

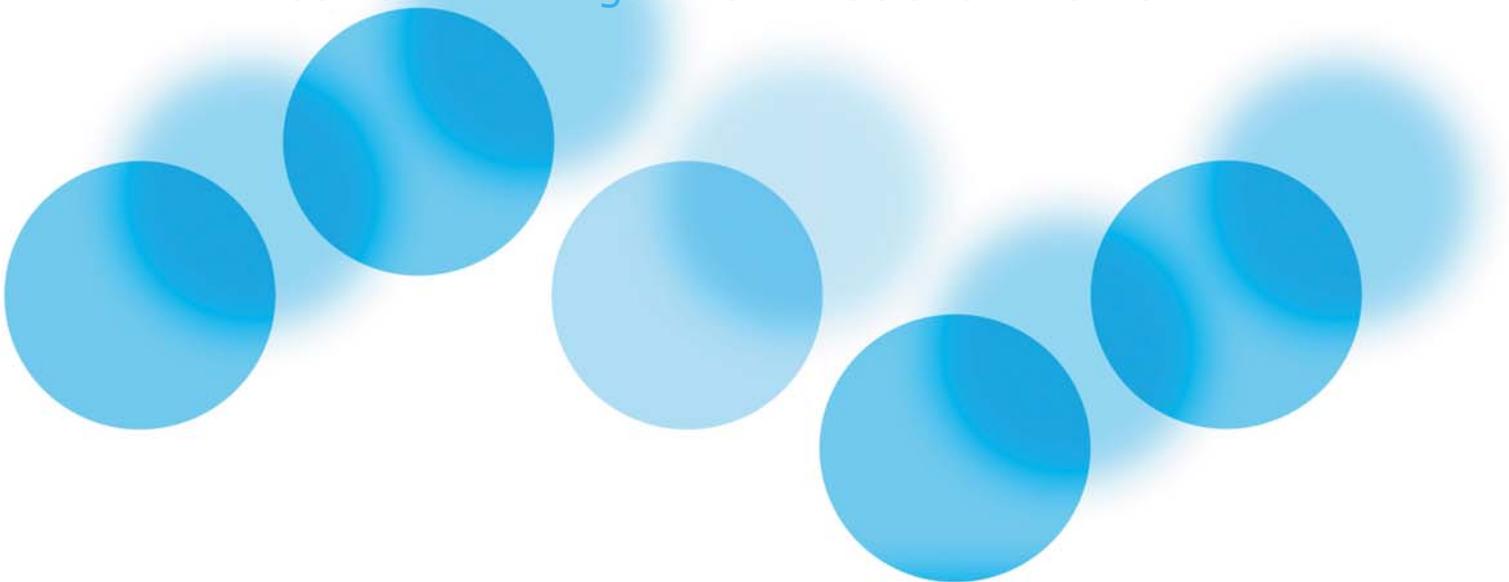


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DANUBE  
REGIONAL  
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# ASSESSMENT AND DEVELOPMENT OF MUNICIPAL WATER AND WASTEWATER TARIFFS AND EFFLUENT CHARGES IN THE DANUBE RIVER BASIN.

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



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](http://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° 26' and 45° 15' northern latitude and 15° 45' and 19° 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<sup>2</sup>, which is the total area of B&H, 38,719 km<sup>2</sup> or 75.7% belongs to the Blacks Sea, that is, Sava river catchment area, while 12,410 km<sup>2</sup> 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<sup>2</sup>). 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 <sup>2</sup> ) BiH	Population in 1991	Mean flow (m <sup>3</sup> /s)	Minimum flow (m <sup>3</sup> /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<sup>3</sup>/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<sup>3</sup>/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<sup>2</sup> and the population is 1,820,000 and the population density 180 persons/km<sup>2</sup>. The biggest cities are **Sarajevo** (510,000), **Zenica** (146,000), **Tuzla** (132,000) and **Dobo**j (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<sup>3</sup>/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<sup>2</sup> (MQ 401 m<sup>3</sup>/s), out of which only 7,200 km<sup>2</sup> belongs to BiH (MQ 124 m<sup>3</sup>/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<sup>3</sup>/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<sup>3</sup>/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<sup>2</sup>, 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 Brčko District

