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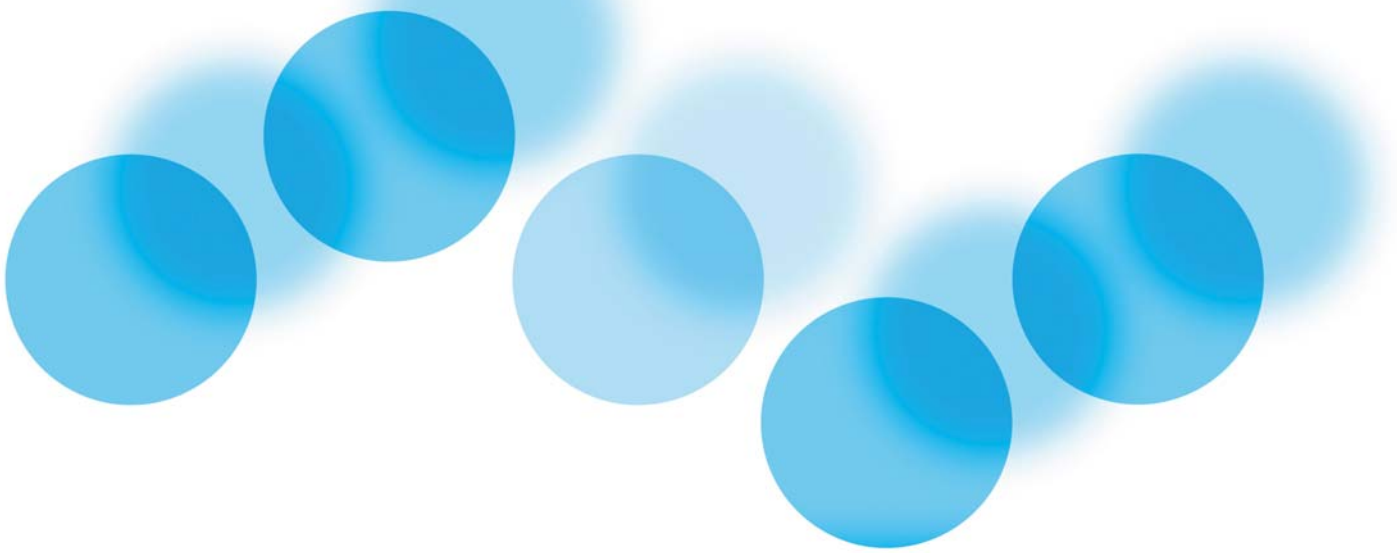
ASSESSMENT AND DEVELOPMENT OF MUNICIPAL WATER AND WASTEWATER TARIFFS AND EFFLUENT CHARGES IN THE DANUBE RIVER BASIN.

Volume 1: An Overview of Tariff and Effluent Charge Reform Issues and Proposals



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PREFACE

The long term goal of the DRP is, in short, to strengthen capacities of key Danube stakeholders and institutions to effectively and sustainably manage the Danube River Basin's water resources and ecosystems for citizens of Danube countries.

Water and wastewater service tariffs and effluent charges, fines and incentives (Tariffs and Charges) have the potential to improve both water resource management generally and protection of water bodies from nutrification and hazardous substances. They may be able to make a substantial contribution towards increasing internal funds and releasing public budgets and thereby facilitate the provision of baseline contributions for new investment projects in nutrient reduction and pollution control.

The purpose of this assignment was to develop strategies for tariff and effluent charge introduction and reforms given the prevalent conditions in the various countries of the region and taking into consideration the implementation plans of the EU accession countries. The assignment was intended to develop policy measures for DRB countries that help assure economically and socially acceptable tariffs and/or effluent charges. The assignment was also to consider the potential for the increase of revenues of the companies operating in the water and wastewater sector. The development and assessment of country-specific concepts for tariff and effluent charge reforms was intended as well.

This report provides analytical background on, and summarizes results derived from, the entire Tariffs and Charges Project. This work principally involved examination of current conditions related to regional or Municipal Water and Wastewater Utilities (MWWUs) in eight countries of the region, identification of possible tariff and effluent charge reforms, and evaluation of these prospective reforms. A MWWU case study was developed in each of the countries. Baseline physical and monetary accounts for the MWWU were constructed and budgetary, tariff, service, and effluent consequences of various reforms were tested. The baseline conditions and simulations were undertaken within the framework of the Accounts Simulation for Tariffs and Effluent Charges (ASTEC) model and numerous individual reform proposals were identified and evaluated.

Getting the MWWU in good financial order is a necessary pre-requisite for any tariff or effluent charge reforms aimed at pollution reduction to be successful. A challenge of this assignment, is, and will continue to be in Phase 2 of the DRP to convince national policy makers, system managers, etc. of the general merit of the reforms. The final success will also depend in part on the willingness of national authorities to support the demonstration projects and make the allowances for these experiments in national policies and institutions.

The results of this component are intended on the one hand for policy makers and regulators at a central government level as well as for local governments and managers of water and wastewater municipal companies at the more local (pilot site) level.

The report was prepared by Dr. Glenn Morris, the consultant to the DRP, in cooperation with Andras Kis from MAKK, Hungary and the team of national consultants from Danube countries and reflects the views of the expert team. The report and its contents remain the property of the UNDP/GEF DRP and should not be used without providing full credit to the DRP.

For further information about the DRP, objectives, activities, results etc. please visit the DRP webpage at: www.undp-drp.org

INTRODUCTION

The international environmental community has been disappointed by the slow pace of improved effluent control in the Middle and Eastern Danube River Basin (ME DRB) countries, especially the pace of nutrient and toxics reduction signaled out for particular consideration in the Danube Regional Project. Representatives of governments in the ME DRB countries, at all levels, say that there is simply not enough money (resources) to make quick and substantial progress. The international environmental community sometimes reflects the view that what is lacking is enough political "will" to make such progress. Our task in the "Tariffs and Charges Project" was to see if, for the special case of Municipal Water and Wastewater Utilities (MWWUs), there are some ways in which tariff and effluent charge reforms can ease both the financial and political barriers to improved effluent control and water quality in the ME DRB countries.

This document, Volume I of our final report, is one of the products of our efforts. It introduces the reader to the objectives and methods of our Project. It also provides an analytical discussion of the ways in which tariffs and effluent charges link to behavior - production and consumption decisions - and on to pollution reduction. Such linkages must be understood before they can be effectively utilized. This report also summarizes the current conditions of eight ME DRB countries pertaining to 1) the tariffs charged by MWWUs for water supply and wastewater collection and treatment services and 2) the effluent charges to which their wastewater is subject. It then identifies a wide array of potential reform proposals and discusses advantages and disadvantages of each considering their "effectiveness, proportionality, and practicality". After summarizing suggested reforms and reform strategies, our report concludes with a discussion of follow-up activities that would provide further evaluation, fine tune reform ideas to match particular settings, and generally serve to promote successful implementation of the suggested reforms.

Guide to Reading This Report

While we expect the reader to begin this report with the Executive Summary, we also encourage reading the Glossary of terms before beginning the body of the text. Serious confusion has been created by different usage and terminology in the general literature pertaining on legal forms, finance, and economics. This Glossary is meant to help reduce this problem and anchor the readers understanding.

While this report is organized in a linear, academic way, some readers may find it more useful to read the chapters in a different order. After reading the Executive Summary and Glossary, we encourage the reader who is more policy and results oriented to go to Chapters 5 and 6. These Chapters describe the tariff and charge reforms considered and our proposals for mutually reinforcing reform "bundles".

Chapters 5 and 6 use terminology and results from a background examination of tariffs and effluent charge designs that is developed in Chapter 2. Readers who want to understand more about tariff and effluent charges design philosophies and the advantages and disadvantages of alternative tariff and effluent charge designs should read Chapter 2 but, while it is helpful, it doesn't need to be read before the other chapters. Those readers interested in more detail on the current water management and service conditions in the ME DRP countries, including tariffs and effluent charges, can turn to Chapter 3. Chapter 4 is a synthesis chapter. The reader who wants to know more about how the analytics of tariffs and effluent charge designs were combined with existing conditions to identify possible reform issues and reforms themselves will find this discussed in Chapter 4.

Chapter 1 describes the administrative history and terms of the T&C Project and the way we have organized our thinking to make this complex problem more tractable. It also describes in more detail the way in which we executed the project and the materials produced by the Project. This Chapter is useful to someone who wants to better understand the context of the Project and its implementation.

Finally, we provide four Annexes for those readers who desire deeper background on elements of these tariff and effluent charge reform proposals. Annexes 1 and 2 provide a discussion of the analytical links between tariffs and effluent charges, respectively, and water pollution reduction. These links are regularly referred to when discussing reform advantages and disadvantages. Annex 3 provides 'Users Guide" to the ASTEC (Accounts Simulation for Tariffs and Effluent Charges) model for those readers who want to know more about the design and use of this case study tool. Annex 4 provides a list of currency exchange rates used to convert currencies in this Project.

Other T&C Project Products

Volume II of Tariff and Charges Project Final Report contains country reports for seven of the eight countries of the ME DRB for which we compiled information. These countries are: Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, Romania, and the Slovak Republic. Each country report has an Overview of issues and reforms in the country, a National Profile of trends and conditions in local water and wastewater management, and a Case Study that examines in greater detail the current and prospective budgetary, production, and consumption consequences of selected reforms undertaken at a particular MWWU. We urge the reader to consultant Volume II in order to get a fuller understanding of background conditions and the role of reforms in particular national and case study contexts.

The T&C Project Team

The primary responsibility for the Country Reports rested with the country consultants hired by the DRP (Danube Regional Project). The country consultants also provided critical support to this volume. Their intellectual and personal contributions to the Project were invaluable. The country consultants are listed in Table 1 below.

Table 1. Country Consultants on the Tariff and Charges Project

Country Consultants	
Country	**Consultant**
Bosnia-Herzegovina	Ms. Ramiza Alic
Bulgaria	Dr. Galia Bardarska Ms. Vania Shopova, MSc.eng Mr. Dimitar Tropchev
Croatia	Ms. Dubravka Mokos, B.Sc
Czech Republic	Ms. Lenka Camrova
Hungary	Mr. Gabor Ungvari
Moldova	Ms. Elena Muntean
Romania	Mr. George Dulcu Dr. Victor Platon
Slovakia	Ms. Danka Thalmeinerova-Jassikova

Caution to Readers and Reformers

While we have tried our best to be as complete and up-to-date as possible in our descriptions and analyses, some features, data, policies, and regulations may be overlooked or outdated. Indeed, in so

dynamic a setting even the passage of a few weeks time can leave a discussion out-of-date. Furthermore, a more in-depth consideration of special national and/or local conditions can always improve the analysis found in a survey such as ours. Thus we urge here, and again in our recommendations in Chapter 7, that the descriptions and reform proposals provided, developed, and assessed here be further evaluated and tested as part of any adoption and implementation process. At the very least, there will always be particular design and operational issues that must be addressed and tested before any set of tariff and effluent charge reforms should be considered for permanent, widespread adoption.

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ABBREVIATIONS

AC	Average Cost
ASTEC Model	Accounts Simulation for Tariffs and Effluent Charges Model
B&H	Bosnia and Herzegovina
BGN	Local currency of Bulgaria
CEE	Central and Eastern Europe
CMPF	Central Managed Pooled Fund
CZK	Local currency of the Czech Republic
DRB	Danube River Basin
DRP	Danube Regional Project
FB&H	Federation of Bosnia and Herzegovina – part of Bosnia and Herzegovina
GEF	Global Environmental Facility
GNI	Gross National Income
GWP	Global Water Partnership
HH	Household
HRK	Local currency of Croatia
HUF	Local currency of Hungary
IAWD	International Association of Water Supply Companies in the Danube River Catchment Area
KM	Local currency of Bosnia and Herzegovina
MC	Marginal Cost
MDL	Local currency of Moldova
ME DRB	Middle and Eastern Danube River Basin
MRDPW	Ministry of Regional Development and Public Works
MU	Management Unit
MWWU	Municipal Water and Wastewater Utility
PIP	Project Implementation Plan
RBA	River Basin Authorities
ROL	Local currency of Romania
RS	Republika Srpska - part of Bosnia and Herzegovina
RU	Regulatory Unit
RWC	Regional Water Company
SK	Local currency of Slovakia
SU	Service User
T&C	Tariffs and (Effluent) Charges
UNDP	United Nations Development Program
W&WW	Water and Wastewater
W&WWS	Water and Wastewater Services
WEC	Water Extraction Charge
WW	Wastewater
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

SCOPE AND OBJECTIVES

The purpose of the Tariff and Effluent Charges (T&C) Project is to identify and assess 1) water and wastewater tariff reforms and 2) effluent charge reforms that might be used to help reduce water pollution emitted by Municipal (including Regional) Water and Wastewater Utilities (MWWUs). The MWWUs of the Middle and Eastern portions of the Danube River Basin (ME DRB) provide the geographic scope and point of departure for this investigation.

In this volume we provide analytical background on, and summarize results derived from, the Tariffs and Charges Project. This work principally involved examination of current conditions related to regional or MWWUs in eight countries of the region, identification of possible tariff and effluent charge reforms, and evaluation of these prospective reforms. We also developed a MWWU case study in each of the countries. In the case studies we constructed baseline physical and monetary accounts for the MWWU and tested budgetary, tariff, service, and effluent consequences of various reforms. The baseline conditions and simulations were undertaken within the framework of the Accounts Simulation for Tariffs and Effluent Charges (ASTEC) model.

BROAD CONCLUSIONS

Getting the Municipal Water and Wastewater Utility in good financial order is a necessary pre-requisite for any tariff or effluent charge reform aimed at pollution reduction to be successful.

Too often the MWWUs current account balances are weak and artificially bolstered by 1) failure to write off bad debts, 2) insufficient expenditures on maintenance and repair, and 3) inadequate provision for replacement of depreciating infrastructure. Pollution reduction generally requires large investments and increased operating costs, further aggravating the financial difficulties of the MWWU and/or escalating tariffs. Increased tariffs are difficult to justify without a corresponding improvement of service quality and reliability, therefore use of tariffs as a means of financing an up-grade in effluent control or extension of sewer service is contingent on using tariffs to first achieve financial sustainability for the utility, preferably starting with investments that contribute to an improved financial balance, such as leakage reduction.

A comprehensive program for installation of new wastewater collection systems and technically advanced treatment systems from own resources or commercial loans is not a reasonable near term strategy for most MWWUs even when coupled with an aggressive program of tariff or effluent charge reforms.

The tariff increases required would mean that regional households would spend a share of their disposable income on water services that was two to three times more than their counterparts in OECD currently do. Given the cost of these systems and the low incomes of customers in the Region, it makes more sense to devote efforts to planning use of the existing, limited resources in an efficient or, at least, cost-effective, way. A less burdensome program may not only mean scaling back current ambitions, but also scaling back current operations and use of small-scale, simple technology for provision of safe water and wastewater services for the weakest and/or most over-built systems.

It is a mistake to consider tariff and effluent charge reforms too narrowly; to consider them only as instruments for pollution reduction.

Tariffs and effluent charges are economic instruments and by their nature impinge on a variety of behaviors and choices simultaneously. A single tariff or effluent charge intervention may affect effluent levels through several pathways and each pathway may have qualitatively, as well as quantitatively, different results. For example, higher tariffs may decrease wastewater flows but increase wastewater concentrations. Moreover, there are also many other changes beyond a change in pollutant levels per se that should be considered. For example, in evaluating a reform one would want to also consider how the revenues produced by an increase in effluent charges would be used and whether an increase in tariffs would result in some customers dropping the service.

Tariff and effluent charge reforms will need to be introduced concurrently with legal, administrative, and institutional changes that will safeguard the integrity of the reforms.

The "constituencies" of the MWWUs are very skeptical about the merit of new policies and programs. They are concerned, quite legitimately in our view, that the reforms will be designed to serve other interests. The customers, especially, but also system management, ministry officials and municipal owners need to be more assured that the MWWUs are run 1) without undue political influence, 2) that the revenues produced by tariffs and effluent charges are efficiently allocated, and 3) that the donor community will reward current sacrifices in the future. Some of the necessary institutional reforms may be local, e.g. improved bookkeeping practices, or implementation of strategies to reduce non-payment of bills. Other reforms are national, such as legal changes to assist enforcement of the collection of bills, regulations that allow private participation in service provision, or national oversight of public utility pricing.

REFORM PROPOSALS

We identified and evaluated numerous individual reform proposals and in some cases elaborated them with reference to a specific country or MWWU. In keeping with the general conclusion just cited, however, we encourage the following bundling or packaging of reforms in order that they might be mutually reinforcing and operationally more effective. Of course, some of the assignments of "component" reforms in each of these bundles are a little arbitrary; they may also be seen as supporting both other reform components and other "bundles". What we present here are the main reform themes identified in our Project.

Tariff Re-Design

1. *Simple multipart tariff designs* – including a fixed cost component to provide revenue stability and a commodity charge that approximates marginal costs.
2. *Cost-of-service tariff setting* – to pass the differences in costs between customers, regions, and water and wastewater services to the consumer of those services.
3. *Book keeping improvements* – to support the more demanding tariff setting and cost determination requirements.
4. *Independent performance audits* – to assure that the costs are properly accounted and assigned and folded into the tariffs.

Collection and Billing

1. *Improved account collection* – to increase revenue.
2. *Institutional support for collection enforcement* – to increase revenue.

3. *Provision of low-level water and wastewater services* – as an alternative for those customers that are burdened by even modest tariffs.
4. *Billing system improvements* – to increase the revenue stream and the transparency of the tariff system.
5. *Community relations* – to explain the reasons for, and consequences of, more active collection of bills.
6. *Metering* – to improve the fairness of the system through more reliable meters and assure that a customer's payment matches the amount of service used.

Tariff Increases and Locally Financed and Directed Investment

1. *Increases in average tariff levels* - to support a sustainable provision of services and an appropriate investment program.
2. *Pooled capital (and pollution control credits) for pollution reduction* – allow MWWUs to pool resources to invest in pollution reduction where it is most cost-effective.
3. *Reduction in central government fees and taxes on water and wastewater services* – leave more resources for investment in the local system at the discretion of local managers/owners.
4. *Build management capacity* – to improve tariff analysis, investment decision-making, and streamlining operations.
5. *Strengthen economic regulation* - by an independent agency of the central government to assure that costs are controlled and that the higher tariff levels, whether proposed by a publicly or privately operated MWWU, are justified to support a well-designed and executed investment program.
6. *Private participation* – make regulatory changes to provide the possibility of private participation in MWWUs.

Effluent Charge Introduction or Re-Design

1. *Effluent charges should be directly linked to effluent levels* – to help ensure the incentive for effluent reduction.
2. *Effluent charge regimes should be developed to cover all pollution, not only above limit pollution* – the effluent charge encourages exceedence of standards where it is inexpensive to do so.
3. *Set the level of effluent charges to levels that are commensurate with the environmental damage* - for efficient resource allocation.
4. *Effluent charge revenues should be returned to MWWUs as a lump sum rebate whose size is proportionate to the population served with wastewater collection services* – to eliminate high transaction costs and misallocation of resources that commonly occur with centrally directed Funds.

We offer these reform proposals with the acknowledgement that we are not as close and familiar with specific problems as local system managers, local public officials, and, most importantly, the local customers who pay the W&WW (Water and Wastewater) tariffs and live beside the water bodies of the region. Consequently, this is not a blueprint reforms, but some ideas and proposals that 1) may support detailed design and implementation of changes whose need had been understood for some time and 2) inspire consideration of some new approaches that still need to be examined through the lens of both national and local conditions. Indeed, we doubt the reforms we are proposing for

consideration would work unless they resonate with the experience of local customers and assessments of the water managers and planners of the Region.

Finally, we can't stress enough the need for coordination of these reforms. As both our analysis and evaluations emphasize, each reform has its downside(s). If introduced without other, complementary reforms it may do more harm than good. Unhappily, there are many examples of past "reforms" that have not been successful because the downside had not been properly anticipated and addressed in advance. This must always be part of our awareness as we encourage and assist reform design and implementation.

RECOMMENDATIONS FOR FURTHER EVALUATION AND IMPLEMENTATION

Broad Recommendations

- **Work closely with selected MWWU and country water and regulatory agencies to develop, evaluate, implement, and monitor specific tariff and effluent charge reforms.**

While the ultimate purpose is sustainable finances and improved pollution control at MWWUs through upgrade of the pollution control technology, the collaboration should result in more specific goals and tools to get there, including specific laws and policies to be enacted, and strategies and reforms to be implemented.

- **Develop working relationships with financial institutions, assistance programs, and international organizations so that our contributions are as complimentary as possible.**

Help the international community find attractive points of intervention: "bankable" projects, technical and financial assistance opportunities. The reforms of the project should also provide a foundation for other programs that support the reforms and wish to continue encouraging implementation and assessment beyond the life of the DRP. The support and encouragement of these institutions is believed to be instrumental in achieving improvements in resource allocation and successful tariff reforms.

Specific Elements

- **Elaboration and application of ASTEC-based case studies.**

The existing case studies can be developed for 1) more detailed examination of policy strategies in the specific MWWUs, 2) to provide materials for seminars and workshops for both policy makers, the new municipal owners of systems, and water system operators. The existing set of case studies can be supplemented with other cases of interest. We view this as a first step to building a constituency for tariff, effluent charge, and related institutional and legal reforms through familiarity with the possibilities and likely results. Close collaboration with local policy makers and operators is key to the success of this element.

- **Review of privatization and private operation experience in the region.**

A number of the important MWWUs in the region have been partially privatized or they are fully or partially operated by private partners – most notably in Budapest, Bucharest, Sofia and Zagreb. The experience gained in these cases is an important basis for setting parallel and complementary organizational reforms. The prospects, as well as the pitfalls, of privatization and private operation are great enough to merit special attention in future reform "bundles". Moreover, private participation is often directly related to tariff reforms resulting in cost recovering tariffs, as private partners both require that finances are sustainable and can often contribute with skills, experience and capital that is useful in streamlining operations and improving the financial position of the MWWU.

- **Workshop on tariff and effluent charge reforms for policy/decision makers in the ME DRB countries.**

These workshops should be designed to both inform participants and solicit views regarding the merits and problems of various bundles of reforms. It seems especially important that the national policy makers develop reforms that compliment the best opportunities for MWWU-specific tariff reforms and investment programs.

- **Demonstration workshops for MWWU managers and directors.**

Development of local management capacity and experience is one of the key compliments of tariff and effluent charge reforms. After all, the notion behind using incentive based instruments assumes that operators can identify and appreciate the financial consequences of changes in tariffs and effluent charges. This is not just a question of numbers, however. The workshops need to help the managers and directors anticipate the issues that their decisions create for the customers and citizens of their service community.

- **Demonstration projects working with specific MWWU operators and owners to develop, test, and implement a bundle of reforms.**

This is the most important element of any successor to the T&C Project. We think that demonstration projects are critical for both testing and establishing the practical legitimacy of the reforms. In the process the demonstration projects would build ties with international programs and national policy makers by providing experience that is useful in their program designs. Most importantly, we believe that the local managers and municipal owners with experience in implementation of reforms are the most important constituency for adoption of complementary legal and institutional reforms at the national level.

GLOSSARY

Amortization - a financial term that refers to the payments designed to pay off a debt. For example, the amortization payment of a €1 million debt over 20 years (with an interest rate of 8%) is €101,852 per year to cover principle and interest in equal payments over the amortization period. Amortization is determined by the terms under which debt, which may have been used to purchase an asset, is financed. The amortization payment is contractually required; it is not, generally speaking, optional and does not depend on production or revenues during the year. The payment term and interest rate may have little or nothing to do with the life of the asset purchased with the €1 million. As such, it may also have little or nothing to do with the physical depreciation of an asset.

Depreciation - an allowance, usually expressed in monetary terms, for actual wear and tear on long-lived plant and equipment over time. For example, the depreciation on a water tower that is fifteen years old may be €5,500 in the 16th year. Depreciation can be based on estimates of actual wear and tear (useful for management decisions), the market value of used equipment, or a standard schedule usually used for tax or bookkeeping purposes. Depreciation can be annual or cumulative. Depreciation is not amortization. Despite the common use of cognates of "amortization" e.g., amortizing in Hungarian, to mean depreciation in many CEE (Central and Eastern Europe) languages, in English amortization is very different from depreciation.

Effluent Charges – a monetary charge assessed by central authorities for discharge of pollutants into water bodies by MWWUs. The base for the charge can vary. Some of the variations are based on the number of pollutants and the extent of discharge. The level of the charge can also vary: with the pollutant, the level of treatment before discharge, and the receiving water body. The purpose of an effluent charge is primarily to provide a "signal" to MWWUs about the social damage of their pollution and an incentive to reduce that pollution. A good effluent charge design, then, is one that 1) is based on the pollutants and pollution characteristics that cause the damage, 2) is set at a level that reflects the marginal damages of these pollutants and pollutant characteristics, 3) effectively conveys this information to the decision making entity so that they respond by taking appropriate abatement actions. In this study we encounter "effluent charges" that are nominally tied to pollution levels but which have an incomplete or poor basis for the scope and level of the effluent charges and do not effectively convey this incentive to abate to decision makers. For example, effluent charges that are assessed directly on customers based on MWWU behavior does not provide a direct incentive to the MWWU to reduce pollution. While these may be ineffective designs, we still discuss them as effluent charges.

Multipart Tariffs - Multipart tariffs refers to any tariff design that has more than one basis besides a single commodity charge for computing the expenditure on water or wastewater services of a single customer. The multipart tariff can have a fixed charge and one/or more multiple "commodity" charges. A tariff design with increasing block tariffs (IBT) – rates where the commodity charge increases as the customer consumes more water – is a multipart tariff. A design in which the commodity charges decline with the level of a customer's consumption is called a decreasing block tariff (DBT) design. A design with a single commodity charge and a fixed rebate (a negative fixed charge) is a multipart tariff, as is a design with a zero initial tariff for the first X units of consumption and a positive commodity charge for all consumption greater than X. The problem with a lot of tariff design terminology is one of non-uniqueness – different terms to identify essentially the same designs. It is best, we think, to use "multipart" and then describe the particular tariff algorithm that one is referring to.

Net Revenue – this is the difference between the revenue of an enterprise and its explicit costs. Sometimes the cost elements are supplemented by some implicit cost items that are a little easier to estimate because of the particular setting e.g., the cost of capital since it is "borrowed" at a given interest rate or the cost of management in a corporation which pays its CEO and other leadership a wage. Net revenues, in these later cases, can approximate profits but it is better to keep the concepts distinct to reduce confusion. For example, most "profit taxes" are actually taxes on computed net revenue (not profit).

Profit – this term, like many others, has a technical meaning in economics that has sometimes been confused by common usage. Technically, the economic "profit" is a return in excess of both explicit costs (the purchased inputs) and implicit costs (the opportunity cost of a management or entrepreneurial inputs, the depreciation of equipment). Because implicit costs are sometimes difficult to estimate they are sometime (and incorrectly) ignored when calculating the return to an enterprise. In long run competitive equilibrium economic profit will be zero. A perfectly regulated public utility will mimic this "efficient", zero profit solution; the utility will operate at service levels where demand is equal to long run marginal cost and its output will be priced so as to just recover both explicit and implicit costs.

Public Enterprise - Any enterprise the majority of which is owned by any arm of government is a public enterprise. Thus a municipally owned enterprise is just as much a public enterprise as one owned by the central government. A further source of confusion can arise when a confederation of states forms a republic. In this case you can have a "state" owned enterprise that is not owned by the central government, but by one of the states of the confederation. We therefore recommend that when describing ownership of a public enterprise that you note the particular public entity(ies) that own the enterprise and avoid using the term "state" ownership when you mean central government ownership.

Sustainable Scenario – In these scenarios the current service levels are sustained indefinitely in the future. In addition to current costs, provision must be made for the full depreciation of plant and equipment so that whenever a piece of infrastructure is worn out, it will be possible to replace it. The level of service under a sustainable scenario is not necessarily the same for any two MWWUs, since sustainability refers to maintaining *present* service levels, which may differ from case to case. A complicating factor in determining the requirements for sustainable service is that elements of the current system do not always make economic sense. These elements may have been added to the system during a period of distorted prices or under different planning policies. Determining a financially sustainable level of service therefore also means rationalizing service levels so that those services that are disproportionately expensive may be scaled back or eliminated.

Tariffs - This is the "price" of a water or wastewater service. The point of departure for our discussion of a tariff is a simple "commodity charge" where the tariff is set at X monetary units per m^3. Expenditures for the service, then, are the commodity charge times the consumption level. This type of tariff is the norm for the MWWUs of the ME DRB since most customers' water consumption is metered. Different groups of customers may have different tariff levels, but if they all have only one commodity charge then this tariff design is still called a simple commodity charge design.

Upgrade Scenario – In these scenarios in addition to maintaining service levels for an indefinite future (see sustainable scenario) the MWWU also expands and/or upgrades the service that is provided. These scenarios may involve adding new customers to the water or wastewater system, or an upgrade in service such as development of a more reliable water supply, better treatment of drinking water, or new or more complete wastewater treatment. There is no uniform definition to upgrade, in fact, several upgrade scenarios can be defined for any particular MWWU depending on the mix of

system elements that will be developed. In this spirit, while upgrade in our project is usually equivalent to improved collection and treatment of wastewater in order to reduce the release of nutrients and toxics, we always try to provide details on particular assumptions of the scenario.

1 Methods of the Tariff and Charges Reform Project

1.1 Objectives

This Tariff and Charges (T&C) report was commissioned as part of Phase I, Objective 1 of the UNDP/GEF Danube Regional Project (DRP) and embraces the overall objectives of that Project and Objective 1 in particular. The DRP objective 1 is as follows: The Creation of Sustainable Ecological Conditions for Land Use and Water Management.

DRP's Project Implementation Plan (PIP) (DRP, 2003) includes a call for production of two related Outputs in support of Objective 1:

- Output 1.6 Policy reform and legislation measures for the development of cost-covering concepts for water and wastewater tariffs, focusing on nutrient reduction and control of dangerous substances,
- Output 1.7 Implementation of effective systems of water pollution charges, fines and incentives, focusing on nutrients and dangerous substances.

The PIP lists activities and products for Phase I of the DRP that support achievement of Outputs 1.6 and 1.7. These include review, analysis, and evaluation of municipal water and wastewater utility (MWWU) tariffs and effluent charges in the countries of the ME Danube River Basin (DRB). The PIP called for both general, and country-by-country, consideration of these tariffs and charges and development, at the end of Phase I, of proposals for institutional and design reforms related to MWWU tariffs and effluent charges. These reforms, when properly and thoughtfully implemented, would assist the Region in meeting the objective of "sustainable ecological conditions" for municipal water and wastewater management.

This report, in two volumes, meets the Phase I output targets for assessment of, and recommendations for, tariffs and charges institutional and design reforms. This volume, Volume 1, describes the methods used in this study. It also summarizes the data, assessments, and results, including tariff and charge reform proposals that emerge from Phase I activities. This volume also includes a brief discussion of implementation activities under Phase II that compliment the reform proposals offered here. We also include an Annex that describes the Accounts Simulation for Tariffs and Effluent Charges (ASTEC) model. ASTEC is a spreadsheet model developed as an assessment tool for the MWWU case studies undertaken as part of this study.

1.2 Organizing Principles

In developing this Phase I T&C study, we took our guidance from the descriptions, activities, and outputs of the DRP PIP. We examine "municipal" water and wastewater tariffs and the effluent charges applied to these municipal sources.[1] This scope reflects the fact that, to various degrees, all the ME DRB countries have established and implemented policies devolving water system ownership and management to local authorities. The extent of this devolution varies from country to country, so some of the countries have district or regional water systems. For our purposes, we consider all of these "municipal" water systems, even if they serve several municipalities or are regional in scope.

1 The term "tariff" as used here is nearly synonymous with water or wastewater "price" or "rate". The tariff is the basis for determing what a customer owes in exchange for receiving water and wastewater service. As this suggests, the tariffs for water service are usually different from the tariffs paid for wastewater service. As a practical matter – to obviate the need for metering of wastewater and because wastewater quantities are highly correlated with drinking water quantities in urban and suburban environments – the wastewater tariff is almost invariably computed using the metered quantity of water delivered.

The critical feature is that either all or a substantial amount of system ownership and control is vested with the municipal governments of the communities served by these systems. Moreover, the municipal water systems are, or are moving toward, more financial independence. For the most part they no longer depend on the central government or adjacent water systems for operating subsidies and plan and finance more of their infrastructure "internally".

Likewise, we examine and evaluate the existing system of effluent charges that affect wastewater collected and discharged by municipal utilities. This focus is implicit in the activity descriptions of PIP Objective 1.7 and the fact that effluents originating from other sources, including specific activities addressing agricultural and industrial sources, are addressed by other DRP components.

1.2.1 Tariffs and Charges in the Middle and Eastern DRB

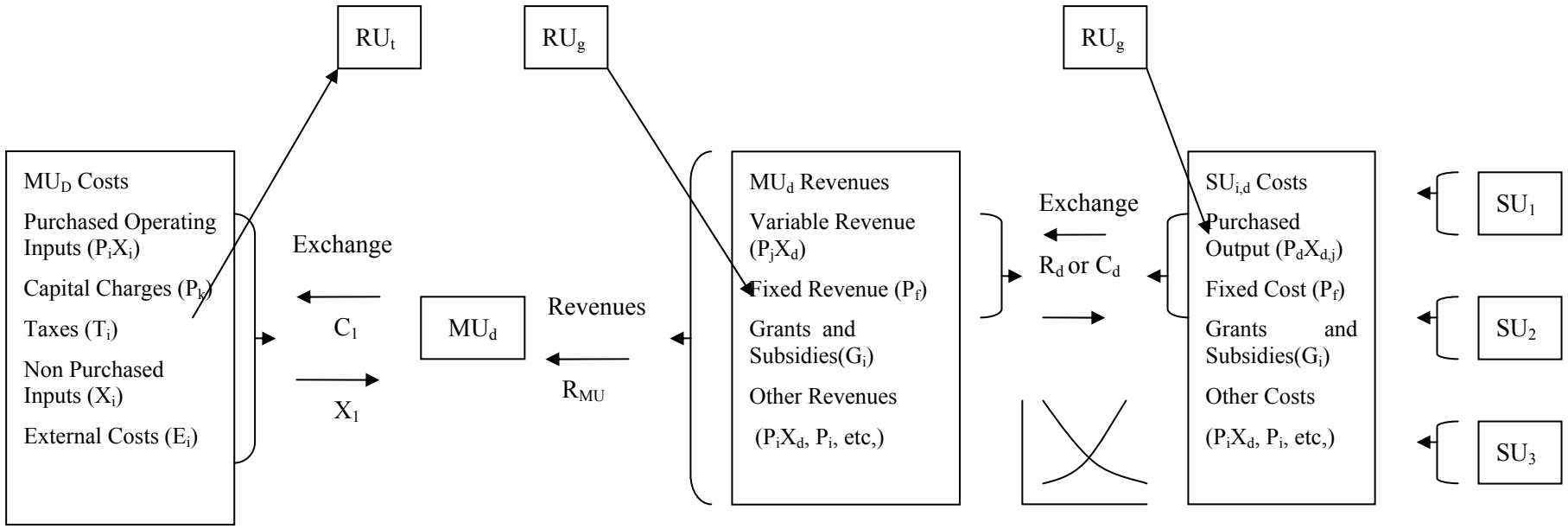
Before we could identify and evaluate potentially attractive MWWU tariff and effluent charge reforms, especially reforms "focusing on nutrient reduction and control of dangerous substances", it was necessary to put both tariffs and effluent charges in proper context. Both tariffs and effluent charges are "economic instruments". As described below, they operate by providing financial incentives for MWWUs and their customers to change behavior in ways that ultimately result in reducing pollution discharged to receiving water bodies. In order to know how reforms might work, one needs to understand the financial and institutional setting in which the reforms would function. Consequently, we made it a priority to examine the current operations of MWWUs and the role of tariffs and effluent charges in those operations. As part of this effort we reviewed recent regional studies of water management and environmental regulation, especially those addressing the situation regarding tariffs and effluent charges. Included among our sources were K. Berbeka, et. al. (2000); Speck, McNicholas, and Markovic (2001); IAWD – International Association of Water Supply Companies in the Danube River Catchment Area - (2002) and background papers of the Global Water Partnership (GWP) study of water and finance in Central and Eastern Europe (CEE) (various years). These documents, together with consultations with the professional staff from expert organizations and our own pool of local experts strongly suggested that many MWWUs of the study countries are either now, or shortly will be, financially unstable. Since tariffs are primarily a revenue tool, one cannot effectively address their use for financing pollution control independently of the need to use tariffs to stabilize the financial condition of the water utilities per se. **Use of tariffs as a means of financing an up-grade in effluent control or extension of sewer service is contingent on using tariffs to first achieve financial sustainability for the locally owned and operated water utility.** Consequently, we found it necessary to examine tariff reform as a means of achieving financial sustainability generally as well as a means of financing upgrades in the provision of wastewater services.

Recognizing that economic and financial conditions, both current and prospective, are critical to the effectiveness of various tariff and effluent charge reforms, we adopted an analytical framework in this study based on the notion of a system of accounts (Morris and Kis, 2003a). These accounts are "balance sheet" systems that represent: 1) current account or budgetary balances based on current costs and current revenues, 2) capital accounts that allow for long-lived debt and infrastructure services and 3) social accounts that reflect environmental and social goods (and bads). Each of these accounting schemes broadens the basis of the accounting calculations: the movement from current to capital accounts to examine longer term financial sustainability, the expansion from capital accounts to social accounts to examine aspects of economic welfare that aren't well reflected by product and capital markets e.g. externalities and transfers.

These systems of accounts are focused on the entity that operates the MWWU (the "management unit" or MU).[2] The analytical framework we introduce and use also identifies two other groups of entities that play a critical role in the accounts of the MU. These are the "service users" (SU) that are the customers of the water utility and the "regulatory units" (RU) that condition the activities and finances of the MU. These entities are then linked to each stage of the process that characterizes the operation of the MWWU: raw water production and treatment, water distribution, water use, wastewater collection, wastewater treatment and discharge. The relationships among MUs, RUs, and SUs along this continuum of activities are depicted in Figure 1 and Figure 2 below.

[2] The MU is often synonymous with the MWWU. There are times, however, when the MWWU managements discretion is curtailed and the "management unit" includes not only the MWWU but also some active input from owners or their designates e.g., when the central or local government, in its capacity as owner or co-owner, delegates one of its administrative units as an active partner in municipal water and wastewater system management.

Figure 1 Municipal Drinking Water Supply Service Accounts and Links to Markets and Regulation

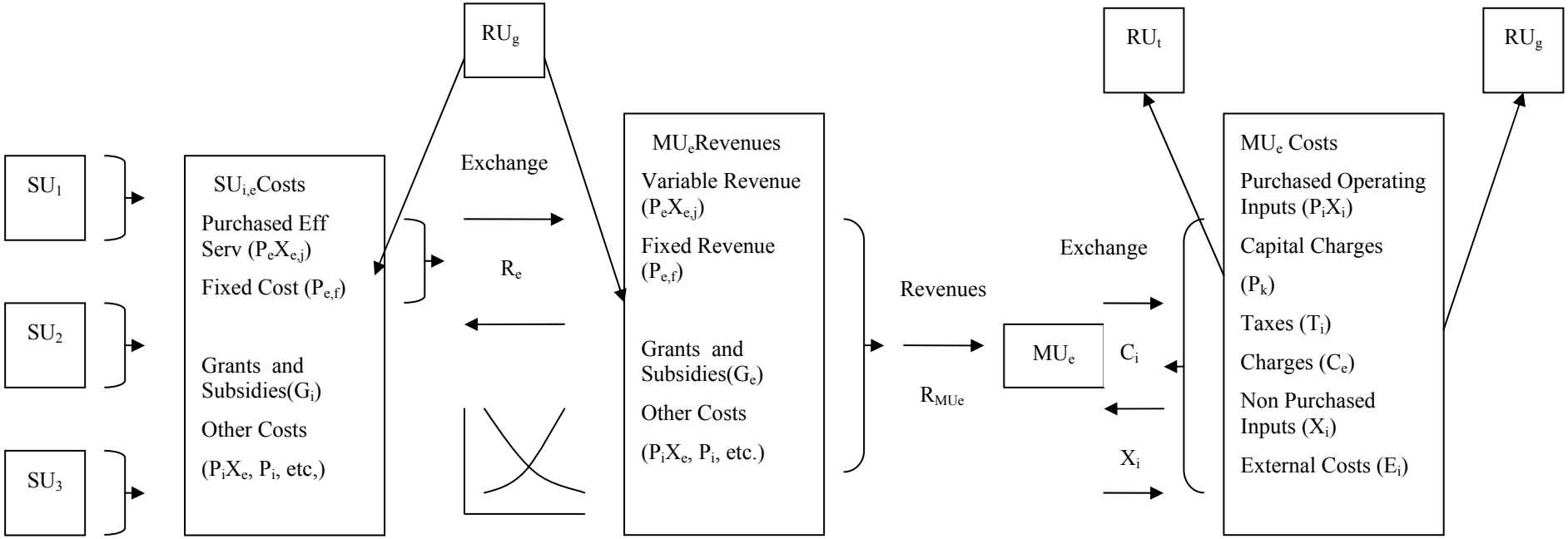


Commentary on Figure 1:

The first of the three large boxes contains the water service cost accounts of the management unit for drinking water (MU_d costs); the second one contains the water service revenue accounts of the management unit (MU_d revenues). As depicted in the Figure, the MU_d exchanges costs (C_i) for inputs (X_i). It then produces drinking water services in exchange for revenues (R_{MU}) of various sorts, including grants and subsidies. Regulatory units (RUs) can intervene to affect both the cost or revenue accounts of MU_d (RU_t for is a tax cost and RU_g is a possible government transfer). The third box of the Figure contains the costs of the drinking water service users ($SU_{i,d}$ costs). These items are the service user expenditure account and they can include not only purchased drinking water but also transfers or taxes (involving RU_g) and own costs. The drinking water service provider's revenue account and the drinking water service users expenditure accounts are linked by a market for drinking water where revenues or costs (depending on whether you are the MU_d or the SU_d) are exchanged for drinking water services.

Specific notation: RU_t is regulatory unit collecting taxes, charges and fees for water abstraction or use; RU_g is regulatory unit providing grants and subsidies; P_iX_i is X amount of purchased input i for price P (e.g. labor, energy); P_k is capital charges (e.g. investment into capital infrastructure); T_i is tax payment; X_i is non-purchased input (e.g. water in some cases); E_i any external cost; R_{MU} is revenue of the MU_d that is paid out in exchange for inputs; C_i is the actual cash paid for inputs; P_jX_d is commodity charge revenue received by the management unit for service quantity X_d at a price of P_j; P_f is fixed charge revenue (e.g. monthly fixed charge) received from the service users; G_i is grant or subsidy received from the regulatory unit; SU is the service user.

Figure 2 Municipal Wastewater Service Accounts and Links to Markets and Regulation



Commentary on Figure 2:

Figure 2 is organized like Figure 1, except that it depicts accounts and transactions for wastewater services rather than drinking water services. The first box contains the wastewater service cost accounts of the service users ($SU_{i,e}$ costs). The second box contains the wastewater service revenues of the management unit for wastewater (MU_e revenues). Between the two is the market for wastewater. In this case, both the wastewater and money flow from the SU while wastewater services flow from the MU_e to the SUs. The third box represents the cost accounts of the wastewater service provider (MU_e costs). The service provider purchases inputs and pays taxes and fees, including effluent charges, as part of providing wastewater treatment services. The regulatory units responsible for the level and administration of the taxes and fees are shown as RU_t and RU_g respectively. Likewise, RU_g is depicted as providing financial support to the cost account of SUs and the revenue account of MU_e. The figure does not exhaust the possible relationships between MU_g, RUs, and SUs, but indicates the complexity of possible relationships that may exist in any given setting.

