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

Volume 2: Country-Specific Issues and
Proposed Tariff and Charge Reforms:
The Czech Republic – Case Study



WORKING FOR THE DANUBE AND ITS PEOPLE

AUTHORS

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PREFACE

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

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

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

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

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

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

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

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Abbreviations

ASTE	Accounts Simulation for Tariffs and Effluent Charges
CZSO	Czech Statistical Office
CR	Czech Republic
CZK	Czech currency (about 32.9 CZK is 1 Euro – 12 February 2004)
EIB	European Investment Bank
EU	European Union
MU	Management Units - municipalities or companies established or hired by municipalities to run the system
PWSS&S	Public Water Supply Systems and Sewers - the official title for the MU in the Czech Republic
RU	Regulatory Units, e.g. the government, Ministries and other offices of the public administration which impose some regulation on the MU
SU	Service Users are households and businesses
VaK Vyskov	Public Water Supply System and Sewerages in Vyskov (selected case site)
VK	Sewage system without treatment
WWTP	Water treatment plant

Executive Summary

The Pilot Case Study for Water and Wastewater Management in the Czech Republic was developed to examine the opportunities for, and consequences of, possible tariff and effluent charges reform in a certain water and wastewater service area of the Morava River basin.

The case selected, the Vyskov public water supply system and sewers, represents an average Czech management unit in the field of water and wastewater services. The analyses of its cost conditions and decision-making processes regarding future investments helped us to discover some future issues related to this public sector.

The Pilot Case Study focused mainly on two important cost factors: constructing sewage treatment plans under the requirements of the EU directive and the impact of real investment needs to ensure the sustainability of the whole system.

The testing of particular tariff changes was made by using ASTEC, a water spreadsheet model, which can be considered as an important and useful tool for this type of analysis.

1. Introduction

The Pilot Case Study constitutes a complementary part of the report: National Profile for Water and Wastewater Management in the Czech Republic. It is focused on the practical functioning of Public Water Supply and Sewers (PWSS&S) which provides water supply and wastewater services under the conditions of the current regulation in the Czech Republic.

These analyses were developed under the auspices of the UNDP-GEF Danube Regional Project and thematically belongs to components 1.6 and 1.7.

1.1. Purpose of the Pilot Case Study

The Pilot Case Study contributes to the analysis of water and wastewater tariffs and effluent charge designs focusing on nutrient reduction and the control of dangerous substances in the Danube river basin. The main purpose is to propose a possible country tariffs and effluent charges reform which:

- a) enables the ongoing development of the water supply and sewage systems,
- b) ensures service providers' financial stability ,
- c) meets the environmental criteria stemming from the EU directives.

1.1.1. Develop a Case Study

The Case Study analyses the economic and environmental position of owners of the infrastructure and service providers in the field of water supply and sewerage. The infrastructure owner is usually a municipality, the service provider is a person contracted by the owner to provide water supply and sewage services. Municipalities can run the system themselves.

Several existing forms of MUs can be divided up into 3 groups according to size and ownership. These are described in the National Profile that accompanies this case study.

The Case Study use the water spreadsheet model to work with the empirical data from a particular water supply and sewage system. As a result of this modelling, the possible institutional and financial reforms can be proposed based on different scenarios, but in a realistic content.

1.1.2. Data

In the Czech Republic, the following sources of data are available on individual PWSS&Ss:

Czech Statistical Office (CZSO) provides information divided according to districts and regions. The Census of Public Water Supply Systems and Sewers was executed in 2002. The study contains the technical data of districts (length of pipelines and sewers, No. of people connected, water sources ... etc.).

T. G. Masaryk Water Research Institute is the organization working under the Ministry of the Environment. It annually publishes data on river basins and PWSS&S, where about 120 of the largest companies are included. Data on PWSS&S is aggregated for the whole country.

Particular PWSS&S and their private statistics, financial and technical data represent an essential source of required information. For the purpose of this study balance sheets, tariff calculations, numbers on production and consumption were used.