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

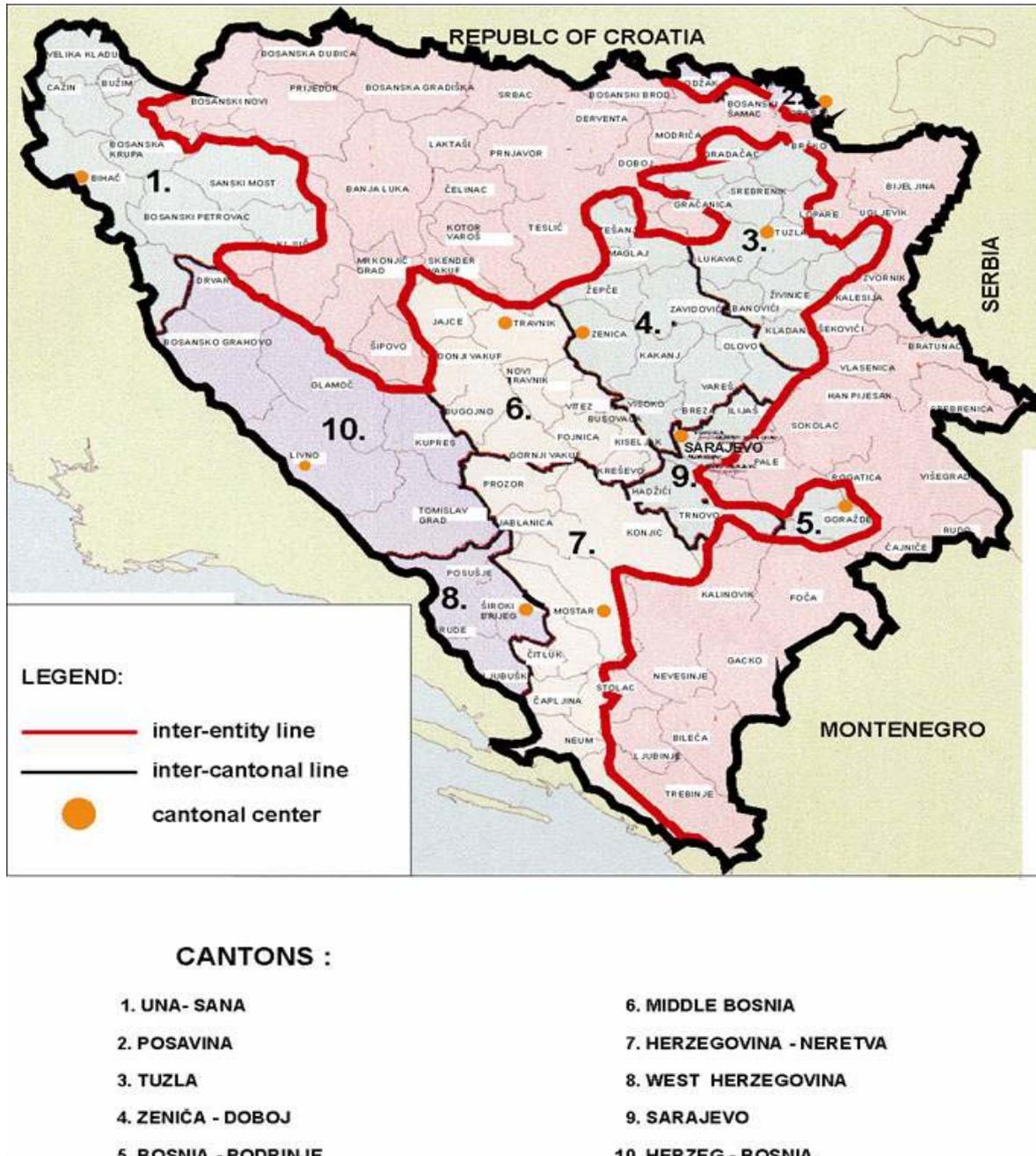
The Government is composed of 10 Departments, of which environmentally related are:

- 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 - Dobož
  - 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
  - -----
  - 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:

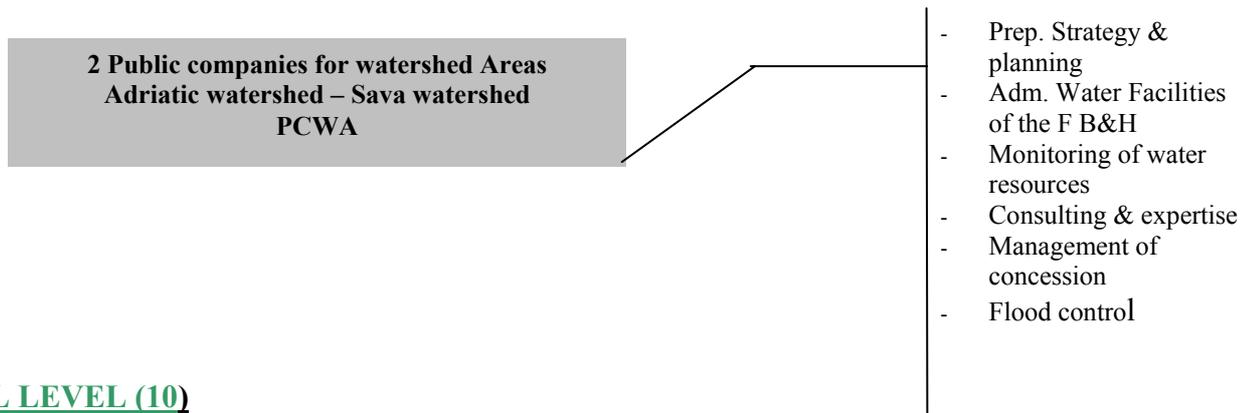
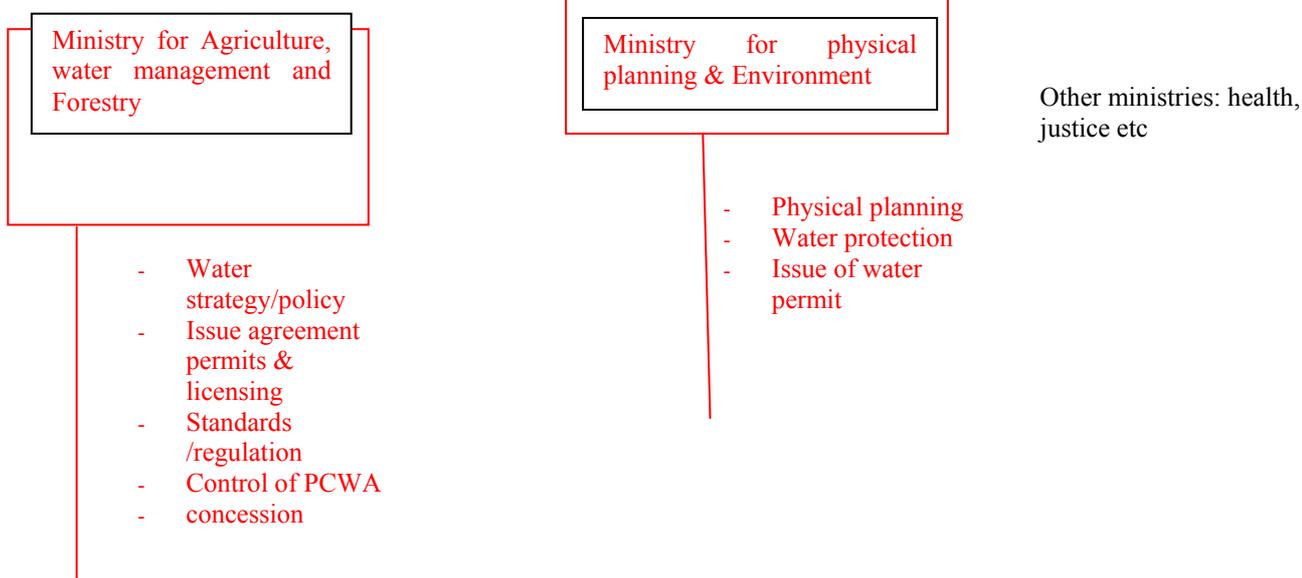
- preparation of all strategic decisions and planning (watershed and basin long-term plans, all regulations, decrees and by-laws necessary for the application of the Water Law);
- administration of principal (owned by the Federation) water facilities;
- management and monitoring of all water resources;
- 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.