Specific notation: RU_t is regulatory unit collecting taxes, charges and fees; RU_g is regulatory unit providing grants and subsidies; P_iX_i is X amount of purchased input i for price P (e.g. labor, energy); P_k is capital charges (e.g. investment into capital infrastructure); T_i is tax payment; C_e is charge payment (e.g. effluent charge); X_i is non-purchased input; E_i is external cost; R_{MUe} is revenue of the MU that is paid out in exchange for inputs; C_i is the actual cash paid for inputs; $P_eX_{e,j}$ is revenue received from assessment of a commodity charge by the management unit for service quantity X_d at a price of P_j; $P_{e,f}$ is fixed charge for the wastewater service (e.g. monthly fixed charge) received from the service users; G_e is grant or subsidy received from the regulatory unit in relation to wastewater services; SU is the service user.

1.2.2 Country and Municipality Focus

The activity descriptions associated with the Tariff and Charge Outputs 1.6. and 1.7 make it clear that the DRP recognizes the value of examining T&C reforms from both a regional and country perspective. We have adopted this approach in our study and commissioned a series of Country Reports (see Vol. II of this report). These allow us to consider tariff and charge reforms on both a regional and country-specific basis. At the same time we have extended this concern for singular conditions to the municipal level and encouraged the examination the particular circumstances of municipalities.

Country Reports have been developed for the following ME DRB countries: Croatia, Czech Republic, Bosnia-Herzegovina, Bulgaria, Hungary, Romania, and the Slovak Republic.[3] Each of the Country Reports has been produced by a local expert or experts following common guidelines regarding structure and content. The Country Reports consist of a National Profile of MWWU systems and a Case Study that describes conditions and prospects for a fairly typical municipal water utility. The content of these components of the country reports are reviewed below.

1.3 National Profiles of Municipal Water and Wastewater Systems

Each National Profile provides an overview of country features that affect water management generally and MWWUs in particular, including a brief history of municipal water service provision. The Profile includes a discussion of the legal and institutional setting affecting MWWUs. This includes identification and discussion of RUs (such as ministries, water authorities, regulatory commissions, etc.), MUs (ownership and operation regimes), and SUs (the different classes of customers). The body of the Profile includes discussions of various dimensions of MWWU operations: service provided, water production, and water quality; regulatory conditions including permitting, approvals, and performance limits; financial and economic data including tariff setting; and physical infrastructure technology, age, and operating condition. Throughout this discussion the authors made a special effort to identify issues of concern that were related directly or indirectly to tariffs and effluent charges. The concluding section of each National Profile reviews key issues or problems faced by the MWWUs in the country and possible tariff, effluent charge, and related institutional reforms that could address the issue or problem.

1.4 Case Studies of Selected Municipal Water and Wastewater Utility Systems

Each Country Report also includes a Case Study of a representative MWWU in that country. The Case Study provides background information on the MU and from this background develops "Baseline" information. The information includes current production and service levels, customer usage by different groups of customers, water discharge quantities and quality, water and wastewater tariffs, production and treatment costs, and revenues from the sale of the different water and wastewater services. As in the case of the National Profile, the case study text includes identification of issues or problems – directly or indirectly linked to water or wastewater tariffs or effluent charges - identified during development of information about the case study MWWU.

The case study data was used either directly in, or modified for entry into, the input data array of the ASTEC model. Then the model was run for a variety of scenarios. One scenario confirms the current financial condition of the MU. Other scenarios can explore the financial, effluent, and other impacts

[3] Preliminary work on national profiles and case studies for Moldova and the Republic of Serbia was also done as part of the T&C Project.

of different tariffs or effluent charges, maintenance programs, and management practices under the "baseline" conditions.

The case study data was also used to investigate the implications of "sustainable" service levels. In this instance one includes the full capital accounts necessary to sustain current service levels indefinitely in the ASTEC data entry. Scenarios under these data explore the financial and activity implications for the MU, SU, and RU of maintaining current levels of service in the long run. These explorations include consideration of different policies and designs for water and wastewater tariffs and effluent charges.

The "sustainable" data entries for the case study community were then supplemented with cost and financing data for MWWU development plans, including both voluntary and mandated changes in service and wastewater treatment. These combined data constituted the basis for "expansion/upgrade" scenarios with ASTEC. The development plans vary from case study to case study but usually included new or improved levels of wastewater treatment. Additional data needed under the service expansion/upgrade scenarios included the capital and operating costs of implementing these plans. The results obtained provide a basis for estimating the tariffs levels sufficient to cover these costs, including any effluent charge payments. ASTEC also simulates concurrent changes in water consumption, debt payments, and other physical and financial conditions.

Box 1 ASTEC Features

As the name suggests, the ASTEC model simulates MWWU accounts. This simulation includes separate accounts for drinking water and wastewater services and both financial and physical accounting for those services. In ASTEC, MWWU case study customers can be divided into up to nine groups and distinguished by any dimension considered important by the model user. In general, service users are distinguished by the type of activity in which they are engaged e.g., households vs. industrial; the type of services they use e.g., water only vs. water and wastewater; and the costs they impose on the MWWU e.g., local vs. remote location.

The input data of the model can be changed to represent different conditions. As noted above, the progression from baseline, to sustainable, to expansion/upgrade circumstances can be reflected in ASTEC input data. For any data set, ASTEC also allows the user to make some choices as to how costs are allocated to different SU groups and what SU groups must pay the same rates. The user can also select some built-in options regarding tariff design e.g., fixed fees vs. fixed fees and commodity charges. The model also has an "optimization" option: the user can ask the model to compute the minimum tariffs necessary to just cover the costs of service. ASTEC also has features that allow the user to incorporate into a scenario the consequences of tariff and effluent charge levels for water use, wastewater production, and effluent output. The interested reader can learn more about the features and structure of ASTEC in the User's Guide attached as an Annex to this Volume.

1.5 Reform Proposal Development and Evaluation

1.5.1 National Profiles and Case Studies – Issue Identification

The National Profiles and Case Studies include identification of issues and opportunities for institutional and policy reforms at both the national and local level that would enhance the use of tariffs and charges for water pollution reduction generally and nutrient and toxic effluents reduction in particular.

1.5.2 Reform Proposals

In the last sections of the National Profiles and Case Studies the issues and opportunities identified in the body of these two documents were recast as broad reform proposals. These circumstances of MWWU and these proposals are further summarized in the Overview of the Country Reports. These proposals were therefore based on both general national conditions and the specific results obtained from the Case Study scenarios investigated using ASTEC. Some of these proposals address specific tariff and effluent charge levels and designs; some address the process by which these tariffs and charges are set. Others address institutional and legal arrangements that influence the effectiveness of tariffs and effluent charges. In structuring reform proposals, the authors reflect an understanding of how these various design, process, and institutional conditions interact to determine ultimate effectiveness. In order to aid the reader in understanding these interactions and their role in conditioning our proposals, we offer summary analyses of the general functioning of tariffs and effluent charges in Chapter 2, Annex 1 (for tariffs) and Annex 2 (for effluent charges).

1.5.3 Proposal Evaluation

The contributors to both volumes of this Report have tried to assess the merit of various T&C reform proposals using three criteria: are they 1) effective, 2) proportionate, and 3) practical. While it is difficult to make these criteria operational in an objective way, we have tried to elaborate them for the purpose of evaluating reform proposals as follows.

Effective – Given the objective of reducing polluting effluents from MWWUs, can we be reasonably assured that the tariff or effluent charges reforms or related institutional and policy reforms will result in less water pollution? In order to obtain this assurance, we need to understand how the incentives created by the reform will work their way through the financial and physical system. Beyond this, we need to have some quantitative sense that the possible multiple channels and direct and indirect effects of the reform proposals, when implemented, will result in net reductions in polluting effluents. Sometimes this is not as easy to determine as it might first appear (see Chapter 2).

Proportionate – Assuming that the policy reforms are effective, can we also be reasonably assured that the social benefits of the changes resulting from the reforms are at least as great or greater than the costs that are also incurred. In order to make this principle more operational one needs to be able to identify and trace all the major changes resulting from the policy change and compare the benefits with the costs. Such a calculation may include costs or benefits that are incidental to reductions in polluting effluents but that should still be reflected in our evaluation of the reform proposal.

Making such net-benefit calculations in practice is extremely difficult to do in a completely satisfactory way. One problem is the difficulty of finding a common metric for the very different classes of benefits and costs. A variety of approaches have been tried here. In our National Profiles we sometime simply identify the main sources of benefits and costs (advantages and disadvantages) associated with a reform proposal.

In our Case Studies we use our accounts framework to consider the financial costs and benefits (in the form of revenues). This use of the proportionate criteria, in the form of account balances, helps identify whether the case study MWWUs are in net financial balance in 1) their operating account, 2) their capital account, and 3) their accounts when expanding or up-grading service. In the Case Studies we also sometimes explore proportionality by comparing monetized costs and physical changes in effluent production. This results in a kind of primitive cost-effectiveness analysis. We recognize that this kind of comparison falls far short of the fully monetized ideal social benefit-cost proportionality measure, but it can still be helpful in structuring analyses and guiding public policy decisions.

To supplement the financial balance and cost-effectiveness calculations in the Case Studies, we also compute "burden indices" that suggest how much of a burden supporting a MWWU will be to a local

community or household.[4] These indices are usually a percentage ratio of some measure of expenditure on water and wastewater services to some measure of total budget. The question one hopes to help address with this information is whether an increase in this percentage is reasonable in proportion to the additional services received? More concretely, does the prospective increase in a households expenditures for water and wastewater services from 2% to 4% of disposable income seem reasonable in proportion to the increased level of service it may expect to receive?

Practical – Assuming that proposals are found effective and proportionate, we are also concerned that there is some basis for getting them implemented. Part of this criterion is economic. Is there some way to put these reforms into operation with a minimum of "transactions" costs? Some way to further limit the costs associated with any change? Part of this criterion is political. Is there the political "will" to implement a proposed reform in an effective and proportionate way? Are there influential groups or individuals who would be, or can be persuaded to be, supportive of the proposed reform? Correspondingly, are there groups or individuals who will be likely to opposed to the reform? If so, are there some variations of the proposal that might be used to reduce or eliminate this opposition without compromising the effectiveness and proportionality criteria of the reform?

This criteria, too, is extremely difficult to make operational or determine with precision. In fact, we don't try to provide any formal calculation of the practicality of a reform beyond citation of some of the more obvious practical problems. We base our proposals and their variations on our judgment of what is more or less practical. Ultimately, the process of review and implementation in Phase II will determine the extent to which these judgments have been correct or not.

Figure 3 and Figure 4 present forms for reform strategy descriptions and evaluations that were developed to help the T&C Project team describe and evaluate reform proposals. We would recommend that any national and local policy maker also provide the information and answer the questions asked in these Figures as part of their own evaluation process.

[4] Such calculations are sometimes called "affordability" measures. We feel this is a mis-nomer since anyone can afford to pay for a good up to the limits of their disposable income. The real issue is one of "burden" or reasonable burden given the cost of other goods and services that are important to the household.

Figure 3 Reform Strategy Description

TARIFF AND CHARGE REFORM STRATEGY DESCRIPTIONS

Author: _____

Date: _____

Issue: The issue of particular interest

Issue Summary: Summarize the issue, including: scope, applicability, features of interest, and link to other issues or considerations

Possible Reform Strategy(ies): *List the strategy(ies) that you think should be considered. Add rows for additional strategies or more numerous descriptive elements.*

Strategy Name	Strategy Description	Comments/Concerns

Figure 4 Reform Strategy Evaluation

TARIFF AND CHARGE REFORM STRATEGY EVALUATION

Author: _____

Date: _____

Cross Reference the Reform Issue. *Enter the issue and strategy descriptions that you are evaluating*

Strategy Evaluation - Effective? Proportionate? Practical? *For each strategy identified, note advantages and disadvantages and evaluate each advantage or disadvantage qualitatively or quantitatively relative*

Strategy Name	Advantages		Disadvantages	
	Advantage	Evaluation	Disadvantage	Evaluation

Recommendation(s) – Make a recommendation(s) for these strategies-which to adopt, which to drop, and which require more examination. If further examination is required, how would you recommend it be undertaken?

2 Background on Water and Wastewater Tariff and Effluent Charge Designs and Experience

As “economic instruments”, tariffs and effluent charges work by using financial incentives to encourage behavioral changes. The linkages from these incentives to pollution reduction are numerous and vary in both the direction and size of their effect. Annex 1 contains an analysis of these linkages for an increase in a simple commodity charge tariff. Annex 2 contains an analysis of these linkages for an increase in a simple, single pollutant effluent charge. We encourage those readers who are eager for analytical background to read these Annexes. In this chapter we discuss the various objectives of tariff and effluent charges, the way in which various designs achieve or fall short of the different objectives, and some international experience when various tariff and effluent charge design strategies have been put into practice. We begin with water and wastewater tariffs and then turn to effluent charges.

2.1 Tariff Design Options

The fact that MWWUs are legal local or regional monopolies usually gives them considerable flexibility in the design and setting of tariffs.[5] For local water monopolies, pricing power is only limited by the costs of self-service (which for drinking water and wastewater is often pricy and/or inconvenient) and whatever additional economic regulation and oversight has been established in the community and country. This pricing power is why, in considering tariff reforms, we are also concerned with concurrent reforms in policies and institutions that provide economic oversight of the local and regional MWWU monopolies.

2.1.1 Revenue Requirement Designs

Meeting "revenue requirements" – collecting enough revenue to at least cover the cost of providing the service – dominates tariff design. This is quite reasonable given the fact that tariff studies are often undertaken by managers who are also responsible for paying the bills of the MWWU. One common design rule of thumb for meeting revenue requirements is "average cost pricing". This means that commodity charges are established by dividing total cost of service by total water delivery. Of course, there are other ways to set tariffs so as to raise enough revenue to cover costs. These often begin, however, with average cost pricing as a point of departure.

2.1.1.1 Cross-Subsidization in Favor of Household Customers

A common practice in tariff design has been to shift much of the burden for paying for the municipal water system to non-households. While this does not make good economic policy (see the discussion of cost-based tariff designs below) it is popular with household customers and their representatives in the municipal government. The design often involves reducing commodity charges for household or residential customers below their average cost and raising them for other, especially industrial,

[5] The strength of MWWU monopoly pricing power is important and sometimes critical to an assessment of tariff and effluent charge reforms. This is the reason why, in the country reports, we develop discussions of the features that affect this power e.g., the definition and durability of exclusive service areas, the possibilities for self-supply of both drinking and wastewater services.

customers above their average costs.[6] Revenue requirements are met by raising non-household commodity charge tariffs just enough to offset the loss in revenues from the reduction in household customers' commodity charge tariffs. Of course, there are practical limits on such cross-subsidization. In particular, if industrial or other large customers can creditably threaten to develop their own water and wastewater service or move to a new community, cross subsidies to households will be constrained.

2.1.1.2 Revenue Requirements and Cost Control

Cost control is an important issue with any regulated public monopoly, including MWWUs. With inelastic demand (see below), tariffs can be raised to cover costs with little or no erosion in the revenue stream. This reduces the pressure to control costs. As a public company, management is especially loath to make un-popular decisions regarding employment or wages. It is, quite simply, often easier to add employees and raise wages and pass these costs along to customers. These pressures apply under all tariff designs, but other tariff designs usually require more information on the source and nature of costs for different customers and different services than average cost tariff designs. Under a simple "average cost" tariff rule, detailed cost center and cost accounting information is not required, so it is usually easier to hide excess or excessive costs.

2.1.2 Cost-Based Designs

2.1.2.1 Full Cost Pricing

One principle of tariff setting usually endorsed by economist and, in qualified ways, by international organizations such as the EU (Water Framework Directive) is "full cost pricing". They argue that, generally speaking, service should not be cross-subsidized by transfers from other programs or budgets so as to artificially reduce tariffs and increase resource consumption. Tariffs should equate the cost of providing service with the willingness-to-pay (demand) of service users. To do otherwise would result in “excessive” or inefficient water use. In keeping with this principle, the EU Water Framework Directive encourages tariffs based on 'full cost recovery'.

This principle can be extended to assert that MWWUs should set tariffs based on the particular costs associated with serving a particular customer or class of customers. For example, industrial customers with wastewater that is rich with difficult to treat pollutants may be charges higher tariffs than the average customer.[7] Economists encourage setting rates based on the costs incurred in serving a particular group of customers. Such differentiation in tariff setting promotes efficiency of resource use and is simply application of the "full cost recovery" principle at a more refined level. In this context, it means that one group of customers is not responsible for paying for, or "cross subsidizing", the service provided to other customers.

Unfortunately, properly assigning costs to customers cannot always be done uniquely using a solid economic rationale (Hall, 1973; Lau 1978). In particular, costs that are incurred independently of the number of customers or water consumption, sometimes called “joint costs”, makes assignment of costs to particular customers difficult. Sometimes assignment of these costs have a veneer of plausibility, but they ultimately lack a compelling economic justification. For example, overhead costs cannot be assigned to customers exactly in proportion to the overhead costs they impose on the system because

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[6] It is not necessarily a case of cross-subsidization when household customers pay lower tariffs than industrial or commercial customers. The difference may be due to differences in the cost of serving these different classes of customers. See the discussion of cost-based rates.

[7] Note that such tariffs, while perhaps based on effluent levels, are not effluent charges as discussed below. They are charges for wastewater collection and treatment service.

so much overhead activity is "joint" – it is performed for all customers simultaneously. Some suggestions for assigning overhead costs include setting them in proportion to 1) the number of customers in the system (in a 100 customer system, each customer pays $1/100^{th}$ of the overhead costs), 2) the length of time a customer has been served, or 3) the size of the service line that connects the customer to the system. None of these criteria has a completely satisfactory economic justification for assigning the joint costs i.e., none is clearly more economically efficient than the other although assignment based on consumption may be clearly inefficient. We will return to this issue again as we discuss tariff designs below.

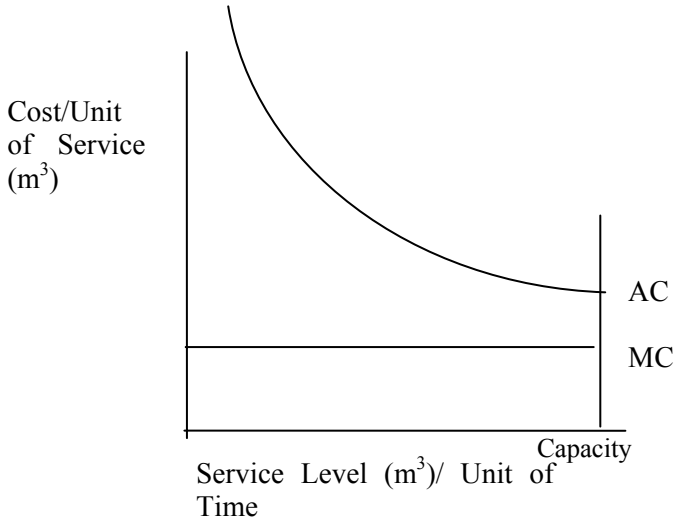
2.1.2.2 Marginal and Average Cost Pricing

Another tariff design principle encouraged by economists and international organizations such as OECD (2003b) is "marginal cost pricing". With some qualifications, such pricing is fully, socially efficient. [8] This occurs when tariffs are set at the marginal cost (not the average cost) of providing service to the each customer. Assuming that customers are purchasing service so as to maximize their welfare, setting tariffs at marginal cost assures that customers purchase the efficient amount of the service i.e., the amount that equates the marginal cost of producing that last unit of service with the marginal benefit of consuming that same last unit. Unfortunately, setting tariffs for water and wastewater service at marginal cost may pose some problems.

In a "natural" monopoly like a municipal water and wastewater utility we often have decreasing short run average costs and constant (or rising) short run marginal costs of production up to the point of current industry capacity. This is illustrated in Figure 5 below. The practical explanation for such a short run cost structure is the high, lumpy fixed cost of infrastructure that supports production. In the extreme, all infrastructure is installed before any water service is actually produced. The marginal cost (MC) of service, after construction of the infrastructure, is the sum of operating costs, such as the cost of energy, labor, and chemicals, used to produce each additional m^3 of water. The MC line shows that average cost of each unit of water produced is roughly constant. As more water is produced, the average cost (AC) of production – the line the decreases as production increases - declines because the fixed cost of infrastructure can be spread over more units of service output. The marginal cost in this setting, however, is lower than average cost at all service levels up to capacity.

[8] The equivalence between efficiency in pricing and efficient use of resource generally is contingent on general application of efficient pricing. If there are gross price distortions in other parts of the economic system, then we cannot be as certain that full cost pricing in one market will result in higher efficiency for the economy in general. This issue is discussed in the economics literature as the "theory of second best". Furthermore, this validity of this result also depends upon having already established policies that "internalize" environmental and other externalities.

Figure 5 Municipal Water Utility Short Run Costs: Decreasing Average Cost

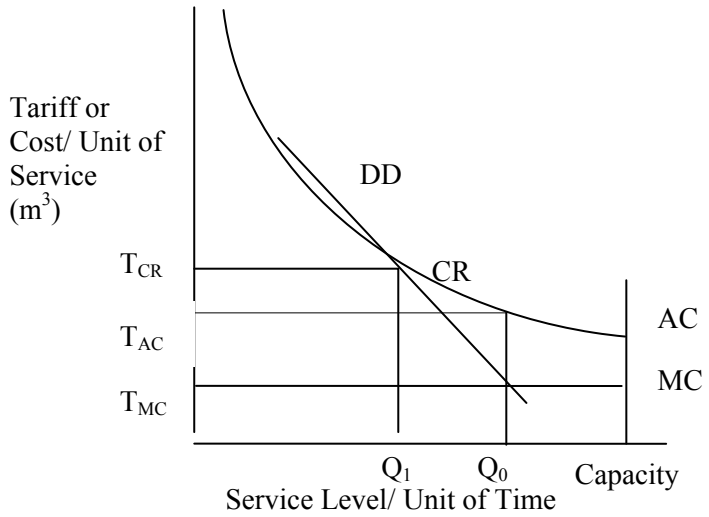


From the social efficiency perspective, using the infrastructure doesn't cost anything once it is installed; all fixed infrastructure costs are sunk costs. The efficient level of service provision is that which equates demand with marginal costs. Thus, efficient tariffs should be set at marginal cost and customers should be allowed to purchase as much water as they are willing to buy up to the limit of system capacity. Any other tariff design would, from a social efficiency perspective, "underutilize" the water system.

This policy, however, can create financial problems for the MWWU if the commodity charge, set to MC, is less than AC. In Figure 6, we show an example of a case where the demand (DD) for water services intersects MC and AC at a level below current capacity.[9] When commodity tariffs are set at MC (T_{MC}), the demand for service is Q_0. This is the efficient marginal cost based level of service provision under these circumstances.

[9] Marginal cost pricing in the long run i.e., when demand at short run marginal costs exceeds capacity, involves a extension of the analysis that we don't develop here. For the time being we simply note that marginal cost pricing principles direct policy makers to allow tariffs to rise above short run marginal costs so as to just reduce demand to a level consistent with current capacity. Such tariff setting should be practiced up to the point when these tariffs rise to the level of long run marginal costs. In other words, the long run marginal costs that are used as a reference for tariff setting are based on the marginal costs of building and operating the infrastructure needed to add additional capacity. For an elaboration on the theory and practical application of marginal cost pricing in the context of water utilities see Russell and Shin (1996a and 1996b).

Figure 6 Municipal Water Utility Costs: Setting Tariff at Short Run Marginal Cost



One problem with this example of marginal cost pricing, however, is that the revenues collected (T_{MC} * Q_0) are less that the costs of providing that level of service (T_{AC} * Q_0). Setting tariffs at MC results in a short run budget deficit for the MWWU. Moreover, the short run can last for years if the MWWU has built a large capacity system relative to demand.

This issue – setting efficient tariffs when there is substantial excess capacity – is a common problem for the MWWUs of the ME DRB. Due to economic restructuring water demand of industrial customers has dropped sharply, leaving substantial excess capacity. This has often resulted in reductions in MWWU revenue. Efforts to compensate for this revenue loss from industry have included raising the tariffs to residential customers. This has sometimes resulted in even further reduction in demand for water. As Figure 7 illustrates, you have to move back along the demand function to the point where DD intersects the AC before tariffs are once again high enough to cover costs. This is the cost recovery tariff level T_{CR} and service level Q_0. Fortunately, Figure 6 probably exaggerates the problem slightly relative to the ME DRB MWWUs. For one thing, much of the excess capacity was built with Central Government grants, so the real AC function probably does not lie so far above the MC function. Secondly, the demand for W&WWS is likely to be less elastic than that depicted, especially as the tariffs rise and conservation become more difficult.

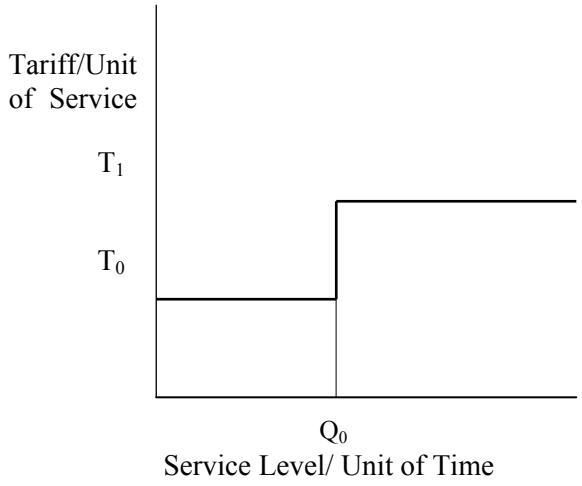
As noted above, many MWWU managers and water utility trade organizations argue that tariffs should be set at average costs. This assures that total costs will be covered by total revenues. While this would also result in inefficiently low levels of water use in the short run, they believe the disadvantage of lost efficiency is small relative to the advantage of financial stability that average cost pricing achieves.

Another tariff design strategy is to combine marginal cost pricing, in the form of a commodity charge tied to operating costs, with a fixed charge per customer that is designed to make up for any shortfall in the revenues. A fixed charge is a lump sum payment that will not significantly distort the efficiency advantages of a commodity charge based on marginal costs. It also has the advantage that it may be set and assigned to customers using virtually any criteria except the level of service used by the customer. On the other hand, the fixed charge may be significant. In cases such as that illustrated in Figure 6, it may be as large as the average commodity charge. Because of this, it may be difficult to find a way of adopting MC pricing in combination with a fixed charge that will be acceptable to key MWWU policy makers.

2.1.3 Equity Designs

The equity criterion asks that tariff setting reflect the ability-to-pay of customers as well as their willingness-to-pay. Ability-to-pay is not an observable criterion, so there are many operational variants. One common variant is "two part pricing" in which two tariffs are set. Such a design is illustrated in Figure 7 below. The first tariff, T_0 is a commodity charge set at some value lower than average price. It applies to some initial level of consumption Q_0, for example the first 2 m^3 of water per month for a household customer.[10] The second tariff, T_1, is higher, sometimes much higher, than average price and is a commodity charge that applies to all consumption above Q_0 m^3 per month.

Figure 7 A Two-Part Commodity Charge Tariff with the Second Part Applied after Consumption of Q_0



The two-part tariff is considered by many to be a compromise between efficiency and equity objectives. The assumption is that customers with low ability to pay will also exhibit low willingness to pay. They will consume at levels below Q_0 and will expend relatively little on water services. Other customers are assumed to have a high ability (and willingness) to pay and will consume at levels well in excess of Q_0 in Figure 7. If most customers consume above Q_0, and the Second tariff is roughly equal to marginal cost, then the two part tariff will both provide some expenditure relief to low demand customers and provide the approximately correct social marginal cost signal to the high demand customers.

As in the case of marginal cost pricing, however, two-part tariffs that provide significant relief for low demand consumers and charge other customers marginal cost may not meet "revenue requirements". There may still be a shortfall in revenue and, if revenue must cover cost, the two-part tariff designer may find it necessary to compromise some or all of the equity and efficiency advantages of the original design. Also, two part tariffs are not, efficient if some of the customers are paying tariffs that are either less than or greater than their marginal cost of service. The more the tariffs deviate from marginal cost, the greater the inefficiency.

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[10] The first commodity charge can, and often is, recast as a fixed charge. One does this simply by setting a fixed charge equal to the first tariff rate, T_0, times the amount of service (m^3) to which this rate applies. The result becomes a fixed charge and, when paid, is said to qualify the customer for up to Q_0. For example, if the initial tariff is set at .50 € for 4 m^3 of water per month, the fixed charge is 2 € per month and qualifies the user for up to 4 m^3 of water a month for "free". While motivated by entirely different considerations, such a tariff regime may be the first step toward an often efficient two-component tariff system in which the fixed component is set to cover fixed costs assigned to the customer, while the variable component is set at MC.

2.2 Lessons on Tariff Reform from International Experience

Partly because of the many and sometimes conflicting objectives of tariff setting, it is difficult to develop and successfully implement tariff reforms that, on balance, improve services at reasonable costs. The problem is widely recognized and some experience with the process of tariff reform has stimulated some useful observations regarding successful implementation of genuine reforms.

2.2.1 Leveraging Crisis

The reform process, including discussion of alternatives and resolution of conflicts, usually moves faster if it is stimulated by some "crisis": a technical failure, a drought, the imminent end of an existing supply contract, etc., cf. Hall (1996a). While we would never recommend "manufacturing" a crisis to expedite reform, it is important to recognize that such circumstances can galvanize local citizens and authorities to action, including adoption of tariff and investment reforms that make sense even after the immediate crisis has been addressed. Recognizing such a relationship might be one basis for deciding where and how hard to push for implementation of beneficial, long-term tariff and effluent charges reforms.

Of course, we also recognize that the value of this observation may be slight in those countries and communities of the ME DRB that have had a surfeit of crises over the past decade and a half. In a political and economic environment in which change has been the common denominator and crises of various sorts a daily fact of life, any impetus to reform sparked by such change may easily be offset by the desire for stability.

2.2.2 Consideration of Compensation for "Losers"

Welfare economics is based on the notion of seeking policies that result in Pareto “improvements”. There is a net improvement in welfare if the benefits of the change exceed the costs. Another way of saying this is that the beneficiaries of the change can make lump sum side payments that fully compensate those who lose for their loss and still be better off. The difficulty with making such improvements the basis for choosing a policy reform is that such compensation very rarely actually takes place. In certain respects this is the result of a practical problem: it is so difficult to correctly identify the winners and losers, calculate the extent of their loss, and arrange for compensating payments from the winners that are neutral with respect to the merit of the original policy change.

In the case of the tariff reforms considered here, we doubt that the losers can be ignored. For the most part, the losers are the customers who have to pay higher tariffs to support changes in the system. Their roll as owners and indirect directors of many of the MWWUs, through their municipal representatives, give them special influence on the adoption of reforms. They must see as least some “compensation” for the tariff increase, perhaps in the form of improvements in service reliability, cost savings in the long run, or some other benefit that is coincident with their experience. Some of these benefits may be natural products of the reforms, but others may have to be designed into the reform itself.

We cannot say, more generally, how a tariff reform should be done to accomplish this. We know that trying to provide compensation through increasing block tariffs has problems in practice (see below). The discussion of the design options described above may provide some ideas. Still, we want to encourage those who are working on the details of implementation to think about the ancillary features of a reform that can be used to attenuate the opposition of the clear losers without imposing costs that exceed the benefits of the new policy.

2.2.3 Performance Audits

An approach used in the field of 'performance accountability' (regular reporting about the economy, efficiency and effectiveness of public services) is that service providers or regulatory bodies identify a set of performance indicators and performance targets for the public service, including possible cost reduction targets. Service providers aim to reach those performance targets during the year, and in their annual reports they publish their performance results. This is an approach mostly used in the English speaking countries and Northern Europe, it is spreading in the world as it is seen a kind of "best practice". Of course, the indicators have to be very carefully selected or created in light of the specific nature of the given service, and they have to be 'objectively verifiable'. The performance audits may be an effective way of promoting good management and cost control in a local public monopoly.

2.2.4 Multipart, Increasing Block Tariffs

OECD (2003b) warns that trying to protect low income customers from tariff increases by adopting increasing block tariffs (IBT) is not a well-targeted policy. Too many of poorest households are not protected financially and more affluent households often are. Boland and Whittington (2000) devote a article to the subject and note that IBTs:

1. Are not commonly used in industrialized countries.
2. Purported advantages – income redistribution (several ways), economic efficiency, public health, and conservation - each may be an illusion upon further analysis.
3. In practice: for six developing cities
    a. Lowest, initial blocks tend to "spread" and bestow the lowest rate on many more customers
    b. MC at only a few blocks, so "30-75 percent of household pay artificially low first block" tariffs
    c. Break points in the blocks can result in large errors in revenue estimates for new tariff levels.
    d. Only an "optimal departure" from efficiency under special, technical conditions.
    e. More complicated IBTs provide misleading or confusing price signals.
    f. Counterproductive for unmetered household or household that share a connection.

Bolland and Whittington conclude by recommending a single, MC tariff with a rebate (negative fixed charge). The technical condition for this type of tariff is – MC>AC – does not apply to the ME DRB countries in the short or intermediate run, but their recommendation to use a combined fixed and commodity charge is probably worth considering seriously.

2.2.5 Bundling of Tariff Reforms with Other System Reforms

One staple of the international literature on water pricing is the lament that the authorities have created legal, contractual, or political constraints that effectively bar the most effective reforms. This is the message of Cueva and Lauria (2000) for municipal water management in Dakar where past privatization contracts and political agreements with commercial growers (a customer category) severely limited the base for tariff reforms and made tariffs that stabilized the system much higher. They demonstrate how the opportunity to improve the service of the water system dramatically with only modest rate increases has been lost unless parallel reforms in the contracts and past agreements can also be re-negotiated. This is a dramatic example to the need to "bundle" reforms if the potential benefits of a tariff reform are to be realized.

2.3 Effluent Charge Design Options

The effluent charge is an economic instrument that provides an incentive to reduce discharges or polluting effluents from point sources. As described in Annex 2 it works through several links to pollution reduction, interacting with tariffs and having possible significant affects through the revenue use of the effluent charge revenue collected by a RU. As in the case of the tariff, the effluent charge can also have impacts beyond pollution control; on behavior, budgets, and other dimensions of service.

The effluent charge itself is usually set nationally, with the charge applied to any source in the nation. It is exceptional to find effluent charges that are set to reflect local waterbody-specific conditions. However, for some effluent charge designs there can be some local variation in the operation of the effluent charge due to local permitting decisions.

The advantages of different effluent charge designs will depend on the objective of the effluent charge. One objective may be to raise the effluent charges so high that MWWUs are "forced" to install tertiary treatment on all wastewater discharges. Another objective might be to set an efficient effluent charge by equating the charge with the marginal social damages of the effluent. Another objective may to maximize the revenue of the RU(s) that receives the effluent charge payments as income. In the following we discuss some design alternatives, but, to keep from getting overburdened and too hypothetical, do not try to construct analyses that relate to each of these objectives or the various institutional settings that might condition the results.

2.3.1 Effluent Charges: Fines or Taxes

Since most effluent emissions are subject to operating permits reflecting point or ambient emission standards or regulations, a main feature of effluent charge design is whether the change should only be levied for effluent discharges in excess of the permit or on all effluent discharges, even those within “permitted” levels. In the former case, the effluent charge design operates more like a fine for exceeding permitted effluent levels. As noted in Annex 2, this kind of design encourages effluent control only up to the point of the permitted discharge. At the same time, the design limits the financial burden the effluent charge places on an MWWU. The merit of this design – its effectiveness, proportionality, and feasibility - depends not only on the level of the charge relative to the cost of abatement and the damage of the effluent but on the set-points established by the permit.

An effluent charge that applies to all effluent flows, whether within permitted levels or not, is more of an effluent tax. It provides an incentive for effluent abatement below permitted levels and is a cost to the MWWU regardless of the extent of treatment or care taken in operation. If a country wants to design the effluent charge so that a charge is paid on all effluents, a legal or ethical issue may arise as to the validity and meaning of the permits that had granted MWWUs the “right” to produce effluents up to the permitted level. Such an effluent charge begins to look and behave more like a simple tax than an incentive to reduce effluents to efficient levels, especially if there is no attempt to link the effluent charge to the recreational, ecological or other damages caused by the effluent.

2.3.2 Effluent Charges Per Unit of Pollution

Most effluent charges are, in principle, levied per unit of pollution. Making them operational, however, requires the identification and measurement of pollutants, selection of pollutants to assess the charge on, and setting the charge level itself.

2.3.2.1 Load or Concentration?

The measurement of the concentration of pollutants in a wastewater stream is difficult and often costly. Combined with enough flow data, concentration data can be used to estimate the "load" – usually denominated in some weight of mass per unit of time - of a pollutant in a wastewater stream. Both measures, however, may be important in estimating the damage associated with the release of the pollutant in a water body. If one wants an effluent charge design that signals the severity of the threat to the receiving water body, one probably needs to not only select effluent charges that vary with the pollutant, but also ones that varies with both the concentration and load.

Indeed, it can even be the case that some effluents are beneficial up to a point. For example, a certain level of nutrient load is necessary for a healthy ecosystem since many species depend on the small animals that are nourished by the nutrients in the water column.

2.3.2.2 Selection of Pollutants

The selection of pollutants against which to apply an effluent charge can be all embracing or reflect a few "criterion" pollutants that are indicators of others. The pollutants subject to effluent charges might also be determined by their toxicity, the threat they pose to a given water body, and, perhaps most importantly, the cost of measuring the concentrations and volumes accurately. For those countries that have recently joined or wish to become part of the EU, the various water directives provide some specific guidance as to the pollutants that would have to be monitored in any case and these would, in principle, be good candidates for an effluent charge. The directives themselves, however, establish or promote effluent and ambient water quality standards. They do not direct the establishment of or set a level for an effluent charge.

2.4 Lessons from International Experience with Effluent Charges

Our first and perhaps most important observation regarding effluent charge experience is that there are no instances that we are aware of in which the effluent charge is used strictly as an incentive tool for pollution reduction. The effluent charge is almost invariably imposed in tandem with effluent standards and often serves to supplement other penalties for non-compliance with these standards. As noted in a recent study of environmental taxes and charges in EC countries (Ecotec Research and Consulting, 2001) in Germany and Denmark the effluent charge designs are based on the "fine" design and are sharply reduced on effluents that are within standards. In this sense they are designed like a multipart tariff, with much lower charges applied on the "first" block of effluents. Ecotec's elaboration regarding the German design is that, "emphasis …is on the technical discharges… and the tax (effluent charge) is a supplementary instrument used more or less as a penalty for non-compliance".

As of 2001, seven of the then fifteen EU countries had effluent charges (Ecologic, 2001). In the Netherlands, France, Spain, and Belgium the effluent charges are considered primarily as revenue instruments and incentive effects are "unclear but probably low" (Barde and Smith, 1997). The revenues are used for water pollution control measures. In England and Ireland, the effluent charges are designed to collect revenues, but rates are set to cover the cost of operating the effluent standards program (Ecotec Research and Consulting, 2001).

When it comes to the effects of effluent charges via the "cost side" i.e., the incentive to reduce costs, it is almost impossible to untangle the effects of the effluent charges from the standards and their enforcement. Most examinations, in fact, focus on the effects of effluent charges in general and not on municipal wastewater sources. Since most sources are industrial point sources, the role effluent charges have played in reducing municipal wastewater pollution is further obscured. A study of Danish municipal sewerage treatment by Miljøstyrelsen (1999), however, found improved compliance with standards coincident with the increase in the effluent charges but concluded that this was mainly the result of improved enforcement and that the effluent charge per se played only a supplementary

role in the improvement. In some instances, e.g., Denmark (Ecotec, 2001), the effluent charges include special considerations for different affected sectors. This is probably a good design feature but, again, one that makes it difficult to assess the effectiveness of the effluent charge in the municipal setting.

Finally it is also difficult to assess the effluent charge experience of those countries whose designs focus on the "revenue side" because, of course, the merit depends on the amount of revenue produced and how that revenue is allocated. Some of the effluent charge programs e.g., France, Netherlands, have been on-going for some time and appear to have passed the test of effectiveness at some very basic level: they have generated revenues and have survived. At the same time, however, one doesn't know whether the programs have been "proportionate" or how they would fare upon careful comparison to a counterfactual.

Some European countries have some innovative features in their effluent charges. Denmark, for example, designed its program as a "green tax" and revenues accrue to the general budget. It also makes substantial distinctions in the effective effluent charge rate based on the sector and the amount of household wastewater in the effluent stream. In Belgium, Italy, and Spain the effluent charge system is not national but they differ by region.

A recent EU parliament workshop on effluent charges included summarization of a report on effluent charges prepared by Ecologic (2001).[11] The broad conclusion is that effluent charges have been "an effective instrument for water pollution control". But this same report notes that the seven effluent charge programs in the old EU "differ strongly in functions, calculation methods, pollution parameters, level of charges, exemptions, and the use of revenues". There is no comparative analysis that suggests what consequences these differences have and how this experience might be used by the countries of the ME DRB.

[11] Ecologic is affiliated with the Institute for European Environmental Policy (IEEP). IEEP was, in turn, a collaborator with Ecotec Research & Consulting in its 2001 report on economic instruments for environmental protection.

3 Status of Municipal Systems in Danube River Basin Countries

There is a wide range in the size and extent of MWWU service systems in the countries examined in this report. Some service areas are coincident with a municipality and its immediate environs. In this instance it is often the case that the system elements are "technically dependent"; the system is well interconnected to common sources, distribution lines, collection lines and discharge points. Other MWWUs cover a "district" comprised of a core municipality and a few other larger towns in the vicinity as well as suburbs and villages in between. In this case, some parts of the system may be technically independent elements: independent well fields and distribution systems. Finally, in some countries one of the main forms of organization is the "regional" water utility. There may still be a central city that anchors this regional organization, but the utility can cover a large area, embrace some large industrial communities as well as significant cities, towns, and villages. Such a "regional" MWWU often has separate system elements: water sources, distribution networks, sewerage collection systems, WWT plants, and discharge points. All are within the scope of our study.

In this chapter the structure and operation of MWWUs of the study countries will be assessed through a variety of features. Our goal, besides providing a basic classification of W&WW utilities of the region, is to highlight those issues and problem areas, the handling of which is key to improved and more efficient water related services, to reduced release of toxics and nutrients into the Danube tributaries. The assessment of MWWU conditions in this chapter, together with the discussion of tariff and effluent charge purpose and design in Chapter 2 and the discussion of links between tariffs and effluent reductions (in Annex 1) and effluent charges and tariff reductions (in Annex 2), provides the basis for tariff, effluent charge, and supporting institutional reforms developed in succeeding chapters.

3.1 Organization of Water and Wastewater Utilities

Table 2 reviews the number of MWWUs of different size in the study countries of the DRB. In most of the countries there used to be a limited number of large W&WW utilities before economic and political transition in the early 1990s. These companies were closely managed by central authorities. In the beginning of the 1990s in some of the countries the obligation to supply W&WW services, as well as the ownership and management rights of the utilities were transferred to local levels, most often to municipal councils.[12] For a variety of reasons, such as demand for autonomy or cost differences in supplying water to participating municipalities, some of the regional companies were split into smaller units, corresponding to the geographical layout of the involved municipalities, and eventually resulting, in some cases, in a large number of relatively small MUs of great diversity. This process took place, most of all, in the Czech Republic and Hungary and it is discussed in detail in the National Profiles contained by Volume 2 of the present report.

A large number of MWWUs in any given country does not, however, mean that each of the individual utilities are small in size. Urban areas usually have one MWWU each[13], therefore the overwhelming majority of population in these countries is served by just a few dozens of MWWUs. Furthermore, while the small utilities are legally independent entities, they are not always technically independent of each other. They often purchase water from, and release wastewater to, the networks of neighboring MWWUs.

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[12] Romania is an exception in that local ownership and management, still with extensive central budget support, was the rule before 1990. Only in two cases were these roughly county-level management units further sub-divided in the 90s.

[13] Three exemptions from this observation are Prague, Budapest, and Zagreb where water service and wastewater service are separated and provided by two independent companies.

In some of the countries, such as Slovakia and Bulgaria, large regional companies dominate water services even today. Some of these companies were transformed into municipal ownership, but then stayed together as one unit, as separation was prohibited by regulation, or the potential advantages of breaking up the large MWWUs was either not compelling or overlooked for the time being.