Assumptions are important data sources as well. In the Case Study all assumed data are labeled in italics.

In the pilot case study, all data are related to the year 2002, if it is not mentioned otherwise.

1.2. The Case Selected

Name of the MU: **Vodovody a kanalizace Vyskov, a. s. (VaK Vyskov)**
Translation: Vyskov Public Water Supply System and Sewage, joint-stock company

In the considered territory, the Morava River basin, there are about 22 large MUs, which run under different ownership structures and operate at diverse levels of infrastructure, which was mostly built before 1989. From this point of view, the current joint-stock company VaK Vyskov operates over the entire territory of the former Vyskov District State Company. This fact enables us to analyze the current position of such a the context of the past level of district investments, which were planned and financed by the Central Government.

In the Czech Republic tariffs on water supply and sewage are regulated. The country average is about 19.11 CZK/m³ for water and 15.61 CZK/m³ for wastewater, although these tariffs vary enormously from company to company. In VaK Vyskov, the water rate is about 22.80 CZK/m³ and the sewage charge is about 14.40 CZK/m³. That means VaK Vyskov charges roughly average tariffs. There are many institutional and economic factors which influence the level of both tariffs charged by VaK Vyskov and these will be discussed in the following chapters.

The criteria of MU selection:

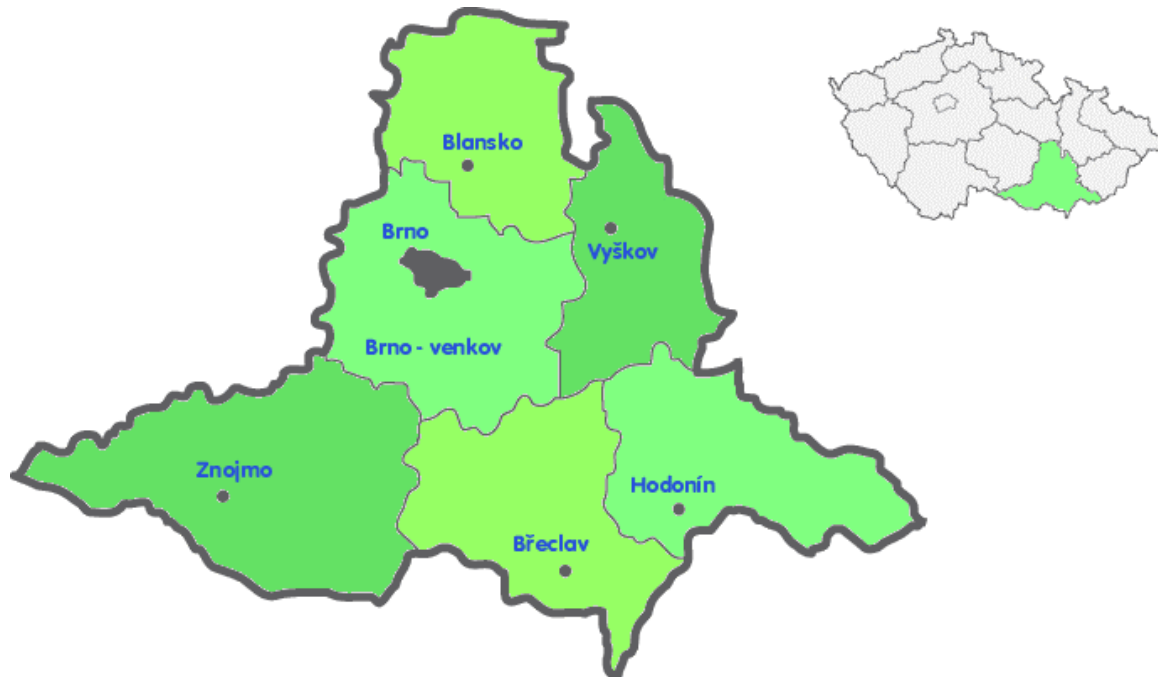
- a) location in the Morava River basin,
- b) historical infrastructure links,
- c) Czech average tariff level,
- d) data accessibility.