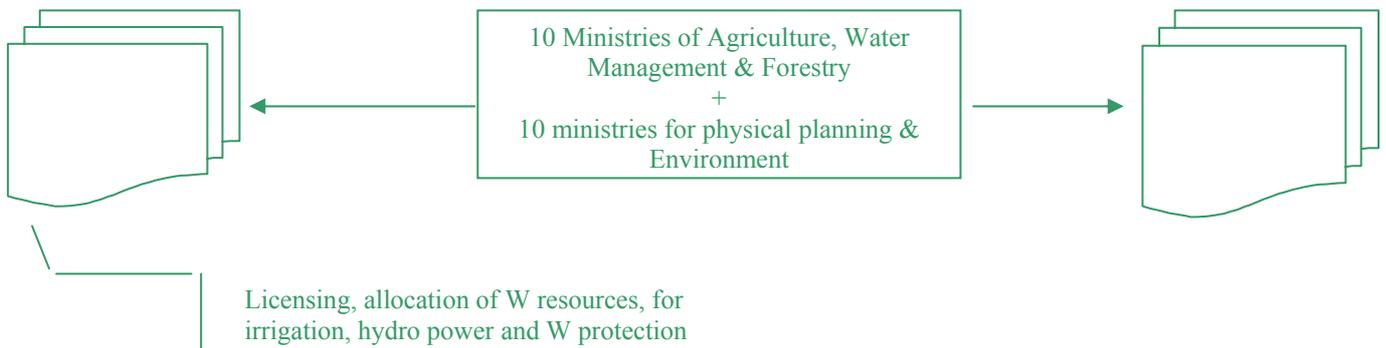
The distribution of General and Special Water Fees in the Water Law indicates the true respective power of the institutions: 70% of the collected water fees (100% of concessions) are directed to PCWAs, 10% to the Federation Ministry of Finance and 20% to the Cantons. Financial management lacks transparency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

## FEDERATION B&H SIMPLIFIED INSTITUTIONAL ARRANGEMENTS

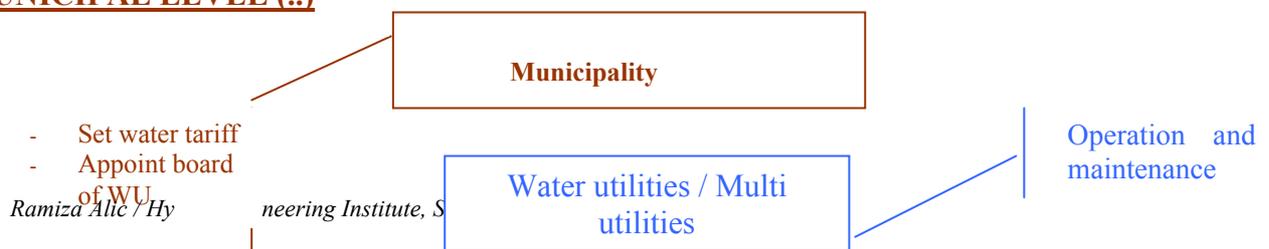
### ENTITY LEVEL



### CANTONAL LEVEL (10)



### MUNICIPAL LEVEL (..)



## 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.

**RS GOVERNMENT**

Ministry of agriculture, forestry and water management

- Master plan
- Fees for water
- Classification of water + master plan & w balance



9 Water Engineering Cies (WEC)

Water management Institute (WMI)

- Flood control
- Maintenance/rehab. Of facilities Gal interest + inter regional facilities
- O&M +engineering & control
- Collection of data
- Control of w use
- Has private business (70% of income)