As depicted in Table 3, devolution of central government ownership is either complete or well advanced and municipal ownership of MWWU fixed infrastructure is commonplace in the region. Some of the larger regional utilities in Bulgaria and Hungary are fully or partially owned by the central government, but most MWWUs in Hungary, and a significant number of MWWUs in Bulgaria are owned exclusively by municipalities. Moldova is the only country where the state is the predominant owner of water infrastructure, and prospects of near-future decentralization are uncertain. According to our information, private ownership of majority stakes in MWWUs is not allowed by regulation in any of the study countries, while minority private ownership is made possible by law in the Czech Republic, Hungary, Croatia, and Slovakia. In Slovakia there is only one instance of a private co-owner, in the Czech Republic only a few cases, while in Hungary private investors bought minority stakes in a number of medium and large MWWUs. In Croatia we are not aware of any private investment, other than some shares held by employees of MWWUs.

Private operation, as opposed to private ownership, is more frequent in the region. Central government-owned MWWUs, as far as we know, do not have concessions contracts for private operation, although such plans have been discussed in Bulgaria. Concessions are negotiated between municipalities and private operators, coupled with minority private ownership in some instances. Examples of private operation of municipal infrastructure can be found in part of the region, and these arrangements are more widespread in the Czech Republic, Hungary and Slovakia, than in the other countries. We are not aware of private concessions in Moldova and Bosnia. The lack of these arrangements is due partly to regulation, and partly to lack of interest in operating companies which are financially unstable with badly deteriorated or damaged infrastructure.

In the case of most concessions the role of concessionaires is limited to operation and management under policies established during concession negotiations. The concessionaire may recommend or propose a policy change or investment program but the authority to make strategic decisions is usually retained by the municipal boards.

Table 2. Number and Size of Municipal Water and Wastewater Utilities in Study Countries of the DRB

Country	Municipal Water and Wastewater Utilities	Distribution by Size			Comments
	Number of utilities	Large (> 100,000 inhabitants)	Medium (25,000 - 100,000 inhabitants)	Small (< 25,000 inhabitants)	
Bosnia-Herzegovina	106	No data			Bosnia has 134 municipalities (as administrative units, many times comprising of several settlements), served by 106 MWWUs. Data is from 1999.
Bulgaria	50	27	12	11	29 "regional" and 21 "municipal" companies. Some of the municipal companies are also large (e.g. Sofia) but most are quite small
Croatia	130	3; only Zagreb is in the DRB	8 above 35,000; 5 in DRB	About 120	
Czech Republic	1 600	20	100	1 480	
Hungary	377	24	353		2001 data. The number of the smallest utilities may have changed since then. The largest 24 companies serve 75% of the population.
Moldova	51	2	about 40	about 10	
Romania	565	23	~60	~480	Estimated data. Not every single utility provides W&WW services, but the overwhelming majority does.
Slovak Republic	11	11		Not recorded. These are small municipal water companies that usually provide a single service (e.g. drinking water supply) to their communities	5 regional and 6 municipal companies servicing virtually all municipalities in Slovakia. Some small municipalities are not yet part of the regional companies, but they will be joining them in 2004

Table 3. Ownership and Management of MWWUs in Study Countries of the DRB

Country	Ownership of the Fixed Infrastructure	Ownership Comment	Strategic Management of the MWWU	Policies and Day-to-Day Management of the MWWU
Bosnia-Herzegovina	FB&H (Federation of Bosnia and Herzegovina): • Utilities are owned by the municipalities.	FB&H: • Ownership of W&WW utilities is mostly regulated at level of the cantons (the Federation consists of 10 cantons). • Water supply facilities are the property of the cantons, unless otherwise defined by the cantonal water law.	FB&H: • Federation-owned wholesale water supply facilities are managed by the two Public Companies for Watershed Areas. These companies are also responsible for management of concession matters (although we are not aware of any concessions at this time). • Strategic planning at the MWWUs is carried out by the municipalities.	FB&H: • The utilities are allowed to be operated by a variety of entities, including both public and private companies, according to federal legislation. To our knowledge, most or all MWWUs are operated as municipal companies. • Most of the smaller municipalities operate a number of municipal services together with W&WW services.
	RS (Republika Srpska): • W&WW utilities are owned by either the republic or the municipalities.	RS: • Certain MWWUs are ”of state interest”, while others are ”of municipal interest”, depending on the amount of company capital, and the field and geographical territory of company activities. Private ownership is not allowed by regulation.	RS: • In companies of municipal interest, the Municipal Assembly elects the members of the governing bodies. • No data on how companies of state interest are managed.	RS: • W&WW utilities are operated by public companies. Private operation is not allowed by regulation. • A few of the smaller municipalities operate a number of municipal services together with W&WW services.

Country	Ownership of the Fixed Infrastructure	Ownership Comment	Strategic Management of the MWWU	Policies and Day-to-Day Management of the MWWU
Bulgaria	• 29 Regional Water Supply and Sewerage Companies. 13 of these are 100% central government owned and 16 jointly owned (51% by the central government and 49% by the municipality).21 municipally owned water and sewerage companies serving only small areas and populations. • In 2000 the concessionaire "international Water" and the municipality of Sofia registered the joint stock company "Sofiyska Voda AD" to operate the water supply and sewerage services of Sofia	• Private ownership is not a legal option at the moment.	• Strategic decisions are made by the owners (state – Ministry of Regional Development and Public Works and/or municipalities)..	• MWWU operations are managed by the owners (in most cases) and/or the concessionaire (infrequently) • A growing number of concessions are expected, though the process of establishing concessions has so far been slow.
Croatia	• 99% owned by limited liability companies controlled by one or more local governments.	• Sometimes employees have a minority stake in the MWWU. No known instances of professional private investors in MWWUs, even though they could legally have a minority stake in MWWUs. • Concessions (without ownership of infrastructure) are becoming more common, but municipalities, due to lack of such experience and fear of losing control, are very cautious in this process.	• Strategic management is usually delegated by local governments (and the concessionaire, if there is any) to supervising committees. Sometimes it is assigned to one of the partner local governments.	• Many of the smaller municipalities have the same limited liability company also operating other public services e.g., waste management.
Czech Republic	• Mostly owned by municipalities through joint stock companies. Occasionally minority ownership by private investors.		• Strategic decisions are generally made by join-stock companies, in which both operators and owners of infrastructure are represented. The real power depends on their mutual position in a particular MWWU.	• The joint stock companies operate the systems.

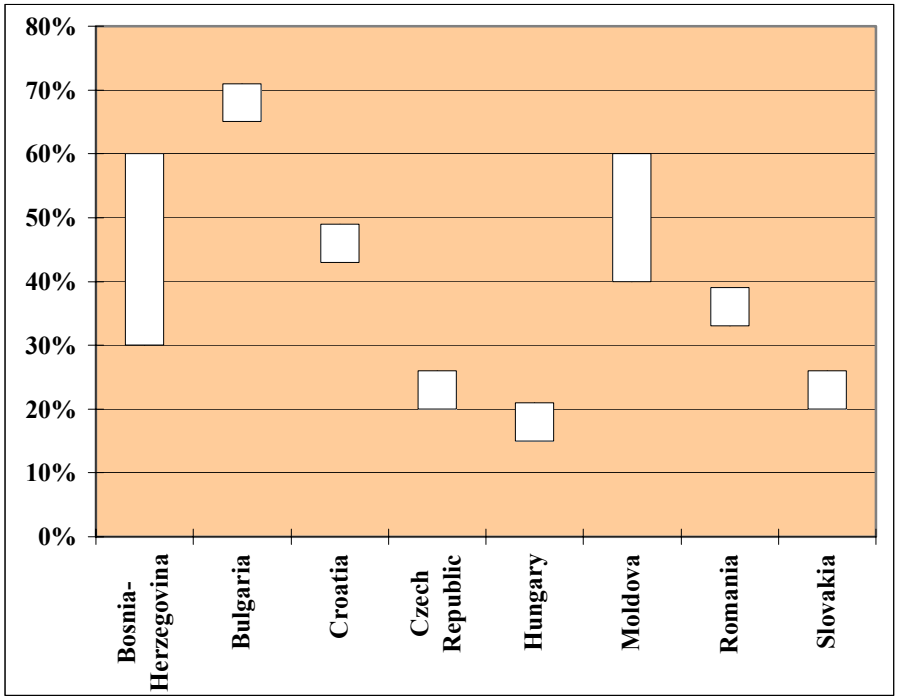
Country	Ownership of the Fixed Infrastructure	Ownership Comment	Strategic Management of the MWWU	Policies and Day-to-Day Management of the MWWU
Hungary	• 60% local governments • 20% central government • 20% joint ownership of municipalities and private investors	• Percentage distribution provided at the left is based on asset values. • By regulation private investors are allowed to have only a minority stake in a MWWU (up to 50% minus one share).	• Investment decisions (including savings for investments) usually rest with the municipalities. Strategic managers are appointed by the owners (and concessionaires, if there are any).	• The operating company usually represents the interests of the owners (and concessionaires, if there is a concession agreement). • Often the concessionaire pays a rent to the municipality for use of the infrastructure.
Moldova	• Central government ownership (through the Ministry of Economy and Reforms), except for Apa Canal Chisinau, which is owned by the municipality.	• Apa Canal Chisinau was transferred to the municipality in order to qualify for an EBRD loan. The loan, however, is guaranteed by the central government.	• Appointed by the municipal board with a veto right of the Ministry of Economy and Reforms.	• Takes place at the municipal level.
Romania	• All infrastructure is owned by municipalities		• According to ownership of the operating company	• There are concessions to operate the infrastructure in two big cities. In these cases operation is carried out by the concession company.
Slovak Republic	• 100% municipal ownership, except for Trencin, in which there is 49% private stake.	• Ownership opened for private shares by new regulation, but not tested yet.	• Strategic decisions, including appointment of strategic manager, are made by municipal boards.	• Municipal boards delegate day-to-day management to Ltd. Companies (municipal and/or private)

3.2 Status of System Infrastructure

In general the conditions of infrastructure and the quality of service are better in the North Western part of the region than in the South East. Daily disruptions of water service are ordinarily related to the poor conditions of infrastructure (e.g. fracture of pipelines, break-down of pumps) or financial problems of the MWWU (e.g. disrupted electricity supply due to non-payment of energy bills). Occasionally an inadequate supply of water resources also has a role in daily restrictions of water provision. Restrictions on service are more frequent and their duration is longer during arid periods, especially during the summer.

Estimated average distribution or leakage loss by country is provided in Figure 8. In the case of Bosnia-Herzegovina and Moldova it is uncertain if the water loss data include any unmetered consumption and illegal connections. Within some of the countries, especially the ones with higher national average loss, like Bulgaria, there is substantial variation of leakage among MWWUs, depending on the conditions of the distribution network. Water loss in some countries is on slow decline (e.g. Croatia), in other countries it is slowly increasing as the network degrades due to inadequate maintenance (e.g. Czech Republic). At MWWUs with high ratios of leakage the loss of water, and related increased operational costs notably contribute to the financial difficulties. Some of the MU scenarios in ASTEC, as described in the Case Study Documents of Volume 2 of the present report, examine the effectiveness of investments into leakage reduction. According to the results, there is room for improving the financial performance of MWWUs in the region through appropriately selected leakage reduction investments, which very often have short repayment periods.

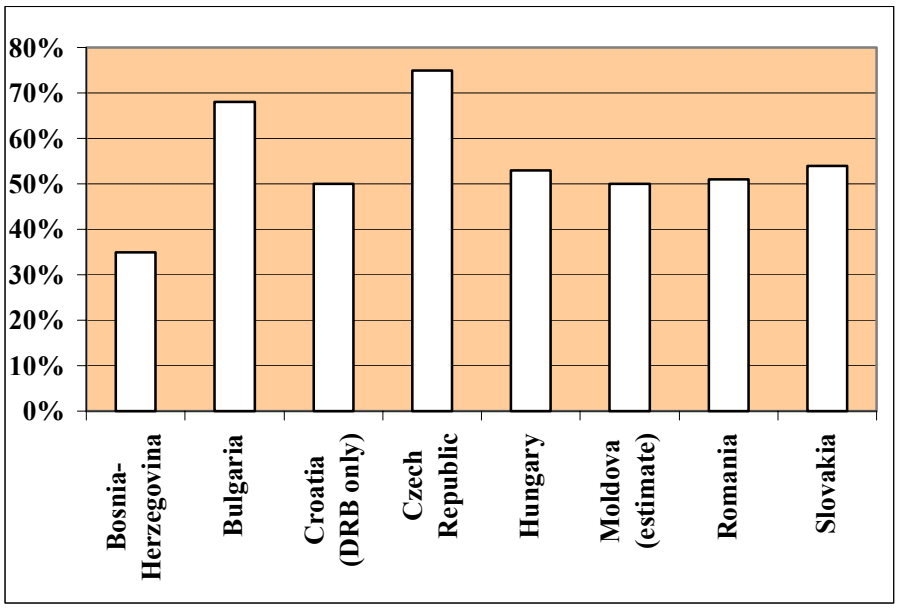
Figure 8 Average National Distribution Loss in Study Countries of the DRB



In most countries of the region around 50% of the population is connected to the wastewater collection network (Figure 9). Exceptions from this observation are the Czech Republic and Bulgaria (with higher sewerage connection rates) and Bosnia-Herzegovina (with lower sewerage connection rates). Connection ratios in the cities are higher than in rural areas. In Bulgaria and Croatia settlements closer

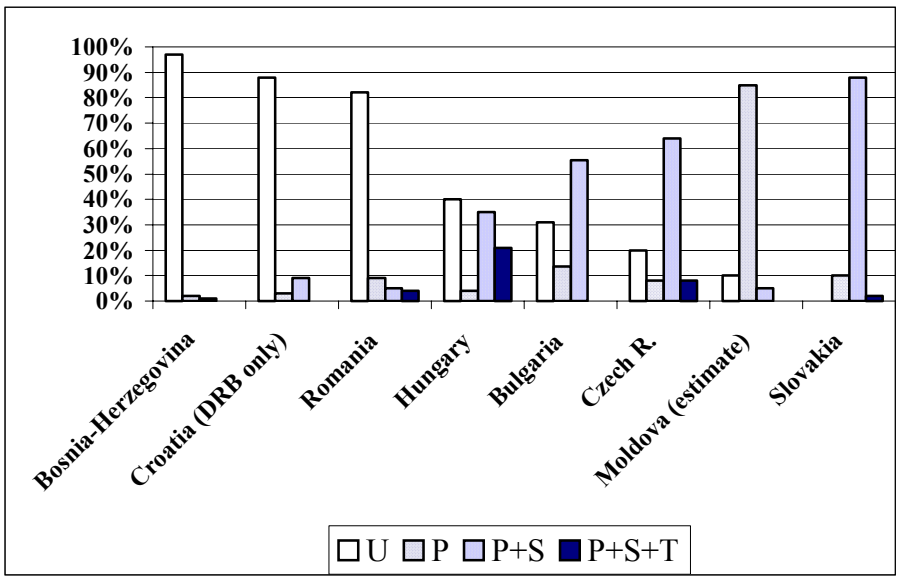
to the sea also have higher sewerage connection ratios than farther away towns. In some of the countries of the region (e.g. Croatia, Hungary) programs for expansion and construction/upgrade of the wastewater infrastructure are being implemented, therefore statistical data on connection rates and treatment levels is quickly getting outdated.

Figure 9 Percentage of Population Connected to the Sewer in Study Countries of the DRB



While connection ratios of wastewater do not show extraordinary variation within the region, the same is not true for treatment of effluent (Figure 10). A substantial portion of wastewater is treated biologically or chemically only in the Czech Republic, Hungary, Bulgaria, and Slovakia. In the rest of the countries most wastewater is either not treated, or only mechanically, with very low portions of secondary and tertiary treatment. Low levels of treatment are mostly explained by lack of WWTPs and lack of advanced technologies at existing WWTPs. In some cases, like in a number of MWWUs in Moldova, WWTPs do exist, but their operation is impeded by financial difficulties of the utilities.

Figure 10 Treatment of Effluent Collected by Wastewater Systems in Municipal Water and Wastewater Utilities in the Study Countries of the DRB



Notation: U = untreated; P = primary treatment only; P+S = primary and secondary treatment; P+S+T = primary, secondary and tertiary treatment.

Table 4. Service Reliability and Distribution Efficiency of MWWUs in Study Countries of the DRB

Country	Reliability			Distribution Losses	
	Daily	Monthly	Seasonally	Extent (Severity Index *)	Comment
Bosnia-Herzegovina	There is a low reliability of water services in general. The condition of the network is poor, the pumps do not always operate, therefore interruptions of service are common.			Serious (4)	Reported water losses are between 50 and 70 percent, but a large share of this is due to unrecorded and unbilled consumption. Actual leakage is estimated to be at around 30%, but this figure is rather uncertain.
Bulgaria	In some locations (where water supply is not sufficient to cover demand at present prices) water is not provided all day long. Restrictions on supply of water to the population usually apply outside of peak hours (during the night, and mid-day), and more frequently in villages than in towns. This is most common in communities that use a surface water resource but where there is no dam or major impoundment to provide adequate storage.	During dry periods water supply is more restricted than otherwise. Hours of the day when water will not be available are usually announced in advance.		Serious (4)	Average loss was 68% in 2002, with a range of 20% to 80% in the case of regional water companies.
Croatia	Generally reliable	Generally reliable	Generally reliable	Moderate to serious (3-4)	No system-specific data available. Average leakage is 46% of produced water. Some modest reductions in losses in the last few years. The situation is worst in areas which were directly hit by the mid-90s war
Czech Republic	The service provider guarantees an un-disturbed supply 24 hours a day. Any supply disturbance (e.g. in a case of a repair) has to be announced ahead and a provisional supply has to be provided, if there is a longer break in a supply.			Low (2)	About 23% of produced water. There has been a slow increase of losses in pipelines during the past decade.

Country	Reliability			Distribution Losses	
	Daily	**Monthly**	**Seasonally**	**Extent (Severity Index *)**	**Comment**
Hungary	There are infrequent and usually short (a few hours) disruptions of the service, e.g. if a pipeline ruptures or is damaged. In general, water supply is reliable.	In case of shortage of water supply (mainly in the summer) occasionally there may be administrative restrictions on water use – e.g. prohibiting watering of the garden. The supply of the water, however, is continuous.		Low (2)	The national average in 2001 was 18%
Moldova	All municipalities, except for the largest cities, regularly (often daily) experience disruptions in water service. The smaller a town is, the more frequent and longer the disruptions are. The main reasons for the breakdown of the service are financial problems (e.g. the MWWUs do not receive electricity at all times due to problems with debts to the grid operator)			Serious to high (4-5)	In some locations water loss reaches 70%. This figure may include illegal connections and unmetered consumption. No data on the national average water loss.
Romania	Water supply is in general reliable. Occasional rationing in dry periods.			Moderate to serious (3-4)	National average 36%. Regional variation: 21-49% Highest in the Bucharest region. In some settlements there is virtually no leakage, while in the case of one settlement it is above 80%
Slovak Republic	Reliable service in general			Low (2)	At a few locations water loss is at 40%, the national average is 23%

** High (5), Serious (4), Moderate (3), Low (2), Not a Problem (1)*

Table 5. Effluent Collection and Treatment in MWWUs in the Study Countries of the DRB

Country	Wastewater Collection	Treatment of Collected Wastewater				Comment
		Untreated	Primary Treatment	Primary and Secondary Treatment	Primary, Secondary and Tertiary Treatment	
		(Percent of all collected wastewater)				
Bosnia-Herzegovina	35% of households are connected to the sewer.	97%	3%			The sewers of the country are generally in bad condition. Usually sewage and storm water is collected in combined systems
Bulgaria	Very common in cities, rarely in villages. More common closer to the Black Sea than in other parts of the country. Wastewater from about 68% of the population is collected.	31%	13.5%	55.5%	0%	Estimation based on National Statistical Institute information for 2002
Croatia	In the DRB, roughly 50% of inhabitants are connected to a public sewer system	88%	3%	9%		Data are for the DRB basins in 1999.
Czech Republic	Common in towns above 5,000 inhabitants. About 75% of total population connected into networks	Estimate: about 20%	8-10%	60-70%	<10%	
Hungary	53% of the population is connected to the sewer. Large settlements have higher connection rates than small ones. E.g. villages between 2 and 10 thousand inhabitants have a rate of 26%, while towns between 50 and 150 thousand have a rate of 77%.	40%	4%	35%	21%	There are currently several on-going investments into both sewerage networks and into WWTPs, partly financed by ISPA grants, therefore the figures supplied here are likely to improve within the next few years. The data is from 2001.

Country	Wastewater Collection	Treatment of Collected Wastewater				Comment
		Untreated	Primary Treatment	Primary and Secondary Treatment	Primary, Secondary and Tertiary Treatment	
		(Percent of all collected wastewater)				
Moldova	Sewerage networks are present in the towns; but rare in villages. Between 60 and 90% of wastewater is collected from towns (the larger a settlement, the higher the collection rate). Only 10% of wastewater generated in villages is collected.	WW from towns is generally treated WW from villages is generally untreated	More than 90%	Less than 10%	0%	The technological potential to increase biological treatment levels exists. While most facilities are equipped for biological treatment, in practice the majority of wastewater is only mechanically treated due to financial difficulties (e.g. disrupted power supply because of irregular payment to the grid operator).
Romania	Very common in cities, occasional in villages. 51% of the population has wastewater service (out of 65% receiving piped water)	82% (out of which 4% does not require any treatment)	9%	5%	4%	Estimated values
Slovak Republic	Very common in cities, occasional in villages. 54% of population connected to sewage system	0%	~10%	~90%	Very low volumes (maybe 1-2%)	Statistical data about treatment levels is not entirely coherent.

3.3 Financial Status of Water and Wastewater Utilities in the DRB Study Countries

3.3.1 Financial Status: Country-Wide

The financial status of MWWUs in the study countries is described in Table 6. In two of the countries, Bosnia-Herzegovina and Moldova, current account losses predominate among MWWUs. In the rest of the region the W&WW sector as a whole either has a slight negative current account balance or just breaks even. While the water sector of a particular country may just balance out, there is great variation among individual MWWUs, including some with attractive, and others with troubled financial performance.

In Hungary, for example, the sector as a whole made modest profits according to a survey in 1998. While the current account balances in general were at acceptable levels, contributing to the maintenance of service quality, the situation of individual Hungarian MWWUs was rather mixed;. Some of them had substantial surplus revenues, while others accrued significant losses. Provision of water on the whole was a loss-making activity for the 90 biggest MWWUs, while wastewater collection and treatment was profitable. However, there were also examples of considerable surplus in water service, and loss in wastewater service.

Another good example for the variation among the financial status of MWWUs is Bulgaria. The accounting profit for all Regional Water Companies (RWCs) is about 1.5% of all revenues. Two RWCs, out of 29, make huge losses. Fourteen companies report current account net revenues equivalent to between 0 and 2% of revenues, while current account net revenues for eleven companies is between 2 and 5%, and for two companies over 15%.

While the current account balance is a key indicator of MWWU performance, this figure alone does not tell the whole story. There are companies with zero balance that, by properly and regularly maintaining the infrastructure, are on a sustainable path of operation. Some other companies also report they are breaking even financially, but they do not fully maintain their infrastructure and therefore experience a deterioration of system assets and quality of service. A large number of MWWUs in the ME DRB appear to belong to the latter category. Their operation should probably not be considered as financially stable in the longer term. In order to better understand this situation, the claim of a current account balance has been tested in a number of the project case studies. In particular, attention was given to possible "over depreciation" of assets to keep the system in short run current balance or crediting revenues that have not actually been collected to keep the current accounts looking healthy. This approach sets the foundation for big increases in costs in the future as infrastructure deteriorates and no financial allowance is usually being made for this condition. Detailed results of case study scenarios are in Volume 2 of the Final Report, while the results are summarized in Chapter 4 of the present report.

Financial difficulties of ME DRB MWWUs can be traced back to a number of factors. A major cause, particularly in less affluent areas, is insufficient collection of bills (see Table 6). For some MWWUs (e.g. in Bulgaria and Moldova) increased ratios of payment would help to go from a financial break-even or loss to a positive net revenue status – at least with regards to short run costs. Companies, however, do not in general have effective strategies to increase collection rates, partly because their state and municipal owners do not have real expectations of cash balances. In fact, many times, municipal decision makers would rather buy popularity at the expense of losing water revenues, as they decide not to pursue disconnection of non-payers. Disconnection is also often made more difficult or impossible by legislation (e.g. obligation to provide service for sanitary reasons) or technical reasons (e.g. several apartments are linked with one water pipeline). Let us note that

increased collection of bills is an important step towards sustainable operations and extension of service, but in itself may not provide enough relief for financially strained MWWUs of the region.

Another problem on the revenue side of company accounts is insufficient W&WW tariffs. The level of tariffs is often deliberately kept at an artificially low level in order to avoid conflicts which may result in political costs to decision makers.

On the cost side, many MWWUs in the region have low operating efficiency, as they have no real incentives to reduce costs or do not have the means to do so. Poor conditions of the infrastructure contribute to this problem, the most dramatic manifestation of which is leakage (see Table 4). In Bulgaria, for instance, the two companies with the most serious financial imbalance also have particularly high distribution loss, around 80%. High levels of costs can sometimes be associated with low penetration of metering, too, as households without meters lack the incentive to reduce water use, contributing to increased operating costs of the MWWU. Outdated machinery with high energy consumption and costly maintenance, and redundant and sometimes under trained workforce also contribute to financial difficulties.

MWWUs in bad financial positions follow different "strategies" to deal with current account problems. Cutting back on or reducing the quality of service is one way of reducing costs. Very often maintenance is neglected or it is carried out from government or foreign grants and preferential loans, and own resources are dedicated only to emergency repairs. State subsidies for operating purposes are rare. Development of infrastructure is usually out of question. While the MWWUs may wish to take on loans, actual commercial loans are rarely available for these companies, their options are limited to taking on unwelcome debts in the form of delayed payments for materials, energy and labor, or pursuing assistance from the state budget. In order to raise revenue, tariff increase is often targeted at politically less sensitive service users, especially legal entities, eventually resulting in cross-subsidies seriously distorting the price of the W&WW services.

Table 6. Financial Condition of MWWUs in the Study Countries of the DRB: Current Balances and Payment of Invoices by Service Users

Country	Current Account Balances		Non-Payment of Invoices	
	Description	Comment	Extent (Severity Index *)	Comment
Bosnia-Herzegovina	Most companies make a significant loss	Most companies would not break even, even if all bills were paid.	Serious to high (4-5)	Average national non-payment ratio is 60%. The worst payers are the military and hospitals, but there are problems with payment in each SU category.
Bulgaria	Most companies break even or have a mild surplus.	2 companies make a significant surplus, while 2 other companies make huge loss	Moderate to serious (3-4)	Average national non-payment ratio is 22%
Croatia	Most companies appear to be in current financial balance	Companies have difficulty saving for future investments	Low (2)	Around 10% nationally. A portion of actual payments, however, arrives only with delay, increasing the level of costs at MWWUs.
Czech Republic	Most of the companies are in a balance.		Not a problem (1)	
Hungary	There are profit making companies as well as loss making companies.	In general, the short and mid term operations of the companies are not threatened by negative current account balances.	Not a problem (1)	
Moldova	Most companies have a negative balance	Companies face financial difficulties constantly. They have difficulty paying for their inputs, such as energy and labor.	Serious to high (4-5)	Non-payment ratio is around 50% on average
Romania	The majority of companies have moderate profits (close to zero). A portion of companies (20-40%) incur losses.		Moderate to serious (3-4)	Non-payment is a location specific matter. Delayed payment used to be an important concern in periods of high inflation rates.
Slovak Republic	The sector as a whole has a slight negative balance, with some individual companies making loss, and others making low profits.	The service level in the short run is not threatened by the financial situation of the companies.	Low (2)	No problem for households, but problematic for some loss-making industries and public entities. Some of these industries provide "basic services", and it may therefore be politically risky to disconnect them from the water service

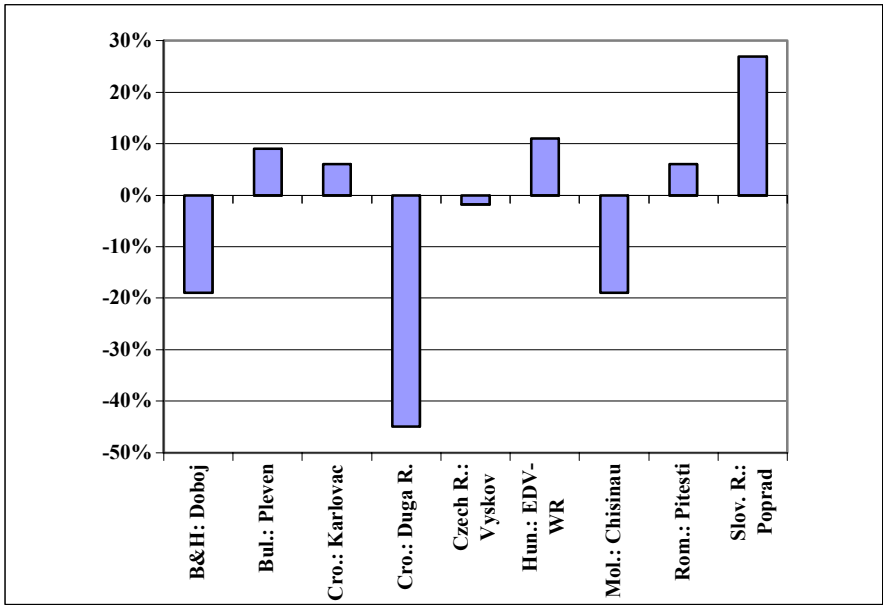
** High (5), Serious (4), Moderate (3), Low (2), Not a Problem (1)*

3.3.2 Financial Status: Case Studies

Table 7 reviews the current account balance and data on non-payment of the case study MWWUs. Our intention in the beginning of the project was to select case study sites, which would be representative of the study countries. Based on the financial status information of the case study MWWUs we think that this criterion was fulfilled for most countries.

The Doboj, Chisinau, and Duga Resa MWWUs, in Bosnia-Herzegovina, Moldova, and Croatia, respectively, incur substantial losses. These companies also experience high levels of non-payment, which are partly responsible for the negative current account balance. All other case study utilities are close to breaking even or have considerable revenue surplus (see Figure 11 below). Some of these MWWUs do not have difficulty collecting bills. Other companies (e.g. Pleven in Bulgaria) have some problems with non-payment, but nonetheless operate without major financial difficulties, at least in the short run.

Figure 11 Current Account Balance as a Ratio of Revenues According to ASTEC Baseline Scenarios



For a number of the case study MWWUs there is substantial difference between the actual reported current account balance and the one computed with ASTEC. The main reason for this is that ASTEC is used to "normalize" the case study conditions, especially with regards to accounting conventions. For example, some of the costs in the books are for repayment of debt that has little to do with the current operations of the MWWU. These costs, nevertheless, erode reported current account balances. In other cases the accounting depreciation distorts the books in comparison with actual cash flows. Sometimes the MWWU carries out a mix of activities or has a larger geographical scope than what is actually modeled (e.g. Poprad, Slovakia), resulting in a difference of modeled and reported account balances. A difference in base year, data problems and non-recurring financial items can also explain (some of) the difference between the reported and the computed financial balance.

Table 7. Financial Condition of Case Study MWWUs: Current Balances and Payment of Invoices by Service Users

Country and Case Study MWWU	Currant Account Balances (approximate figures in €/year)	Rate of Non-Payment of Invoices	Comments
Bosnia-Herzegovina: Doboj	• ASTEC: 160,000 €/year of LOSS (equivalent to 19% of revenues) • Reported: 70,000 €/year of LOSS in 2002 (equivalent to 13% of revenues)	About 25% for households, and 15% for industry.	Interestingly the ratio of non-payment is lower than average for multi-apartment buildings and higher than average for individual homes. This may reflect particular circumstances (e.g. difference in the level of welfare of different consumers) or problems with data consistency.
Bulgaria: Pleven	• ASTEC: 113,000 €/year of SURPLUS (equivalent to 1.4% of revenues) • Reported: 120,000 €/year of SURPLUS (equivalent to 1.5% of revenues)	About 18% according to official reports, and 8% according to ASTEC computations. Non-payment is greatest among households.	18% is the rate of receivables to revenue. In the ASTEC we assume that more than a half of these are eventually collected within a year
Croatia: Karlovac	• ASTEC: 215,000 €/year of SURPLUS (equivalent to 6% of revenues) • Reported: 99,000 €/year of LOSS in 1999 (equivalent to 2.6% of revenues)	About 15%	In addition to 15% of non-payment, there are also bills, which are paid with several weeks or months of delay. The difference between the actual and the computed balance can be due to the different base year, non-recurring items, problems with the reliability of the data supplied, and high depreciation in the books.
Croatia: Duga Resa	• ASTEC: 121,000 €/year of LOSS (equivalent to 45% of revenues) • Reported: 15,000 €/year of SURPLUS in 1999 (equivalent to 1.5% of revenues)	About 15%	In addition to 15% of non-payment, there are also bills, which are paid with several weeks or months of delay. The difference between the actual and the computed balance can be due to the different base year, non-recurring items and problems with the reliability of the data supplied.
Czech Republic: Vyskov	• ASTEC: 70,000 €/year of LOSS (equivalent to 1.8% of revenues) • Reported: Approximately in balance	Close to zero - not a problem	Operational cost completely covered by current payments. Within the reported costs a capital cost of about 10% of the capital invested (however established) is included.
Hungary: EDV-WR	• ASTEC: 400,000 €/year of SURPLUS (equivalent to 11% of revenues) • Reported balance is not available for the case study area, which is a subsystem of a regional waterworks company, in addition to a few local sewage service providers. EDV, the regional company has close to zero financial balance.	Close to zero - not a problem	The surplus is mostly related to water services, while wastewater services just break even. There is considerable cross-financing going on among SUs and services: from industry to households, from larger towns to villages, and from water service to wastewater service. Sustainable operation for short to medium run.

Country and Case Study MWWU	Currant Account Balances (approximate figures in €/year)	Rate of Non-Payment of Invoices	Comments
Moldova: Chisinau	• ASTEC: 3,300,000 €/year of LOSS (equivalent to 19% of revenues) • Reported: Information not available	About 50-55% for households, 40% for industry, and 10% for public units.	
Romania: Pitesti	• ASTEC: 330,000 €/year of SURPLUS (equivalent to 6% of revenues) • Reported: 0 €/year of SURPLUS (equivalent to 0% of revenues)	Close to zero - not a problem	Water service is cross-subsidized by net revenues of the wastewater service in the short run.
Slovak Republic: Poprad	• ASTEC: 1,250,000 €/year of SURPLUS (equivalent to 27% of revenues) • Reported: 1,250,000 €/year of SURPLUS (equivalent to 23% of revenues)	About € 3 million in 2002. This comprises mainly non-payment of industrial customers. Negligible portion belongs to households.	The loss reported by the Poprad MWWU also credits unpaid claims and the losses of the two neighboring units, which are under the same organization as the case study community of Poprad.

3.4 Water and Wastewater Tariffs

3.4.1 Tariffs: Country-Wide

In the study countries of the DRB most power for setting tariffs rests with the municipalities. Municipalities have a role in either setting tariffs, proposing tariffs or accepting/rejecting proposed tariffs. One exemption is Bulgaria, where the role of municipalities is limited to appealing against tariffs proposed by the management unit and approved by the public utility regulator. Why legally this situation is distinct from the rest, there is not much difference in practice, since municipalities have much influence on tariff setting as they appoint the management of the utilities.

Management units in most cases also have a role in the tariff setting procedure, but their actual power is much more limited than that of municipalities. They may propose tariffs, simply compute tariffs based on predetermined formulas and/or regulatory requirements or just provide data for tariff setting to the municipality.

State regulators have varying degrees of control over tariff setting. In some countries they do not have any major influence on tariff setting or at least we are not aware of such a role (e.g. in Bosnia-Herzegovina). In some countries the state provides anti-monopoly/competition overview of the water sector, either on a case-by-case basis (e.g. after a request is submitted) or by examining each and every tariff proposal. The state only has a direct tariff setting role when it is the majority owner of a given MWWU. This is the case for some of the Hungarian and Bulgarian MWWUs. Furthermore, by setting water use/ water management fees, effluent charges, and other taxes, the state has a significant indirect influence on tariff setting. Occasionally the state provides operating subsidies for selected MWWUs (e.g. in Hungary) and has an option to review tariffs before distributing subsidies.

The detailed rules of different parties on tariff setting are included in Table 8. Municipalities certainly have a difficult task when it comes to determining tariffs, as they would like to go along with several contradicting interests. On the one hand, they are in most cases majority owners of the infrastructure, and would be interested in realizing a return after their assets, upgrade and develop the service, or at the minimum they would like to maintain the infrastructure. All this needs cost-covering tariffs. On the other hand, they have service users, especially households, as their political constituency, with elections usually being held every four years. This appears as an obstacle to raising tariffs.

Concerning tariff designs the dominant tariff structure is quite simple in the ME DRB: one component variable tariff for provision of water and another one component variable tariff for provision of wastewater service (see Table 9). Application of a fixed charge is allowed by regulation in some of the countries, but this option is not widely used in most countries. Other charges, such as connect charges and service fees for repair also exist for some of the MWWUs, but not for the majority of utilities.

The tariffs within one MWWU are almost always uniform for all household consumers. In some of the countries there are several tariff designs for industrial users and other legal users, sometimes there are individually negotiated tariff schemes set in unique contracts between the MWWU and the largest consumers. Tariffs are frequently set at a lower level for households than for industrial consumers and other legal entities.

While in most study countries there is a variable tariff for every cubic meter of consumption, at some of the household consumers water meters are not installed, therefore instead of a metered amount, they need to pay based on an estimated lump sum consumption. These estimates are often based on metered amounts for a group of users together (e.g. all apartments within a large building, the water consumption of which is metered at the entry of the pipeline into the building), and then shared among the individual users through some commonly accepted or regulated method. Less frequently, the consumption of unmetered households is estimated by the MWWU uniformly across the service area.

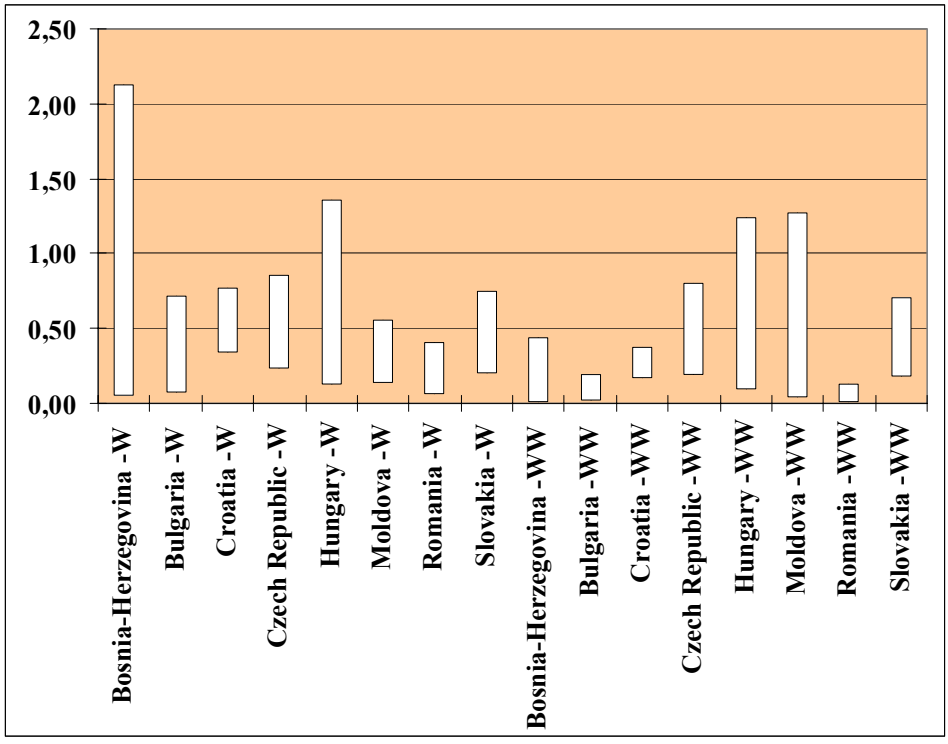
In this case there is a risk that some of the costs related to distribution loss will also be charged onto unmetered households. This is the case, for instance, in Chisinau, Moldova.

Figure 12 illustrates the ranges of water and wastewater tariffs in the countries of the region. Tariffs set by major MWWUs in each of the countries would fit into the respective ranges in the figure – while a few small MWWUs with unusual conditions may fall outside of these ranges. In case of multipart tariffs, which are occasionally applied in the region, a unit tariff was computed by dividing all payments with all consumption, in order to ensure comparability of tariffs.

The diagram clearly indicates that there is great variation of tariffs not only across, but also within countries. The difference between the lowest and highest tariffs within any particular country is 3-10 times, but in Moldova and Bosnia-Herzegovina it is up to 30-40 times. The variation in tariffs is especially large for wastewater services, which are provided at close to zero price in many locations without a WWTP.

In Hungary there are a few small and medium sized settlements with extremely high water tariffs, up to 8 €/m^3 (these tariffs are not displayed in the diagram below). Such high level tariffs, however, are only paid by non-household consumers, as there is a state subsidy system in place for those municipalities in which the cost of supplying water and wastewater services to households is excessive; if the justified costs of water and wastewater supply are above the limit published by the authorities each year, then the respective municipality can apply for a subsidy from the central budget to cover the difference between actual costs and the regulated price limit. The subsidy is only available for household services, non-household users must pay the full price.

Figure 12 Range of Water and Wastewater Tariffs in Study Countries of the DRB (€/m^3)



Tariffs often include transfers to the government in the form of water extraction charges, value added tax (VAT) or effluent charges. Effluent charges will be described later at section 3.5. VAT in the study countries is in general paid on water and wastewater; an exception is Bosnia and Herzegovina where there is not VAT on these services. In Moldova households do not have to pay VAT after their water and wastewater consumption. In all the other countries, both household and non-household

users pay VAT, but there is a preferential rate in Hungary and the Czech Republic compared to other goods and services – although in the Czech Republic the preference will likely phase out from 2005. VAT payments are revenues of the general state budget. The highest VAT rate in the examined countries is in Croatia, with 22%, although not all components of the tariff are subject to VAT, the water use charge, water protection charge and the development component (for investment purposes) are exempt from the VAT base.

There is great variation within the region in terms of the water extraction charge (WEC) - sometimes also called water management fee or water use charge. The WEC is usually proportionate with water use, but in Bulgaria it only applies to consumption above a certain limit. The level of the WEC very often depends on a range of factors, including purpose of use, origin of water (e.g. ground water, surface water), and location, but these factors are not always designed in consistency with the value of specific water resources. In Slovakia, for instance, extraction of ground water at present has a lower WEC, than use of surface water, even though ground water generally replenishes slower than surface water. The level of the WEC is low compared to water tariffs in some countries (e.g. Bulgaria, Romania, Hungary), and serves mainly as an instrument to collect revenue, while it is larger and may provide an incentive for reduced water use in other countries (e.g. Slovakia, Czech Republic, Croatia). Ideally the WEC is levied on water extraction at the source, providing an incentive to reduce not only consumption, but also leakage. In some locations, however, extraction at the source is not measured, and consequently the WEC is paid after consumed and billed quantities. WEC revenues either go to the state budget, or they are collected by a water fund, from which they will be disbursed for water related activities.

Table 8. Tariff Setting Process for MWWUs in Study Countries of the DRB

Country	Role of the Management Unit	Role of the Municipality	Role of Regulatory Units		
			Public Utility Regulators	Water Regulators	Other Regulators
Bosnia-Herzegovina	Determines tariffs based on the procedure determined by the municipality	Determines the tariff setting procedure, formulas and approves the tariffs			
Bulgaria	Makes tariff proposals based on the notion of cost recovery. Costs related to water loss in excess of 25% cannot be used as a basis for setting cost-recovering tariffs. In practice up to 10% of the collected tariffs creates the basis partly for net current revenue that could be used for future investments or to cover errors in cost estimates, revenue generation etc.	The municipality may appeal against tariff decisions at the "Competition Committee"	From 2004 a commission within the Ministry of Regional Development and Public Works is in charge of approving tariffs proposed by the MU		The Competition Committee may accept or reject a tariff proposal, if an appeal is submitted from municipalities or customers of the MU.
Croatia		Has wide latitude to set tariffs for water and wastewater service	The central government sets additional, earmarked fees and taxes that must be added to the local tariffs.		
Czech Republic	Makes tariff calculations according to formulas given by regulation.	As owners of the property, municipalities can push service providers to lower the cost of services.	State audit office can perform audit on request (and upon cost reimbursement) of the municipalities or the regional office if there is suspicion of application of improper tariffs.	No direct influence..	Ministry of Finance monitors if the tariff formulas given by regulation have been met.

