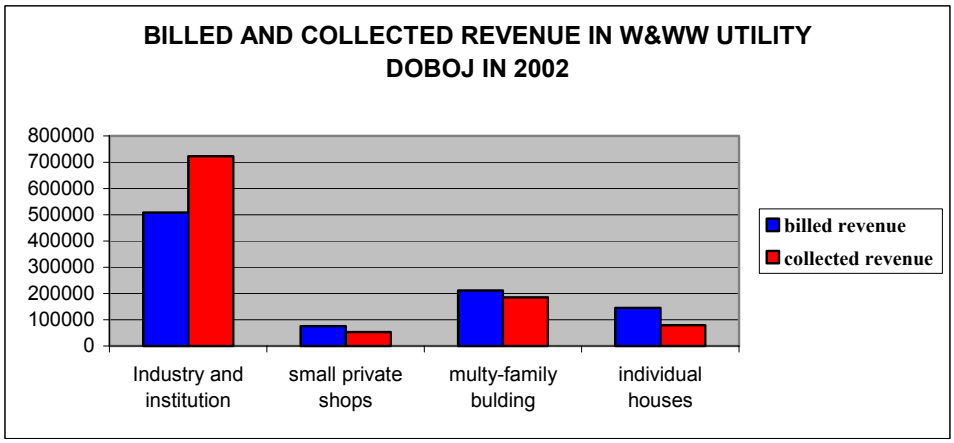
Billed and collected revenue by categories in 2002 is shown in Table 4 and Figure 3 below (including collected account receivable from previous periods from industry and institution – this is the reason for more collection than billing for industry in 2002):

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.

Ramiza Alic, *Hydro-engineering Institute, Sarajevo*
Bosnia and Herzegovina

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

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PROJECT

September 2004

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 – Summary

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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Executive Summary

The Country Report developed within the UNDP/GEF project include a "National Profile" that provides descriptions of existing situation in water sector in B&H and "Case Study" that provides descriptions of existing situation in selected municipal water and wastewater utility.

The National Profile is organized in the following way:
Introduction describe mainly Country back ground and characteristic of River Basin in B&H. Chapters 2 to 4 deals with administrative units in B&H, institutional and legislation framework related the water sector in B&H (describe state, entity, cantonal, municipal level). Chapter 5 covers Management units that describe mainly characteristics of water and wastewater utilities in B&H such as service area, management, administration, staffing, customer relations, and type of services, accounting system, rate structure and ownership. Chapters 6 and 11 deals with data: on water and wastewater service users, water and wastewater production, distribution, processing, wastewater effluent, economic data, infrastructure and economic regulation. Chapter 12 describe of status of national water sector reform. Chapter 13 and 14 are composed of recommendations for institutional and financial water and wastewater utilities.

The Case Study provides information and data of selected pilot municipal water and wastewater utility. Data are related regulatory, management and financial aspects. These aspects are described in Chapters 2, 3 and 4.The investment needs of pilot utility 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.

Water and wastewater services are now generally provided in municipalities by a “Water and Wastewater Utility” (W&WWU), a company that usually provides only water and sewerage services. In earlier years and in smaller towns, water and sewerage were included along with many other municipal services, such as street maintenance, central heating, care of parks and cemeteries, solid waste collection and other services. Some municipalities still operate that way. All these services were provided by a public company under the municipality called a communal services company.
W&WWU have during the past decade experienced a number of changes in their working environment which have weakened their performance capability drastically. Even before the war (1992 – 1995) there was a serious disrepair of municipal services caused by strictly controlled and non-cost recovering pricing that did not allow proper investment and maintenance. The situation was compounded by serious operational deficiencies and outdated managerial practices. The sector was highly centralized and was operated in accordance with socialistic principles. The four-year war led to significant destruction and deterioration of facilities. It also caused major disruptions in operation and maintenance of utility systems, from both neglect and from extensive dislocation of population, including management and operators of the utilities. In some of the utilities practically none of the present management or staff has experience from a “normally” operating utility. To great extent utility know-how, maps and records are lost. Continuing poor financial situation in the country is effectively hampering efforts to improve water and wastewater services.
Most water utilities have rate structures that need to be changed and rates that need to be increased, in order to cover costs.

The customer charges varied, based on the size of the meter or type of service. Other water utilities charged a volume rate that was uniform for all water sold (a common practice for most water utilities).

The water utilities used a form of inclining rate structure in which larger users, such as industrial customers, are charged a higher (but still uniform within their class) rate per cubic meter than the smaller users such as residential customers.

Almost all water utilities metered most of the consumption of large commercial/industrial customers. For residential customers, if the water utility did not have working meters for residential homes or apartment buildings, the amounts charged were based on estimates. The bills were based on either an estimate of use based on historical usage (before the war), a lump sum per person estimated at the connection, or an amount based on an estimated per capita consumption (often very low) for an estimated number of persons at that connection.

Federation of Bosnia and Herzegovina and Republika Srpska have its own Water laws that impact the delivery of water and wastewater services, affecting most aspects of technical, administrative and financial matters

According to the Federal Law on Municipal activities (Official Gazette of Socialist Republic of B&H No. 20, July 26, 1990) and Law on Municipal activities of RS (Official Gazette of RS, No. 11/95), the Municipal Assembly defines the method of service pricing, but the service provider defines the price of the service

The first study of countrywide reform of the water and wastewater sector started at April 1999. The key recommendations were given for reform of water sector such as for reform of municipal water and wastewater utility.

Main results of the analysis and simulation in the case study the UNDP/GEF project could be summarized in following recommendations:

- Improved accounting information by introducing a second, parallel system that 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.
- Increased autonomy from municipal from two main reasons:
    - 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)
- 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
- 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.