- Assist MAFWM in master plan
- Provide technical opinion on w management permit
- Has other activities with private sector

Institute for water (Share Cie Mix private/public sector)

- Scientific research work
- Consulting activities incl. Tendering & superv.
- Perform test requality of water

**MUNICIPAL LEVEL**

**MUNICIPALITIES**

- Appoint board of Directors + Tariff issues

Water utilities / Multi utilities

Operation & Maintenance of municipal facilities

### **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, Gradacac, 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<sup>1</sup>**

Municipality	Population					
	Total Municipality	Central Town plus Others <sup>2</sup>	Served by Piped Water		Served by Sewers	
			Pop'n	Percent <sup>3</sup>	Pop'n	Percent <sup>4</sup>
Konjic	35 000	23 000	14 000	60%	7 000	30%
Čajniče	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%
Orašje	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%
<b>Total</b>	<b>852 000</b>	<b>644 900</b>	<b>502 000</b>	<b>78%-59%<sup>5</sup></b>	<b>299 600</b>	<b>46%-35%<sup>6</sup></b>

<sup>1</sup> 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.

<sup>2</sup> 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.

<sup>3</sup> Percent of the estimated population of the central town and surrounding communities it purports to serve.

<sup>4</sup> Percent of the estimated population of the central town and surrounding communities it purports to serve.

<sup>5</sup> 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.

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<sup>6</sup>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 sur- charged 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 re- pumping	Yes Mostly Separate	Yes (See Note A)	To River
Orasje	3 wells 1 new, 2 old	None Chlorination	Includes PS and hydro- pneumatic 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
<b>TOTAL</b>	<b>1 757</b>	<b>100</b>	<b>1 609</b>	<b>100</b>	<b>5 452</b>	<b>100</b>	<b>455</b>	<b>100</b>	<b>775</b>	<b>100</b>

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	<b>10</b>
Electricity	630	11	1 313	17	90	24	27	7	<b>11</b>
Spare parts, stores	40	1	11	0	1	0	3	1	<b>1</b>
Depreciation	1 244	22	2 800	35	82	22	12	3	<b>29</b>
Personnel	1 500	26	2 200	28	100	27	58	16	<b>26</b>
Transportation	5	0	4	0	2	1	8	2	<b>0.5</b>
Maintenance, repair	97	2	106	1	5	2	0.1	0	<b>3.5</b>
Rent	0	0	100	1	0	0	0	0	<b>0.5</b>
Taxes	0	0	29	0	1	0	1	0	<b>0.5</b>
Miscellaneous	1 912	33	605	8	67	18	140	39	<b>16</b>
Capital investments	0	0	74	1	0	0	64	18	<b>1</b>
<b>TOTAL</b>	<b>5 734</b>	<b>100</b>	<b>7 894</b>	<b>100</b>	<b>372</b>	<b>100</b>	<b>363</b>	<b>100</b>	<b>100</b>

**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	Orašje	Bijeljina
<b>Operating Margin</b>	-97%	-13%	-14%	0%	-16%	0%	-2%	0%
<b>Net Worth</b>	9	46	33	1	72	7	2	8
<b>Assets/Net Worth</b>	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.
- **Industry** – 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.
- **Commercial** – Handcrafts company, usually smaller users,
- **Whole sale customer** - customer that buy a water in large quantity 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<sup>3</sup>/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<sup>3</sup>/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  $29.85 \text{ m}^3\text{s}^{-1}$ , 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<sub>5</sub> 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
<b>Total</b>	<b>7</b>	<b>484 600</b>	<b>2</b>	<b>7</b>	<b>50 500</b>

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:

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

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

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

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

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

$E_{SS}$	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 <sub>5</sub> (g/day)
$K$	the ratio of HOD/BOD <sub>5</sub>
$\sum_{i=1}^n \left( \frac{COD}{BOD_5} \right)_i$	sum of ratios COD and BOD <sub>5</sub> 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
$\bar{q}$	wastewater flow (m <sup>3</sup> /sec)
$q$	wastewater flow (m <sup>3</sup> /day)
$T_{max}$	maximum temperature of wastewater (°C)
$T_D$	maximum permitted temperature of wastewater ( $T_D = 30^\circ\text{C}$ )
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 $< 30^\circ\text{C}$

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

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

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

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

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

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

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

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	
<b>73 096 609 m<sup>3</sup>/y</b>	
Tariffs (KM/m <sup>3</sup> ) (1 EURO = 1.95 KM)	
Domestic	Industry
<b>0.28</b>	<b>0.75</b>
Sales of water in KM/y	
<b>20 467 050</b>	<b>54 882 456</b>

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.