Country	Role of the Management Unit	Role of the Municipality	Role of Regulatory Units		
			Public Utility Regulators	Water Regulators	Other Regulators
Hungary		Sets tariffs for municipal utilities. In case of concessions, the tariff setting formulas are usually included in the concession contract.	Appeals against tariffs can be submitted to the Office of Competition. Until now, however, there have been no such appeals.	The Ministry of Environment and Water sets the tariffs for the 6 state owned regional water companies. Furthermore, if household tariffs justified by the costs of any utility reach a threshold value, a central budget subsidy can be requested by the utility to be able to provide service to households at the threshold value without accruing related losses. The total nominal amount of subsidy available for distribution is more or less constant through the years, while the cost of W&WW services increase, therefore the tariff ceiling rises year after year.	There are plans for a Water Sector Authority (the duties of which are considered similar to existing authorities in other fields, like the Financial sector Authority or the Telecommunications Authority). The tasks would be to overview the operations of water utilities, making sure, among other things, that no monopoly power is exercised and that current practices are financially sustainable in the long run.
Moldova	Makes tariff proposals	Accepts or rejects proposed tariffs			
Romania	Makes the tariff proposal upon changes in costs; In case of a concession, formulas for regular tariff changes are included in the contract	Approves or rejects the tariff; In case of a concession, reviews that the tariffs is set according to the formulas and based on proper information	The approval of the National Authority for Public Services is required in normal cases i.e., without concession. The approval of the Ministry of Finance must be obtained for the update of the tariffs according to the formula set in the concession contract. (Up to 2004 the now-eliminated Office of Competition held this responsibility).		A governmental ordinance sets the major rules for tariff setting
Slovak Republic	Makes tariff proposals	Accepts or rejects proposed tariffs	Issues decision on tariffs: may accept or reject them.		

Table 9. Tariff Designs in MWWUs in the Study Countries of the DRB in 2003

Country	What is the Median Water Tariff? Median Wastewater Tariff? (Local Currency, €)	What is the Range of Tariffs for Water? For Wastewater? (Local Currency, €)	What are the Tariff Designs?				
			Different Tariffs for Households and Industry	Varies by Cost of Service to Customer Groups	Fixed tariff	Commodity charge (variable tariff)	Other features and comments (e.g. connect charge, special fees)
Bosnia-Herzegovina	• HH water tariff: 0.5 KM/m^3 0.26 €/m^3 • Industry water tariff: 1.19 KM/m^3 0.61 €/m^3 • HH WW tariff: HH 0.15 KM/m^3 0.08 €/m^3 • Industry WW tariff: 0.37 KM/m^3 0.19 €/m^3	• HH water tariff: 0.1-1.0 KM/m^3 0.05-0.51 €/m^3 • Industry water tariff: 0.3-4.16 KM/m^3 0.15-2.13 €/m^3 • HH WW tariff: HH 0.02-0.36 KM/m^3 0.01-0.18 €/m^3 • Industry WW tariff: 0.1-0.85 KM/m^3 0.05-0.44 €/m^3	Yes	Yes - in some cases	Yes - in some cases	Yes	Tariff data is from 2001. Increasing block tariffs in some municipalities for household customers. Connect charges usually apply. Other specific fees: turn on/off fees, late payment charges.
Bulgaria	• Water tariff: 0.68 BGN/m^3 0.35 €/m^3 • WW tariff: 0.12 BGN/m^3 0.06€/m^3	• Water tariff: 0.16-1.41 BGN/m^3 0.08-0.72 €/m^3 • WW tariff: 0.04-0.38 BGN/m^3 0.02-0.19 €/m^3	Yes	Yes *	No	Yes	Based on average tariff of regional water companies only, as data for municipal companies was not available. * Tariff designs are not always consistent with costs of service – sometimes SUs with lower costs face higher tariffs
Croatia	For a Sample of Seven Larger Cities. • Water tariff: 3.5 HRK/m^3 0.47 €/m^3 • WW tariff: 1.69 HRK/m^3 0.23 €/m^3	For a Sample of Seven Larger Cities. • Water tariff: 2.58-5.78 HRK/m^3 0.34-0.77 €/m^3 • WW tariff: 1.27-2.76 HRK/m^3 0.17-0.37 €/m^3	No	No	No	Yes	Connect charges do exist in some cases. The municipal owners have substantial discretion in design and level of the basic tariffs and assessment of other charges.

Country	What is the Median Water Tariff? Median Wastewater Tariff? (Local Currency, €)	What is the Range of Tariffs for Water? For Wastewater? (Local Currency, €)	What are the Tariff Designs?				
			Different Tariffs for Households and Industry	Varies by Cost of Service to Customer Groups	Fixed tariff	Commodity charge (variable tariff)	Other features and comments (e.g. connect charge, special fees)
Czech Republic	• Water tariff: 17.20 CZK/m^3 0.53 €/m^3 • WW tariff: 14.50 CZK/m^3 0.45 €/m^3	• Water tariff: 7.80 – 28.00 CZK/m^3 0.24-0.86 €/m^3 • WW tariff: 6.10 – 26.00 CZK/m^3 0.19-0.80 €/m^3	No	No	Yes - in some cases *	Mostly	* MWWUs have the option of applying a 2-composit system of pricing
Hungary	• Water tariff: 163 HUF/m^3 0.68 €/m^3 • WW tariff: 148 HUF/m^3 0.62 €/m^3	• Water tariff: 31-2058 HUF/m^3 0.13-8.58 €/m^3 • WW tariff: 24-1146 HUF/m^3 0.10-4.78 €/m^3	Yes/No	No (with some exceptions)	Yes/No	Yes	For some MWWUs a fixed tariff supplements the variable tariff. The data is from 2001. The extreme high tariffs apply to non-household consumers, since household prices do not generally go above the threshold value at which subsidies can be requested (see text above table). Instead of mean charges, weighted average of tariffs is supplied. Connection charge for services usually applies.
Moldova	• Water tariff (for a sample of three cities): 3.4 MDL/m^3 0.22 €/m^3 • WW tariff (for a sample of seven cities): 4.15 MDL/m^3 0.26 €/m^3	• Water tariff (for a sample of three cities): 2.23-8.76 MDL/m^3 0.14-0.56 €/m^3 • WW tariff (for a sample of seven cities): 0.07-20.0 MDL/m^3 0.04-1.27 €/m^3	Yes	No *	No	Yes	* Tariffs do vary, but unrelated to costs

Country	What is the Median Water Tariff? Median Wastewater Tariff? (Local Currency, €)	What is the Range of Tariffs for Water? For Wastewater? (Local Currency, €)	What are the Tariff Designs?				
			Different Tariffs for Households and Industry	Varies by Cost of Service to Customer Groups	Fixed tariff	Commodity charge (variable tariff)	Other features and comments (e.g. connect charge, special fees)
Romania	• Water tariff: 6200 Lei/m^3 0.15 €/m^3 • WW tariff: 1600 Lei/m^3 0.04 €/m^3	• Water tariff: 2,400-16,300 Lei/m^3 0.06-0.41 €/m^3 • WW tariff: 500-5,300 Lei/m^3 0.01-0.13 €/m^3	No	No	No *	Yes	Tariff data is from 2001. Since then, most tariffs increased by 30 to 40%, mainly due to general inflation in the economy. * The fixed tariff is a legally recognized option, but there is no evidence that it is used in practice.
Slovak Republic	• HH water tariff: 14.10 Sk/m^3 0.35 €/m^3 • Industry water tariff: 24 SKK/m^3 0.6 €/m^3 • HH WW tariff: HH 8.90 SKK/m^3 0.22 €/m^3 • Industry WW tariff: 22 SKK/m^3 0.55 €/m^3	• HH water tariff: 7-16 Sk/m^3 0.2-0.4 €/m^3 • Industry water tariff: 12-30 SKK/m^3 0.3-0.75 €/m^3 • HH WW tariff: 7-10 SKK/m^3 0.18-0.25 €/m^3 • Industry WW tariff: 15-27 Sk/m^3 0.38-0.70 €/m^3	Yes	No	Yes Legal, but uncommon	Yes	Use of a fixed charge is made possible by regulation. A number of companies have proposed a fixed charge for 2004, but they have not yet been approved by the public utility regulator. Moreover, one company applies a decreasing block tariff structure, in which large consumers have to pay a lower than average commodity charge.

Table 10. Fees and Surcharges on Municipal Water Services in Study Countries of the DRB

Country	Water Use and Management Fees			
	Fee and Rationale	**Fee Level or Computation**	**Distribution of Fee Payments**	**Comments**
Bosnia-Herzegovina	FB&H: • Fee for water use	FB&H: • 0.10 KM/m^3 (0.05 €/m^3)	FB&H: • 10% for the federal budget and earmarked for water management • 20% for the canton budgets • 70% for the public company in charge of water supply and management in the drainage area	
	RS: • Two types of water management fee: general and specific.	RS: • General fee: 1.5% of gross salary and/or gross earnings from copyright and patent rights. • Specific fee: 0.035 KM/m^3 (0.018 €/m^3) paid by municipal water utilities. Most other water users pay a different fee level. • If water abstraction is not metered (and it is not metered for half of the utilities) then it is estimated by the utility.	RS: • General fee: 80% goes to the budget of RS (20% of that is earmarked for investment in water development), 20% goes to the municipal budgets • The specific fee is the revenue of the Ministry of Agriculture, Forestry and Water Management, and used by the Directorate for Waters.	
Bulgaria	Extraction charge above certain small user allowances. Most MWWUs are subject to the extraction charge.	The level of the fee depends on a number of factors, such as use of water, and category of the water source. Withdrawal of drinking water has a fee of 0.006-0.02 BGN/m^3 (0.003-0.01 €/m^3)	The charge is received by the Enterprise for Management of Environmental Protection Activities, which is the successor of the National Environmental Protection Fund.	

Country	Water Use and Management Fees			
	Fee and Rationale	**Fee Level or Computation**	**Distribution of Fee Payments**	**Comments**
Croatia	Water User Charge – to cover the development of water resources	0.80 HRK/m^3 (0.11 €/ m^3)	All the fee goes to the Water Management Fund administered by Croatia Water	The Water Management Fund is partly used to provide preferential loans to MWWU investments. In the future, a shift in focus towards preservation of water resources, river basin planning, coverage of central water administration expenses is expected.
	Water Use Concession Charge – uncertain, most likely revenue generation.	For municipal use 0.08 HRK/m^3. (0.01 €/m^3)		A concession charge on water and wastewater services goes to the State Water Directorate. Only paid by companies, which are in concession contract. Its level depends on the field of the concession, the volume of the good/service, and the concession investment. The state budget is the recipient of this charge
Czech Republic	Payments to Cover Watercourse and River Basin Administration	2.60 CZK/ m^3 (0.08 €/ m^3)	River Board Morava (administrator)	
	Charges for the Withdrawing Groundwater	2 CZK/ m^3 (0.06 €/ m^3)	Half of the payment belongs to the Czech State Environmental Fund and the second half to the State Budget	
Hungary	Water extraction charge for use of water resources. The purpose is to conserve water resources, to generate revenues, and to restrict (make more expensive) certain uses of water in specific areas of the country. Some uses are exempted from payment of the charge, but it is paid for a large majority of water use, including water extraction by utilities.	The basic charge is 1.8 HUF/m^3 (0.0075 €/m^3), equivalent to about 1% of the average cost of drinking water supply. The basic charge is modified through multiplication with a number of different factors (see comments)	Central budget. In 2000 revenues of HUF 5.7 billion (€ 23.8 million).	The charge varies according to a number of factors, in order to provide more incentive to conserve sensitive or scarce water resources, and increase the costs of certain uses. The factors include type of water resource, purpose of use, volume of water, and water management in the region. There are disputes about the logic of the internal design of the charge.
Moldova				

Country	Water Use and Management Fees			
	Fee and Rationale	**Fee Level or Computation**	**Distribution of Fee Payments**	**Comments**
Romania	Water extraction charge. Varies with source of water and user.	71.2 ROL/m^3 – 0.00178 €/m^3 – (for municipal water supply to 153.6 ROL/m^3 – 0.00383 €/m^3) for industrial abstraction from ground water.	Paid to the National Authority "Romanian Waters"	
Slovak Republic	Water extraction charge	1 SKK/m^3 (0.02 €/m^3) ground water and 2 SKK/m^3 (0.05 €/m^3) surface water	Passed to state budget	The extraction charge for surface water was increased recently. There are plans to increase the extraction charge for ground water, too.

Table 11. Taxes on Municipal Water Services in Study Countries of the DRB

Country	Value Added Taxes		Other Taxes
	Level	Comment	
Bosnia-Herzegovina			10% tax on wastewater collection, the basis is the wastewater tariff (both in *FB&H* and *RS*)
Bulgaria	20%	Uniform for all goods and services.	
Croatia	22%	On basic service tariffs (before fees) The tax must be paid even on uncollected bills but VAT payments after bad debts can be reclaimed.	None
Czech Republic	5%	VAT will be 19%, probably from 2005	
Hungary	15%	There are two VAT rates. 25% for most goods and services, and a preferential 15% for certain goods and services, including W&WW services.	
Moldova	20%	VAT only applies to non-HH users	
Romania	19%	Uniform for all services and goods, with some exceptions (9% rate)	
Slovak Republic	19%	Uniform for all services and goods.	

3.4.2 Tariffs: Case Studies

The dominant tariff design in case study MWWUs is a one component variable tariff (consumption charge) for water, and another simple variable tariff for sewage. A fixed tariff is applied only in the case of Doboj MWWU in Bosnia and Herzegovina; water users pay a "water meter charge" regardless of their consumption. The charge is based on the size (diameter) of the water meter, thus there is some tentative relation between the fixed cost generated by a given consumer and the fixed tariff paid by it – the presently applied fixed tariffs, however, are substantially below the fixed costs (for more information see the Bosnia Case Study document).

In part of the cases households pay less for the same service than non-household consumers (Bosnia, Croatia, Moldova, and the Slovak Republic), in the other cases (Czech Republic, Hungary, Bulgaria, Romania) the tariff for all consumers is about the same for each cubic meter of water, or wastewater. Most methods of cost allocation suggest that cross-subsidies are present even in the case of uniform tariffs, since large consumers can be served at a lower unit cost than small consumers like households.

For any given user the tariff paid for water is higher than the tariff paid for sewage, with the exception of some of the users in the Hungarian study, who live in isolated locations where wastewater service provision is rather expensive.

Table 12. Tariff Designs in the Case Study MWWUs in 2003

Country	Household Water and Wastewater Tariffs (Local Currency, €)	Water and Wastewater Tariffs for Non-Household Users (Local Currency, €)	What are the Tariff Designs?				
			Different Tariffs for Households and Industry	Varies by Cost of Service to Customer Groups	Fixed charge	Commodity Charge	Other features (e.g. connect charge, special fees)
Bosnia-Herzegovina: Doboj	• Water tariff: 0.29 KM/m^3 0.15 €/m^3 and a fixed charge of about 14 KM/year (7.1 €/year) • WW tariff: 0.13 KM/m^3 0.07 €/m^3	• Water tariff: 1.07 KM/m^3 0.55 €/m^3 and a fixed charge which depends on the capacity of the water meter – average of 198 KM/year (101.5 €/year) was used in ASTEC. • WW tariff: 0.5 KM/m^3 0.25 €/m^3	Yes	Yes, to some degree (the fixed charge is based upon the capacity of the water meter)	Yes	Yes	The tariffs include the water management fee, effluent charge and the tax on wastewater release.
Bulgaria: Pleven	• Water tariff: 0.75 BGN/m^3 0.38 €/m^3 • WW tariff: 0.07-0.12 BGN/m^3 0.04-0.06 €/m^3	• Water tariff: 0.76 BGN/m^3 0.39 €/m^3 • WW tariff: 0.07-0.52 BGN/m^3 0.04-0.27 €/m^3	Yes	Yes (but not always and not coherently)	No	Yes	Industrial users pay different (three) levels of wastewater tariffs based on BOD_5 and other pollutants content.
Croatia: Karlovac	• Water tariff: 2.00 HRK/m^3 0.26 €/m^3 • WW tariff: 0.95 HRK/m^3 0.13 €/m^3 • Total Tariff After Taxes and Fees: 5.30 HRK/m^3 0.71 €/m^3	• Water tariff: 6.5 HRK/m^3 0.87 €/m^3 • WW tariff: 1.75 HRK/m^3 0.23 €/m^3 • Total Tariff After Taxes and Fees: 11.77 HRK/m^3 1.57 €/m^3	Yes	No	No	Yes	

Country	Household Water and Wastewater Tariffs (Local Currency, €)	Water and Wastewater Tariffs for Non-Household Users (Local Currency, €)	What are the Tariff Designs?				
			Different Tariffs for Households and Industry	Varies by Cost of Service to Customer Groups	Fixed charge	Commodity Charge	Other features (e.g. connect charge, special fees)
Croatia: Duga Resa	• Water tariff: 2.00 HRK/m^3 0.26 €/m^3 • WW tariff: 0.30 HRK/m^3 0.04 €/m^3 • Total Tariff After Taxes and Fees: 4.32 HRK/m^3 0.58 €/m^3	• Water tariff: 5.3 HRK/m^3 0.71 €/m^3 • WW tariff: 0.30 HRK/m^3 0.04 €/m^3 • Total Tariff After Taxes and Fees: 8.63 HRK/m^3 1.15 €/m^3	Yes	No	No	Yes	
Czech Republic: Vyskov	• Water tariff: 22.80 CZK/m^3 0.71 €/m^3 • WW tariff: 14.40 CZK/m^3 0.45 €/m^3	• same as for households	No	No	No	Yes	
Hungary: EDV-WR	• Water tariff: 190 HUF/m^3 0.73 €/m^3 • WW tariff: 122-378 HUF/m^3 0.47-1.45 €/m^3	• Water tariff: 190 HUF/m^3 0.73 €/m^3 • WW tariff: 122-390 HUF/m^3 0.47-1.50 €/m^3	Yes/No (different tariffs in one group of settlements only)	Yes/No (for wastewater tariff there is some variation)	No	Yes	Connect charge for new connections
Moldova: Chisinau	• Water tariff: 1.96 MDL/m^3 0.15 €/m^3 • WW tariff: 0.66 MDL/m^3 0.05 €/m^3	• Water tariff: 9.82-11.3 MDL/m^3 0.77-0.88 €/m^3 • WW tariff: 2.95-3.6 MDL/m^3 0.23-0.28 €/m^3	Yes	No (the tariffs do vary, but unrelated to costs)	No	Yes	

Country	Household Water and Wastewater Tariffs (Local Currency, €)	Water and Wastewater Tariffs for Non-Household Users (Local Currency, €)	What are the Tariff Designs?				
			Different Tariffs for Households and Industry	Varies by Cost of Service to Customer Groups	Fixed charge	Commodity Charge	Other features (e.g. connect charge, special fees)
Romania: Pitesti	• Water tariff: 7,020 ROL/m^3 0.18 €/m^3 • WW tariff: 5,752 ROL/m^3 0.14 €/m^3	• same as for households	No	No	No	Yes	No
Slovak Republic: Poprad	• Water tariff: 10.45 SKK/m^3 0.26 €/m^3 • WW tariff: 6.80 SKK/m^3 0.17 €/m^3	• Water tariff: 23 Sk/m^3 0.60 €/m^3 • WW tariff: 17 SKK/m^3 0.42 €/m^3	Yes	No	No	Yes	Recently, a connection charge is being applied for new costumers

3.5 Effluent Charges

3.5.1 Effluent Charges: Country-Wide

There is a lot of variation in effluent charge designs across the region. In Slovakia and Hungary the charge needs to be paid on the entire effluent discharge. In the Czech Republic polluters must pay the charge only when effluent discharges are above a certain limit in terms of effluent volumes or concentrations. Once they are subject to the charge, however, they must pay based on their entire effluent discharge, and not only on discharges above the limit. In Romania there is a mixed system of an effluent charge and a fine. Polluters must pay a basic charge on the entire effluent discharge, while they are subject to fine payments only after discharge above permitted levels. In Croatia MWWUs pay based upon the volume of wastewater they discharge and the level of wastewater treatment they apply. The actual quantity of discharged pollutants is not used in computing the assessment of an effluent charge payment. In Bosnia and Herzegovina even the level of treatment does not influence effluent charge payments. The effluent charge regime is basically a tax on wastewater discharge, paid based on each population-equivalent of discharge. Large settlements have a lower unit charge per population-equivalent, while small settlements must pay a higher charge.

The incentive for pollution reduction also greatly varies among and within countries. When the payment of the charge only applies to above-limit emissions, then MWWUs do not have an interest to reduce pollution below limit values. If the charge relates to treatment levels, as in Croatia, then once a WWTP investment has been carried out, there is no further incentive to use the technology effectively. In Bosnia and Herzegovina the charge provides literally no incentive for emission abatement.

From the perspective of incentives, the level of the charge is just as important as the design. In fact, even the best designs will not attain pollution reduction targets, if the charges are too low in comparison with abatement costs. Our observation is that in most ME DRB countries effluent charge systems only marginally influence wastewater treatment investment decisions. Availability of external financing, especially grants and preferential loans, is the major driver of water pollution investments for most MWWUs. The only exception may be Hungary, where charges are high enough to speed up the construction of wastewater treatment facilities. The same may stand for Slovakia after the planned redesign of effluent charges will take place.

In Hungary and Bulgaria specific further incentives are provided by a design feature that allows use of a share of the effluent charge payments towards pollution abatement investments. In Bulgaria 10% of the charge payments may be used towards investments. In Hungary 50% of effluent charge payments can be reclaimed towards investment expenditures, if the investment reduces the quantity of discharged pollutants. The rate of reclaim has, however, no connection with the rate of decrease of the given discharged material. Furthermore, according to analysis carried out at MAKK (2003) the structure of the reclaim system, together with the gradual introduction of the full effluent charge levels between 2004 and 2008, will provide an incentive for MWWUs to delay the completion of their wastewater investments in order to take full advantage of the reclaim potential. The balance of the different design elements of the Hungarian effluent charge regime on incentive power is not clear.

In addition to incentives, revenue generation is another purpose of the effluent charges. In fact, our assessment is that in most countries revenue generation is the main goal of the charges, and pollution abatement is only a secondary target. With the exception of Slovakia and Hungary, effluent charge revenues arrive at and are collected by funds dedicated to protection of the environment or water management. In Slovakia and Hungary the charges are revenues of the state budget. In Bosnia and Herzegovina 70% of charge payments are made towards water management, while 30% arrive to two separate state budgets.

Table 13. Establishing and Enforcing Effluent Charges on MWWUs in the Study Countries of the DRB

Country	Role of Regulatory Units		
	Environmental Agency	Health Agency	Other Agencies
Bosnia-Herzegovina			
Bulgaria			
Croatia	Helps set the permitted levels; monitors the effluent levels	Helps set the permitted levels	Croatian Waters helps set the fee levels applied directly to the customer's bill.
Czech Republic	Controls permitted discharge.		
Hungary	Verifies emissions data, if suspect, directly monitors emissions		The effluent charge is collected by the Tax Authority, as they have the most experience in enforcement of tax payments.
Moldova			
Romania	Together with River Basin Directorate sets the permitted levels and monitors the emissions	Measures the quality for drinking water and observes the quality parameters	
Slovak Republic	Issues the decision on effluent charges		Interested parties (such as monitoring agency, inspectorate) have commenting role

Table 14. Design and Level of Effluent Charges for MWWUs in the Study Countries of the DRB

Country	Design	Effluent Charge Levels	Additional Information
Bosnia-Herzegovina	FB&H: • The pollution charge is determined based on wastewater discharge per population equivalent (p.e.). The charge is unrelated to actual pollution loads and treatment levels. It does not provide an incentive for treatment.	FB&H: • The charge is 2 KM per p.e. pollution per month.	FB&H: • Revenues distributed similarly to water extraction charges: • 10% for the federal budget and earmarked for water management • 20% for the canton budgets • 70% for the public company in charge of the water area
	RS: • The pollution charge is determined based on wastewater discharge per population equivalent (p.e.). The charge is unrelated to actual pollution loads and treatment levels, it does not provide an incentive for treatment.	RS: • The charge is higher for settlements with low discharge (1 KM/month/ p.e.) than for settlements with large discharge (may be even lower than 0.01 KM/month/p.e.).	
Bulgaria	There are effluent fines when the quality of water is substandard as a result of effluent discharge into surface water. The fine depends on exceedance of concentration limits, wastewater quantity and duration of pollution. It has to be paid only after excess, above-limit emissions.	There are 27 substances on which the effluent fine is collected. E.g. the fine for BOD_5 or COD is 0.45 BGN/kg (0.23 €/kg). 10% discount from effluent fines applies when pollution abatement investments are carried out in accord with the Ministry of Environment and Water investment programs.	Most effluent fine revenues are paid by industries that directly discharge, and only a small portion by MWWUs.
Croatia	Assigned as a Water Protection Charge to be paid by customers as a commodity charge on wastewater services.	For MWWU customers: $N = T*V*K_1*K_2$ • N is the Water Protection Charge • T is the basic charge (0.90 HRK/m^3) • V is the annual quantity of discharged wastewater (m^3/year) • K_1 is a factor that relates to exceedance of permitted emission limits • K_2 is a factor related to the level of treatment. Since wastewater from MWWUs is not subject to wastewater permits, the value of K_1 is 1 for all MWWUs. The unit charge therefore depends solely on the level of treatment, as follows: • None – 0.90 HRK/m^3 (0.12 €/m^3) • 1st Stage - 0.63 HRK/m^3 (0.08 €/m^3) • 2nd Stage - 0.27 HRK/m^3 (0.04 €/m^3) • Tertiary - 0.18 HRK/m^3 (0.02 €/m^3)	The water pollution charge revenues go to the Water Management Fund. The Fund is partly used to provide preferential loans to MWWU investments. In the future, a shift in focus towards preservation of water resources, river basin planning, coverage of central water administration expenses is expected.

Country	Design	Effluent Charge Levels	Additional Information
Czech Republic	The effluent charges are calculated based on the following two components: • charges for the volume of wastewater if its volume from any given source exceeds 30,000 m^3/year • charges on the quantity of pollution, if the concentration or the quantity exceeds certain levels. Essentially, the effluent charge regime only applies to large polluters.	The volumetric charge is 0.1 CZK/m^3 (0.003 €/m^3) The pollution charge varies with pollutants. A few examples: • COD: 8 or 16 CZK/kg (0.25 or 0.5 €/kg) • Phosphorus: 70 CZK/kg (2.19 €/kg) • Cadmium: 4,000 CZK/kg (125 €/kg) An average payment in 2002 was about 0.48 CZK/m^3 (0.015 €/m^3)	The effluent charge is a revenue of the Czech State Environmental Fund.
Hungary	The effluent charge, called water load fee, is paid after discharged amounts of specified materials, and it is set in HUF/kg. The level of payment is modified by two factors: the sensibility of the recipient water body and the sludge disposal multiplier. The more sensitive the water body, the higher the charge is. The sludge disposal multiplier penalizes temporary and single-sludge-deposit disposal, and reduces the charge payment if the sludge is utilized (agriculture, recultivation and compost activities)	A few examples of the level of the effluent charge: • COD 90 HUF/kg (0.36 €/kg) • Phosphorus 1500 HUF/kg (6 €/kg) • Inorganic nitrogen 180 HUF/kg (0.72 €/kg) • Cadmium 44000 HUF/kg (176 €/kg)	The introduction of the fee is gradual. It starts from 30% of the defined level in 2004 and reaches its full value in 2008. During this period, 50% of the fee payments can be reclaimed, if the MWWU reduces its effluent discharge through abatement investments. The rate of reclaim has no connection with the rate of decrease of the given discharged material. The charge is a general state budget revenue.
Moldova	No information	No information	No information
Romania	Charges on the entire effluent discharge and fines on above limit emissions.	Regularly updated to keep up with inflation. The average charge in 2003 was about 1900 ROL/m^3 (0.05 €/m^3) in Bucuresti (where wastewater is not treated)	Revenues go to the National Administration of Romanian Waters. The funds are then used for improvements in water quality, river bed stabilization, flood control, efficient water use, and to cover water management units' expenses in critical periods (droughts and floods).
Slovak Republic	Five pollutants are subject to the charge. The amount of charge depends upon the quantity of pollutants in the wastewater and on the quantity of the receiving waters. Additional effluent charge penalties of up to 200% of the base rate may be levied to reflect a high level of damage to receiving waters. According to the law, these additional charges must be paid from after-tax profits. The charge rates are not adjusted to inflation.	Charge levels: • BOD_5: $21.5*Z^{0.8265}$ (in thous. SKK, Z is pollution in ton/year) • Insoluble substances: $2.34*Z^{0.7514}$ (in thous. SKK, Z is pollution in ton/year) • Crude oil substances: 1.00 – 3.00 SKK/m^3 (0.025 – 0.074 €/m^3) • Alkalinity or acidity: 135 SKK/kmolle (3.33 €/kmolle) • Dissolved inorganic salts: 120 – 600 SKK/t (2.96-14.79 €/t) Annual revenues have lately been around 200 million SKK (4.93 million €)	The revenue from these effluent charges used to be the income of the Environmental Fund. This Fund was eliminated in 2001. From that time, the revenue is income of the state budget and reports on this specific income stream are not available. An additional problem is enforcement; once the Environmental Fund was cancelled, no agency vigorously enforces effluent charge payment. The regulation is considered to be outdated and is planned to be amended in the near future. The charge levels are expected to become considerably higher.

3.5.2 Effluent Charges: Case Studies

Effluent charge payments are a significant burden for some of the case study MWWUs. Croatia has the highest burden related to wastewater discharge. Here effluent charge payments make up 7-11% of all costs, and more than one-third of all wastewater related costs. The Slovak and Bosnia case study utilities also face relatively high charge payments, at around 5% of all costs. The rest of the MWWUs either do not pay an effluent charge, or the charges make up less than 1.5% of their total expenditures. The Hungarian case study utility will pay a charge in 2004, but estimates on its level have not been available at the time the study was prepared.

For most of the examined MWWUs a scenario was constructed in which wastewater effluents were reduced through construction and operation of a new or upgraded WWTP. The resulting reduction in effluent charge payments were much too low to justify the investment and increased operating costs related to improved treatment of sewage on financial ground.

Table 15. Effluent Charges in the Case Study MWWUs: Payments and Pollutants

Country	Payments of Charge (Local currency/year and €/year)	Payment of Charge (Percentage of all MU costs; percentage of wastewater related costs)	Pollutants Covered by the Charge	Comment
Bosnia-Herzegovina: Doboj	89,000 KM/year 45,600 €/year	4.6% of all costs, 30% of wastewater related costs	The charge is unrelated to pollutants	
Bulgaria: Pleven	None			
Croatia: Karlovac	2.92 mln HRK/year 390,000 €/year	11% of all costs, 42% of wastewater related costs	The charge is based on the level of treatment and volume of wastewater discharge	
Croatia: Duga Resa	200,000 HRK/year 27,000 €/year	7% of all costs, 33% of wastewater related costs	The charge is based on the level of treatment and volume of wastewater discharge	
Czech Republic: Vyskov	Around 1.6 million CZK/year, or 50,000 €/year (expert judgment, not actual data)	Appr. 1.3% of all costs	No data	
Hungary: EDV-WR	No relevant experience yet, as the charge was introduced only on 1 January, 2004			
Moldova: Chisinau	2.6 million MDL/year 200,000 €/year	1.2% of all costs, 5.4% of wastewater related costs	BOD, Suspended materials	Chisinau has some secondary treatment. Most other MUs only have primary treatment
Romania: Pitesti	Negligible			
Slovak Republic: Poprad	9 million SKK/year (225 000 €/y)	4.9% of all costs (including water service)	Volume, BOD, COD, SS	After introduction of the new effluent charge regulation, payments by the company will increase to about 20% of all costs.

4 Tariff and Effluent Charge Reform Proposals

The previous chapter summarized the conditions that characterize the legal, organizational, and economic features of MWWUs in the ME DRB. In this chapter we will begin identification and examination of some reform proposals associated with tariffs levied by the MWWUs and effluent charges levied upon them. We divide this discussion of reform proposals that ultimately may affect pollution control by MWWUs into two parts: tariff and effluent charge proposals per se in this chapter and reforms in other public policies, institutions, and management that support or utilize tariffs and effluent charges to reduce water pollution from municipalities in Chapter 5.

Before we begin with direct consideration of specific tariff and effluent charge reforms, however, we now explore some of the other overarching issues that condition any discussion of "reforms" in the tariff and effluent charge systems that are presently in place in the study countries' MWWUs.

4.1 The Background for Successful Implementation of Tariff and Charge Reforms

We have chosen to evaluate possible tariff and effluent charge reforms using three criteria: are the reforms "effective, proportionate, and practical". While quantitative measurement of these criteria is difficult, we begin this enumeration of possible reforms by noting that the following background conditions weigh heavily on whether even the best-designed tariff revision in the abstract will be implemented at all and, if it is, will it be implemented in a manner that allows full realization of its "effectiveness". Indeed, these background considerations directly bear on all three evaluation criteria.

4.1.1 The Role of Good Governance

There has been a movement in the study countries toward de-centralization. This is partly a result of democratization and partly a reaction to the problems associated with the highly centralized systems of the recent past. In the case of MWWUs, this change is double-edged. Localities now can make decisions affecting local water services etc., but they are also required to be responsible for providing the service and setting the tariffs and fees that support those services. Furthermore, the devolution of municipal water supply and wastewater collection assets and responsibilities to local governments and the rise of joint stock companies controlled by the same municipalities does not entirely solve the governance problem associated with a public monopoly. Even if controlled at the local level, a public monopoly still offers extraordinary economic power to suppliers relative to markets in which competition protects the interests of buyers and sellers alike.

For example, local governance of public water utilities in the lower DRB is sometimes said to be biased toward keeping tariffs (especially household tariffs) low and/or costs high relative to efficient levels. Low tariffs may, in the short run, win the approval of customers, especially households. High costs, in the course of providing political favors e.g., jobs and business to political allies, puts pressure on the utility budget and may move resources away from their most valuable applications. Thus, devolution may be better than central planning of budgets and price regulation, but devolution of a monopoly enterprise still retains the governance challenges of a public monopoly.

There is also the concern that short sighted and/or self-serving (or inexperienced) local authorities will negotiate and sign a long term contract with a system manager (especially a private system manager) that will not be in the best interests of the service users of the community. If one promotes local monopolies, one still needs to assure proper local governance. This means assuring oversight and training that encourages newly empowered owners, managers, and local policy makers to provide cost-effective service and reasonable budgetary support.

4.1.2 The Importance of Customer Satisfaction with Local Service Levels

There is deep suspicion on the part of MWWU customers in the region that the additional resources attainable by MWWUs with higher tariffs will be wasted due to poor management or governance on the part of MWWU administration, its ownership, or both. In the case of locally controlled MWWUs, most customers are not only served by the MWWU, they also influence its management through a variety of processes but most importantly through election of local representatives. While under most circumstances, a customer of a monopoly has limited alternatives, most of which are probably prohibitively expensive in this instance, customers are able to respond to tariff changes through both the commodity and political marketplace.

Local accountability is seen as one of the key advantages of a locally controlled MWWU. This feature also makes maintenance and/or up-grade of local service a key consideration in any tariff reform proposal. The acceptability of higher tariffs or new tariff designs, usually depends on the customers' belief that they are getting some benefit from the increased tariffs. This “benefit” can take many forms: reliability of service, better water quality, better water pressure, etc. In considering tariff reforms, it is very important that they be aligned with provision of local service.

4.1.3 The Complex Role of External Financial Assistance

Current or prospective external financing for the development of water utilities, especially advanced wastewater treatment, can create a set of perverse incentives for local authorities. What local authority will take responsibility forcing customer sacrifices to upgrade or improve the MWWU system if there is widespread belief that future transfers (grants) are going to be proportional to the "gap" between current status and some target level of infrastructure and service. If this view is accurate, any sacrifice today will be rewarded with lower levels of assistance in the future. This creates the “perverse” incentive to underperform in the present.

In such circumstances, it is only important to appear to be making a good faith effort to make progress. The lofty legal and institutional principles, laws and regulations may, by design, not be fully reflected in the reality of water production, distribution, use, disposal, treatment, and discharge (and the corresponding stream of revenues and costs associated with each step in the process). While poor performance may be the result of the hardships of rebuilding or adjusting to a new set of institutional conditions, it may also be the product of an institutional design in which legal loopholes; weaknesses in monitoring; poor, arbitrary or selective enforcement; and outright evasion have been anticipated.

4.2 Tariff Reforms

MWWU tariffs are usually designed to recover costs and promote economic efficiency while considering social equity. Any discussion of tariff reforms aimed at pollution reduction from municipal water systems must necessarily also consider the implications of these reforms for these other objects. In the following text and tables we review some of the tariff and effluent charge issues that were identified and discussed in our Tariffs and Charges Project and the reform proposals that have been offered to address these issues. In the process we begin commenting upon some features of these proposals, including any links between the proposal, its immediate consequences, and pollution reduction.

4.2.1 Tariff Levels

Table 16 contains summary information on some suggested, country-specific tariff level and design reforms. Most of these either originated with, or were developed in consultation with, the various country consultants listed in the Preface of this document. The tariff reforms suggested have been

grouped according to the certain features of the reform e.g., tariff increase, cost-based tariffs, and two-part tariffs. We will discuss the features and issues connected with these general categories of tariff reform in a systematic way below. Table 17 presents proposed reforms derived by the project staff from examination of the conditions and experience of the case study MWWUs. These, too, have been grouped into general categories of reform. The proposals are often similar to those in Table 16, but they sometimes have detail or features that reflect special conditions of the case study MWWU and the associated municipality.

We order the discussion by first beginning with the most straightforward “reform”: a simple increase in the tariff level. Whether this makes sense as a "reform" measure depends on both the circumstances and size of the tariff increase. In some of the countries the current tariff level is sometimes characterized simply as being set "too low". As noted in the discussion in Chapter 3, revenue shortfall is a problem of serious proportions in many MWWUs of the ME DRB, even occasionally in countries where it is definitely not the norm. In other cases, the motivation for higher tariffs is associated with the need to support a new repair and maintenance plan or to make a significant investment in infrastructure. In discussing the circumstances of tariff increases, we make use of the distinctions used in the development of case study scenarios: tariff increases to 1) balance the current budget, 2) achieve a sustainable level of current service, and 3) expand or upgrade the system (most usually wastewater treatment facilities). What distinguishes these scenarios is the motivation for the tariff increase:

- Current Budget Balance – the purpose of the tariff increase is to raise tariffs enough to cover current, immediate financial obligations or costs.
- Sustainability Service – the purpose of the tariff increase is to cover not only current costs but also to make provision for the depreciation of plant and equipment. If done properly, the tariffs will be high enough to support the indefinite continuation of the current service level.[14]
- Expanded/Upgraded Service – the purpose of this tariff increase is to cover the costs of expanded service, such as adding more customers or capacity, or up-grade the service, such as adding new levels of pollution control or improving the quality of the produced water.

We sometimes refer to these different motivations for tariff increases as the “scenario progression”. Obviously, a single tariff increase can meet some combination of these purposes. It is our view, however, that it is only sensible to address tariff increases for expansion/upgrade after or in combination with those increases that balance the current budget and put the MWWU on a stable, sustainable financial footing.

In this discussion of tariff levels we take as a point of departure the tariff design used in most of the municipalities throughout the region. The water and wastewater tariff is a commodity charge per m^3 of water based on the amount of water an account consumes (or imputed to the account if it is not metered).[15] Special wastewater charges may apply to industrial facilities that produce difficult-to-treat

[14] This sustainable financial condition could be obtained by setting aside part of the revenue stream each period that is equal to the rate of depreciation of the system. Making appropriate adjustments for any discounting, the resulting fund created by these set-asides would be just large enough to support the continuing purchase of new equipment and infrastructure as it reached the end of its economic life. Even if the MWWU has received its current infrastructure as “gift” from the central government and can operate without making set-asides now, eventually it will have to replace this infrastructure. The sustainable scenario estimates the tariffs required when the MWWU has fully exhausted the infrastructure included in its gift.

[15] Wastewater charges are usually based on the amount of drinking water a household consumes. This is usually a pretty good surrogate for the amount of wastewater the account produces and errors it might introduce are not usually so great as to justify the transactions costs associated with actual metering of individual account wastewater flows. At some MWWUs, however, the customers have the option to separately meter water used specifically for gardening purposes, and only the difference of total water use and gardening use will be subject to the wastewater charge. In Hungary a regulation requires that MWWUs provide this option to their customers from 1 January 2004.

or high concentration wastes. These wastewater customers usually impose extraordinary wastewater treatment costs on the MWWU. Such customers usually have their wastewater flows metered and monitored (or at least sampled regularly) and are billed based upon their actual pollutant loads as well as the volume of wastewater. The MWWU usually negotiates special wastewater service rates for such customers.

4.2.1.1 Current Budget Balance

In a few study countries, especially Moldova, and B&H (Bosnia and Herzegovina), the proposed tariff increases are motivated primarily by the need to produce enough revenue to balance the current accounts. In others, notably Bulgaria, Croatia, the Czech Republic, Hungary, Romania, and Slovakia, most of the MWWUs are in current budget balance but there are still some MWWUs that are exceptions to that rule. Consequently, we introduce the following tariff reform: a change in tariff level based on the need to cover current costs.

Table 16. Tariff Level and Design Reform Proposals Affecting MWWUs in Study Countries of the DRB

Country	Changes in Current Tariffs		Set Tariffs Based on Local Costs		Test Two Part Tariff	
	Reform	Rationale	Reform	Rationale	Reform	Rationale
Bosnia-Herzegovina	• Set tariffs for different customer classes based on the real cost of service. This will result in an increase of tariffs, especially household tariffs. • Tariffs should be raised gradually over some period of time	• Current tariffs are not set at a realistic level – a level high enough to cover either the current costs of the system or maintain the system in the long run. • This is especially true for household water and wastewater tariffs. Household tariffs are heavily cross-subsidized by the tariffs of other service users. • An abrupt increase in tariffs may further escalate the problem of non-payment.	• Support and encourage new tariff design models that fully and realistically reflect local conditions and circumstances • Prepare a "Water and Wastewater Tariff Manual" to assist municipalities in developing and evaluating new tariff levels and designs. • Applies to both FB&H and RS	• Current tariff designs and levels don't reflect current costs. • Municipalities, which have the most power in determining tariffs, often lack the skills and knowledge to introduce cost-covering tariff designs	• Set tariffs using "Base-Extra Capacity" method which distinguishes a tariff for base service and one for peak service. This is a two part tariff with two, increasing "commodity charge" blocks. • Introduce tariffs with fixed and variable components, or increase the fixed tariff at MWWUs where two part tariffs already exist. • The fixed tariff component should be increased gradually, and not abruptly.	• Through two part tariffs with fixed and variable components all consumers contribute towards fixed costs. This system is more equitable and more efficient than the simple commodity charge, especially since a large share of water and wastewater service costs are fixed costs when there is excess capacity. • Through two part tariffs with fixed and variable components increase the dependability of the revenue stream, as a portion of the revenues do not depend directly on consumption levels. • A sudden increase of the fixed tariff may result in increased avoidance of payment at households with financial problems.
Bulgaria	• Increase the level of tariffs	• Most current tariffs do not ensure medium and long run sustainability, or upgrade of service.	• Increase economic efficiency through more closely adjusting tariffs to reflect local costs	• At present there are uniform tariffs within many MWWUs, regardless of differences in cost	• Introduce a two part tariff, with a fixed charge to cover current fixed and joint costs and a commodity charge to approximate marginal costs	• To ensure cash flows for long term sustainability of the utilities, and to enhance economic efficiency through a more direct connection between tariffs and costs.