2. Case Settings

2.1. Service Area of the MU

VaK Vyskov administrates the whole territory of the former district Vyskov. Only one municipality not in the district is connected to the system (Ujezd u Brna)

Map 1. The Location of the Vyskov District in the South-Moravian Region



The Vyskov district is a part of the South-Moravian Region. It covers a territory of about 889 km², where 5 towns and 77 villages are situated. It has about 86 400 inhabitants. The population density is 97 inhabitant/km², which is below the average of the Czech Republic (131 inhabitant/km²). The capital of the area (former district) is the town Vyskov with 22 400 inhabitants. Other towns and villages with more than 1000 inhabitants are listed in Table 1 and labeled in Map 1.

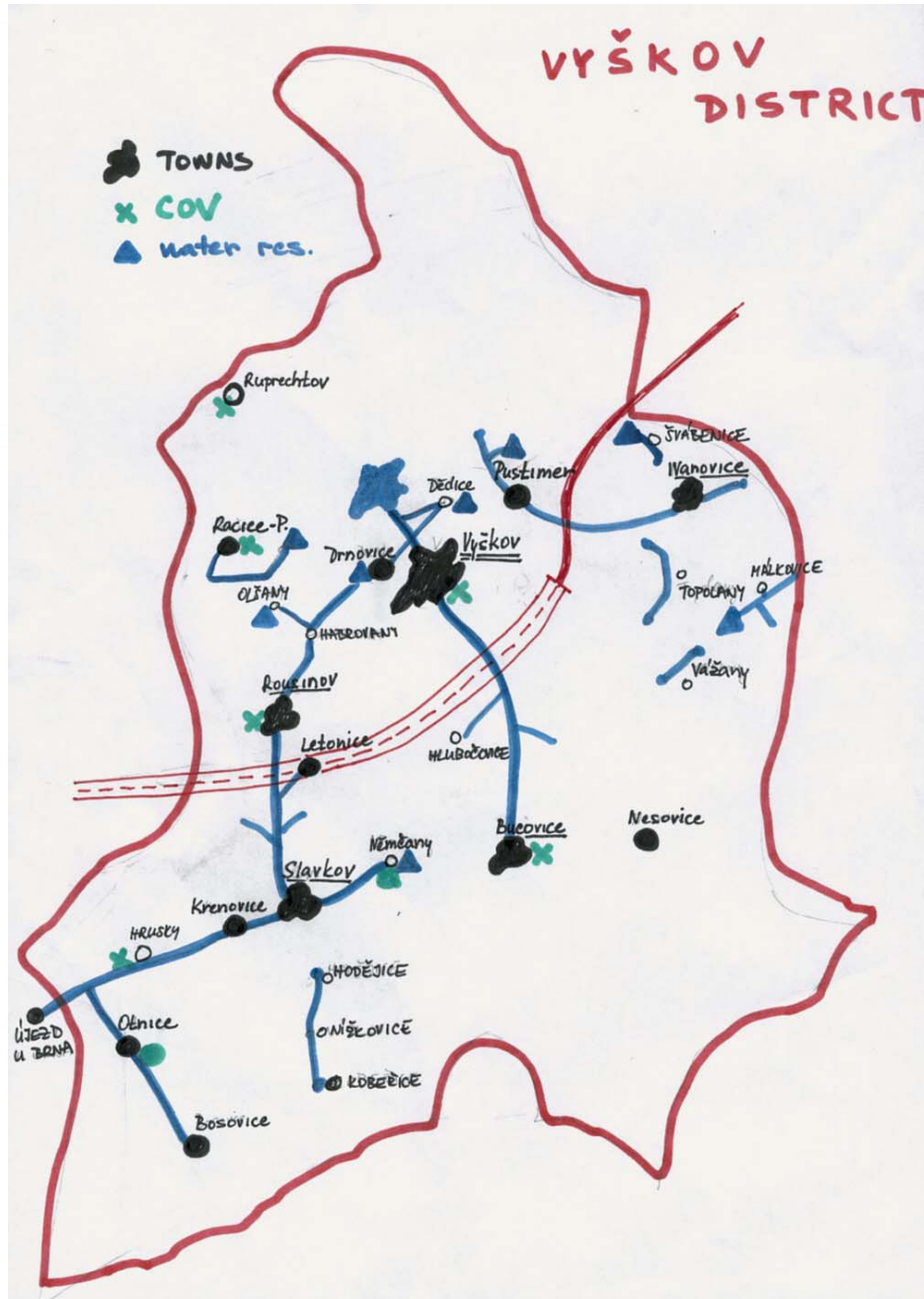
Table 1 Towns and Municipalities of the Vyskov District with Population up to 1000