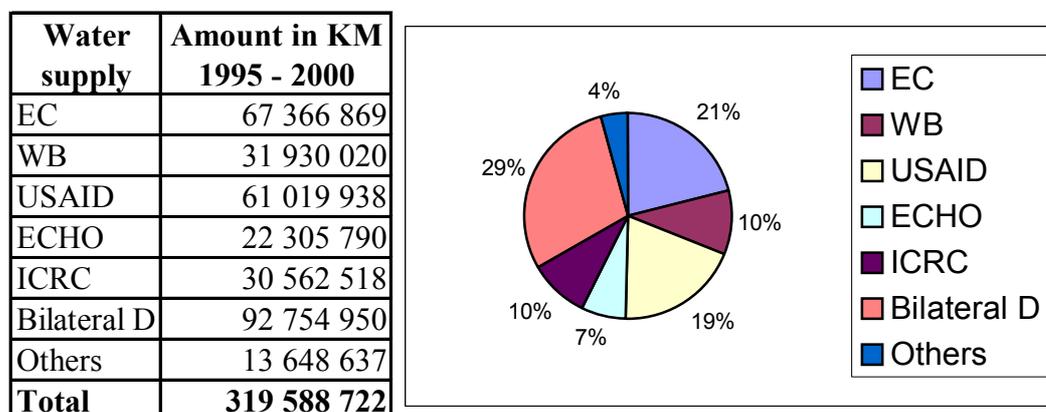
## 8.4 Donations

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

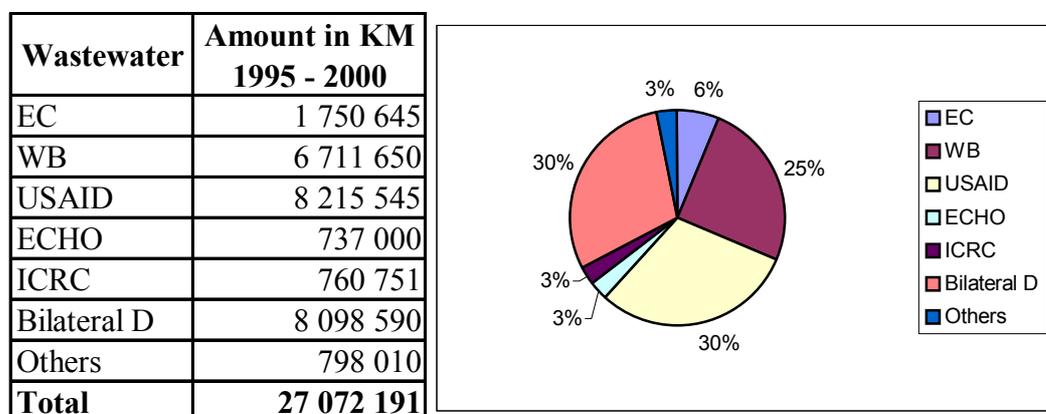
	Identified	Pledged/fin.	Covered %
<b>Water supply</b>	508 220 000	319 588 722	62.88
<b>Wastewater</b>	231 224 000	27 072 193	11.71
<b>TOTAL</b>	739 444 000	346 660 915	46.88

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

**Table 12 Donor Participation in Water Financing (million KM)**



**Table 13 Donor Participation in Wastewater Financing (million KM)**



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 led 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**

#### **FB&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<sup>7</sup> 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.