Country	Changes in Current Tariffs		Set Tariffs Based on Local Costs		Test Two Part Tariff	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Croatia	• Increase the level of tariffs • Tariff increases should primarily take place for household customers	• In the short run MWWUs in general are in a financially stable situation. The infrastructure, however, is being depreciated not only in terms of accounting, but also physically, and major investments will be needed to maintain and/or replace pieces of it. Tariffs will need to be increased in order to generate appropriate revenues for this purpose • Households are most often cross-subsidized by other consumers, e.g. industry	• Increase economic efficiency through more closely adjusting tariffs to reflect long term local costs	• The cost of services and tariffs are not closely related at most MWWUs.	• Introduce a two part tariff, with a fixed charge to cover current fixed and joint costs and a commodity charge to approximate marginal costs	• To ensure cash flows for long term sustainability of the utilities, and to enhance economic efficiency through a more direct connection between tariffs and local costs.
Czech Republic	• Increase of tariffs is needed at many (but not all) MWWUs	• Current tariffs at many MWWUs do not ensure sustainable operations			• Introduce a two part tariff, with a fixed charge to cover current fixed costs and a commodity charge to cover variables costs	• For long term sustainability. Water losses are rising as the systems age. Current tariffs are not sufficient to maintain and replace the current infrastructure.

Country	Changes in Current Tariffs		Set Tariffs Based on Local Costs		Test Two Part Tariff	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Hungary	• Stop cross-subsidization from industry to households, i.e. household tariffs should increase more than industrial tariffs (some industrial tariffs may even be lowered) • Many MWWUs, however, are on a sustainable path of operation, and there is no need for *uniform* increase in tariffs. Some MWWUs, nonetheless, will need to introduce substantial tariff increases in order to be able to satisfy EU requirements.	• This will help ensure sustainable tariffs and economic efficiency. However, there are some vulnerable consumer groups, where a dramatic increase in tariffs can create problems – this needs to be considered when devising the tariff design.	• Set tariffs based on local costs, but at the same time keep in mind the risk of prohibitively high tariffs for some isolated communities often inhabited by poor people.	• The consolidation of the Hungarian W&WW industry in the 1990s was fuelled by separation of MUs based on differences in local costs of service provision. The final result is a fragmented system of utilities, some of which face extremely high costs, and the state needs to provide subsidies to ensure equity.	• More widespread use of two part tariffs – it is already used by some of the utilities. • Make sure that revenues collected for future investments through the fixed tariff are accumulated.	• To ensure cash flows for long term sustainability of the utilities, and to enhance economic efficiency through a more direct connection between tariffs and costs.
Moldova	• Gradually phase out cross-subsidization of household tariffs by industrial users	• Industrial users pay about 5 times more for the same water and sewage services than households. Increase of household tariffs, should, however be implemented cautiously, and possibly together with some other measures (e.g. introduction of metering in order to provide an opportunity for reduced payments through reduced consumption)	• Stop the practice of dumping the costs associated with leakage onto households that do not have meters. The costs associated with leakage should be recovered by all SUs, and the MU should establish a strategy to reduce leakage through cost effective measures.	• Metered households pay according to their actual consumption, while unmetered households pay based on an estimate, which, however also contains part of the leaked water. This practice is not only unjust, but also ineffective due to high ratios of non-payment on part of households, especially unmetered households.	• Introduce a two part tariff with a low initial fixed tariff, which can be raised to the level of fixed costs in the future. • The variable component could initially consist of an increasing block tariff.	• Many households face difficulty paying their W&WW bills, an "equity feature" in the design of a two-part tariff makes the tariff more acceptable among consumers, and may also contribute to improved collection of bills. A prerequisite for this proposal is metering of water use at households.

Country	Changes in Current Tariffs		Set Tariffs Based on Local Costs		Test Two Part Tariff	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Romania	• Initially increase tariffs with the proceeds earmarked to reduce system losses and improve reliability	• Improving service reliability will increase the willingness-to-pay for water service. Shift up and more inelastic demand. This will raise revenues at the new tariffs and make future tariff increases both more acceptable and revenue producing. • Reduced losses will also reduce some costs and this will enhance net revenue.	• Revise the system of tariff adjustment to allow it to quickly pass along new energy costs or, during an inflationary period, costs in general.	• MWWU revenues fell way behind costs in the last decade due to inflation and, especially, energy price increases.	• Introduce a two part tariff, with a fixed charge to cover current fixed and joint costs and a commodity charge to approximately cover marginal costs	• To ensure cash flows for long term sustainability of the utilities, and to enhance economic efficiency through a more direct connection between tariffs and costs.
Slovak Republic	• Increase in tariffs should be based on actual production cost of operator rather than national "flat" regulation	• More efficient (reduces cross subsidization across communities and customer classes) • More protective of the financial integrity of those communities that have inherently high costs of water and wastewater service.	• Abandon national tariff calculations for households based upon the coefficients of an increase and let local MWWU to set tariffs based on local conditions	• More efficient (reduces cross subsidization across communities and customer classes) • More protective of the financial integrity of those communities that have inherently high costs of water and wastewater service. • Get National Regulatory Office out of the tariff business and into rate of return regulation	• Introduce a two part tariff, with a fixed charge to cover current fixed costs and a commodity charge to cover variables costs	• To ensure cash flows for long term sustainability of the utilities, and to enhance economic efficiency through a more direct connection between tariffs and costs.

REFORM: Tariffs for Covering Current Costs

Issue Summary: Revenues do not cover current, short run variable costs and financial obligations

Possible Reform Strategy: Increase in existing tariff with earmarking of revenues

Strategy Description	Comment/Concerns
Raise tariffs just enough to cover current budget deficits	Helps stabilize the current budget condition, therefore a step toward good management and future development. May be counter-productive if there is high price elasticity and/or high tariff increases
Earmark the revenues so that they are only spent to cover current activities and associated costs	Helps address the concern that the customers will really benefit from the higher tariffs. Earmarking may be difficult to enforce without good book keeping and accounting practices.
	May only be a short-term solution to the budget problem.
	Addresses pollution control only indirectly: through any "demand side" effects and creating a more stable foundation for utility planning and management.

This "reform" proposal is often conditioned by a need for prioritization in spending the additional revenues hopefully produced by the higher tariffs. This would place highest priority on the need to balance current MWWU books.

At the same time, our study team commonly observes a strong resistance to a MWWU tariff increase for any reason, even the occurrence of operating losses at the local MWWU. As noted in our discussion of background issues, most municipal authorities are extremely hesitant to support and, in some cases, even hostile to any proposal to increase tariffs. The customers (the municipal authorities constituency) are often not convinced that the tariff increase is either necessary or that any increased revenues will really be used to maintain their service.

A common argument against any tariff increases in ME DRB countries with weak economies is that 1) many residents of the municipality are unemployed and/or have low incomes and 2) these residents cannot afford any increase. One can argue about the merit of this argument (see data relevant to this issue under "burden indices" in section 6.6) or whether it should be the MWWU's responsibility to provide social support – isn't that task of the central government? However, the high sensitivity to this problem suggests that any tariff increases must be seen as "fair" to these low income households. In many cases, a tariff increase may have to have, either by design or as a supporting program, a feature that will help insulate lower income households from excessive tariff increases. Some possibilities for such protection are discussed under "revenue recovery" reforms discussed in Chapter 5.4.1. In many cases it appears that any tariff increase would have to be proposed in combination with other reforms that are designed to protect the interests of the poorest customers.

Table 17. Tariff Levels and Design Reform Proposals for Case Study MWWUs *

Country	Increases in Current Tariffs to Cover Current Costs		Fixed and Variable Component Tariff to Cover Current Costs		Increase Tariff to Cover Upgrades (Usually a New Wastewater Treatment Plant)	
	Reform	**Rationale/Result**	**Reform**	**Rationale/Result**	**Reform**	**Rationale/Result**
Bosnia-Herzegovina: Doboj	• Tariffs on average need to be increased by 10-20%, and cost savings measures need to be implemented in order to achieve financial balance in the short run, while better maintaining the infrastructure. Tariffs of the households will need to increase at a higher rate, than the tariffs of other consumer groups. In fact, the tariffs of some of the other service user groups may stay constant or may even be reduced • Wastewater tariffs at present are higher than needed to cover costs. Instead of lowering these tariffs, it is advisable to start creating a fund that will be used for future wastewater investments.	• Tariffs at present barely cover costs, and there are no resources for systematic maintenance of the infrastructure. • Household tariffs are cross-subsidized by industrial and other tariffs, therefore tariff increase need to be selective in order align revenues with costs for each service user group. • The fund for wastewater investments will find opposition from the municipality, since wastewater revenues benefit the municipal budget under current arrangements	• Keeping a two part tariff, and increasing both the fixed and the variable component, rather than only the variable component, to cost recovering levels.	• This structure will result in a potentially more efficient tariff regime, than if cost recovery was achieved only through an increase of the variable tariff	• Tariffs, especially household tariffs, need to be increased 4-8 times in order to ensure adequate revenues to cover the costs of upgrade. The increase may be offset if outside grants are available. • Both the fixed and the variable components of the tariff would need to be raised.	• A high fixed tariff in the sustainable and upgrade scenarios, however, may cause payment problems, increasing the level of outstanding bills. Graduality is therefore important, and the role of investment grants is crucial for large developments, especially for the WWTP

Country	Increases in Current Tariffs to Cover Current Costs		Fixed and Variable Component Tariff to Cover Current Costs		Increase Tariff to Cover Upgrades (Usually a New Wastewater Treatment Plant)	
	Reform	**Rationale/Result**	**Reform**	**Rationale/Result**	**Reform**	**Rationale/Result**
Bulgaria: Pleven	• Significant increase of tariffs not justified. • More transparency of tariff setting and better measures for collection of receivables • Allow for tariff setting that will be based on long-term, sustainable development of the unit. • Adjust tariffs to reflect actual costs incurred by each SU category. Find alternative ways to support budget entities. • Additional study needed to estimate the resulting changes on the demand side.	• The company was overcharging and the increase could only be used to cover the uncollected receivables. • Improve the image of the company and willingness of the users to pay thus increasing revenues and decreasing debt outstanding. • If service prices are deliberately kept low, management will not have incentive and possibility to invest in up-grades or improvements of the system. • Stop cross-subsidizing among SUs. At present most of debt outstanding is due to households. • The positive effects could be offset by increased consumption, which could overburden the system.	• Introduce a two part tariff, with an initially low but gradually increasing fixed component	• Possibly more efficient than the present simple commodity charge • Assures a dependable revenue stream, independent of changes in service use	• Invest in leakage reduction, new sewage connections with treatment and improve the efficiency of the existing WWTP while increasing tariffs. • Increase household and budget entity tariffs. Lower industry users' tariffs.	• Improve effluent reduction and lower production costs as well as water consumption by SU with excessive debt outstanding. Reduce leakage by better water supplied measurements and cutting illegal connections. • Avoid cross-subsidizing and give stimuli for industry to develop, thus increasing the chances for investment in pollution reduction. Address the need to create better incentives for SU to pay their bills.

Country	Increases in Current Tariffs to Cover Current Costs		Fixed and Variable Component Tariff to Cover Current Costs		Increase Tariff to Cover Upgrades (Usually a New Wastewater Treatment Plant)	
	Reform	**Rationale/Result**	**Reform**	**Rationale/Result**	**Reform**	**Rationale/Result**
Croatia: Karlovac, Duga Resa	• Increase tariffs to generate revenues for replacement of existing infrastructure in the medium term • Increase should primarily take place at households	• In the short run the two case study MWWUs are in a financially stable situation. The infrastructure, however, is being depreciated not only in terms of accounting, but also physically, and major investments will be needed to maintain and/or replace pieces of it. • Households are at present cross-subsidized by other users.	• Introduce a two part tariff, with an initially low but gradually increasing fixed component	• Potentially more efficient than the present simple commodity charge • Assures a dependable revenue stream, independent of changes in service use	• Increase household water tariffs 1.5-2 times, household wastewater tariffs 4-7 times to generate enough revenue to cover the investment and operating costs related to upgrade • There is no need to increase industrial water tariffs, while industrial wastewater tariffs need to increase 2-4 times. • Try to secure EU grants to cover part of the investment costs • Develop the sewerage in order to connect new customers	• Upgrade of the wastewater network and construction of the WWTP may not be feasible entirely from revenues, as tariffs would grow excessively. Outside help, in the form of grants or preferential loans, is needed, or the investments need to be delayed until the economic status of consumers considerably improves. • New connections will lower the pressure to increase the fixed tariffs related to wastewater service of existing connections, as the costs of constructing the WWTP will be shared by a higher number of service users.

Country	Increases in Current Tariffs to Cover Current Costs		Fixed and Variable Component Tariff to Cover Current Costs		Increase Tariff to Cover Upgrades (Usually a New Wastewater Treatment Plant)	
	Reform	**Rationale/Result**	**Reform**	**Rationale/Result**	**Reform**	**Rationale/Result**
Czech Republic: Vyskov	• Introduce tariff increase to cover costs including real system depreciation into the cost basis for full cost tariff setting	• Reduction in water consumption. • Possible reduction in water losses due to demand side effects. • Prospective reduction in deterioration due to supply side effects. • Result – 30% rise in water tariff, 50% rise in wastewater tariff	• Introduce two part tariff with a fixed charge to cover fixed costs and a commodity charge to cover variable costs.	• Possibly reduces the share of water losses due to demand side effects. • Prospective reduction in deterioration due to supply side effects • Relative to straight commodity charge: increase water use, lower residential expenditures if fixed costs are allocated by customer class.	• 20% co-finance a new WWTP on a part of the system that has no WWTP at present	• Reduces effluent by treatment and lower water use • Making all households pay increased wastewater tariffs by 200% • Cross subsidy to household served by the new WWTP • Substantial burden increase – from 1.4% to 2.4% for average income household, 6% to 11% for household in lowest decile of income.
Hungary: EDV-WR	• Increase tariffs for households and decrease tariffs for large industrial consumers.	• This way cross-subsidization would end. Increased wastewater tariffs, however, have a risk of disconnection (or slower rate of connection) to the existing wastewater collection network by households, especially in rural areas of the case study region.	• Introduce a two part tariff, with an initially low but gradually increasing fixed component	• Potentially more efficient than the present simple commodity charge • Assures a dependable revenue stream, independent of changes in service use	• 2-2.5 times increase in tariffs, unless investment grants are available.	• Household tariffs should increase at a higher rate than industrial tariffs.

Country	Increases in Current Tariffs to Cover Current Costs		Fixed and Variable Component Tariff to Cover Current Costs		Increase Tariff to Cover Upgrades (Usually a New Wastewater Treatment Plant)	
	Reform	**Rationale/Result**	**Reform**	**Rationale/Result**	**Reform**	**Rationale/Result**
Moldova: Chisinau	• Approximately 2.5 times higher water tariffs and 3 times higher wastewater tariffs for households in order to cover current costs.	• The tariffs of industrial consumers and public entities can be lowered by about one-half for both water and wastewater. • If the presently poor collection of bills cannot be improved substantially, then the tariffs of households need to be increased further, while the tariffs of industry and public entities cannot be lowered.	• Introduce a two part tariff with a low initial fixed tariff, which can be raised to the level of fixed costs in the future.	• Graduality is important due to the poor economic status of service users. A fixed tariff component can help in stabilizing revenues, which would be essential for MWWU Chisinau.	• Gradually increase tariffs in order to start building up a reserve for future upgrade investments.	• No major upgrades, financed from tariffs, are feasible within a few years time due to economic hardships in Moldova. • A combination of increased tariffs, improved collection of bills, and investment grants may be feasible for upgrade investments.

Country	Increases in Current Tariffs to Cover Current Costs		Fixed and Variable Component Tariff to Cover Current Costs		Increase Tariff to Cover Upgrades (Usually a New Wastewater Treatment Plant)	
	Reform	**Rationale/Result**	**Reform**	**Rationale/Result**	**Reform**	**Rationale/Result**
Romania: Pitesti	• Place priority on investments from increased revenues to rehabilitate the water supply • Allow the automatic revision of water tariffs based on electricity costs and general inflation	• Improving service reliability will increase the willingness-to-pay for water service. Shift up and more inelastic demand. This will raise revenues at the new tariffs and make future tariff increases both more acceptable and revenue producing. • Reduced losses will also reduce some costs and this will enhance net revenue. • The current process takes too long. Agree to formulas for interim updates and review after the fact to see if some adjustment is in order. •	• Introduce a two part tariff, with an initially low but gradually increasing fixed component	• Potentially more efficient than the present simple commodity charge • Assures a dependable revenue stream, independent of changes in service use	• Not tested due to lack of data	
Slovak Republic: Poprad	• Allow for the increase/decrease of tariffs based upon production costs	• More efficient (reduces cross subsidization across communities and customer classes)			• Appr. 50% increase is needed in wastewater tariffs.	

* Results are elaborated in Section 4.2.1.4 for tariff increases under “current”, “sustainable”, and “expansion/upgrade” scenarios.

4.2.1.2 Sustainable Service

The MWWUs of the ME of the DRB are commonly characterized by decaying and/or oversized infrastructure. Unless steps are taken to provide preventive maintenance and/or replacement of this infrastructure, MWWUs will be forced to address the problems created by broken pipes and broken equipment as a continuing, and ever-more-frequent, series of emergencies. Reducing budgets by postponing maintenance and replacement results not only in the loss of infrastructure services but also the loss in skilled and knowledgeable staff. If the maintenance and replacement program is well-designed to begin with, any short run costs associated with maintenance and replacement will be more than offset by higher long term savings.

The program of investments for a sustainable system may require much higher tariffs than suggested by the cost of a well-designed maintenance program. Even a good program can't extend the life of some equipment and material indefinitely. Some provision must be made for replacing the structural elements and durable equipment of the current water and wastewater system. The municipalities, as noted above, often inherited infrastructure without debt.[16] This "gift" allows the municipalities the luxury of not having any debt burden associated with most of their infrastructure. Ultimately, water and sewer lines, mains, valves, water tanks, etc., have to be replaced. The municipality must decide whether to finance these systems in advance or to put off making any provision for the future until the replacement investment must be made and then borrowing the capital to finance the investment and repay principal and interest on the loan. The former choice means a small increase in tariffs today; the latter means a higher increase in tariffs in the future. In making this decision availability of commercial loans is a key factor for consideration. In either case, due to the age and rapid deterioration of much of the infrastructure, this choice – and the tariff difference between them – may not be very great.

With this as an impending future choice, one can understand how important it is to the managers, owners, and customers of the MWWU to establish clear priorities regarding various investments in the system. An advanced WWTP may be "affordable" now, but that doesn't mean it should be the highest investment priority. Provision for long-term replacement of the water and sewerage network (including separation of storm and wastewater sewers) may not yet have been factored into the tariff calculations. If network replacement is a higher priority than the WWTP, then we can only assess its "affordability" after the tariff implications of network replacement have been factored into tariffs.[17]

In examining the design and financing of a sustainable system, it may come to the attention of decision makers that elements of the current system do not make economic sense. These elements may have been added to the system during a period of distorted prices or under different planning policies. Determining a financially sustainable level of service also means rationalizing service levels so that those services that are disproportionately expensive may be scaled back or eliminated. This may complicate the development of this tariff reform and push tariff reform toward other designs (see

Section 4.2.2 below).

Increasing tariffs to support a cost-effective program of long run sustainable service is an alternative to reducing budgets. This tariff reform is summarized below. Like other tariff reforms, it may need to be bundled with other features, especially consideration of and protection to low income households.

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[16] This isn't really as generous as it may at first appear. All infrastructure bestowed by the central government was in fact paid for by the citizens of the country through past taxes or transfer of other assets. Any remaining debt will, likewise, be paid of by the citizens in future taxes or assets transfers.

[17] The proper "ordering" of options is a common feature of good policy analysis, whether examining cost-effectiveness or "affordability".

REFORM: Tariffs Covering Sustainable Service

Issue Summary: Budgets may be too small to support sustainable service levels

Possible Reform Strategy: Raise tariffs to cover current service levels in the long run.

Strategy Description	Comment/Concerns
Raise tariffs enough to cover budgets that support sustainable service levels	Cost-effective in the long run. Need to allow for any "demand side" response that loses revenue. A multi-tariff scheme including a fix tariff component can limit the loss of revenues.
Demonstrate that this strategy is cost-effective in advance	Use engineering/economic model to support demonstration. Show that these tariffs today are an alternative to higher tariffs and/or declining service in the long run.
Earmark new revenues to maintain and replace existing infrastructure in a durable fashion.	Customers will experience more reliable service; a tangible quid pro quo for the tariff increase.
	Puts the utility on the road to long-term solvency. Establishes it as reliable and far-sighted, and this can enhance its access to capital and lower the cost of capital.
	Addresses pollution control only indirectly: through any "demand side" effects and creating a more stable foundation for utility planning and management. Lower volumes of wastewater may still contain the same amount of pollution

4.2.1.3 Expanded/Upgraded Service

Many MWWUs hope to expand and/or upgrade their service in the coming years. These aspirations will have to be financed in some way. If by "expansion" we mean the addition of new customers connected to the water or wastewater system, connect charges or fees can be assessed to cover the fixed costs of this service. On the other hand, an upgrade in service such as development of a more reliable water supply, better treatment of drinking water, or new or more complete wastewater treatment, will often require an increase in water and wastewater tariffs. In this discussion, we have in mind the case of an up-grade in wastewater treatment; the case that most directly relates to pollution reduction, particularly nutrient and toxics reduction.

REFORM: Tariff increases covering up-grade of wastewater treatment

Issue Summary: Need to finance new or up-graded wastewater treatment required or encouraged by regulation or fees.

Possible Reform Strategy: Raise tariffs to cover the cost of capital (principle and interest) and operating cost of the WWTP

Strategy Description	Comment/Concerns
Increase tariffs to cover the costs of the WWTP	Compliance with regulations; avoidance or reduction of high effluent charges. Revenues from higher tariffs may be offset by reductions in water demand.
	Pollution reduced from the supply side if the WWTP is built and properly operated. Possible reduction from the demand side if reduced sewerage flows are not offset by increase in pollution loads.
	If the MWWU is not on a stable financial footing, capital to finance the WWTP may not be available or available only at high interest rates.
	Political and economic resistance may be very high: non-payment may increase and new local authorities may be elected with a mandate to roll back the tariff increases; cross-subsidy by other communities not using the WWTP may be especially high and stimulate changes in tariff policy or sub-division of the MWWU.
	To ease the increase in tariffs, other investments may be canceled or deferred, perhaps even threatening investments aimed toward sustainability of operations, introduction of wastewater treatment at an uncontrolled discharge point, expansion of wastewater collection, etc.

Resistance to this tariff increases to support wastewater treatment upgrades reform may be very high because of the size of the tariff increase and the fact that the customers do not see much, if any, increase in their service levels. As noted earlier, we have computed some burden indices for WWTP upgrades in case study communities in Chapter 6.6. These results illustrate that upgrade of the infrastructure is likely to be excessively burdensome in most cases given the current levels of economic development. Substantial external assistance may be required for the burden to be acceptable even in some of the more developed countries of the ME DRB.

Another concern, specifically related to nutrient and toxics reduction, is the fact that serious reductions in these particular pollutants require the most extensive wastewater technology (tertiary treatment). This level of treatment is very expensive, both in itself and because the two earlier stages of treatment are a necessary pre-requisite. In addition, costly technological changes will be required for sludge management. This means that tariff increases necessary to address these particular pollutants will need to be especially large. The corollary is that tariff and charge reforms that effectively reduce these pollutants may need to be fairly dramatic. The many problem areas noted with the succession of tariff increase reforms just discussed suggest the need for further consideration of tariff designs. We now turn to some other aspects of tariff design and their possible role in tariff reforms.

4.2.1.4 Scenario Progression in the Case Study Utilities

To provide more concrete insight into tariff increase reforms introduced within this chapter, in this section the tariff consequences of progressing from present operating conditions to sustainable service, and to expanded/upgraded service are discussed.

4.2.1.4.1 Drinking Water Tariff Consequences

Table 18 depicts, and subsequent figures illustrate how household and industrial "drinking" water (excluding wastewater) tariffs and wastewater (excluding drinking water) tariffs change through progression from the baseline to the "upgrade" scenario. In order to be able to make a comparison across modelling results, we tried to create roughly uniform scenarios for the modeled MWWUs. We tried to construct comparable data across MWWUs and scenarios but that was strictly impossible.

Some of the key features and assumptions of the scenarios are shown in the footnotes of Table 18 below.

Table 18. Water Tariffs (Excluding Wastewater Tariffs) in Case Study Utilities under Different Scenario Assumptions (€/m^3 incl. VAT)

Country/MWWU	Household Water Tariffs			Industrial Water Tariffs		
	Baseline scenario	Sustainable scenario	Upgrade scenario	Baseline scenario	Sustainable scenario	Upgrade scenario
Bosnia-Herzegovina: Doboj	0.19	0.82	1.02	0.67	0.49	0.64
Bulgaria: Pleven	0.38	0.40	0.40	0.39	0.41	0.41
Croatia: Karlovac	0.37	0.72	0.74	0.96	0.73	0.74
Croatia: Duga Resa	0.38	0.67	0.74	0.81	0.67	0.68
Czech Republic: Vyskov	0.70	0.75	1.02	0.70	0.75	1.02
Hungary: EDV-WR	0.74	0.66	0.84	0.74	0.45	0.51
Moldova: Chisinau	0.13	0.35	0.35	0.72	0.35	0.35
Romania: Pitesti	0.16	-	-	0.16	-	-
Slovak Republic: Poprad	0.11	-	0.29	0.11	-	0.29

Scenario Assumptions:

1. *Baseline Scenario* tariffs are usually 2003 tariffs of the case study utilities. With these tariffs most of the companies break even only in the short run or have mild short run profits or losses. We adjusted the 2003 Slovak case study (Poprad) tariff to a level at which the case study company would have zero profits.
2. In the *Upgrade Scenario* no grants or subsidies associated with infrastructural development were included in the model. The costs of the service are covered entirely by tariff increases.
3. In the case of Bulgaria, Bosnia and Hungary case study MWWUs, cost-based tariffs were applied for the sustainable and upgrade scenarios for each service user category, eliminating cross-subsidization among service user categories. For the baseline scenario and the other

case studies, however, it was not possible to separate the costs related to service users and cost-based tariffs were not computed for each service user category.

4. It was assumed that each case study community had successfully launched a zero-cost program that eliminated non-payment.
5. Data for specific scenarios for some of the countries was not available at this time, therefore the tables and figures below are not completely filled up.
6. Average tariff was applied in case of a range tariffs, such as for Bulgaria, for instance.

Some of the MWWUs in the scenarios actually face financial difficulties in the short run. In contrast, the Slovak case study utility, however, would be highly profitable with the tariffs that they currently collect. From these profits the losses of other parts of the regional company are financed (the regional company consists of three main parts, including Poprad, which was the case study site). This is the reason for the special, Slovak baseline tariff adjustment.

Based on the results of the other countries, as well as economic concepts such as economies of scale, one would expect that truly cost-based tariff setting in Slovakia, the Czech Republic, Moldova and Croatia would also result in lower tariffs for industrial, and higher tariffs for household users as it had in Bulgaria (for wastewater), Bosnia and Hungary.

As collection of revenues is problematic in some of the ME DRB countries, especially the ones with low per capita disposable income and GDP (most importantly Moldova and Bosnia), sustainable W&WW services would be very difficult to reach for these countries if an effective, low cost revenue recovery program is not feasible.

Due to radically different circumstances among some of the case study communities in Table 18, it is very difficult to implement identical modelling assumptions for each of them. Therefore the exact tariff levels may not be fully comparable with each other. At the same time, the general trends and magnitudes are considered to be valid.

Differences in baseline household water tariffs reflect different levels of service, baseline sustainability as well as input costs across the countries. An exception may be Slovakia, where a high quality and sustainable water service is coupled with a low unit cost, partly due to favorable geographical conditions. Baseline industrial water tariffs are, without exception, equal to or higher than household water tariffs, as they cross-subsidize household consumers. This phenomenon is very well depicted by the fact that in the sustainable scenario (where cost recovery is required) most of the industrial tariffs decline (see Figure 14) compared to the baseline (in which cost recovery is not required), while most household tariffs increase (Figure 13). For most utilities within the sustainable scenario the water supply infrastructure is already in an advanced state, there is not much to upgrade on it, therefore tariffs do not increase further significantly. There are three exceptions. In the case of the Hungarian and the Czech utility there was no clear-cut upgrade scenario for water service. Rather, this scenario should be interpreted as long-term sustainability, as opposed to mid-term sustainability. In the case of Bosnia a water softening plant is constructed and operated as part of the upgrade scenario.

Figure 13 Household Water (Excluding Wastewater) Tariffs in Case Study Utilities in Three Main Scenarios (€/m³ incl. VAT)

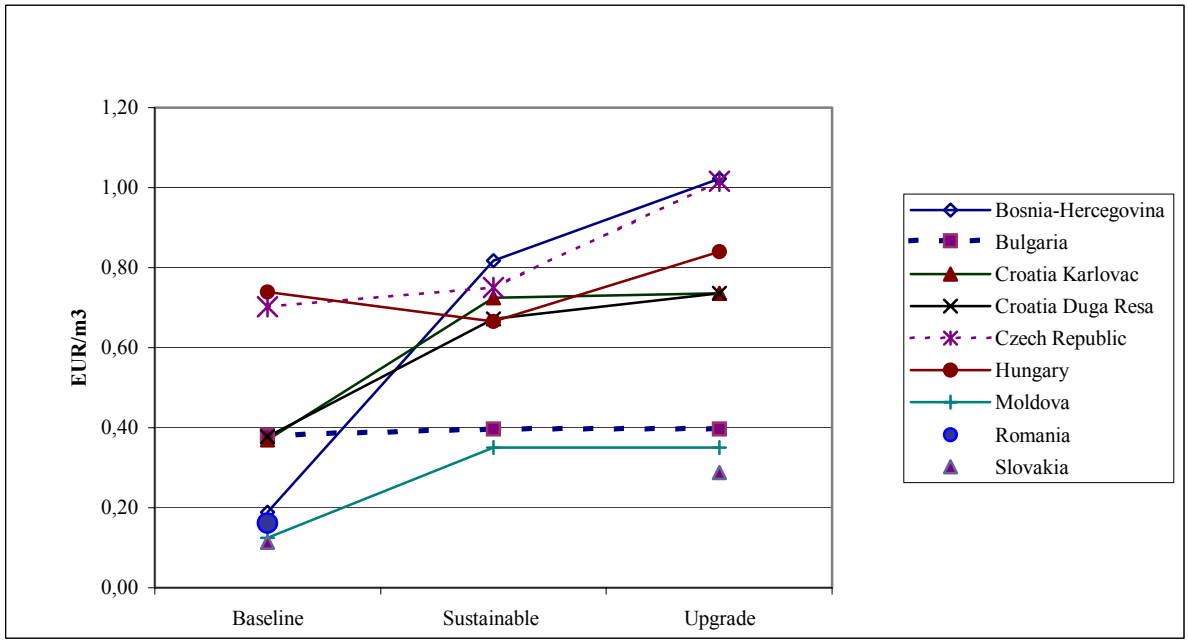
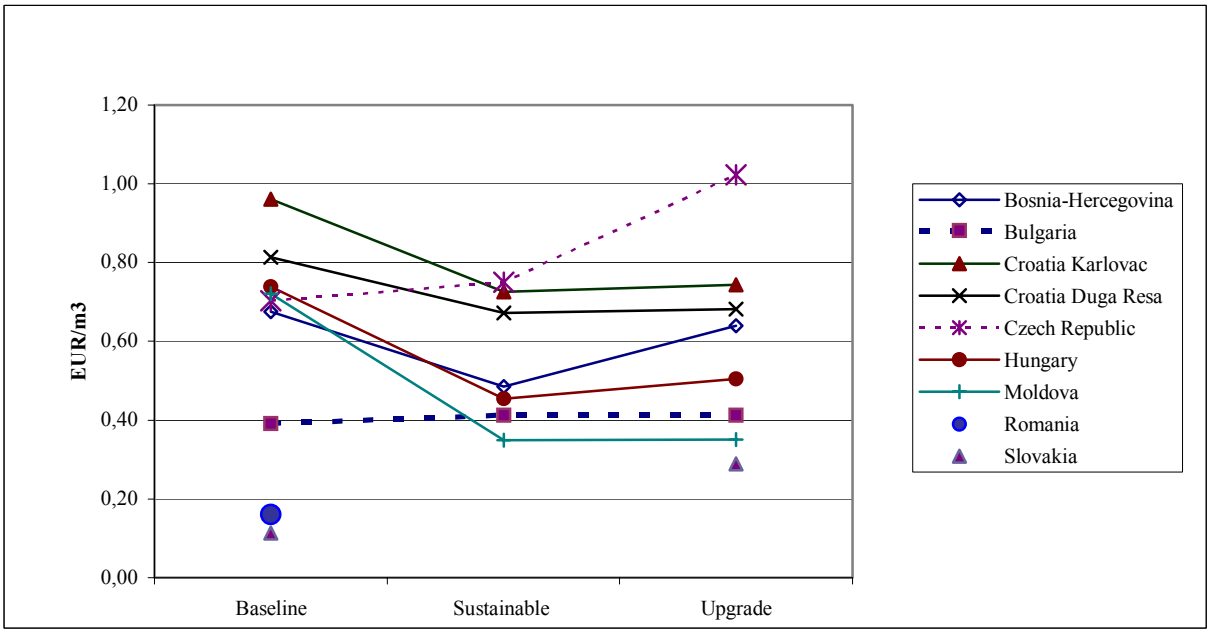


Figure 14 Industrial Water Tariffs in Case Study Utilities in Three Main Scenarios (€/m³ incl. VAT)



4.2.1.4.2 Wastewater Tariff Consequences

With the exception of the Slovak case study community, baseline wastewater tariffs are 20-90 percent lower than water tariffs. This is partly due to low costs due to levels of treatment (mostly mechanical, sometimes biological treatment, in some places complete lack of treatment), and low level or lack of effluent charges, while in some communities water services also cross-subsidize wastewater services (especially in Bulgaria and Hungary). In Slovakia higher wastewater tariffs appear to be primarily due to low costs of water supply in the short run.

Similarly to water services, industrial users (and other legal entities) pay as much or more for wastewater services as households. We have not investigated the extent to which higher industrial tariffs are justified by industrial pollution loads, but the change in tariff levels from the baseline to the sustainable scenarios suggests that industrial users cross-subsidize household users. This point is addressed again when we consider cost-based tariff reforms later in this chapter. Upgrading wastewater services, usually by means of constructing new or modernizing existing wastewater treatment plants, considerably raises the wastewater tariffs in most cases. The countries with higher per capita GDP (Croatia, Czech R., Slovakia and Hungary) will experience tariffs in excess of 0.5 €/m^3.

Table 19. Wastewater Tariffs in Case Study Utilities under Different Scenario Assumptions (€/m^3 incl. VAT)

Country	Household tariffs			Industrial tariffs		
	Baseline scenario	Sustainable scenario	Upgrade scenario	Baseline scenario	Sustainable scenario	Upgrade scenario
Bosnia-Herzegovina: Doboj	0.07	0.40	1.05	0.24	0.37	0.92
Bulgaria: Pleven	0.04 – 0.06	0.10 – 0.14	0.17 – 0.20	0.04 – 0.27	0.10 – 0.19	0.17 – 0.21
Croatia: Karlovac	0.24	0.42	1.09	0.35	0.42	0.77
Croatia: Duga Resa	0.16	0.58	1.09	0.16	0.36	0.71
Czech Republic: Vyskov	0.44	0.53	0.91	0.44	0.53	0.99
Hungary: EDV-WR	0.47	0.77	1.14	0.47	0.58	0.83
Moldova: Chisinau	0.04	0.13	0.14	0.23	0.13	0.14
Romania: Pitesti	0.13	-	-	0.13	-	-
Slovak Republic: Poprad	0.42	-	0.67	0.42	-	0.67

Scenario Assumptions:

1. *Baseline Scenario* tariffs are usually 2003 tariffs of the case study utilities. With these tariffs most of the companies operate sustainable only in the short run: they just break even, or have mild profits or losses. We adjusted the 2003 Slovak tariff to a level at which the case study company would have zero profits.
2. In the *Upgrade Scenario* no grants or subsidies associated with infrastructural development were included in the model. The costs of the service are covered entirely by tariff increases.
3. In the case of Bulgaria, Bosnia and Hungary case study MWWUs, cost-based tariffs were applied for the sustainable and upgrade scenarios for each service user category, eliminating

cross-subsidization among service user categories. For the baseline scenario and the other case studies, however, it was not possible to separate the costs related to service users and cost-based tariffs were not computed for each service user category.

4. It was assumed that each case study community had successfully launched a zero-cost program that eliminated non-payment.
5. Data for specific scenarios for some of the countries was not available at this time, therefore the tables and figures below are not completely filled up.

Figure 15 Household Wastewater Tariffs in Case Study Utilities in Three Main Scenarios (€/m³ incl. VAT)

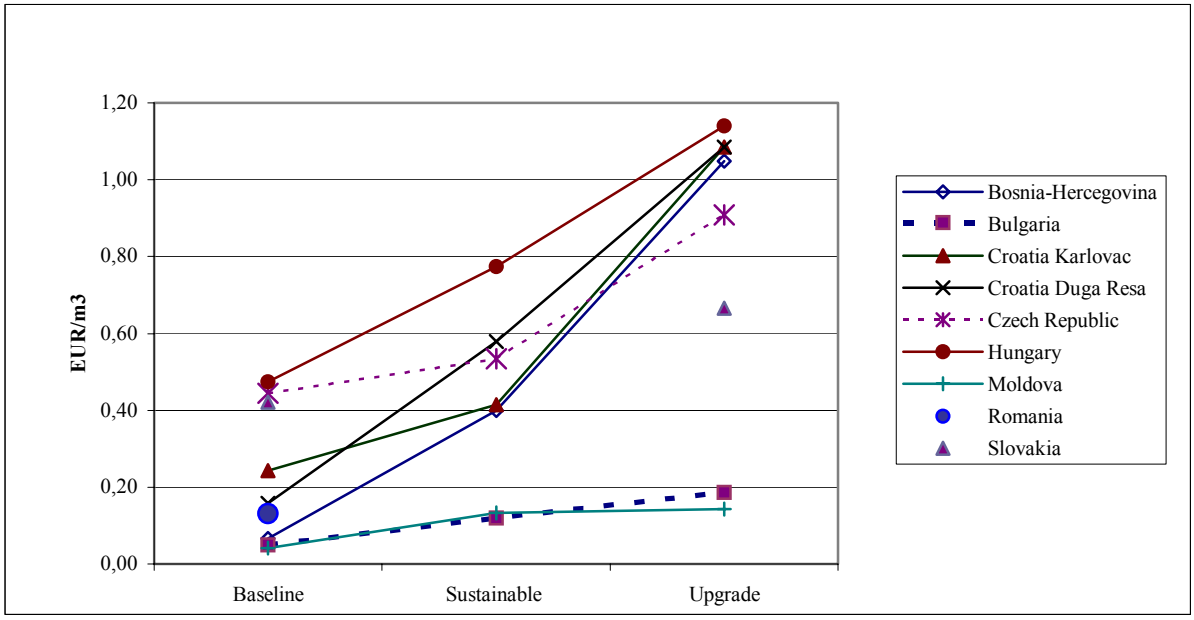
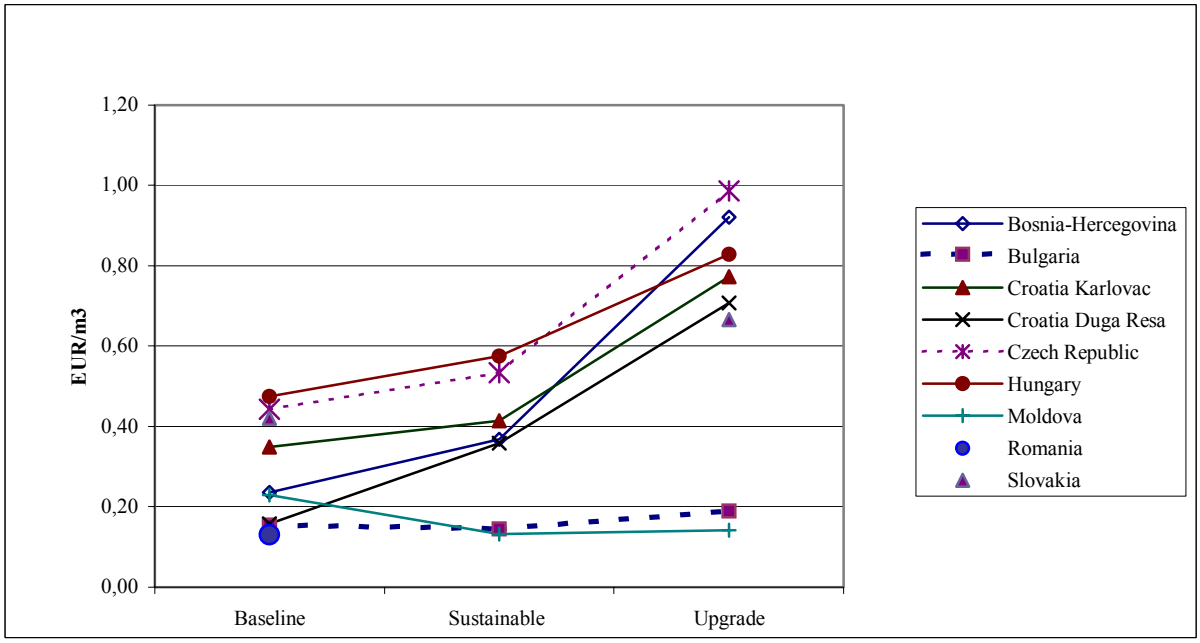


Figure 16 Industrial Wastewater Tariffs in Case Study Utilities in Three Main Scenarios (€/m³ incl. VAT)



4.2.2 Cost-Based Tariffs vs Cross-Subsidies

The countries and municipalities of the ME DRB are, for the most part, moving away from a variety of preferential tariff practices in which one group of customers pays higher tariffs than another group, even though their cost of service is roughly the same. Moving beyond this principle of "equal tariffs for equal service", however, there is also a move toward "cost-based" tariff setting; tariffs are different, reflecting different costs of service. As noted above, such a design is supported on efficiency grounds. In the following we look at three types of "cost-based" tariff reforms.

4.2.2.1 Customer Category

When MWWUs (or the central government) were setting tariffs based on operating costs, household customers were typically "cross-subsidized" by industrial customers. When municipalities took control of the MWWUs, they also took upon themselves the obligation of paying for both the operating and capital requirements of the system. In some countries these capital costs were "real" in that the MWWU really did have to make some capital investment. In other cases the capital cost were an accounting device – an allowed amortization that could legally be recovered by the MWWU.[18] To cover these additional costs the tariff decision makers often raised household tariffs to be more in line with the tariffs charged to "other" and "industry" customers. Even so, there is still plenty of evidence that "industrial" and "other" customers currently pay higher commodity charges than household customers.

At the same time, "industry" and "other" customer classes were often being privatized and were much more sensitive to costs. They pressured MWWU to reduce the tariff disparity or face the loss of their business. There is evidence in both the Czech Republic and Slovak Republic that the threat of industrial users to "self supply" their water and wastewater service influence the trend toward a re-design of tariffs for both water and wastewater. In those countries, however, which have not yet gone far enough in economic transition, including privatization of industrial facilities, strong competition in domestic markets, and deregulation of water utilities, the degree for “overcharging” industrial consumers is larger. Table 20 below indicates the ratio between water and wastewater tariffs of industry and households in case study communities. Interestingly, there is not a single utility in which industrial consumers would pay less for W&WW services than households, while, certainly in the case of water supply, provision of service to industry is almost always less costly than to households.

[18] The problem of accounting amortization was discussed previously and will be revisited again when we discuss financial reforms. We raise it here simply as a feature of the cost structure that puts pressure on municipalities to reduce or abandon the practice of cross-subsidizing households.

Table 20. Ratio of Industrial to Household Water and Wastewater Tariffs in Case Study Communities

	Water	Wastewater
Bosnia-Herzegovina: Doboj	3.57	3.54
Bulgaria: Pleven	1.03	3.10
Croatia: Karlovac	2.61	1.43
Croatia: Duga Resa	2.15	1.00
Czech Republic: Vyskov	1.00	1.00
Hungary: EDV-WR	1.00	1.00
Moldova: Chisinau	5.77	5.45
Romania: Pitesti	1.00	1.00
Slovak Republic: Poprad*	2.20	2.50

* Authorities are planning to equate household and industrial tariffs in 2005.