Name	Status	Population
Bosovice	village	1 073
Bucovice	town	6 286
Drnovice	village	2 171
Ivanovice na Hane	town	2 892
Krenovice	village	1 755
Letonice	village	1 438
Nesovice	village	1 137
Otnice	village	1 409
Pustimer	village	1 532
Racice-Pistovice	village	1 019
Rousinov	town	4 929
Slavkov u Brna	town	5 893
Vyskov	town	22 433
Total – town	-	42 433
Total	-	53 967

Source: Czech Statistical Office, 2002

Map 2. Municipalities, Pipelines and Sewage Treatment Plants in the Vyskov District

- pipelines
- ▲ water resources
- × sewage treatment plants
- towns



The population is mostly concentrated in the central part and in the Southwest of the service area. The Northern part of the Vyskov district is covered by mountains (Drahanska vrchovina). There is a motorway, which divides the territory into 2 parts – the hilly area in the north and flatlands to the south. As for water resources, there is a large surface reservoir, Opatovice, near the town of Vyskov and about 15 sources of groundwater of which Dedice, Manerov and Drnovice are the most important.

2.2. History of the Current Organization

The first pipelines in the area of the Vyskov district were built in Slavkov in 1932 and in the town Vyskov in 1935. From 1955, these pipelines were administrated by the regional organization as public property.

In 1960, there was institutional reform establishing districts as a second level of the government administration. In that year, the Vyskov District Watercourse Administration was established for providing water supply and sewage services. In the following 20 years, large investments into improving quality and enlarging the network of pipelines and sewers were made. The construction of the large surface water reservoir in Opatovice had been initiated, the first sewage treatment plants were constructed.

In 1977, the district organization was assimilated by the South-Moravian Water Supply Systems and Sewerages within the government idea of the central management of the whole public water service. This idea of successfully managing 6 large state PWSS&S was not fulfilled.

After 1989, the South-Moravian state company entered into the second wave of voucher privatisation. It was partly privatized according to the proposal of the Vyskov district towns and municipalities. In 1993, the VaK Vyskov was established as a joint-stock company. VaK Vyskov is considered to be a “integrated” company, because its ownership consists of both, infrastructure and operating property such as trucks, pumps, etc. (type one from Chapter 1.1.1.). Both Mayors and the management are represented on the company Board.. VaK Vyskov owns about 360 km of pipelines, 385 km of sewerages, 3 water processing plants and 7 sewage treatment plants.

2.3. The Current Organization

2.3.1. Identification of Water and Wastewater Services

Water supply and wastewater services represent the major part of the company’s activities. Besides that, the following services are provided:

- construction works in the field of water management,
- consulting and project creation in the field of water management,
- laboratory testing of water quality.

These services represent about 8% of company revenues.