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<sup>7</sup> 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
<b>RIVER BOSNIA CATCHMENT AREA</b>			
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 <sup>-</sup> , reduction of Cr <sup>6+</sup> , neutralization, sedimentation of metals, filtration of sludge	High effects of treatment, effluent satisfactory
7	"ENERGOINVEST" - "ENKER" MOTOR SPARK PLUGS FACTORY TESANJ	Oxidation of CN <sup>-</sup> , 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 <sup>-</sup> , reduction of Cr <sup>6+</sup> , neutralization, sedimentation of metals, filtration of sludge	Low effects, high concentrations of metals in the effluent
9	"STROLIT" ODZAK	Oxidation of CN <sup>-</sup> , reduction of Cr <sup>6+</sup> , neutralization, sedimentation, filtration	Tests have not been made
<b>RIVER VRBAS CATCHMENT AREA</b>			
1	"UNIS" SPRING FACTORY, GORNJI VAKUF	Oxidation of CN <sup>-</sup> , reduction of Cr <sup>6+</sup> , neutralization, sedimentation, filtration of sludge	Effluent satisfactory
2	AIRPLANE FACTORY "KOSMOS", METAL PLATTING, BANJA LUKA	Oxidation of CN <sup>-</sup> , reduction of Cr <sup>6+</sup> , neutralization, sedimentation, filtration of sludge	High effects, pH from 1.9 to 9.9
3	"RUDI CAJAVEC", ELEKCTRO- MECHANICS, BANJA LUKA	Oxidation of CN <sup>-</sup> , reduction of Cr <sup>6+</sup> , neutralization, sedimentation, filtration of sludge	Considerable effects, but metals higher then MCL
<b>RIVER SAVA CATCHMENT AREA</b>			

1	"STANDARD" METAL INDUSTRY, BOSANSKA GRADISKA	Oxidation of $\text{CN}^-$ , reduction of $\text{Cr}^{6+}$ , neutralization, sedimentation, filtration of sludge	All parameters satisfactory except cuprum and nickel
2	FAMOS MOTOR PARTS GRADACAC	Oxidation of $\text{CN}^-$ , reduction of $\text{Cr}^{6+}$ , neutralization, sedimentation, filtration of sludge	low concentration of metals, high concentration of oils, suspended and organic matters very high
<b>RIVER UNA CATCHMENT AREA</b>			
1	"ENERGOINVEST" CABLE HEADS FACTORY BIHAC	Oxidation of $\text{CN}^-$ , reduction of $\text{Cr}^{6+}$ , neutralization, sedimentation	Effluent satisfactory
<b>RIVER DRINA CATCHMENT AREA</b>			
1	"UNIS-POBJEDA" GORAZDE	Oxidation of $\text{CN}^-$ , reduction of $\text{Cr}^{6+}$ , neutralization, sedimentation, sludge filtration	Low effects, high concentrations of Cu, Zn, Cr, low pH
2	"UNIS" METAL FURNITURE PARTS "FON", SEKOVICI	Oxidation of $\text{CN}^-$ , reduction of $\text{Cr}^{6+}$ , 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:<sup>8</sup>

#### 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<sup>3</sup> 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<sup>3</sup> of dug out material from water stream, regardless the quality of dug out material. Level of this charge is KM 1/m<sup>3</sup>.

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<sup>9</sup> 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.

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

<sup>9</sup> 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<sup>3</sup>
- for irrigation: 0.006 KM/m<sup>3</sup>
- for fish farming in artificial reservoirs: 0.013 KM/m<sup>3</sup>
- for industry, construction, mining, energy (except hydropower plants), forestry, water management, transport, hotel trade, commerce and tourism: 0.045 KM/m<sup>3</sup>
- for financial, technical and professional services; for activities related to education, science, culture, information, social protection and health: 0.040 KM/m<sup>3</sup>
- for water exploitation activities (public and other companies), municipal water supply companies: 0.035 KM/m<sup>3</sup>
- 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<sup>3</sup> for gravel and 1.5 KM/m<sup>3</sup> 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.
- **Industry** – 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.
- **Commercial** – 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<sup>3</sup> 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 <sup>3</sup> /year	Water billed m <sup>3</sup> /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<sup>10</sup> (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.

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<sup>10</sup> 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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