REFORM: Tariffs based on costs of service for different classes of customers

Issue Summary: Continued cross-subsidy of households by other customers is untenable given increased capital costs and the threat of industrial self-supply

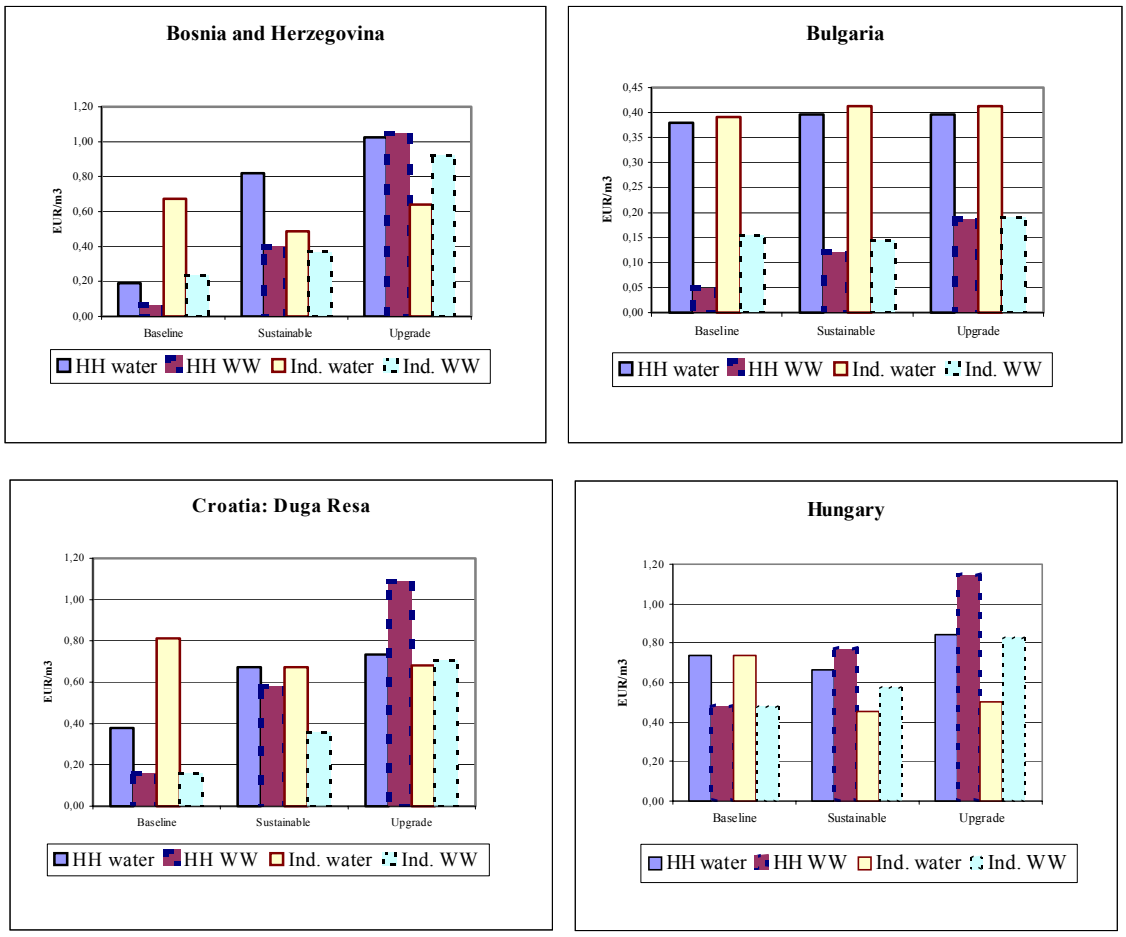
Possible Reform Strategy: Set tariffs based on costs of service for the different customer groups

Strategy Description	Comment/Concerns
Cost-of-service tariffs for households, industry, and other customer classes	Likely increase in economic efficiency but possible hardship for low-income households.
There will be some "arbitrary" assignment of joint and fixed costs if the decision is made to set tariffs that generate revenues that will cover all costs.	MWWU keeps industrial customers.
	Higher industrial wastewater costs may reflect the higher concentrations of pollutants in these wastewaters
	Increased tariff revenues from households with possible reductions in water use by households that partially offset the tariff increases.

Figure 17 illustrates the change in tariffs in those case studies in which cost recovery from different groups of SUs was possible to model. The figures clearly show that in the baseline water tariffs are significantly higher than wastewater tariffs for households as well as industrial users. This difference decreases through progression with the scenarios, wastewater tariffs outgrow water tariffs with the upgrade scenarios in Bosnia, Croatia and Hungary. It can also be observed that the household water and wastewater tariffs in each of the localities increase at a faster rate than industrial water tariffs.[19]

[19] "Increase" is relative, since sometimes tariffs decrease or stay constant, but progression is less disadvantageous for industrial users than household users as long as tariffs are based on costs.

Figure 17 Commodity Charges in the Bosnian, Bulgarian, Croatian and Hungarian Case Study Utilities in Three Main Scenarios



4.2.2.2 Type of Service

Some communities use wastewater tariffs to cross subsidize water service and vice versa. While this is mostly important in situations when some customers use one and not the other service, cost-of-service tariffs can be used to correct this source of inefficiency.

4.2.2.3 Geography

Geography, both physical and political, can influence the cost of serving particular customers. As MWWU service areas increase in size, especially as they become more regional in character, substantial differences in the cost incurred by the Utility to serve customers in different areas are likely to emerge. Often these differences simply reflect geography: higher, more remote areas are usually more costly to serve. A number of country or case study reform proposals of Table 16 and Table 17 emphasize linking tariffs more closely to local costs.

These differences can also, however, reflect the amount of capital and other infrastructure that components of the system "inherit" from the old regimes. These may not be "fairly" or uniformly distributed and efforts to devolve ownership and cost may not be equitable in this regard i.e., those communities favored by centrally financed infrastructure under the old system have higher service levels or lower prospective costs (in the near term) than communities that have to finance comparable

systems themselves.[20] This condition could also cut the other way: the operating costs of over-designed systems will burden the "blessed" communities. They may actually be at a disadvantage e.g., very small communities with large and expensive sewerages systems and treatment. In Hungary, one small community, whose water system is regarded by some as "compensation" for forced collectivization, depends on cost-subsidies from urban areas to keep its very expensive system operating.

REFORM: Tariffs based on costs of service for different geographic areas

Issue Summary: Continued cross-subsidy of one geographic area by another creates tension within the MWWU.

Possible Reform Strategy: Set tariffs based on costs of service for the different geographic areas

Strategy Description	Comment/Concerns
Cost-of-service tariffs for each geographic entity	Likely increase in economic efficiency but possible hardship for high cost areas.
There will be some "arbitrary" assignment of joint and fixed costs if the geographic areas share some infrastructure	MWWU keeps industrial customers and other customers in the low cost areas; possibly loses them in the high cost areas.
	Instituting this reform may mean that higher levels of wastewater treatment or expansion of the sewerage system are "unaffordable".
	Failure to institute this reform may result in further devolution into smaller, independent utilities.

The current organization of MWWU systems in many of the ME DRB countries is somewhat unstable in part because of the cost differences across communities. In Slovakia and Hungary, in particular, there has been continued sub-division of MWWU systems, as communities want to have more local autonomy with respect to service and tariff policy. This is, in some measure, motivated by a desire to shed high-cost elements (and communities) from the system.

A group of communities that are part of a MWWU can, of course, develop some middle ground on this question of cross subsidies across communities. Part of the reason for striking a compromise may be economic: economies of scale in administration and production. This compromise might include some continued sharing of costs up to some reasonable level as well as lower service levels and/or abandoning overly expensive infrastructure at the high cost communities. In the Czech case study, it is clear that the WWTP considered would never be financed by the served community alone and, that while arguably "affordable" for MWWUs as a whole, it is not a cost-effective means of nutrient reduction (see Table 17).

4.2.3 Tariff Designs

4.2.3.1 Multipart Tariffs

Responsibility for setting tariffs is devolving from the central government to local authorities, owners (sometimes the local authorities), and operators (at least initial recommendations). These local

[20] The "inherited" infrastructure is sometimes technologically or otherwise unsuited for upgrade. In such cases, the Utility must replace most of the infrastructure. In these cases, the endowment of infrastructure is really worth very little when the current system, especially a wastewater treatment system, must be upgraded.

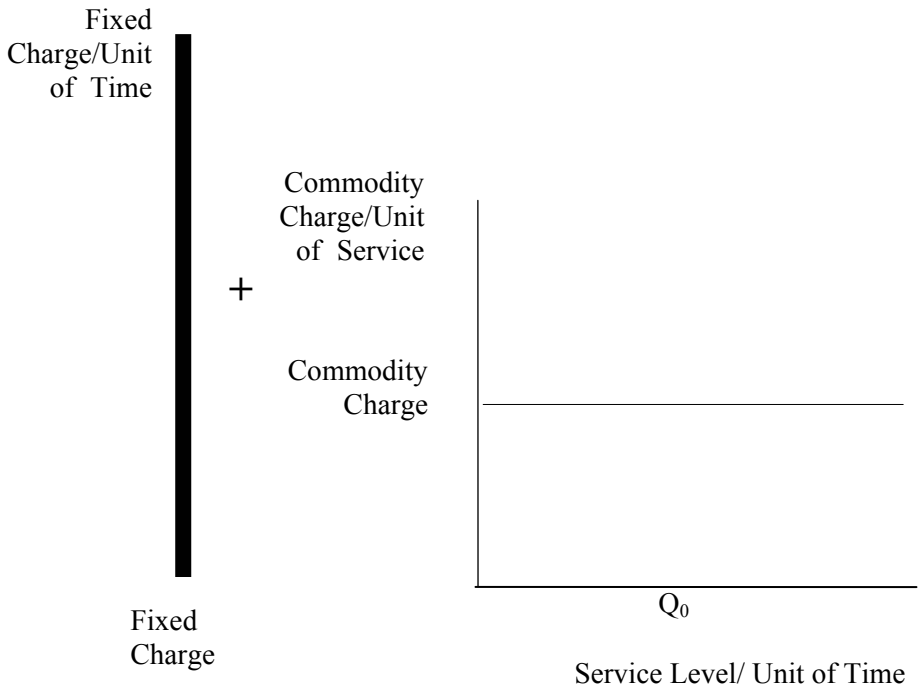
authorities and operators might prefer alternatives to simple commodity charges, such as "two part" tariffs and connect charges to more effectively cover costs and more efficiently deliver service. Here we describe some of the main options regarding simple two part tariffs, some of which are proposed in Table 16 and Table 17. Of course, there are many variations and permutations of these options, including extension to multipart tariff schemes with commodity charge both increasing and decreasing in a number of steps with the amount of water consumed. With regard to these latter designs, we share the concerns of Boland and Whittington (2000) and the OECD (2003b) that these more elaborate designs can become counterproductive, actually undermining efficiency and transparency objectives.

4.2.3.1.1 Fixed and Variable Costs

This tariff structure splits costs into fixed and variable (commodity charge) components. This distinction is fundamental to the proper application of marginal cost pricing with a revenue requirement, but the tariff design is of general interest as well. As illustrated in Figure 18 below, the first part of the tariff is a fixed charge per period that is paid by the customer regardless of the amount of water consumed or wastewater produced.[21] In principle, this covers the fixed costs the MWWU incurs regardless of the amount of water produced or treated. The commodity charge component is the second part of the tariff and is set on the basis of variable costs necessary to produce a unit of water in the period. In regions where the water supply is seasonal, the commodity charge may change as the costs of production change.

[21] The terminology of tariff design is not firmly fixed in the literature. Some would say that the term "two part tariff" only applies to a situation in which there are two distinct commodity charges. Here, because one can blend into the other, we offer the fixed and variable design as a type of two part tariff.

Figure 18 A Multipart Tariff with a Fixed Charge and a Commodity Charge



REFORM: Two-part tariff design with fixed and variable components

Issue Summary: Setting commodity charge levels so that revenues cover costs is difficult to do since fixed costs must be covered regardless of the amount of water sold.

Possible Reform Strategy: Create a two part tariff, with a fixed charge and commodity charge

Strategy Description	Comment/Concerns
Choose a two part tariff design: fixed charge to cover fixed costs and commodity charge to cover variable costs	Almost by definition, this is a cost recovery strategy.
Allocation of fixed costs is arbitrary. To maintain efficiency property it must not be allocated in any way to the amount of water actually consumed.	Efficient if, at the particular commodity charge, the demand for water is less than capacity.
	The impact on low income customers depends to a large extent on how fixed costs are allocated.
	Additional pollution control will impact both fixed and variable cost. Expenditures, rather than tariffs per se, are the key to "affordability".

Marginal cost pricing with a revenue requirement can be pursued as a special application of the fixed and variable cost two-part tariff. In such an application when the system is operating at less than full capacity, variable costs are, in fact, marginal costs and fixed charges are used to cover any fixed capital costs. As the system reaches capacity, the commodity charge is allowed to rise in excess of variable cost. Any excess revenues (revenues in excess of costs) collected from the commodity charge may be used to reduce the fixed charge. At some point the commodity charge gets so high that it is equivalent to "long run" marginal costs. These long run marginal costs are usually defined as the average capital cost of the new capacity plus the variable cost at the new capacity. At that point, the new capacity is built, and the cost of that new capacity becomes a fixed cost and the commodity charge drops back to the variable costs of operating with the new capacity. For further discussion and an illustration see Hall (1996) and Hall and Hanemann (1996).

REFORM: Marginal cost tariff setting

Issue Summary: Current tariffs are not economically efficient.

Possible Reform Strategy: Create a two part tariff with the commodity charge equal to either short or long run marginal cost, depending upon excess capacity.

Strategy Description	Comment/Concerns
Choose a two part tariff design with the commodity charge equal to marginal cost	The most efficient pricing strategy; static and dynamic efficiency.
Commodity charge is equal to variable cost with excess capacity; long run marginal costs when the system is capacity constrained.	Can also be a cost recovery design through the use of the fixed charge..
	Customers, operators, and owners must be highly tolerant of, and responsive to, possible large changes in tariffs over relatively short intervals.
	The efficiency property depends, in large part, on low transactions costs associated with customer adjustment to new tariffs.
	The design will automatically make efficient choices regarding pollution reduction if the effluent charge levels are themselves based on an accurate social damage function.

4.2.3.1.2 Multipart Tariffs – Low Initial Commodity Charge

Another two-part tariff design is motivated by an attempt to improve the "equity" characteristics of the tariff without badly compromising the efficiency and cost-recovery features. This tariff design assigns artificially "low" commodity charges to the first portion "block" of the two part tariff and higher charges to succeeding blocks. Such a design is illustrated in Figure 7 on page 33 and often referred to as an increasing block tariff design.

REFORM: Two-part tariff with low first block, high second block

Issue Summary: Prospective tariff increases are particularly threatening to low income households.

Possible Reform Strategy: Create a two part tariff with a low commodity charge for the first few units of water use.

Strategy Description	Comment/Concerns
Choose a two part tariff design: low commodity charge in the first block and high commodity charge in the second block	Reduces expenditures of low water use customers. If low-income customers are also low water users, then it is more "equitable".
	Efficiency and cost recovery may be compromised. The former if the second block tariff is too high, the later if the second block tariff is too low.
	May allow the MWWU to generate more revenue to support pollution reduction without hitting the affordability barrier of low-income households.

As already suggested, there are many variations in both the application and rationale of a two-part tariff with two commodity charges. One alternative, discussed in Table 16 as a possibility for B&H, is designation of a "base" level of consumption and any level of water or wastewater consumption above that as "peak" level of consumption. The commodity charge of the "base" level would reflect the costs of both infrastructure and operation that are necessary to meet these lower levels of demand. The "peak" commodity charge would be higher, reflecting the higher costs of building and operating capacity needed to meet this "peak" consumption. While there is no inherent economic merit to this distinction, the operational effect is still the same as the increasing block tariff reform described above: low expenditures for customers that use lower amounts of water and disproportionately higher expenditures for customers that use larger amounts of water. As noted above, however, the experience with such tariff structures is that they do not allow one to really effectively target those customers (and only those customers) one would like to protect (OECD, 2003b).

4.3 Effluent Charges

Effluent charges currently seem to provide little incentive on "the costs side" for MWWUs to invest in wastewater treatment. This could be because the effluent charges are too low relative to the costs of control. In some of the countries, the effluent charge is designed as a “fine”; it only applies to effluents levels or concentrations in excess of some levels set in the operating permit. Also, it could be poor design: as discussed above. Croatia and B&H have high “effluent charges” but impose them in a way that does not provide much “cost side” incentive: those that pay the charge have no control over the variables the will reduce it. Alternatively, effluent charges might be high enough ”on paper” but in practice the system may be easily manipulated so as to result in a much lower effective rate. As a related consideration, strict enforcement may result in such a burden to the MWWU or its customers that the service itself, or valued components of it, may be threatened. Hence, MWWUs in Bulgaria pay very little effluent charge.

Of course, lack of WWTP construction does not necessarily mean the effluent charge is "too low". In principle, we could stimulate some increase in WWTP construction if we simple raise the effluent charge high enough and made sure that it was enforced.[22] Furthermore, the absence of current construction does not mean the "revenue" side of an effluent charge is inconsequential. It would appear that in countries like Croatia the effluent charge, in the form of an environmental protection fee, has a significant revenue effect. The extent to which, under the current system, this translates into actual pollution reduction needs to be more carefully examined in each country. In general, however, when effluent charge revenues are recycled through third parties (such as environmental funds) before being returned to MWWU to subsidize pollution reducing investments, additional transactions costs and opportunities for resource misallocation arise.

There may be a special role for effluent charges even when they aren’t high enough to induce investment in the most advanced WWTP technology. However a WWTP is financed, even if the whole plant is built with grants, it still requires funds to operate. The effluent charge might be set high enough that it provides a financial incentive to the MWWU to operate the WWTP as effectively as possible e.g., minimize by-passes, keep up residence times, refresh filters, etc. This feature is especially relevant for the MWWUs in those countries that have recently joined, or will in this decade likely join, the European Union. Here strict command and control requirements on effluent discharge are set by EU legislation, and there is limited room for effluent charges to trigger further effluent reduction investments. Effluent charges, however, can provide incentives for effective operation of WWTPs.

[22] Also in principle, the efficient level of the effluent charge is that which is set to cover the marginal cost to society of an additional unit of effluent. An effluent charge set higher than this might stimulate more WWTP construction and increase effluent treatment, but it would not be “efficient” to do so since the marginal cost to society would be greater than the marginal benefit.

4.3.1 Effluent Charge Level

We begin this discussion of effluent charge reforms, like that of the discussion of tariff reforms, by considering an increase in the effluent charge level. While the design of effluent charges differs substantially from country to country, we begin with the assumption that the increase in the level of the effluent charges occurs with an effluent charge designed as a "fine" i.e., it only applies to excess levels of effluent discharged.

Table 21 lists some proposals for effluent charge reform based on country reports. In general, there seems to be support for an increase in the effluent charge in those countries where they are relatively low. In fact, several countries (Hungary, Slovakia) report that increases have already been set or are under consideration (Czech Republic).

REFORM: Increase in the volume (flow) or concentration (load) effluent charges

Issue Summary: Current charges were set too low or have been eroded by inflation.

Possible Reform Strategy: Raise the effluent charge.

Strategy Description	Comment/Concerns
Increase the effluent charge assessed by volume and/or concentration.	Encourages MWWU to reduce effluents in order to reduce costs. Extent of the reaction is uncertain.
	Increases the cost of operation. These will have to be passed on to customers as higher tariffs or absorbed by the MWWU as it reduces service or allowances for future investment.
	May increase payments for effluent charges. Whether it does or not depends on the size of the effluent charge increase and the elasticity of substitution for pollution reduction in production of wastewater services.
	If effluents are reduced, it is likely that solid waste production by treatment facilities will increase.
	Once the command and control requirements of the EU environmental acquis, especially Directive 91/271/EEC concerning Urban Water and Wastewater Treatment have been met, further pollution abatement becomes very expensive, and it would be triggered only by extremely high effluent charges. There is even a risk that a dual burden (cost of WWTP investment and effluent charge together) would cause delays in the construction of treatment plants.

A cost minimizing Utility will respond to the increased effluent charge by reducing pollution to the point where the marginal cost of abatement is equal to the new effluent charge. As shown in Annex 2, the reaction depends on both the new charge level and the cost of abatement. As noted in the comments to the reform above, the predicted impact of the increased effluent charge, assuming it is effectively implemented, will depend on the specific technical and economic conditions of the MWWU and its customers. Beyond the immediate effects on MWWU behavior, the "revenue" effects and their ultimate impact on investment in pollution reduction are also uncertain. All this suggests that effluent charge tariffs should not be increased without careful examination and consideration of both 1) the technical and institutional context into which it is introduced and 2) the objectives that wish to be achieved.

Table 21. Effluent Charge Reform Proposals Affecting MWWUs in Study Countries of the DRB

Country	Revise the Effluent Charge	
	Reform	**Rationale**
Bosnia-Herzegovina	Make a connection between effluent loads and effluent charge payments.	At present "effluent charge" is based on population equivalent, providing no incentive to reduce pollution.
Bulgaria	Review the distribution of effluent charge revenues with the intent of using them more directly to support MWWU water protection programs, including water resource use. Improve scope and enforcement of existing effluent charges. Consider raising effluent charges for discharges in excess of permitted levels in order to provide more support for "revenue side" links to pollution protection.	Most effluent charge revenues from MWWUs are channeled to municipal governments. The current effluent charge raises little revenue from MWWUs and, apparently, provides little incentive for MWWUs to reduce effluents. Directing the proceeds of effluent charges more effectively to MWWU projects, including water resource use, may make it easier to increase the scope, level, and enforcement of effluent charges.
Croatia	Make the "Water Protection Charge" (WPC) more sensitive to the effluent loads. Allow the MWWU to withhold some of the charge payment to build, upgrade, or better manage a WWT facility.	The current WPC is relatively high (up to twice the size of the municipal sewerage service charge) but doesn't seem to have stimulated improvements in WWT, as the next level of treatment, which would result in lower WPC payments, is very expensive to introduce.
Czech Republic	Higher effluent charges proposed by MoE as an amendment of the Act.	Effluent charges are rather low and eroded by the inflation. Their operative change is difficult because the level of charges is stated by the Act.
Hungary	No specific proposal.	In Hungary an effluent charge regime was introduced in 2004. Policy recommendations can be made after the operation in the first year of the charge has been assessed.
Moldova	Set effluent charges at a level prompting operation of existing WWTPs	In Moldova there are a number of WWTPs, which are, however, not in operation due to the financial difficulties of MWWUs. By introducing a relatively low level of effluent charge and an effluent monitoring program, the wastewater treatment infrastructure could be brought back to operation. There is, however, a risk that financially unstable MWWUs would not respond to the effluent charges in any way.
Romania	Redesign the effluent charge to cover the full load of pollution, not only above limit effluents. Increase the charges to levels providing an actual incentive for effluent reduction.	The present levels and design of effluent charges do not prompt effluent reduction.
Slovak Republic	Increase the effective effluent charges so as to ensure an "incentive" function. This requires an examination of the unit cost of pollution reduction. Allow for payment holidays in case of mitigation investments	An increase in effluent charges is currently being discussed. The outdated regulation on pollution charges (valid from 1979) does not suit the current situation. An expert group of water engineers was invited to assess the unit cost of pollution reduction and this will serve as a basis for setting new effluent charges. Provides an incentive for MWWU to reduce effluents and concentrations.

4.3.2 Effluent Charge Designs

One difficulty with effluent charges is that they are an economic instrument usually applied on top of command and control regulatory standards. Each MWWU has to get approvals to build and operate the elements of its system. This usually means that its designs are usually scrutinized by various interested authorities and subject to environmental reviews. When approved for operation, a WWTP usually is assigned limits on the amount and concentration of effluent. In this setting, the effluents charges are often assessed only on the excess of these limits. The reason behind this is that the WWTP has already had to install expensive equipment to reduce effluents to a reasonable level. Why penalize the MWWU by making it pay effluent charges on effluent levels that are inherent to the technology that was approved by during environmental review of the WWTP? Shouldn't you only penalize to the extent that the operator exceeds the assigned limits? While this is not universally the case e.g., Croatia increases customer wastewater tariffs directly with its water protection fee and Slovakia applies the effluent charges to all effluents, many effluent charges are applied only on the excesses above the assigned effluent limits. These effluent charges are often called fines.

Operating a system of fines instead of a charge regime does not necessarily have a valid economic argument. Whether or not the fines are compatible with economic efficiency criteria depends on the technology approved and the damage function for relevant effluents. One option that would increase the incentive for pollution control on the cost side of the effluent charge is to apply the effluent charge to the total, not just the excess, effluent. If, however, the effluent charge levels are based on a revenue target rather than a damage function, extension of effluent charges to all effluents may actually reduce economic efficiency. As in some other examples cited here, the merit of the reform depends on more than just one dimension of design or one consequence of the many changes stimulated by the reform.

An issue that sometimes arises during the design of effluent charges in the region is the inherited WWTP infrastructure of utilities. At some of the utilities advanced wastewater treatment equipment were installed from government sources at some point in the past, when the utility was either state owned or the investment was supported through a grant scheme. These utilities, whatever their present ownership, are certainly at an advantage compared to those utilities which were never granted modern WWT technology, and now have to invest in it without outside help[23], for two reasons:

- Initial effluent charge payments of the utilities with more advanced technology will be lower due to less pollution released.
- They do not have to invest into WWTP now, or only to a lower extent, spending on, for instance, modernization of existing equipment.

There are several ways of easing the dual burden of utilities that lag behind. One possibility is to set the compliance date for the effluent charge several years in the future, ensuring enough time to design and construct an appropriate collection and treatment system. The effectiveness of this strategy depends crucially on the credibility of government. Moreover, ME DRB governments usually run negative budget deficits, and they are keen on securing more revenues, having low willingness to "postpone" introduction of the effluent charge.

Another possibility is offering the option to the utilities to spend a certain percentage of effluent charge payments for a specific number of years on investment into their abatement technology. Lastly, a government or W&WW industry operated sinking fund can also be effective. Part or all of the effluent charge revenues would be channeled into this fund, from where WWTP investment would be supported, either as a grant or as preferential loan. (See section 5.2.2 for more detail on the last option.) Provision of government grants, however, runs a serious risk of low economic effectiveness, this option should therefore be applied with great care, if at all. EU grants, at the same time, will be available in most ME DRB countries to upgrade or introduce WWTP technologies at MWWUs, and these grants will, by design, assist in bridging the gap between poor and good performers.

[23] In a number of the ME DRB countries some outside investment support is available, from the EU and/or domestic government grants.

REFORM: Effluent charge on total effluent

Issue Summary: Current charges commonly apply to only to excess effluent.

Possible Reform Strategy: Apply the effluent charge on total effluent.

Strategy Description	Comment/Concerns
Apply the effluent charge on total effluent.	Encourages MWWU to reduce effluents beyond current limits. This is true, however, if the current effluent charge is higher than the current marginal cost of control.
	Has little effect on discharge points that are essentially weakly controlled as a result of problems with measurement and enforcement.
	The revenue effect – the amount of new fee revenue produced – may be significant.
	Will increase costs and probably the tariffs charged by the MWWU.

4.3.3 Process Changes

4.3.3.1 Measurement/Monitoring

Most effluent measurements are self-reported i.e., they are made and reported by the polluter, in this case the MWWU. The greater the effluent charge, the greater the incentive the MWWU has to under-report effluent levels. While it is common to have local environmental agencies double checking effluent levels, the resources of these organizations are limited and the likelihood of the MWWUs data being successfully challenged is very small. Allocating more resources to monitoring programs may be a wise decision in some countries.

4.3.3.2 Reduce Latitude for Regulators Judgment

When issues arise regarding the assessment of an effluent charge, the environmental authorities will often begin negotiating agreement to remedy the problems rather than insisting that the MWWU pay up right now. This approach may actually be optimal given the appeal process or other means an MWWU has of contesting the effluent charge payment. However, this does pose a problem for the effectiveness of the effluent charge even if the charge levels are raised.

4.3.3.3 Publish effluent charge payments

Publication of effluent levels, effluent charges assessed, and effluent charge payments is a good way to raise public awareness on how effective current effluent charges are in reducing pollution, and may provide an incentive for polluters to comply with regulations.

5 Supporting Reforms for Tariffs or Effluent Charges

5.1 Bookkeeping and Accounting Reforms

5.1.1 Bookkeeping/Accounting

Potentially one of the most important areas of reform is the development of bookkeeping and accounting practices that support modern management and oversight of the MWWU (See Table 22). More specifically, the books – or some part of the books - must be kept to provide a good picture of the cost structure[24]. This information on cost structure should support cost-of-service pricing through cross tabulation of costs by activities, service areas, and accounts. Both the need for such a capability, as well as the value of such information for planning and analysis purposes, was abundantly clear to members of our Project team that needed to collect and interpret case study information.

The bookkeeping should also support public oversight of the MWWU. The owners or their representatives cannot meet their responsibilities unless they have access to information that clearly shows the financial condition of the MWWU and has enough detail to explain why it is in that condition. The owners have an interest in seeing that the MWWU is being run in a cost-effective manner and the MWWU accounts should be designed to help them make that judgment. Similarly, the bookkeeping and accounting practices should be designed to support the oversight of economic regulators. Their responsibility is to assure that the MWWU does not abuse its privileged economic position as a public monopoly. To provide this information may require reforms in bookkeeping standards in general; developing new standards for regulated, local monopolies; or moving the MWWUs into a class of business entities where the necessary scope and standards already prevail.

REFORM: Upgrade bookkeeping and accounting practices

Issue Summary: Current book keeping is not detailed enough to support planning and oversight

Possible Reform Strategy: Upgrade the bookkeeping practice

Strategy Description	Comment/Concerns
Develop a set of book keeping accounts that provide better information on the costs structure and better supports investment planning and tariff calculations.	Supports management decision making, including tariff design and investment planning
Integrate the accounts with the billing system	Supports oversight by owners and economic regulators
	Will involve extra personnel and other costs.
	May not conform to current book keeping requirements; may be necessary to keep two or more sets of accounts.

An important aspect of this system would be use of the economic lives of assets (not their tax lives) in the computations of tariff requirements and other management decisions. This could mean, for example, that the economic depreciation of gifted infrastructure in the revised management books can be used as a cost in the calculation of "sustainable" tariff levels.

[24] It is sometimes said of modern corporations that they keep three sets of books: for tax purposes, for the use of external audits/accounts, and for use in business management.

5.1.2 Audit Reforms

While bookkeeping reforms will help the MWWU with economic oversight, the study team also identified the need for public audits to assure that the books are honest and tariffs justified. For those MWWUs that are owned outright by municipalities or jointly with partners, the municipalities' citizens – as both owners and customers in most cases – desire the assurance that the Utility's books are clean and accurate. This is one way to address the lack of confidence in governance that seems to be uppermost in people's minds when they are asked to consider an increase in tariffs.

The audits we have in mind are "performance" audits. Such audits go more deeply into the books and examine the structure of costs and tariffs to see that the MWWU is well organized and managed. Such audits can assist the managers to identify potential cost savings and cost-effective ways to improve the overall level of service.

For audits to be effective, the country may have to establish rules and regulations for auditing, especially related to allowances for depreciation of "inherited" infrastructure based on "book value" and other possible abusive practices. As part of this process the MWWUs need to establish how they plan to finance future investment, the two main strategies are: 1) to set up reserve funds that are funded from current tariffs (and drawn down as the future investment is required) and 2) fund the future investments externally and repay the debt using future tariffs. The ASTEC model allows the user to select either strategy.

REFORM: Introduce a periodic public audit of MWWU books

Issue Summary: The regulators and customers desire some assurance that the books are accurate as a basis for establishing rates.

Possible Reform Strategy: Require periodic performance audits

Strategy Description	Comment/Concerns
Require periodic independent performance audits of MWWU books	Will involve extra costs. Should be paid for by the MWWU (customers) but the contract might be awarded by the regulators.
Can reduce the cost by making them the audits samples of parts of the books.	There may be problems with the legal basis for this requirement - privacy provisions etc.- that have to be worked out.
The frequency and depth of audit can vary with the size, financial condition, and investment plans of the MWWU.	

Table 22. Accounting, Bookkeeping, and Audit Reform Proposals Affecting MWWUs in Study Countries of the DRB

Country	Book-Keeping for Management		Audit of MWWU Books		Rationalize the Cost Basis Used in MWWU Regulation	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Bosnia-Herzegovina: Applies to both RS and FB&H	• Prepare new accounting standards specifically designed for cost centered accounting of MWWUs. • If this is not feasible, then a "parallel" cost center accounting should take place within MWWUs to help planning. • Need help in preparation, implementation, and use of the new accounting standards and system. Needs to be coordinated across water utilities	• Existing accounting standards are too general and rigid and do not allow accounting for management purposes. • Reformed accounts should continue to provide required reports to support economic regulation.	• Periodic, independent audit of MWWU books is needed • Audit results should be made available to the public	• Audits contribute to more efficient operations as well as more credible tariff setting • Improved transparency of books contributes to the credibility of the management and increases the acceptability of new tariffs among service users	• Budget from the department up. Each department in the MWWU will develop its own budget based on its costs and conditions. Include budgets for both operating and capital accounts in each department.	• There is currently no way to compare actual to budgeted costs by department or activity within MWWUs.
Bulgaria	• Introduce cost centers at MWWUs.	• Good quality accounting and financial information for cost based tariff setting is difficult to obtain at most MWWUs due to lack of cost center accounting	• Periodic, independent audit of MWWU books is needed	• Audits contribute to more efficient operations as well as more credible tariff setting	• All MWWU fixed assets should be re-valued so that cost based tariffs have a realistic basis	• Re-valuation of assets is essential due to high inflation in the 1990's. According to the Water Law, however, only fixed assets that are not state (public) or municipal property must be re-valued.

Country	Book-Keeping for Management		Audit of MWWU Books		Rationalize the Cost Basis Used in MWWU Regulation	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Croatia	• Consider separating the water and wastewater components of operation • Creation of cost centers within accounting • New data requirements and reporting templates to assist financial analysis	• Many smaller communities operate the water system as part of the general municipal utility enterprise. • This bookkeeping requirement will make it possible to begin a determination of the balance sheet and management performance regarding the water and wastewater component.	• Require periodic, independent audit of water utility books to identify possible cross-financing of other projects with funds ear-marked for pollution reduction. • Audits to identify that central government support for MWWUs is actually being spent effectively and enhancing water services.	• Supports central government grant and financing programs.	• Allow real depreciation to be used in the cost basis used in tariff review	• Old, artificial depreciation and valuation data are often being used for this purpose. Better, current market and technology data should be used.
Czech Republic	• Introduction of cost centers by service users or geographic locations.	• Many MWWUs do not have sufficient information on the costs and revenues related to specific customer groups.	• Make technical audits standard and periodic. Have MWWU pay for the audits, but direction of the audits under the regulatory authority.	• Current "technical audits" by the Ministry of Agriculture (MOA) are occasional and rare. Makes it difficult for the MOA to get the data to do its job. • MOA has an initiative to amend the Act; reform proposal to support/qualify the proposal? • May need to develop a parallel reform for the smaller MWWU not under MOA authority.	• Allow real depreciation based on the economic life of equipment and current investment costs to be used in the cost basis used in tariff review	• Old, artificial depreciation and valuation data are often being used for this purpose. Better, current market and technology data should be used.

Country	Book-Keeping for Management		Audit of MWWU Books		Rationalize the Cost Basis Used in MWWU Regulation	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Hungary	• Introduction of cost centers by service users or geographic locations.	• Many MWWUs do not have sufficient information on the costs and revenues related to specific customer groups (the accounting standards provide this option, there is no need for "shadow" accounting in order to operate cost centers).				
Moldova	• Improved book keeping by cost centers	• To provide information for cost based tariffs	• Periodic, independent audit of MWWU books is needed	• Audits contribute to more efficient operations as well as more credible tariff setting		
Romania						
Slovak Republic	• Require MWWU to keep detailed books (accounts) on water system costs, etc. This supports independent audit, tariff setting, and regulatory review. • Examination of individual constituents of costs and tariffs • Clear description of cost items including depreciation and future savings	• Current book keeping reflects old, centralized budget and management system • New, cost centered system is needed to meet the needs of auditors and regulators	• MWWU has a periodic audit of its books to show that costs and revenues are being properly logged.			

5.2 Financing Reforms

5.2.1 Depreciation Reforms

Amortization, as described in the Glossary, refers to repayment of capital that was borrowed in the past to construct part of the MWWU system and that has to be repaid. The members of the Project team have also seen it used with reference to infrastructure that has been gifted to the MWWU. The "amortization" used in this sense is really “depreciation”. If properly estimated, it may be introduced as "cost" that can be legitimately recovered by the MWWU in its tariffs. Unfortunately, we don’t see much evidence that the estimates of depreciation (under the term “amortization”) are based on the market value or replacement value of the assets.

Moreover, we are concerned that the tariff levels and resulting revenue supplements supported by the “amortization” of costs are not being used to replace the infrastructure that is, presumably, depreciating with use. If the supplementary revenues so produced were earmarked for a capital fund that would be used to replace the infrastructure in question when its useful life runs out (see "economic life" above), we might have more confidence that the current tariffs and budgets are based on a “sustainable” financial program. Unfortunately, while we encountered "amortization" in the books of MWWUs, we did not encounter such capital funds. The supplementary revenue seems to be diverted to covering other operating expenses. We may be wrong – given the condition of, and our limited access, to the books it was sometimes difficult to understand entries – but this definitely needs additional consideration.

REFORM: Depreciation Clarification

Issue Summary: Sometimes used inappropriately to justify a larger cost basis.

Possible Reform Strategy: Require that depreciation be defined in a way consistent with the economic purpose of the cost basis for a public monopoly

Strategy Description	Comment/Concerns
Review and, if necessary, revise the conditions under which depreciation can be added to the cost basis.	This may, in some cases, reduce the cost basis and the allowable tariff.
Establish a proper economic and technical basis for calculation of depreciation	If depreciation is allowed in the cost basis in anticipation of costs, proper protection of the funds may require that the revenue be earmarked for that purpose
	Can use depreciation in anticipation of a cost to finance future upgrades in pollution control.

5.2.2 Central Managed Pooled Funds

Central Managed Pooled Funds (CMPFs) – environmental funds, regional development funds, water supply development funds, pollution control funds – are a means of overcoming financing problems in various sectors. These CMPFs have been common in the ME DRB countries. They can supply capital when ordinary sources of capital are not available or the cost of alternate sources is considered prohibitive. They address one problem but raise several others: How to capitalize the Fund to begin with? How to decide who gets the capital? On what terms should the capital be offered? How to assure that the capital is used as intended by the CMPF?

It may be possible to address the problem of capitalizing a state fund that helps finance pollution control at MWWUs by taxing the MWWUs. This is essentially the strategy adopted by Croatia, where a series of "fees" are assessed on MWWUs. While the process is under re-consideration, currently a substantial portion of these funds go to the "Croatian Waters" organization and are then used to provide capital needed to make investments by MWWUs. A reform based on this strategy is a type of "forced investment". Certainly, many of the MWWUs are looking to the central government for help to meet their investment needs. It isn't likely, however, that they favor capitalizing this support by having a fee levied on MWWU services.

As noted above, one source of funds that is often "earmarked" for water pollution control is the effluent charge. This financing strategy develops the "revenue" side of the link between effluent charges and pollution reduction.

Such initiatives should be handled with great care in design and execution. In ME DRB countries, there is a tradition of having Central Government financing and, more recently, introduction of CMPF. However, recent experience has demonstrated the possibilities for political influence and general mismanagement in fund allocations. Thus, today, there is a trend toward CMPFs being turned into a "soft-loan bank" (as was the case of Slovenia, the Czech Republic, and Hungary) or partially or fully cancelled (recently the case in Slovakia). Note that the countries cited here are the ones in the ME DRB with more developed capital markets where many of the MWWUs have access to the capital markets and the cost of capital has considerably declined during the past decade. MWWUs in these countries also appear to be operating on a more sustainable financial path than in some of the other countries, making them more attractive clients for the financial institutions.

REFORM: Pooled capital resources to capitalize a revolving fund using the revenues from effluent charges or other taxes or fees added on to water and wastewater services

Issue Summary: Poor access to capital to support MWWU effluent control investment.

Possible Reform Strategy: Capitalize a capital pool that will be earmarked for MWWU pollution control investment using the effluent charge.

Strategy Description	Comment/Concerns
Use the revenues from the effluent charge to capitalize a revolving fund designated for MWWU WWTP investments	It may stimulate investment in WWTP
Organize management of the CMPF to be independent of political influence.	Is the revenue stream large enough to make a difference?
Include post-funding performance reviews of fund recipients.	On what basis will the capital will be allocated? Will it be allocated efficiently? Competitive awards may lose "leverage" but provide an incentive for honest, aggressive bids.
Disperse funds on a competitive basis using cost-effectiveness as the funding criterion. Award the funds on the terms of the marginally competitive application.	How to assure that funds raised are actually used for their designated purpose?
Limit the use of a domestic revolving fund to those MWWUs, which are excluded from access to EU investment grants, such as ISPA and Cohesions Fund. This way the size of the funds, and the corresponding burden on the economy, will be limited.	Will have some, maybe high, "transactions" costs.

Be that as it may, a reform that effectively increases the level or scope of an effluent charge should be coupled with a plan for effective use of the revenues produced. Without major changes in the charter and direction provided for such CMPF in the past, we would be very hesitant to encourage earmarking of revenues from effluent charges to such Funds.

5.2.3 Government Fees and Taxes on Water and Wastewater Services

In most countries, water tariffs are currently inflated by a system of "charges" that are not associated very closely with costs e.g., value added tax, extraction fees, concession charges. The most obvious example is Croatia where up to half the tariff paid can go to paying taxes and fees. While, in principle, water services may be a good product(s) to tax due to its often low elasticity of demand, we might reduce taxes and fees in order to 1) keep the water tariffs lower and 2) give the MWWUs the local capacity, through their tariffs, to finance sustainable levels of water and wastewater services.

REFORM: Reduce taxes and fees paid on MWWU services

Issue Summary: Taxes and fees drain resources from the MWWUs.

Possible Reform Strategy: A variety of components, all connected with reducing the fee and tax burden.

Strategy Description	Comment/Concerns
Reduce the VAT on water and wastewater services	Usually will also reduce the effective tariff
If taxes are necessary because of special obligations e.g., EU tax harmonization, assess fees and taxes only on collected, not billed, revenues.	Will provide additional revenue raising capacity to MWWUs. Use of the capacity based on local investment priorities.
Reduce the fees on water and wastewater services	
Only assess fees or taxes on that portion of services in excess of minimal requirements.	

At a minimum the central government should review the fees and charges it assesses and examine their rationale, and their practical effect. Do the customers get some services for their fees commensurate with the fees themselves? If not, then it is likely these fees are simply taxes with a rationale that may not "hold water".

Table 23. Taxation and Fee Reform Proposals Affecting MWWUs of Study Countries of the DRB

Country	Modify Central Fees		Modify Taxes	
	Reform	Rationale	Reform	Rationale
Bosnia-Herzegovina	• FBiH and RS should change the basis of taxes applied to collected revenue as opposed to billed revenue.	• Provide assistance and support to change the tax laws for MWWUs and establish a tax mechanism that is more equitable		
Bulgaria				

Country	Modify Central Fees		Modify Taxes	
	Reform	**Rationale**	**Reform**	**Rationale**
Croatia	• Reduce or eliminate the fees collected by MWWU for the central government • Pay the "user charge" on water delivered for production, not billed water. •	• The "water user charge", the "development of infrastructure" charge, the "water concession charge" constitute a significant portion of the bill (25% or more). It isn't clear what service customers get for their payment. • Looks as if the fees are used to cross-subsidize services, including infrastructure, in other areas. • Provide incentive to reduce water losses in distribution.	• Reduce the 22% VAT on water and wastewater services.	• As a critical public service that is metered for billing, collecting VAT on this service is a 'regressive' tax. • This tax may impair the ability of the MWWU to collect revenues from poor customers. • This tax may be impairing the ability of the MWWU to raise funds for projects through tariffs increases.
Czech Republic	• Modification of the Charges for the Withdrawal	• 50% of Charges for the Withdrawal of Groundwater will become revenue of regional budgets instead of the Czech State Environmental Fund.	• A change in the VAT from 5% to 19% is proposed as part of harmonization with the EU. Possibly return to lower rates for water and wastewater.	
Hungary	• Revise the water extraction fee	• The present fee structure is not coherent, some of the details lack economic rationale.		
Moldova	No modification is suggested at this time. The level of the fees and taxes is low and they do not impact the operation of MWWUs in any major way			
Romania				
Slovak Republic	• Revise the water extraction charge	• The present ratio of ground water (1 SKK/m^3) and surface water (1 SKK/m^3) extraction fees is not logical.		

5.2.4 Access to Direct Financing from Private and Quasi Private Capital Markets

Achieving reasonable access to direct financing from private financial markets should be a goal of the MWWUs. In most of the region, the many current sources of risk to the lender make this an elusive goal. The MWWUs lack collateral (beyond the systems themselves). Some members of the Project team describe this as a "chicken and egg" problem in so far as it applies to creating a "sustainable" level of operations. The MWWU might be able to invest in cost saving capital improvements that will "pay for themselves". The current revenue stream, however, is compromised by the need to use it to cover the costs that the capital improvement is intended to remedy. The revenue stream can't support

repayment of the loan without the capital improvements but the utility can't make the improvements because it doesn't have access to the capital. Some of the barriers identified include:

- MWWU (owners, management) are not trained to prepare bankable projects (good engineers, inexperienced business people),
- Banks prefer short-term loans rather than long term loans of the sort often compatible with the long operating life of much of the infrastructure,
- In the absence of collateral, banks often require someone to pledge to assume liability should the MWWU default on the load and the MWWU usually finds it impossible to get a third party with sufficient commitment and assets to offer liability,
- Ownership of the "assets" of the water system are sometimes not well-defined,
- There is no agreement as to which MWWU assets can legally be offered or held as collateral,
- Often it isn't clear who might be responsible for repaying the loan and succession of possible loan "guarantors", and
- Substantial uncertainty over the conditions and consequences of a "bankruptcy" filing of a public company (public utility).

Some of these problems are not amenable to changes in laws or regulations, but some are. Those that are, are part of the reform elements listed below.

One possible impediment to private financing - the lack of an interested third party to guarantee a loan – might be addressed by sub-dividing regional MWWUs into operating units that more closely conform to municipalities. If a municipality is more closely associated with a MWWU, and in closer control of the MWWU via its ownership interests, then it might be more predisposed to guarantee a loan to the MWWU using its own assets and revenue stream as collateral.

In addition to commercial loans, private equity (partial private ownership) is potentially a source of financing. Section 5.3.5 below provides some background on privatization of MWWUs. It should be emphasized, that in some of the ME DRB countries well-performing MWWUs, do have access to private capital financing either directly or through their municipal owners. Nonetheless, bad performers, especially in these countries, have difficulty securing capital, which, as described above, places limits on moving towards more efficient operations.

REFORM: Promote access to private financing of MWWU investments

Issue Summary: Most MWWUs currently have no effective access to private capital markets

Possible Reform Strategy: A variety of components aimed at reducing barriers to private financing of MWWU investments.

Strategy Description	Comment/Concerns
Need a clear determination of who owns the "assets" of the water system	May mean that the system and its assets are not the property of the municipality after bankruptcy.
Need to identify clearly what assets can be held as collateral	A possible back door to "privatization"
Provide loan guarantees to the water systems by the municipality or some central government authority	Will the owner of the MWWU abuse the guarantee of the municipality or government authority?
Clarify what recourse the lender has if a loan becomes non-performing	
Possible sub-division of regional MWWUs in order to enhance a municipality's willingness to guarantee a loan to the MWWU.	Resistance from those municipalities whose service is currently cross-subsidized in a regional system.

5.3 Institutional and Other Supporting Reforms

5.3.1 Regulation of Costs and Tariffs at the National Level

One of the recommendations of the OECD is that "governments shift from being a provider of water services to being a regulator" (OECD, 2003b, p.14). This is, indeed, the direction in which many of the ME DRB countries are headed with "devolution" and "privatization". Most, however, do not appear to have a coherent program of economic regulation of publicly sanctioned monopolies, especially public monopolies. This becomes even more crucial as W&WW services start to become either privately owned or privately managed systems.

REFORM: Promote rate of return regulation of public monopolies

Issue Summary: The region needs something to replace the often discredited price regulation of MWWUs

Possible Reform Strategy: Develop a system of rate of return regulation coupled with diligent and independent oversight.

Strategy Description	Comment/Concerns
Develop a rate-of-return system of regulation of MWWUs	May not provide enough incentive to keep costs down.
Regulators should be independent and empowered to evaluate the efficiency as well as the cost basis of the MWWUs.	May be costly to implement.
	How to assure independence of the regulatory body?
	Under the current system tariffs in many countries can include substantial net revenues, but the rationale for these "rates of return" and their effectiveness in promoting good management and justifiable prices is questionable.

5.3.2 Coordination with River Basin Management

Romania, Croatia, and the new countries of the EU in the DRB are developing river basin management bureaucracies along the lines set by the EU Water Framework Directive. These organizations may begin to play a more important role than other entities in infrastructure planning and development. Given that we don't know the specifics of the scope and nature of their authority, we can hardly offer proposals for "reform". However, we do recommend that the MWWUs work with these river basin management agencies to assure that they don't create barriers to effective tariff and charge reform as discussed here.

5.3.3 Perfection of Ownership

Ownership of the MWWUs has, in many cases, reverted to municipal governments or municipal governments in partnership with the central government. Sometimes, however, it isn't clear what is owned. Does ownership include the land on or in which the asset rests? Where does the ownership of the distribution network begin and end? What if there are separate water and wastewater utilities? What about the storm water system; is it part of the wastewater collection system? Numerous questions surrounding ownership should be clarified as part of the effort to improve management of the MWWUs. Resolution can be of great help in effective development and implementation of management, regulation, privatization and other possible reforms.

5.3.4 Customer Choice and Sewerage Connection

In cases when connection to existing or newly constructed sewers is not compulsory, low income households often choose not to connect, in order to save on wastewater tariffs. Their strategy, instead, is to construct and operate septic tanks in their gardens from which wastewater leaks into the ground, or to pay entrepreneurs to collect and transport their sewage with trucks. The transported sewage more often than not, ends up being disposed illegally, causing local pollution of groundwater and surface water. A related consequence is that sewerage systems and treatment plants are frequently underutilized, resulting in higher unit costs, and increased tariffs for those who choose to be connected to it. Increased tariffs may provide even less incentive for connection, and may even prompt some households to disconnect from the sewer.

Possible reform recommendations are the following:

- Make connection compulsory for those households that are located close enough to the sewer.
- Strict monitoring of sewage hauling activities, including prohibitive fines for illegal disposal. Monitoring can extend to invoicing of the service, requiring households to keep the invoice for some time after transport. This way both the delivery of the sewage can be inspected more effectively, and the invoice is also a proof that the sewage from the households does not just leak into the ground (if that is illegal)
- Provide economic incentives to households to connect to existing sewers, e.g. make those households pay a surcharge which could easily connect to the sewer, but choose not to. This surcharge can be increased (or simply just triggered) if they cannot prove with an invoice that their sewage has been collected by an authorized enterprise.
- The municipality might set a liquid waste fee based on water consumption on those households that do not have connection to the sewer. In exchange for the tariff, the municipality provides a properly monitored service of hauling the sewage from the septic tanks of the households without additional fees. This way households do not have an incentive for illegal disposal. On the other hand they are motivated to connect to the sewer (if this is physically feasible), illegal hauling and related illegal disposal is eliminated. There are examples for the successful operation of this scheme in Hungary (Debrecen, Dombovar).

5.3.5 Privatization of the MWWU

This is a reform that has frequently been recommended by international experts. Such a reform might very well remedy both the shortage of financing and the problems with professional management. Even so, there are presently strong legal prohibitions against privatization in which the infrastructure is sold to a private firm under a contract to provide services to the community. These prohibitions may reflect the views of special, local interests currently involved in the operation of the MWWU. They also, however, reflect the very real concerns that the privatization process would be tainted by politics and that the level of service will fall, the tariffs for service will rise, or both. While there is some evidence from the United States that privately owned MWWUs are slightly more efficient and provide comparable service to those owned by municipalities or public agencies, there are substantial risks in pushing such a change too far, too fast.

Table 24. Broad Institutional and Financial Reform Proposals Affecting MWWUs in Study Countries of the DRB

Country	Perfection of Ownership		Devolution of Responsibility for Water System Planning		Organization of Management Units		Supplementary National Financing for Water Systems, Especially Effluent Treatment		Economic Regulation and Rate of Return Regulation	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Bosnia-Herzegovina	• Transfer ownership of assets clearly to the joint stock companies	• Current ownership is sometimes ambiguous e.g., the wastewater collection system is jointly owned with the storm water authority. • Provides incentive for the MU to take better care of existing infrastructure	• Clearly guide or direct the ownership of infrastructure toward a single entity	• Currently the infrastructure for municipal water supply and management may be divided among different entities or parts of the same entity	• Increase the autonomy of the MWWU	• Decisions should be based on local priorities and considering local resources	• No reform proposal	• At this time domestic financing of WWT infrastructure is out of question due to the economic hardship		
Bulgaria	• Offer some of the small MWWUs for privatization or transfer the ownership to the particular municipality if feasible.	• Separating smaller units on a case basis from the big regional company could improve their management efficiency by allowing them to introduce tariff design that reflects the local conditions better than the uniform tariff for the region.					• Domestic financing should focus on those MWWUs which do not have access to EU funds	• This proposal limits the domestic funding need and the potential extent of misappropria-tion	• Currently establishing a new entity for monitoring and regulating the service and economic performance of MWWUs.	• Prior regulation was under a Ministry with many public works responsibilities and reflected the old, state ownership of the entire water system.

Country	Perfection of Ownership		Devolution of Responsibility for Water System Planning		Organization of Management Units		Supplementary National Financing for Water Systems, Especially Effluent Treatment		Economic Regulation and Rate of Return Regulation	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Croatia	• Stop the practice of bailing out bad loans provided by Croatia Waters through acquiring a stake in badly performing MWWUs.	• State ownership in MWWUs does not help to solve their problems, while threatening the independence of local decision.	• State ownership in MWWUs, together with the responsibility of decision making should be transferred back to the municipalities		• Municipal companies providing several independent services should either be organized into separate legal entities or under independent accounts	• Independent activities often cross-finance each other • Difficulty establishing the cost basis for tariff setting	• Reduce the role of Croatian Waters as the lead agency in funding MWWU infrastructure. It should have a coordinating role for river basin management. • Croatian Waters proposes to limit its role to loans to a few priority investments.	• Reduces fees that are simply "recycled" trough Croatian waters. • Gives MWWU more direct control over revenues collected for its services.	• Develop a new system of tariff controls based on rate of return regulation.	• Assuring no monopoly power is used in tariff setting
Czech Republic			• Plan for the development of pipelines and sewerages	• Will be prepared by the Regional office for at least 10 years (new obligation according to the law from 2001 – the first dead line 2005)						

Country	Perfection of Ownership		Devolution of Responsibility for Water System Planning		Organization of Management Units		Supplementary National Financing for Water Systems, Especially Effluent Treatment		Economic Regulation and Rate of Return Regulation	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Hungary					• Encourage cooperation among overly fragmented system elements owned by separate MWWUs	• Actually this is an "anti-devolution" proposal. As devolution in some cases went so far that economies of scale or scope were difficult to realize.	• Domestic financing should focus on those MWWUs which do not have access to EU funds	• This proposal limits the domestic funding need and the potential extent of misappropria-tion		
Moldova			• Transfer MWWUs to the municipalities	• With the exception of Chisinau MWWU, utilities are directly owned, and partially controlled by the state				• At this time domestic financing of WWT infrastructure is out of question due to economic hardship		
Romania			• Devolutio n of decision making and investment initiative to River Basin Authorities from the center (Apele Romane)						• Develop a rate of return regulation	• Assuring no monopoly power is used in tariff setting

Country	Perfection of Ownership		Devolution of Responsibility for Water System Planning		Organization of Management Units		Supplementary National Financing for Water Systems, Especially Effluent Treatment		Economic Regulation and Rate of Return Regulation	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Slovak Republic			• Clearly define and determine the responsibilities of Municipal Boards • Establish a contract review process that will allow review and thoughtful consideration of contracts between municipal representatives and operators	• Currently, Municipal Boards depend completely on the recommendations of "operators". This should be balanced that the responsibility for development plans are agreed among representatives of MB, not purely "what will operator say" • In Slovakia, the process is currently murky. This creates distrust of outcomes.			• Define national priorities in construction of infrastructure including national financial support	• National sources are limited and expensive	• National Regulatory Office (NRO) reviews books to assure that no excess returns are being earned by the operator or owners.	• Currently the NRO is concerned with household tariff setting and the tariff setting formula. This is expensive and time consuming and the resulting tariffs do not necessarily reflect current costs.

5.4 Management Reforms

5.4.1 Collection of Accounts (Revenue Recovery)

As described in Chapter 3, non-payment or extended delay in the payment of existing tariffs is a serious problem for a substantial number of the MWWUs in the ME DRB. This need is further corroborated by the reform proposals of Table 25. The reasons for non-payment (or non-collection) are various and often interrelated: no, weak, or poor tools of enforcement or sanctions for non-payment, including possible entitlement under the law; low incomes of customers decrease their ability to pay; poor management of metering, billing, and collection; migrant customers; special or privileged customer classes from whom payment is not really expected; etc. Even a delay in payment poses problems, especially in a highly inflationary environment. Delays of a year in a country with 25% annual inflation degrade real revenue substantially.

This problem is most pressing in communities with very low levels of economic activity. In such conditions the MWWU sometimes accepts "goods in lieu of payment", especially from business customers. Such transactions reflect the desperation of both the Utility and the customer.

A particularly vexing problem is non-payment by public entities – schools, recreation facilities, government offices, electric utilities, hospitals, police, fire, etc. These entities are particularly stretched. In some countries, they are the most important non-payers. Many don't have any (legal) income stream – or a pitiful level of income beyond whatever budget they get from the central government and municipality. Non-payment by these vital public services is a special problem for a public utility that, almost by definition, has a special obligation to serve the public interest.

Non-payment can also be part of a vicious cycle: non-payment leads the MWWU to increase tariffs levied on those that pay which leads more customers to withhold payment.

Our study, however, did identify some examples of revenue recovery strategies that were successful. These should be examined in more detail for lessons adaptable to other countries and municipalities.

REFORM: Change policies to reduce non-payment

Issue Summary: Non-payment in some MWWUs reduces revenue by up to 50%

Possible Reform Strategy: A strategy compounded of many elements

Strategy Description	Comment/Concerns
Shut off service	Stricter recovery measures may violate legal rights or due process laws. Shutting off service to specific households or accounts may not be possible technically, especially in old-style apartment buildings.
Require deposits of customers in advance of service. These deposits can be used if the customer does not pay on time.	Enforcement may be costly
Apply a late payment penalty to overdue bills.	Non-payment weakens the MWWU financially and undermines attempts to raise revenues that might be used to invest in pollution reduction or other investments.
Recover the payment through legal channels: garnish wages, posses private property.	Sometimes firm action in selected cases, and publicity surrounding the resolve of the MWWU to collect overdue accounts, will stimulate payment from other overdue accounts.
Introduce legal changes that will allow shutting off the service in case of non-payment	

5.4.2 Concession or Franchise Agreements for Operating the MWWU

Privatization of MWWU operations through a franchise agreement, concession, and/or actual transfer of property is becoming more common. In particular, some of the major cities in the ME DRB now have such arrangements with international firms: Sophia, Budapest, Zagreb and Bucharest. In addition, some of the old regional water companies have such agreements with the municipalities that now own the infrastructure of the system.

The reform we think deserves further consideration is one in which a contract to operate a MWWU is awarded to a private "partner" through a competitive bidding process. It is important to explore the terms and conditions set up for "concession" contracts between municipalities (owners) and MU (operators) both locally and internationally to determine how to properly implement such an arrangement. There are examples in Bulgaria where the concession award process resulted in contract that were so suspect that they were voided by the central government. Also, it is important to examine the prospects for this type of reform within the context of national laws and decrees that already regulate the process.

5.4.3 Structure of Water and Wastewater Utilities

One of our company consultants suggested that, in the spirit of eliminating cross-subsidies across different services, MWWU be broken into two independent companies. One provides water services; the other wastewater services. Some municipalities in the region already follow this model e.g., Budapest and Belgrade. This way the water and wastewater costs are automatically kept separate and tariffs are based only on the costs of that particular service. This design has its disadvantages, including duplication of some overhead services and some coordination and operational issues related to metering and billing. These problems, however, are not insurmountable and the duplication burden might be offset by some advantages of specialization.

5.4.4 Community Relations

Given the skepticism of customers regarding the validity of increases in tariffs and the merit of both MWWU investment programs and the efficiency of their execution, it seems that a small investment in improving communications with customers and water policy makers would benefit both MWWU owners and operators alike.

A community relations program of the MWWU might do this communication. The program would be used to explain tariffs to customers, suggest measures for water conservation, explain the reason for an investment activity, follow up on customer's complaints, etc. This would, we think, very nicely compliment other reforms related to bookkeeping, tariff setting, etc.

5.4.5 Training in Management and Finance

At various points in the description of conditions and possible reform proposals, the inexperience of some MWWU owners and management teams has been noted. While most management, and certainly most of the professional staff, may be bright and technically competent, they do not have much training or experience making strategic management and development decisions. They need to become familiar with how to build and use management information system, how to develop and defend forecasts and tariff proposals, how to explain themselves to the owners or customers, etc.

We suggest that the process of training managers and management staff be made more formal, perhaps through a professional development plan designed for, and with, upper tier staff members. Privatization of system operations, and the introduction of new and experienced staff from outside the existing MWWU may be an alternative, but we suspect that part of the private operators plan would involve training of existing managers.

Table 25. General Management Practice Reform Proposals: Metering, Invoicing, Collection, and Revenue Recovery

Country	Metering		Management practices		Management Development and Retention		Revenue Recovery	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Bosnia-Herzegovina	• The early identification and prompt removal and replacement of non-functioning meters, • The periodic (as frequently as six months to a year for the largest meters down to about five years for small residential meters) removal and re-calibration or repair of large and small meters, • The selection (from at least two different manufacturers, for competitive reasons) of meters of a type that are suitable for local conditions at a reasonable price, • The calibration, repair and/or rebuilding of meters of the type and capacity	• Elements needed to establish a truly effective metering program	• Develop and implement business-like and customer-oriented management and planning practices. • Sign a service contract with each customer • Develop an accurate and up-to-date billing system • Use a "Water and Wastewater Tariff Manual" written to develop and evaluate new tariff levels and designs	• Current systems take budgets and customer revenues outside Utility control.	• Establish incentives, including salaries and benefits, to attract and retain well-trained management and staff • Link some of the incentives to improved operating efficiency and/or financial performance	• The potential for improved operations exist at most MWWUs, but well trained workforce is needed to exploit it	• Increase the efficiency of revenue collection by establishing a deposit system and pursuing collection through the courts	• Delay or non-payment are too high and create serious financial difficulties for MWWUs

Country	Metering		Management practices		Management Development and Retention		Revenue Recovery	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
	of those in the system, and • Reading and recording data from all meters in a timely and accurate manner (with an oversight capability to ensure compliance).							
Bulgaria	• Improve water metering along the supply and distribution network, not just at the end consumers. • Continue with installation of water meters at end consumers.	• No reliable methodology and equipment exists for measuring water before distribution, e.g. for surface water the measurement is based on depth of water, and for ground water – on capacity of the pumps.	• Ensure adequate supervision on the water supply network and control of water distribution.	• To avoid distribution of water to illegal connections.	• Loose the political pressure on management and create incentives for performance improvement (in addition to the existing benefits to leakage improvement).	• Working under political pressure can increase the risk of suboptimal decisions	• Try to implement water saving and control programs (lectures, training, etc.) that will decrease budget entities consumption but will be sufficient enough to allow them to perform their daily activities.	• Budget entities are among the biggest debtors and they have little incentives to save water. If it is difficult to ensure payment from them then it could be probably useful to help them use efficiently the water provided.
Croatia	• Not an issue in most places		• Improve financial planning and management accounting		• Improve the non-engineering skills of management through hiring and training of personnel	• In general MWWUs have very good engineers, but often lack other well trained experts, like economists and finance professionals.	• Create incentives to speed up the process of payment.	• While non-payment is not a problem in general, delayed payment is frequent, increasing the costs of service and reducing liquidity

Country	Metering		Management practices		Management Development and Retention		Revenue Recovery	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Czech Republic	• Encourage smaller communities to adopt metering • Encourage individual apartment metering in apartment blocks by increasing tariffs to the owners of blocks that don't have apartment-based metering.	• To encourage water conservation by customers, particularly households in apartment blocks.						
Hungary					• Improve the management skills at small MWWUs, especially skills needed for business planning, tariff setting, financial analysis.	• Large MWWUs, including regional ones, usually have well trained managers, including financial experts and economist.		

Country	Metering		Management practices		Management Development and Retention		Revenue Recovery	
	Reform	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**	**Reform**	**Rationale**
Moldova	• Extend installation of water meters at households	• This will result in lower consumption, lowering the costs of operation for the MWWU • Households will pay based on true consumption, instead of estimated consumption, which is upward biased in order to cover part of the system leakage.			• Retain good personnel through attractive and timely compensation	• Considering the bad financial conditions of most MWWUs in Moldova this is not an easy task.	• Improve the frequency and accuracy of billing • Increase the efficiency of revenue collection by establishing a deposit system and pursuing collection through the courts	• The basis for collecting revenue (bills) is often not promptly and accurately delivered. • Delay or non-payment are too high and create serious financial difficulties for MWWUs
Romania	• Extend installation of water meters at households • Part of the resulting cost savings should be offered to households to compensate for plumbing repair expenses	• This will encourage households to reduce water consumption and repair their household plumbing						
Slovak Republic			• Informing the customers about future investment plans and thus rising costs	• Better acceptance of tariff changes				

6 Conclusions and Recommendations

In this Chapter we develop our reform recommendations further by assembling "bundles" of specific reforms discussed in Chapters 4 and 5. Bundling of reforms is important because reform elements that are complementary and mutually reinforcing will be more effective. Bundling is also important because it provides an opportunity to sometimes compensate for the problem areas inherent in an individual reform proposal e.g., additional elements that make the reform bundle as a whole not only more effective but "proportionate" and "practical". In the following discussion we list the elements of the bundled strategy, describe their advantages and disadvantages, and attempt to link these advantages to the criteria selected for evaluation:

- are the reforms working through tariffs or effluent charges effective in reducing pollution from MWWUs, especially nutrient and toxics pollution;
- are they proportional, in the sense that the effects of the reforms are at least as beneficial as they are adverse;
- and are they practical, in the sense that there will be significant support for implementation.

6.1 Tariff Designs/Bookkeeping/Audit

REFORM: Tariff Re-Design

Bundled Strategy Elements: Multipart tariff designs

Cost-of-service tariff setting

Bookkeeping improvements

Independent, performance audit

Strategy Evaluation:

Advantages		**Disadvantages**	
Advantage	**Evaluation**	**Disadvantage**	**Evaluation**
• Tariffs are more efficient and more reliable and would charge higher-polluting large customers higher tariffs.	• Benefits proportionate with costs at account, system, and social levels • Fixed tariff payments are not subject to shifts in customer demand • The reforms support the principle of charging highly polluting users of the wastewater system more. Indirect but possibly quite effective in pollution reduction.	• Possible sacrifice of some efficiency to equity • No direct impact on pollution reduction through the supply side of tariff reforms, especially nutrients and toxics.	• Trade off a (hopefully) small loss in proportionality for a big gain in practicality.
• Tariffs offer some protection for lower income users	• Offers a means of addressing legitimate equity issues and makes the tariff reform more practical	• Perhaps obtain any equity advantage with a sacrifice of some efficiency • High fixed tariffs may actually be very burdensome to small volume users.	• As above. Probably a good trade-off but depends on the particular reforms and setting.

Advantages		Disadvantages	
Advantage	**Evaluation**	**Disadvantage**	**Evaluation**
• Book keeping supports underlying tariff analyses	• Practical and, to the extent that decision making improves, a proportionate advantage.	• May make administration more costly.	• Costs are low relative to the possible benefits.
• Audit supports the integrity of the change in tariffs.	• A practical advantage	• May make administration more costly.	• Costs are low relative to the possible benefits.
• Move toward a more efficient and transparent organization.	• Indirectly effective if the efficiencies lead to better management and public support	• No direct pollution reduction.	• Most likely a necessary condition for cost-effective pollution reduction.

Cross-reference reforms:

- If the billing system is integrated with the book keeping system, analysis of tariff designs should be better and more up-to-date
- A better tariff design may make it easier to make the case for an increase in tariffs.
- Metering of consumption is required for most tariff reforms

6.2 Collection of Customer Accounts/Billing/Community Relations/Service Levels

This reform is built on improved collection of debt from the MWWU customers. Its success depends in a large measure on the details of the more aggressive collection action (see possible approaches

listed in Chapter 5 and in the summary below) and what the Utility has done in the past to improve debt collection. In some communities of the region substantially improved collection was achieved simply by "demonstration" of enforcement in some high profile cases.

REFORM: Collection and Billing Reforms

Bundled Strategy Elements: Improved account collection

Institutional support for collection enforcement

Provision of low-level water and wastewater services

Billing system improvements

Community relations

Metering

Strategy Evaluation:

Advantages		Disadvantages	
Advantage	**Evaluation**	**Disadvantage**	**Evaluation**
• Revenues enhanced by more effective collection e.g., follow-up correspondence, publicity, deposits, late fees, legal actions enforcing payment, legal property confiscation, criminal penalties.	• Collection supports the proportionality between service and payment • Enhance revenues may support the 'supply' side of tariff reform links to pollution control i.e., more resources to invest in pollution control. • Those accounts that now do pay will reduce water use and may reduce pollution through reduced water (and wastewater) flows.	• May result in loss of service to customers who can't pay	• A possible reduction in the practical appeal of this reform
• Billing system reforms	• Will make invoicing more reliable, regular, and less costly. • Possibly provide a better paper trail for enforcement.	• Cost savings may not be forthcoming right away.	• Value may come from the way billing reforms complement revenue collection.
• Provision of alternative low service levels: collective drinking water provision at pipe stands, public baths and bathrooms, etc.	• An effort to make the reforms practical by reducing some equity concerns	• May be expensive	• The evaluation depends on the particulars of these low service levels.
• Community relations effort to explain the problem and gather community support. Also publication of enforcement actions.	• Probably critical to an effective enforcement effort, a key to a practical reform	• Community relations can be costly and possibly counter-productive	• The practical merits depend on 1) the standing of the MWWU in the community and 2) the quality of the arguments in support of these reforms (which means the quality of the reforms themselves) 3) and the outcome of initial enforcement actions.
• Installation, testing, and replacement of meters	• Helps support practical implementation of the program. • Important to seeing that service is proportionate to payments. • Those accounts that now do pay will reduce water use and may reduce pollution through reduced water (and wastewater) flows.	• Could be some problems with costs, especially in blocks of flats.	• Need to make choices on the extent and financing of the metering program in order to make it as cost-effective as possible.
• Move toward a more efficient and transparent organization.	• Indirectly effective if the efficiencies lead to better management and public support.	• No direct impact on pollution reduction.	• Most likely a necessary condition for cost-effective pollution reduction.

Cross-referenced reforms:

- Multipart tariffs may ameliorate the problem with either non-payment in general or the equity concerns associated with more aggressive collection of debt.

6.3 Local Finance/Central Government Fees and Taxes/Effluent Charge Credits

REFORM: Tariff levels and locally directed investment

Bundled Strategy Elements: Increases in tariff levels

Pooled capital (and credits) for pollution reduction

Tradable effluent charge credits

Reduction in central government fees and taxes on services

Strategy Evaluation:

Advantages		Disadvantages	
Advantage	**Evaluation**	**Disadvantage**	**Evaluation**
• Increased tariffs support larger, locally-directed investments • The investments are locally directed and presumably based on local evaluation of priorities.	• Local direction presumably encourages proportionate and practical investments. • Difficult to evaluate without more detail and testing.	• Local priorities may not encourage investments in pollution reduction. • A strong "presumption" in favor of MWWU and local governance.	• Difficult to evaluate without more detail and testing.
• The MWWU can get credit against payment of current or future effluent charges, usage fees, taxes, etc, by either investing those funds on improvements in its sewerage collection or treatment system or, alternately, loans to another MWWU for a similar purpose	• This could be very effective at directly financing incremental pollution control	• The intent of this reform element would be thwarted if it isn't well and effectively monitored • It could lead to inefficient levels of investment in pollution control.	• The magnitudes of these effects are uncertain, • May be less effective or inefficient unless properly designed and monitored.
• Reduction in government fees and taxes would free local resources for use locally.	• Local direction encourages proportionate and practical investments. • Difficult to evaluate without more detail and testing.	• The resources released may not be used effectively or proportionately.	• The magnitudes of these effects are uncertain, • Difficult to evaluate without more detail and testing.
• MWWU could lend each other capital (including the effluent charge credit) for investment in and operation of a pollution reduction project and "get credit" for this investment as if it were controlling its own effluent or meeting it own emission limits.	• May make the credit more cost effective and assure better proportionality between costs and effects. • Difficult to evaluate without more detail and testing.	• The program may be costly. • The damage functions may be different across the sites and net environmental damage may result	• The magnitudes of these effects are uncertain, Difficult to evaluate without more detail and testing.

Cross-referenced reform:

- Bookkeeping, accounting, and audit reforms may ameliorate some of the concerns regarding judicious use of revenues released under this bundle of reforms.

6.4 Financial Risk Reduction/Management Strengthening

REFORM: Financial risk reduction and access to capital

Bundled Strategy Elements: Investment risk reduction
Management strengthening
Economic regulation

Strategy Evaluation:

Advantages		Disadvantages	
Advantage	**Evaluation**	**Disadvantage**	**Evaluation**
• Financial risk reduction will make the MWWU a better credit and investment risk and open up capital markets • Some institutional elements: ownership perfection, clarification of parties responsible for debt, eminent domain, durable concession contracts	• In reducing risk, one reduces capital costs, a clear benefit. • Uncertainty as to whether this will translate into effluent reduction. Effectiveness depends on the use of capital that is presumably now more accessible and attractive due to the reforms.	• Legal changes that reduce MWWU risk may pose some legal problems.	• The proportionality and practicality of the reform depends on how these effects balance in practice. Very difficult to judge outside of a specific setting.
• Management strengthening, including possible privatization.	• Improves management's ability to sell its projects. • More favorable assessment of risk under better, professional management. • Effectiveness depends on the use of capital that is presumably now more accessible and attractive due to the reforms.	• May prove costly	• The proportionality and practicality of the reform depends on how these effects balance in practice. • Very difficult to judge outside of a specific setting.
• Economic regulation of tariffs and cost basis	• This oversight should encourage investors that costs of capital will be recovered. • Effectiveness depends on the use of capital that is presumably now more accessible and attractive due to the reforms.	• May not be as advantageous if the regulators only discourage excessive tariffs and let local authorities decide on the rate base that must be covered by tariffs.	• If regulation doesn't reduce financial risk, then economic regulation will only be effective in reducing pollution through one of the other links to behavior and investment.

Cross-referenced reforms:

- Independent audits and accounting reforms will also work to reduce risk and open capital markets to the MWWU.
- More stable revenue streams from tariff design and revenue collection reforms will also reduce the perception of risk.

Interaction between tariffs and collection - The reforms must not only occur in the rates per se but the system of billing and collection. Increases in rates without such reforms will only exacerbate the problem of non-collection and may even simultaneously encourage both greater water use and revenue declines. The reasoning is that, as rates rise more customers who are metered cannot (or will not) pay for the service. They will then be freed from any economic constraint on water use and any conservation incentive the existing rate provided would be lost.

Privatization offers a dual advantage: capital, and management expertise. These two together can improve the operating efficiency of the MWWU impressively. Note, however, that a badly executed privatization will do more harm than good, and privatization will provide direct capital to the MWWU only if the buyer has an obligation to raise the shares in the company.

6.5 The Responsibilities of the Central Government: A Local View

Resistance to local tariff increases may reflect the position that national mandates should be financed at the national level. In particular, why should local municipalities – through their local utilities and customers - have to pay for environmental obligations undertaken by the central government? Most especially, why shouldn't the central government pay for them if the cost of those obligations vary from place to place and are particularly burdensome for select customers or geographic regions. Variation in cost is partly due to earlier government or EU grants for some MUs for reaching or getting close to the standards, while not for others.

This argument is especially strong when the obligations that do not equate local costs with local benefits and, further, demand local tariffs reflect "full cost pricing". This may be seen as both inefficient and inequitable and, the more inefficient and inequitable, the greater the resistance by the ratepayers. Such resistance may take the form of moving from the community e.g., an industry that relocates can, with a single decision, devastate the finances of a small water system.

If "full cost pricing" means those that incur the costs should pay the costs, then it may be argued that the central government should be paying for all wastewater treatment beyond what is justified by local benefits. In practice, actually, a large share of national MWWU wastewater treatment investments is paid for by EU funds in most ME DRB countries. In further consideration of the use of tariffs, in particular, as a tool for pollution reduction, more attention should probably be paid to such an "incidence" criterion.

6.6 Burden Indices

Annual baseline expenditures of households in the case study communities under combined water and wastewater tariffs are between 15 and 150 €/year, equivalent to between 0.6% and 4% of gross national income (GNI) per capita. Per household disposable income would provide a better basis to compare the financial burden of W&WW services on households, but disposable income figures were available only for a portion of the case study countries. Data available from a selection of the surveyed countries shows that net disposable household income is slightly higher than GNI per capita in the region. Therefore the percentage figures in Table 26 can be considered as upper estimates of household W&WW expenditures as a ratio of disposal household income.

As we progress through the scenarios, the percentage burden increases to 2.2 to 20% in the sustainable case, despite lower consumption levels as a reaction to increased tariffs. In Moldova and Bosnia Herzegovina W&WW expenditures become so burdensome on households that even the financially sustainable services pose a serious problem. Introduction of higher tariffs to fully support any enhanced wastewater treatment investments appear to be out of the question in these case study communities. Moreover, recall that the "upgrade" scenarios discussed here are based on local targets for water system development. These targets may not, especially in the case of wastewater collection and treatment, be as stringent as those reflected in EU directives or national plans. As a reference point for consideration of tariff burden, OECD reports that water and wastewater charges combined

are mostly less than 1.5% of disposable income in most member countries and between 2.24% and 3.75% of income for the lowest income (usually decile) households (OECD, 2003b).

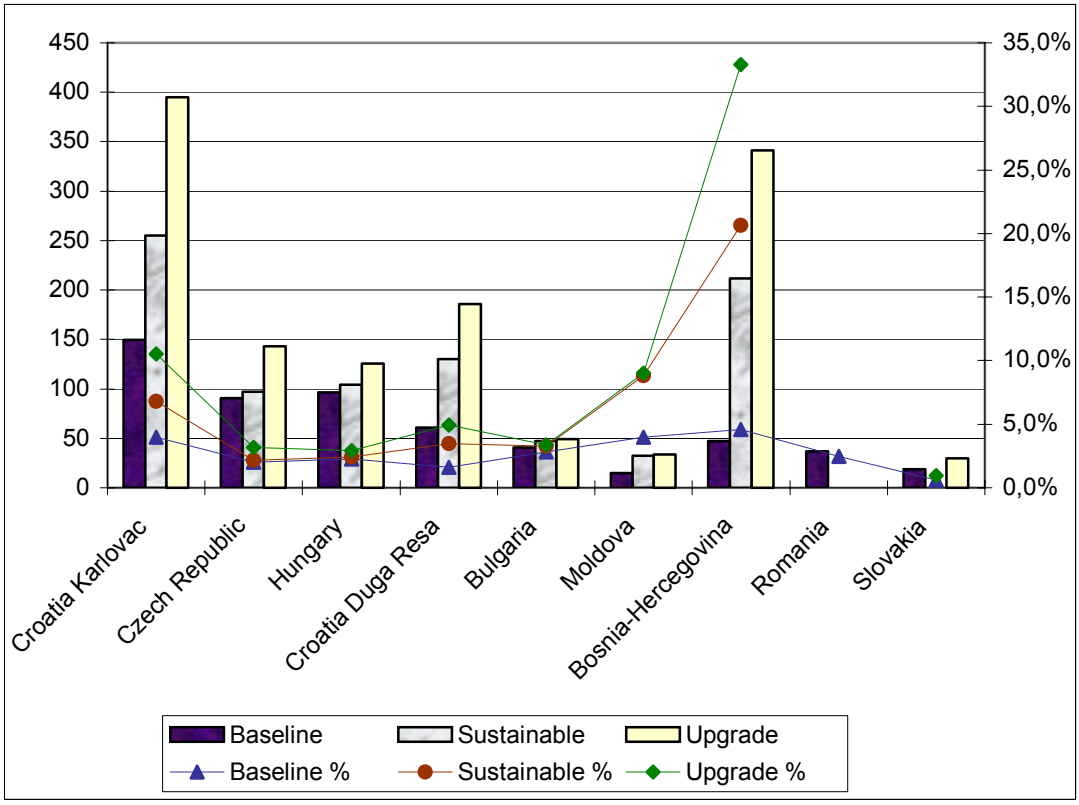
In the case of the Slovakian, Hungarian, Czech, Bulgarian, and one of the Croatian (Duga Resa) case study communities, sustaining and upgrading the infrastructure from own resources may still be affordable for most households. Again, we caution that this may not hold if the local targets for long term service levels are not sufficient to meet more demanding EU directive or National planning targets. Even with existing local targets, the poor households in the case study communities of these countries would likely find it to be a serious hardship to pay increased tariffs necessary for maintenance and development of infrastructure under an "upgrade" scenario. Households in the other Croatian case study site, Karlovac may already be facing tariffs that are overburdening them. In the case of Romania we do not have dependable burden estimates from the case study at this time but the baseline expenditures on water system services as a percentage of national income are in line with those of Hungary and Bulgaria.

We have to keep in mind that the expenditure estimates below were derived from scenarios in which all costs are recovered by service users. In case of (foreign) grants or preferential loans the financial burden placed on the population would somewhat ease. The present practice of cross-subsidizing from other SUs, especially industrial users and legal persons, also contributes to lower household expenditures, but at the price of efficiency loss in sectors of the economy.

Table 26. Annual Water and Wastewater Expenditures of Case Study Community Households under Scenario Progression

Case study site	Baseline	Sustainable	Upgrade	Baseline %	Sustainable %	Upgrade %
	€/year			As percentage of gross national income per capita		
Bosnia-Herzegovina: Doboj	47	212	341	4.6%	20.7%	33.3%
Bulgaria: Pleven	40-42	46-48	47-51	2.8%	3.3%	3.4%
Croatia: Duga Resa	61	130	186	1.6%	3.5%	5.0%
Croatia: Karlovac	150	255	395	4.0%	6.8%	10.5%
Czech Republic: Vyskov	90	97	143	2.0%	2.2%	3.2%
Hungary: EDV-WR	97	104	125	2.3%	2.4%	2.9%
Moldova: Chisinau	15	33	33	4.0%	8.8%	9.0%
Romania: Pitesti	37			2.5%		
Slovakia: Poprad	19		30	0.6%		0.9%

Figure 19 Annual Water and Wastewater Expenditures of Case Study Community Households under Scenario Progression (€/year and % of GNI per capita)



7 Recommendations for Further Development and Testing of Reforms as Part of an Implementation Process

7.1 Project Outputs to Build Upon

The T&C Project has produced:

- Specific reform proposals that are aimed at remedying some of the barriers to efficient, effective, and practical use of tariffs and effluent charges to support financing of important water system investments in general and water pollution reduction investments in particular.
- The ASTEC spreadsheet model for use in testing the effect of a) different tariff and charge regimes and b) investment programs on the balance sheets, consumption levels, and water and wastewater quality of the municipal water utilities.
- A set of exercises (case studies) that, in combination with the spreadsheet model, illustrate the physical, economic and equity consequences of a) different tariff and effluent charge strategies in a specific MWWU context and b) various institutional and management strategies.

The T&C project has developed tools and established a basis for provision of assisted research and evaluation to test and fine-tune country-specific and MWWU-specific reform proposals. These tools can be used in a variety of ways, and with a variety of audiences. For example, they can be used to

- Encourage policy makers at the national level to undertake intelligent consideration of the institutional reforms proposed by the Project.
- Encourage local policy makers to consider thoughtful implementation of new tariff structures and investment policies.
- Train local water system managers to conduct rate studies in conjunction with investment planning and environmental protection.

The precise nature of these interventions will depend on the specific reforms proposed. It is clear that efficient assistance will vary with the:

- Audience (broadly grouped into national, local, management, and customer decision makers),
- Countries (there are large differences in the status and condition of municipal water systems across the region) and

Message (assistance in data development and use of software to help clean up balance sheets, training in development and interpretation of scenarios to test investment options, illustrative exercises to test the consequences of tariff, effluent charge or other policies on the firm and its customers).

7.2 Reform Implementation

The reform proposals and the tools used in their development can now be used to refine, test, modify and implement tariff and charge reforms in the counties of the ME DRB. Based on our collective experience developing and evaluating the reform proposals included in this report, we offer the following recommendations in support of an implementation process.

7.2.1 Elaboration and Application of ASTEC-Based Case Studies

The case studies developed by our country consultants have been extremely valuable in helping our understanding of the issues and reform opportunities in real MWWUs in the DRB. The full value of this activity has not, we think, been fully realized. We think an opportunity exists to develop these case studies in closer collaboration with the country consultant and local system managers. This elaboration will allow us to better test the reform proposals and the operational features of ASTEC. It will also give the local managers and interested local officials a chance to see the tools we developed, to develop an understanding of the way we analyze and evaluate reform proposals, and to develop and test their own variations of those proposals.

7.2.2 Workshop on Tariff and Charge Reforms for Policy/Decision Makers

As a practical observation, interest in tariff reform usually derives from other objectives e.g., to obtain the "internal" capital needed to meet co-investment requirements and operating costs of an ISPA or other grant program. There is not usually a big or powerful "constituency" for the efficiency features of these reforms. Implementation of tariffs reforms that promote pollution control must be bundled with achievement of the other objectives.

It therefore makes sense to test the tariff and charge reforms and reform “bundles” with a group of policy and decision makers who can help us further evaluate these reforms. The purpose of this workshop would be to introduce the policy makers to our work to date and to get their feedback on our initial reform proposals. Their experience and perspective will be invaluable as we try to shape the proposals to be more workable and effective. They would also be able to help direct us toward developing a reform development process that would increase the likelihood of adoption.

7.2.3 Demonstration Workhops for MWWU Managers and Directors

Proposal reforms can be introduced to municipal decision makers through a series of workshops that describe how we developed and tested these reforms in this Project. These workshops would feature the experience of the country consultant and case study managers and staff through their active participation in the workshop. Such workshops would, we hope, also start to build a wider understanding of the tariff and effluent reforms we propose, including their interaction with each other and other policy objectives. Through this process we hope that we can begin building a constituency for implementation of some of the policy reforms. Likewise, such workshops provide another opportunity for feedback on the reform proposals and obstacles to implementation.

7.2.4 Coordination with Other Assistance Projects

The Project should look for opportunities to build on past international assistance projects aimed at supporting MWWUs and identify and collaborate with those projects about to begin or now in progress. Certainly, we don’t want to either duplicate or compete with the assistance project. The reforms we are proposing should also be of keen interest to international finance organizations (development banks, etc.). We should, likewise, be aware of and make efforts to coordinate our work

with such organizations so as to assist the case study or demonstration communities in their search for investment capital on reasonable terms. We should undertake the risk reduction bundle of reforms, for example, with an understanding of what criteria these international "banks" apply when "bankable" is determined and see if we can help the municipal utilities move toward meeting those requirements.

7.2.5 Demonstration Projects of Municipal Tariff and Effluent Charge Reform

Demonstration reform projects are probably the best way to develop and test the reforms to the point where their practical merits can be displayed to interested or skeptical observers. Of course, not all elements of reform can be demonstrated on municipal scale, but those that can will fill in a lot of the uncertainty surrounding the operational details of reform evaluation and implementation. To do this effectively, the demonstration teams will need to represent a pool of skills that cut across the various features of reforms that we have recommended: accounting, investment planning, economic regulation, finance, pollution measurement, meter design and reliability. There will likely be a need to build local capacity in many of these areas as part of each demonstration.

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9 Annex 1: An Analysis of the Links between a Change in Tariffs and Pollution Reduction

Water and wastewater tariffs are levied primarily to produce revenues to pay for the infrastructure and operating costs associated with providing water and wastewater services (W&WWS).[25] In the following discussion we examine how a tariff increase under one of the simplest tariff designs - a single commodity charge - might affect water pollution levels as well.[26] To aid the reader, in Figure 20 we have illustrated the main effects of a tariff increase from T_0 to T_1 in the drinking water market.

The graph in the center of Figure 20 shows what the initial market impacts are likely to be. The change in drinking water consumption corresponding to the tariff increase from T_0 and T_1 is shown by the reduction in consumption from D_0 to D_1. Higher tariffs reduce the consumption for municipal water as a reflection of the demand curve. The increase in the tariff simultaneously affects the amount of money exchanged for the service.
These two effects – a quantity change and a financial change - stimulate changes on both the service user side of the market – labeled the "Demand Side" in Figure 20, and the MWWU side of the market –labeled the "Supply Side". We now elaborate these changes and their possible consequences on each "side" of the drinking water market. On the "demand side" customers will reduce water use and, most probably, will pay more for the water they do use. That is, they will not only pay a higher price but will also likely spend more on the drinking water they do consume. This is noted in the "Demand Side" box. To note that there is a possibility that drinking water customers' expenditures may actually decline when the tariff is increased, we have put a question mark after that initial demand side outcome.[7]

The next box on the demand side of Figure 20 displays the main consequences of reduced water consumption in terms "Wastewater Effluent". Reduced consumption will likely lead to reduced effluent flows (unless all the reduction is the result of changes in use associated with "comsumptive" activities). More problematically, lower consumption may also mean higher effluent loads. Because of the uncertainty we again attach a question mark to this consequence of a tariff increase. The box immediately to the of the right of "Wastewater Effluent" illustrates that, when "Directly Discharged",

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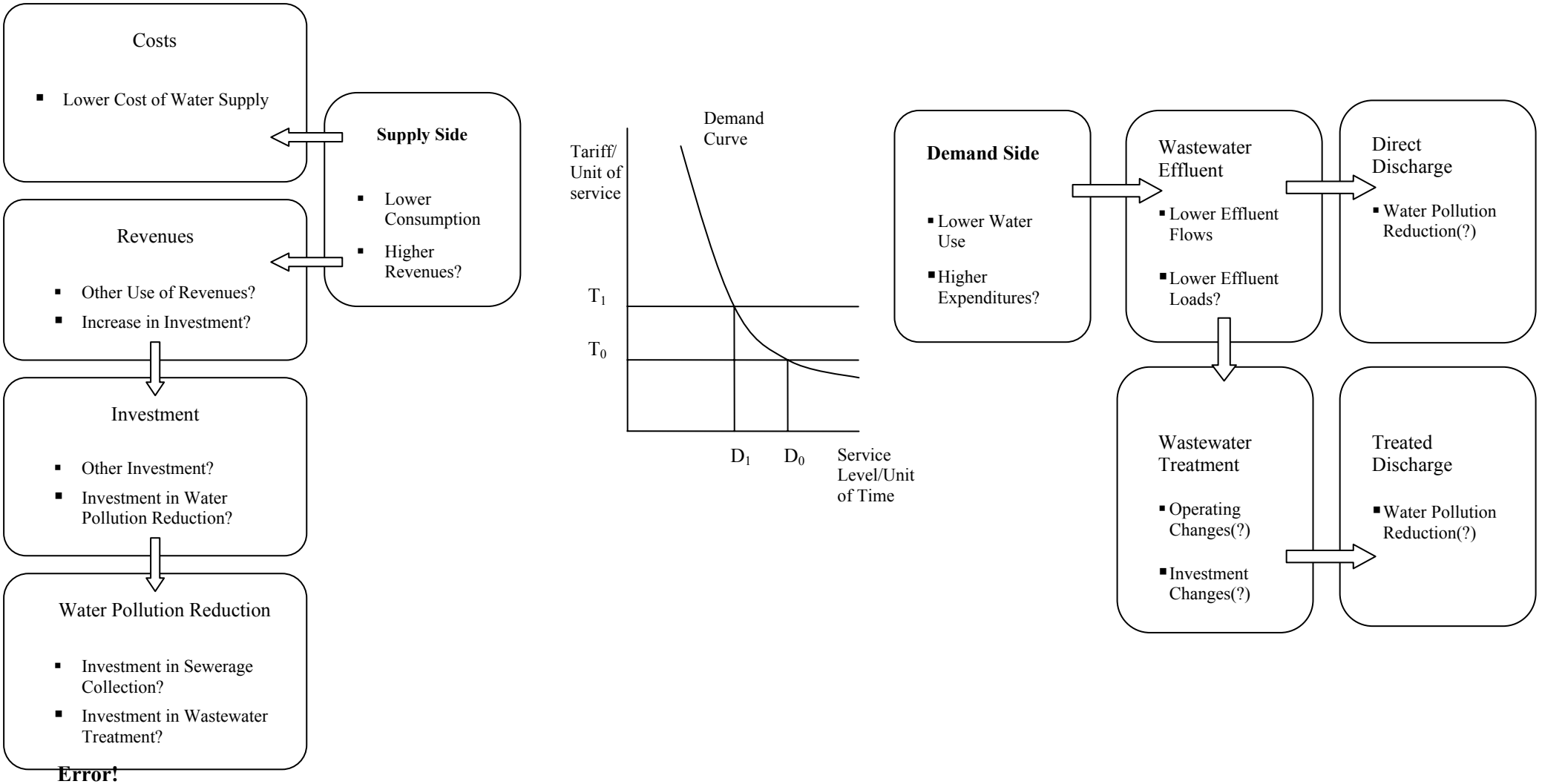
[25] For this discussion we treat water and wastewater tariffs as if they are one tariff applying to one type of service: joint water and wastewater service. While the service is not strictly joint – water and wastewater service levels are in some respects independent of one other – the billing method usually applied makes them appear joint to the customer (SU). In particular, the wastewater tariff, whatever its level, is usually assessed on the basis of drinking water delivered to the SU's account. Sometimes this delivery is estimated; sometimes it is metered. In either case, most customers that have both water and sewer service are billed as if the wastewater service they receive is proportional to the water service. In most cases, this is not a bad assumption, although the factors of proportionality can vary significantly for different types of customers.

[26] A decrease in tariffs will have the same effects but work in the opposite direction.

wastewater effluent reductions resulting from a tariff increase may affect the level of water pollution. In general, the greater the reduction in wastewater and the loading of that wastewater, the greater the water pollution reduction from a tariff increase. Without knowing specifics, we can't say whether these links from a drinking water tariff increase through direct discharge result in lower or higher levels of water pollution.

Figure 20 Principle Links to Pollution Reduction and Other Impacts of an Increase in Water Tariffs from T_0 to T_1



Error!

Below "Wastewater Effluent" is the "Wastewater Treatment" box. If the wastewater is treated, changes in incoming effluent amounts and concentration can affect the level and effectiveness of treatment. The ultimate effect on water pollution reduction will depend on the physical conditions of treatment and their associated costs. Here, again, while we know that an increase in the drinking water tariff, via changes in effluent flows, can lead to changes in wastewater treatment, we cannot categorically determine the associated sign, much less the size, of reductions in water pollution.

In considering the effectiveness of a drinking water tariff reform proposal, the demand side effects on pollution reduction will commonly be small. Demand side effects can, however, be important in some cases and should not be overlooked. It is important, therefore, to understand the various ways in which these effects link to pollution reduction.

Moreover, pollution reduction is not the only concern of public policy. While we have been concentrating here on the "effectiveness" of a tariff reform design in terms of links pollution reduction, we also need to be anticipate the other changes that link to the consumption and expenditure changes of the "demand side". As noted at the outset of this discussion of the demand side, the tariff increase will impact customer drinking water expenditures. This consequence of a drinking water tariff increase also needs to be weighed when assessing the proportionality and feasibility of a tariff reform proposal.

The effects of a drinking water tariffs increase on the "Supply Side" are shown on the left side of Figure 20. Here the reduction in water consumption shown on the demand side is seen as a reduction in production. Simultaneously, there is a change in the revenues received by the MWWU. Just as we expected an increase in customer expenditures on the "demand side", we expect that there will be an increase in revenues on the "supply side". For the same reasons, however, we cannot be sure of this (see footnote 7). We again denote this uncertainty in the direction of the change with the question mark after "Higher Revenues".

In the "Cost" box of Figure 20 we note that lower production will in turn lead to lower total costs of providing drinking water. If the total cost of production decline due to a tariff increase and, as is often the case, the revenues from sales increase, the MWWU should be more net revenue left for other purposes. This link is examined in the "Revenues" box to the left of the Supply Side box.

Whether or not associated changes in revenue translates into water pollution reduction, especially reduction in nutrient and toxic loads, depends on how these revenues are used. This, in turn, depends on the priorities of the MU and its owners. It also depends on the priorities of the RUs that regulate or condition the MU decisions. On the left of Figure 20 we highlight various possible uses of the possible net revenue. "Other Use of revenues" suggests that the net revenue produced by a tariff increase can be used to support the operating costs of a wide variety of service upgrades e.g., improving drinking water quality, and improving the reliability of the billing system. If a decision is made to use net revenues to finance an "Investment", the investment can be used to build a variety of new infrastructure that may have no direct impact on pollution reduction e.g., investment in service reliability, leakage reduction, or expansion in water service. Such investments may even result in higher wastewater volumes, effluent loads and, ultimately, water pollution.[27]

If the tariff increase ultimately leads the MWWU to invest the net revenues in "Water Pollution Reduction" then the tariff increase can potentially have a big impact on water pollution reduction. If the choice is made to use the revenues to support introduction or upgrade in wastewater treatment to secondary or tertiary levels, and to operate these systems effectively, we expect there to be a significant reduction in pollution loads returning to water bodies, especially nutrient and most toxic loads. The net effect on water bodies, of course, depends to some extent on what alternative treatment

[27] Whether such expansion results indirectly in a higher pollution load on the environment depends on what alternative disposal methods were being applied by household and commercial customers who would be served by the expanded water and/or wastewater system.

or disposal methods are displaced by the new investment.[28] Given these contingencies, especially the one regarding proper operation of the new or upgraded treatment facility, we even mark the link between a tariff increase and this outcome with a question mark.

In summary, then, the links through either the supply side or demand side of a tariff reform, - even a reform as seemingly simple as a straightforward increase in a drinking water commodity charge - to water pollution reduction are multiple and can be technically and behaviorally complicated. The effectiveness of the reform depends on the behavior of several agents – MUs, RUs, and SUs - in combination with associated technical and financial conditions.

Finally, we note again that "effectiveness" is not the only criteria by which to judge the merit of a tariff reform proposal. We need to consider the other consequences of tariff reforms, some of which are suggested in Figure 20. On the supply side, for example, there is the critical role of the many agents involved in setting service and investment priorities. There is a political linkage between the municipal officials, representing municipal ownership, and service users, as the political constituency upon which those officials depend for political support. If the costs represented by an increase in tariffs, get disproportionate to incremental benefits derived from the MWWU by the service users, it will be difficult to design a "practical" reform. Such relationships, and the various ways in which they manifest themselves in the ME countries of the DRB, are also very important to understand when identifying and evaluating reform proposals.

[28] Careful land disposal of sewerage, for example, can also result in substantial reduction in nutrients and toxic loads returning to water bodies.

10 Annex 2: Effluent Charge Links to Pollution Reduction

An effluent charge as discussed here is a charge levied on a MWWU based on the amount of effluent that the MWWU discharges into a water body from its wastewater collection system or its wastewater treatment plant. Often times these charges are in the form of a "fine" that is assessed if the MWWU exceeds a "permitted" level of effluent discharge. In other cases it is assessed on all effluent, even that effluent that is within the limits in the systems permit. The actual charge can vary widely in design as both the range of water pollutants covered and the way in which the effluent load is measured varies. Some of these variations are discussed in this Annex or other chapters of this report.

Like tariffs, effluent charges are an economic instrument. Their merit depends not only on the level and design of the effluent charge; it also depends on the reactions of MWWUs and their customers to a change in effluent charge regime. Like tariffs, changing this economic instrument can 1) affect the flow and pollutant load of wastewater in a number of ways and 2) have other important economic and social effects. This is illustrated in Figure 21 for an increase in effluent charge from EC_0 to EC_1. In this case we assume an effluent charge design in which the effluent charge only applies to effluent levels in excess of permitted levels E'. We call this a "fine" design because it works like a penalty or fine that is imposed for violation of a rule or standard. In this case the penalty is proportional to the size of the violation.

The main link between effluent charges and pollution reduction works through the effect the effluent charges have on the MWWUs costs (the "cost side"). In principle, the higher costs imposed by an increase in effluent charge are supposed to stimulate investment in wastewater treatment by MWWUs as a cost savings measure. How this works depends on both the effluent charges (shown as EC_o and EC_1 in Figure 21) and the marginal cost of abatement (shown as MAC in Figure 21). The MAC goes down as the level of abatement goes down i.e., as the amount of effluent goes up. If the MWWU minimizes the total cost of abatement and effluent charges, it will reduce effluent to the point where the marginal abatement cost is equal to the marginal benefit of abatement reduction, which, of course, is the effluent charge. For effluent charge EC_0 in Figure 21, the MWWU abates to the point where effluent production is E_0. The MWWU will pay for abatement up to this point and then pay an effluent charge equal to the product of the effluent charge EC_0 and the effluent in excess of permitted levels ($E_0 - E'$).

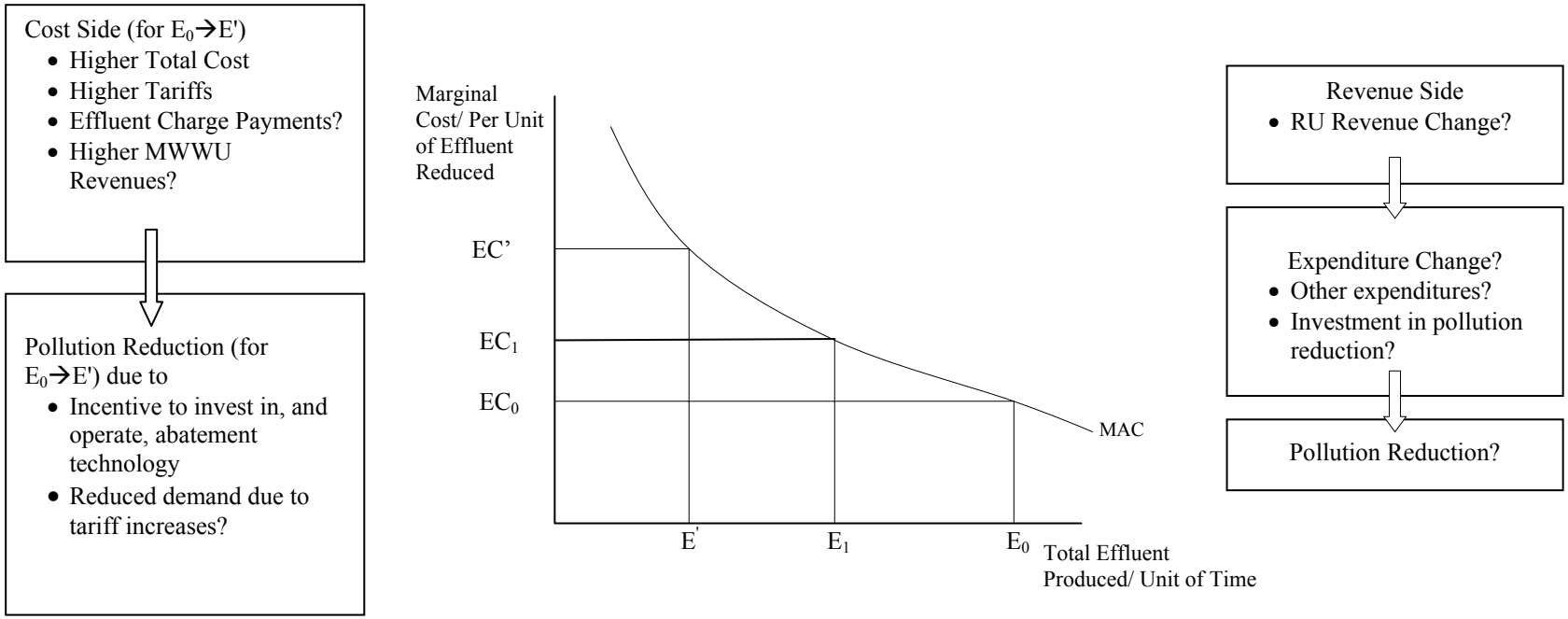
If the effluent charge increases to EC_1, the minimum total cost for the MWWU will be obtained at an effluent emission rate of E_1. In other words, raising the effluent charge will provide the incentive for the MWWU to increase abatement activities and reduce effluent production. Note that in this example, the level of pollution is still greater than the "permitted" level of effluent E'. The higher level of abatement will increase total abatement costs by the amount of the area under the MAC function between E_0 and E_1. The amount paid in effluent charges is now EC_1 times the new excess effluent ($E_1 - E'$). Since EC_1 is bigger and ($E_1 - E'$) is smaller, we don't know under all conditions whether total effluent charge payments will increase or decrease. In Figure 21 it looks as if the effluent charge payments would decline. The geometry of the Figure, however, also can be used to show that under this effluent charge regime the total costs of the MWWU will increase with an increase in EC up to EC' where the MWWU will abate to the point where it is in compliance with its permit.

The cost side box of Figure 21 summarizes these results. With higher effluent charges and reduced effluents the total costs of operating the MWWU increase. As these costs are passed on to the consumer in the form of higher tariffs, customers can be expected to reduce water consumption and wastewater disposal. The consequences of this tariff change are just as illustrated above in Figure 20 of Annex 1. This illustrates, again, that tariffs and effluent charges are likely to have some, perhaps

significant, interdependence. The further effects of these cost side influences on pollution reduction depend on the size of the effluent charges, the tariff increase, and the demand for water and wastewater. As in the case of a tariff increase, this will reduce consumption but the ultimate effect on effluent produced by the MWWU will depend on wastewater service demand and the costs of wastewater service provision.

An examination of this particular effluent charge regime would not be complete without consideration of the "revenue side" of the effluent charge. This is shown on the right hand side of Figure 21. The effluent charge payments made by the MWWU become revenues from the perspective of the recipient, presumably some RU. We note again that it isn't certain that an increase in EC will result in additional revenues and, certainly, an increase beyond EC' in this "fine" design will yield no additional revenue at all. The revenues from the effluent charge, whether increased or not, can be used in a wide variety of ways and their potential impact on effluent generation might vary from a substantial reduction (due to financing of a wastewater treatment facility) to a small increase (due to, for example, the use of the revenues to support expansion of service to new customers).

Figure 21 Illustration of an Effluent Charge Increase: Effluent Fine Design and Baseline Effluents Greater than Permitted



11 Annex 3: The ASTEC Model Users Guide

11.1 General Remarks

The present User's Guide is intended for the country consultants working on components 1.6 and 1.7 of UNDP-GEF Danube Regional Project (Assessment and Development of Water and Wastewater Tariffs and Effluent Charge Designs Focusing on Nutrient Reduction and Control of Dangerous Substances in the Danube River Basin), who have participated at the Orientation Workshop in May 2003 in Budapest, and who therefore received an introductory training about the spreadsheet model. The User's Guide is also useful for other experts, though they may need to spend more time reading it and trying the model in practice to acquire sufficient familiarity with it. Familiarity with not only the model, but also with

- the Guidelines for Entering of Spreadsheet Cost Data for Case Study Scenarios,

- the Pilot Case Study Guidance Document,

- and the Analytical Framework

are essential for proper use of the model and interpretation of the results. The present document is a *„technical" guide*, while the aforementioned other documents help in constructing sensible scenarios, proper use of input data and interpretation of results.

The present version of the model requires Excel 2000 or a more developed version of Excel, with Solver installed and Excel enabled to run macros. The user surface of the model is in English, but the Excel itself can be in any language, that is not supposed to affect the proper functioning of the model. In older versions of Excel or obsolete computers running some of the scenarios may require a lot of time or it may not be possible. If you are experiencing problems running the model, please consult the section on troubleshooting at the end of the User's Guide.

The model that you receive is *read-only version*. When you enter data into it, you need to save it under a different name, therefore you will always have a back-up copy of the original model.

11.2 Structure of the Model

Eight worksheets of the model are displayed for use, while a number of sheets containing side-calculations are hidden.

The *Control sheet* is used for initiating commands, such as running of scenarios, copying one scenario into another one and deleting scenario data. *Sheets S1 to S5* contain scenario specific input data, these sheets are to be filled in by the user. Data should only be entered into *colored cells*, while white cells should not be modified, because that may create problems for the model. Likewise, *cells, columns, rows and worksheets should not be deleted or inserted* by the user, because that will change the references to some of the cells, again creating problems for the model. Information can be copied between colored cells, but it should never be cut and pasted, because cutting cells will modify the references.

Some cells have *comments* with a red little triangle in the right upper corner. By moving the cursor to the cell, the comment will pop up. These comments usually include guidance on data entry.

The *Output_DSR* sheet contains detailed scenario results (after a scenario has been run), while the *Output_CT* sheet contains comparative tables of scenario results. These sheets cannot be modified by the user, but the displayed information can be copied into a different file for further computations by the user.

If operation of the model is interrupted by the user or by an error, then the otherwise hidden sheets are also displayed, but they will be hidden again after the next successful run of the model.

The present model version can be applied for analysis of management units, which serve up to *9 service users* (SUs). An extension for 20 SUs is planned, as the need for a larger number of SU categories arose during elaboration of case studies.

11.3 Operation of the Model

11.3.1 Entering Data

Scenario specific data is to be entered into worksheets "S1" through "S5". On the top of the sheet (rows 2-6) there are hyperlinks pointing to ranges where scenario data is entered. The user can quickly reach these ranges by clicking on the *hyperlinks*. Please bear in mind to fill in only the colored cells, and do not add, delete or cut&paste cells, rows, columns or worksheets during data entry.

11.3.1.1 General Input

Scenario name (cell C9) is the concise name of the scenario, which will be used to identify the scenario in all the other sheets. A longer description of scenario features is possible in cell E9.

Real interest rate is the difference of the nominal interest rate and the rate of inflation. Details on its computation are in the Memo on Guidelines for Entering of Spreadsheet Cost Data for Case Study Scenarios.

Number of loops: the user can maximize the number of loops (iterations) used for modeling. During optimization the computer repeats the same computing algorithms, gradually getting closer and closer to the optimal solution. The higher the number of loops that the user allows, the more precise the final results will get, but the longer the computation process will take. It is suggested that initially this number is between 5 and 10, and if the precision of the results is not satisfactory, then it can be increased for subsequent runs of the model.

Precision: the expected precision of the final results is the maximum difference between the costs and revenues of a given cluster of service user. This figure is only used during cost recovery and/or marginal cost pricing scenarios. The lower this number, the more precise the final results will be, but the longer the computations will take. 3%-5% seems like a reasonable starting point, which can be lowered if the results are not sufficiently precise.

11.3.1.2 Specifications of Service Users

This is the input area for specifying the modeled SU categories and the baseline patterns of consumption and charging regimes in range B14:D22. Baseline refers to the fact that the data provided here is valid for the baseline situation, before the introduction of any scenario changes.

The *name* should concisely summarize the most important features of the SU category. Through the name the user can differentiate between user types (e.g. households, industrial users), it can provide a reference for the type of service (water, wastewater or both), the location of the service area (town, village), the charging regime, the sensitivity of consumption to changes in the commodity charge (low or high elasticity) etc.

A predefined category is "*Leakage and storm water*". While this is not an actual service user, the resources certainly get used, since leaking water first needs to be extracted and treated, and storm

water is also collected and treated together with the rest of the wastewater stream. Subsequently, there are certain cost items that can be associated with leakage of supplied water and collection of storm water, and this SU category is set up exactly for this reason: in order to summarize these cost items and then to make sure that they are eventually distributed to the rest of the SUs and are recovered from the tariffs paid by them[29]. If you do not have information on leakage and storm water or you would not like to make that part of your analysis, you can simply leave the corresponding cells empty.

The *number of accounts* refers to the actual customers or users of the service within a given service category. For instance, if you have 10,000 households in a SU category, and each of them are individually billed then 10,000 is the number of accounts. If these 10,000 households live in 500 apartment buildings, and it is the buildings, and not the households that are the direct users and payers of the service, then it is more logical to use 500 as the number of accounts. The number of accounts may change by the scenario. For instance, if you introduce metering for individual households of big apartment buildings, then the number of your accounts will increase, while average consumption per account will decrease.

The service: a given SU can use only water service (W), only wastewater (or sewage) service (S), both services in a composite way, i.e. they cannot be decoupled from each other (WSc), both services independently from each other (WSi). In the latter case the two services are not linked with each other, the user can choose to abandon one service and switch to an alternative provision, e.g. self-supply, without having to give up the other service.

11.3.1.2.1 Water Consumption and Charging Regime

Baseline annual water use per account: the average water consumption within the SU category. In case of leakage, the total annual leakage in the service area of the MU should be provided here, if available (cell E23).

Fixed annual water tariff: Fixed tariff or service charge that the individual account will have to pay regardless of water consumption.

Commodity charge: a unit charge, which is paid after consumption of each cubic meter of water.

Quantity of water per account provided in exchange for the fixed annual tariff: sometimes SUs are entitled for consumption of a certain quantity of water without having to pay the commodity charge after this consumption. Having this option also provides the opportunity to represent block fee tariff systems. In case of block fees end users are categorized according to their present blocks and all consumption preceding the present block is considered as part of the fixed tariff. As illustration let's imagine a charging regime in which there is a fixed charge of 100 USD, plus a commodity charge of 2 USD/m^3 for the first 1000 m^3, then 2.5 USD/m^3 for all subsequent consumption. In this case end users who consume more than 1000 m^3 will fall in the 2.5 USD/m^3 commodity charge category, and their fixed tariff is 100+2*1000=2100 USD/year, in exchange for which they also receive 1000 m^3 of water.[30]

11.3.1.2.2 Wastewater Discharge and Charging Regime

Other than the baseline annual discharge, all of the variables are defined similarly to baseline annual water consumption. Baseline annual discharge of wastewater can be defined either as an absolute

[29] The underlying rationale is that leakage is an unavoidable side-effect of water service provision (though its extent can be limited), while storm water collection is also a service, even if does not directly correspond with wastewater collection and treatment, and it should not take place through the sewerage.

[30] With the present model setup, this notion limits movement across blocks; therefore if large-scale changes take place (i.e. if the new quantity after a change in price would fall in a different block) then the user category has to be redefined manually.

number in m^3/year, or as a percentage of water use. The latter option should be used only when water and wastewater services are composite services, i.e. they cannot be decoupled from each other and as water consumption changes, so will the discharge of wastewater. Storm water collected by the sewer on the territory of the MU is to be entered in cell I23, if available.

11.3.1.2.3 Elasticity of Demand

Elasticity of demand is the percentage change in consumption as a result of a one percent increase in the commodity charge[31] of the corresponding service. For instance, if the elasticity of demand for water consumption is –0.2 then one percent increase in the commodity charge triggers a 0.2 percent decline in water consumption relative to the baseline level.

Three types of elasticity can be supplied. The actual elasticity that should be filled in depends on the types of services used by the SU, as depicted by the next table.

Type of service	Elasticity to be supplied
Water service only (W)	Water elasticity (range O14:O22)
Wastewater service only (S)	Wastewater elasticity (range P14:P22)
Water and wastewater services provided independently from each other (WSi)	Water elasticity; wastewater elasticity (ranges O14:O22 and P14:P22)
Water and wastewater services provided as composite goods (WSc)	Water and wastewater elasticity as composite goods (range Q14:Q22)[32]

11.3.1.2.4 Value Added Tax (VAT)

Under most VAT regimes corporate entities do not consider VAT as a part of business decisions, since incoming VAT will simply be transferred to the central budget or paid out as part of the bills after purchases.[33] Since MUs in general are corporate entities, and some of the SUs are also corporate entities, VAT should not have a fundamental role during modeling. Nevertheless, in case of households, which cannot get VAT refund, the full W&WW tariff and charge will appear as a real expense. Therefore, in order to account for the different perspectives of households and corporate entities, the financial accounts in the output sheets will include the non-refundable VAT paid by the

[31] Service users will alter their consumption as a result of a change in the commodity charge only. A change in the fixed tariff will not directly trigger a behavioral response, since changing consumption will not alter the payment of the fixed tariff. A change in the fixed tariff will result in an income effect only, which may eventually have minor implications on water consumption, but this effect is not modeled.

[32] The elasticity of demand for water and wastewater services as a composite service is the percentage change in the demand for a unit of this service as a result of a one percent increase in the sum of the water commodity charge and the corresponding wastewater commodity charge together. For instance, if consumption of a cubic meter of water results in 0.9 cubic meter of WW discharge, then the composite service comprises of a cubic meter of water consumption and 0.9 cubic meter of WW discharge. If the commodity charge of the water service is 1 €/m^3 and that of the WW service is also 1 €/ m^3, then an increase of 0.1 €/ m^3 of water service will result in 5% increase of the commodity charge of the composite service (0.1€/2€). If the elasticity of demand is –0.2, then 5% increase in the composite commodity charge will result in 1% decline in consumption.

[33] There may be cases when VAT does have a role in business decisions, subject to e.g. the VAT refund regulations, bookkeeping rules on the VAT part of long-term investments or expected changes in the level of VAT. In the majority of cases, however, VAT is not one of the major factors shaping corporate decisions.

SUs. To be able to do so, the user needs to supply the VAT rates and declare whether VAT is refundable by a given user. This information is to be entered into range R14:T22. Moreover, all monetary values should be entered in the model as net values, without the VAT.

11.3.1.2.5 Avoidance of Tariff Payment

Here the user can specify if a share of the tariff is avoided (not paid) by SUs. The percentage of avoided tariffs needs to be supplied in range U14:V22 by SUs and services. If all tariffs and charges are paid, then these cells should be left empty or zero should be entered. Unpaid tariffs will be displayed in the output sheets after the model has run.

11.3.1.3 Fixed Costs and Grants

Section 3.1.A is for water services, section 4.1.A is for wastewater services. You can enter up to 50 cost or grant items here.

Leakage and storm water. The first column in this matrix (column C) is dedicated for leakage of water in case of water services, and collection of storm water in case of wastewater services.

Costs and grants. The rest of the items are defined by the user. First you need to choose in row 27 if a given item is *cost or grant*. Grant is a transfer from the government, the municipality or the EU to the management unit as a contribution to the investment. If the transfer needs to be repaid, then it is not a grant any more, but a loan, therefore it cannot be included as a grant. If such a loan needs to be repaid with a preferential interest rate, then the interest rate for this item can be changed to reflect the conditions of the loan.

Future or present value payment can be chosen, to differentiate between a loan repayment obligation and savings for future investments. When an investment is financed from a loan, then present value payment needs to be chosen. When the MU makes savings for a future investment, then future value payment needs to be selected.

The *name of the item* should concisely describe the most important feature(s) of the investment cost or grant. The name can refer to the technology, the geographical location, the service users served by the item. E.g. Water treatment at well "A" or Pipeline to town "B".

The *lifetime of the equipment* can be the full lifetime, if the system is to be financially sustained for an indefinite time, it can be the remaining lifetime of the loan which financed the purchase of the equipment, or it can also be the remaining lifetime of the equipment in case of "Future value payment" if the full cost of the equipment needs to be saved until then in order to replace the present equipment.

The *annualized value* is computed by the model automatically. If, for a given cost or grant item, you choose to apply an interest rate which is different from the general scenario interest rate supplied in cell C10, then you need to modify the formula in the annualized value row of the item, by changing the reference to cell C10 to the specific interest rate. Also, attach a comment to the cell describing the reason for the different interest rate.

In order to be able to reach cost recovery for individual service user groups, the costs (and grants) need to be distributed among the SUs. If an item is not distributed among them, that will still be used for cost calculations and appear in the output sheet as non-distributed value. If you would like to distribute a value among SUs, first you need to specify if you would like to distribute it *as a percentage or proportionately with the volume* of water consumed or wastewater discharged by the SUs. The basis for distribution can be set in row 33 for water and row 75 for wastewater services, while the actual assignment of costs takes place in the rows below it. In the first part of these rows the

names of the SU categories are displayed, but only those, which consume the given service, so that you do not accidentally distribute a cost item to an SU, which does not use the service.

In case of *percentage distribution* insert a percentage in the cells in this table. In a closed system, i.e. when all of the cost is distributed among SUs, the column should add up to 100%. It is important that you insert percentage values with the % sign or insert figures which are between 0 and 1, otherwise a 100 times higher value will be used. (E.g. if you would like to assign half of the costs of a given item to a particular SU, then you can insert "0.5" or "50%" in the appropriate cell, but do not insert "50", because that is interpreted by the model as 5000%.)

In case you choose the *volume* of water or wastewater as the basis for distributing costs, insert 1 into a cell if the item appears as the cost of a given service user. Otherwise insert 0 or leave the cell blank.

You can also *allocate costs to leakage* (and storm water collection) and then redistribute them among SUs. This feature is especially useful if you would like to track the costs associated with leakage or storm water collection and/or if these costs should be spread among SUs or some of the SUs according to a specific algorithm.[34] The costs of leakage and storm water can be spread or redistributed among SUs in range C34:C42 and C76:C84, respectively.

11.3.1.4 Investment Costs Covered by a Connect Charge

3.1.B is for water, 4.1.B is for wastewater services. The model offers the possibility for introduction of a *connect charge* in case *new users* are added to the system. New users usually imply increased costs which, to sustain economic efficiency, should be covered by their connect charge, which is a payment category especially for covering the additional costs of connection, which is different from both the commodity charge and the fixed tariff. In cell BB26 (for water) and BB68 (for WW) you can specify the duration of the connect charge, i.e. the number of years through which the costs related to connection will be recovered. The rest of the input data can be entered similarly to fixed costs and grants.

11.3.1.5 Variable Costs and Transfers

In Section 3.2 (water) and 4.2 (wastewater) *variable costs, subsidies and charges* can be entered, the last two items are considered as transfers, since they represent money transfers from or to the government or municipality. In case of water services in row 47 you need to specify the category in which the item falls, then in row 48 the name of the item is to be described, in row 49 its value. If a given item applies to a specific service user, "1" needs to be inserted in the appropriate row below. A similar table for wastewater services is available from row 88.

11.3.1.6 Quality of Supplied Water

In Section 3.3 you can supply important characteristics of the quality of the supplied water, i.e. drinking water. This should not be mistaken for the quality of wastewater or effluent, which is specified in 4.3 under pollution charges. The data supplied in Section 3.3 is not used for any computations, but this is a useful way of describing scenario features. If, for example, you introduce new investments into purification of water, that will not only have an effect on costs, but the supplied water will meet higher standards. Therefore, specifying the quality of water in this section is a way of specifying the scenario.

[34] If you invest into leakage reduction, you need to know your costs before and after the investment, in order to be able to make a reasonable decision on the investment. One can also consider, for instance, that distribution of water in a suburb, with lots of houses spread over a large area, probably results in more leakage per household than in an area with big apartment buildings.

11.3.1.7 Pollution Charges

The water pollution charges under Section 4.3 are specified in more detail than the quality of supplied water in Section 3.3, and pollution charge data is actually used for computations. First, in row 105, the basis of the charge needs to be selected. It can be the *volume of wastewater* as well as the *quantity of pollution*. The name of the pollutant is supplied in row 106. The *concentration* of the pollution only needs to be filled in if the *charge* is based on the quantity of pollution. Actual pollution levels will be computed by the model based on the concentration and the volume of wastewater discharge. The measure or level of the pollution charge is supplied either by cubic meter (in case the charge is based on the volume of wastewater) or ton (if it is based on the quantity of pollution). The distribution of the costs takes place just like in Sections 3.2 and 4.2. It is advised that the order of the pollutants is the same in all scenarios; otherwise the results displayed in the output sheets will not be comparable across scenarios.

11.3.1.8 Modeling Options

11.3.1.8.1 Cost Recovery

In Sections 5.1 and 5.2 you can specify if you would like to have *cost recovery for given SUs* for water and wastewater services, respectively. These choices are only valid for marginal cost pricing and full cost recovery scenarios (see below). If you would like to achieve cost recovery, you need to enter "yes" in column D.[35] There may be scenarios in which you would like to achieve cost recovery in general, but for certain SUs you want to set an exogenous tariff and charge, even if those do not result in cost recovery. You can do this by setting column D of the appropriate row as "no", while supplying the tariff and charge in columns O and P of the same row.

Furthermore, if you would like certain service users to have the same commodity charge then you can specify "*clusters*" here. SUs belonging to the same cluster will have the same commodity charge after the model finished the optimization process. When do you want to use this option? Primarily when you would like to achieve cost recovery or marginal cost pricing for certain SUs together. E.g. you would like to test what happens if the same charges apply to the households of two neighboring towns (which face different cost levels), because you are not able or do not wish to differentiate their charges.

How do you specify clusters? Potential clusters appear in columns F to N. If you would like to assign two service users to the same cluster, then first you decide which cluster (which column) they should belong to, and then you enter "1" into two cells where the column of the cluster and the rows of the SUs cross each other. All the rest of the cells in the column should be left "0".

If there is a SU which is not clustered with any other SU, then you assign that SU into a cluster individually, without any other SUs, i.e. there is only one "1" in that column, all the rest of the cells are "0".

One SU should only be assigned into exactly one cluster. The control cell in column E of the matrix has a red color if you accidentally assigned the SU into more than one cluster, or did not assign it into any. If you do not want to achieve cost recovery for the SU, then you do not need to assign it into any of the clusters.

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[35] If you leave any of the cells in column D of the tables empty, the model will assume that you do not wish to have cost recovery for the particular SU.

Clusters for water services do not necessarily have to be the same as for wastewater services. Nevertheless, having completely different structures for the two services will extend the computing time of the model (and may not even lead to a solution).

11.3.1.8.2 Scenario Choices

The user will need to selected the scenario type out of the following five categories:

1. *Full cost recovery without marginal cost pricing*. During optimization only the commodity charge changes so as to reach full cost recovery by clusters of users. This is economically not an efficient scenario, since some of the investment costs may be recovered from commodity charges; nevertheless it is widely used in practice.
2. *Full cost recovery with marginal cost pricing*. In this case both the commodity charge and the fixed tariff change in order to cover operating costs (with the commodity charge) and investment costs (with the fixed tariff) by clusters of users.
3. *Marginal cost pricing without full cost recovery*. This is a simple marginal cost pricing scenario, in which case commodity charges are equal to operating costs, by clusters of SUs, but fixed tariffs do not have to be equal to investment costs. Original fixed tariffs are used.
4. *No marginal cost pricing, no full cost recovery, original tariffs and charges* are used. Here the original fixed tariff and commodity charge are applied, no optimization is carried out.
5. *No marginal cost pricing, no full cost recovery, new tariffs and charges* are used. The fixed tariffs and commodity charges supplied in ranges O128:O136 and O141:O149 for water and wastewater services, respectively, will be used for modeling. No optimization is carried out, but the new level of commodity charge will influence service level through the elasticities of demand.

In case of a cost recovering or marginal cost pricing scenarios (1 to 3 from the above list) the user can also make a choice on how the model should handle avoidance of payment:

Costs of non-payers are not recovered. In this case it is assumed that payers will need to recover their full costs in case of a full cost recovery scenario, or their operating costs through the commodity charge in case of marginal cost pricing. Payers will, however, not recover the cost of non-payers.

Costs of non-payers are recovered by payers. Here payers will actually pay more than their true share of costs would justify, so that revenues from them will recover all costs, including costs associated with services to non-payers within their own SU cluster (cross-financing among SU clusters is not an option).

11.3.2 Commands

Commands on operation of the model can be initiated on the *Control sheet*.

You can *copy data* from one scenario into another by inserting the number of the source scenario into cell C11, the number of the target scenario into cell D11, and hitting the Copy button. This feature is useful when you would like to create a new scenario by modifying an existing scenario.

Likewise, you can *delete scenario data* by inserting its number into cell C14 and hitting the Delete button. This is quicker and less troublesome than manually deleting the content of the cells on a given scenario sheet.

If you wish to *run a scenario*, insert its number into cell C17 and hit the Run button.

In the range B21:F26 information about the scenarios can be found, with display of the date and time of the last run, the time needed to run the scenario and whether satisfactory results have been produced. If the results have not been satisfactory, that may be either because the set of equations

describing the scenario cannot be solved or because the prescribed precision of the results have not been attained. The latter can be remedied by modifying either the precision of the results (G10 of the scenario sheet) or the number of iterations (cell E10 of the scenario sheet).

Lastly, the name or abbreviation of the *local currency* should be entered in cell C30. The local currency can be set as 1000 (or higher) units, especially if the currency is very weak compared to the EUR or USD. In this case all monetary units in the scenario sheets also need to be entered in a unit of 1000. The *exchange rates* to EUR and USD need to be entered in cells C31 and C32. After the model has run, the results can be displayed in any of the three currencies, by hitting the appropriate buttons. Please note that only the results will be displayed in the chosen currency, the variables on the input sheets will stay in the original currency.

11.4 Troubleshooting

The model was prepared in Excel 2000 and tested both in *Excel 2000 and Excel XP*. In both versions the model worked without problems. In earlier versions of Excel, however, the model, especially when scenarios with marginal cost pricing or full cost recovery are being run, may not work properly.

A number of settings are necessary for appropriate operation of the model:

- Excel should be *enabled to run macros*. You can do this at Tools/Macro/Safety, choosing mid level safety. Any time when the model is opened, you will be asked if you would like to open the macros, and you can say yes.

- *Solver* should be installed in Excel. You can check this on any of the sheets at Tools/Solver. If the Solver window pops up, then Solver is installed. If it is not installed, you can do it at Tools/Add-ins. You may need the installation disk for this.

- A number of items need to be installed within the *Visual Basic Editor* of Excel (Visual Basic is the programming language in which the macros were written). You can reach the Visual Basic Editor by hitting Alt+F11 on any of the worksheets. Then go to Tools/References and check if the following items are marked or not:

Visual Basic for Applications

Microsoft Excel 9.0 Object Library (a different version number may appear for different versions of Excel)

OLE Automation

Solver.xls (or Solver.xla)

Microsoft Forms 2.0 Object Library (or a different version number). If any of the above are unmarked, you need to mark them.

If you do not find Solver.xls or xla in the list, which is the reference most often missing, then you need to hit “Browse” and go to the project library in which solver is located. Most often this library is ProgramFiles/Microsoft Office/Office/Makro/Solver/Solver. If you do not have such a library, then you need to find Solver from Windows Explorer with the „Find” tool.

Sometimes your Solver is installed but you still receive an error message when you try to run the model. As a remedy to this problem, try the following:

- Go to any of the spreadsheets and open the Solver window (Tools/Solver) and then close it. For some reason this action (sometimes) “wakes up” Solver.

- Unmark and then mark again Solver within the Visual Basic Editor, Tools/References.

Another source of error may be when you inserted a wrong type of data into a cell, e.g. text instead of a number, because Excel cannot make a computation on text. We have tried to limit this possibility by restricting the data types of many of the input cells, but the problem may not have been eliminated completely.

If you insert or delete cells, columns, rows or worksheets, that will almost certainly be the source of breakdown, because the program code refers to predefined cells, the location of which now changes. Likewise, if you cut and paste cells, that will change the references, probably resulting in errors during modeling.

12 Annex 4 – Exchange Rates in Study Countries of the DRB

Exchange rates in study countries of the DRB (February 2004)

Country	Currency	Exchange rate (Local currency/€)
Bosnia Herzegovina	**BAM**	1.96
Bulgaria	**BGN**	1.946
Croatia	**HRK**	7.60
Czech Republic	**CZK**	32.50
Hungary	**HUF**	257.00
Moldova	**MDL**	15.70
Romania	**ROL**	40080.00
Slovakia	**SK**	40.60