2.3.2. The Relationship between MU, SUs and RUs

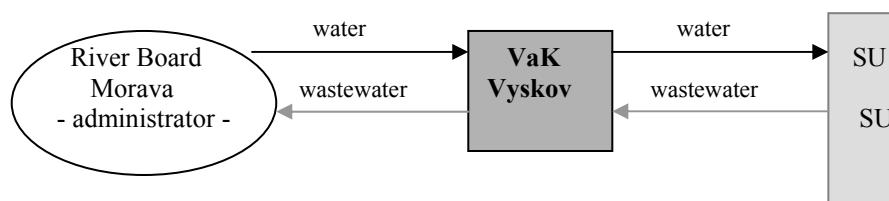
2.3.2.1. Economic Relationships

VaK Vyskov provides water supply and sewage services to all inhabitants and businesses connected to public pipelines and sewage networks. The services are provided on the basis of individual contracts between VaK Vyskov and consumers. Prices (water and sewage tariffs) as well as their calculation must be published annually according to the form set by the Ministry of Agriculture. Manner of the tariffs and supporting calculation have to be sent to a customer whenever requested. If a customer does not pay for the service for more than 30 days from the invoice’s delivery, the MU is allowed to cut off their service.

VaK Vyskov has to pay fees for withdrawing surface water, groundwater and discharging wastewater. These payments have got a different status:

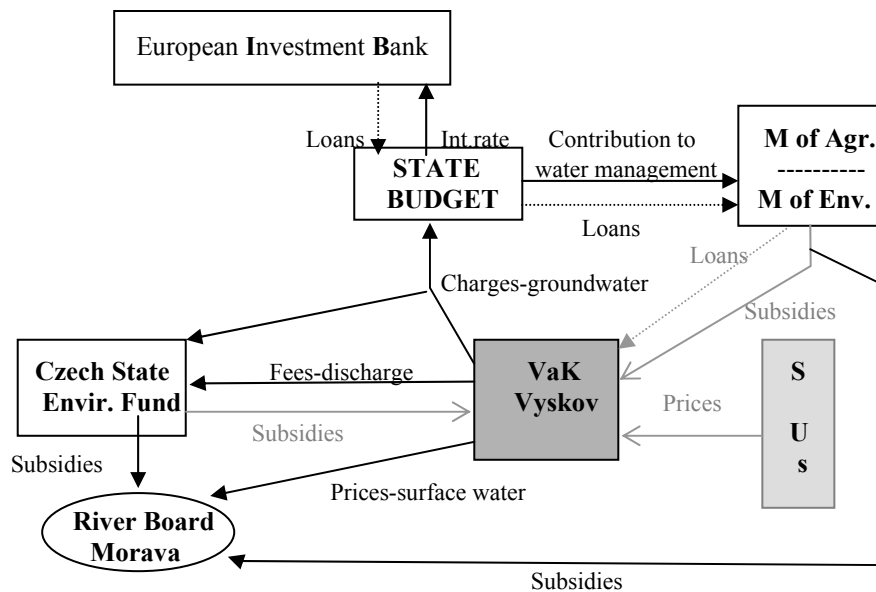
- 1. Payments to Cover Watercourse and River Basin Administration** is a price belonging to the River Board Morava for withdrawing surface water. River Board Morava sets this price per m^3 , the current price is about 2.70 CZK/ m^3 .
- 2. Charges for the Withdrawing Groundwater** are established by the Water Act. For the purpose of drinking water supply, there is a rate of 2 CZK/ m^3 . Half of the payment belongs to the Czech State Environmental Fund and the second half to the State Budget. Until 2001, PWSS&S had an exemption and were not subject to any payment. So only a charge of about 0.70 CZK/ m^3 was paid in 2002 and about 1.40 CZK/ m^3 in 2003. Next year in 2004 the charge for PWSS&S should be the maximum declared sum.
- 3. Fees for the Discharge of Wastewater into Surface Water** are: a Fee for Pollution of the Discharged Wastewater calculated according to particular pollutants (see the National Profile Report), and a Fee for the Volume of the Discharged Wastewater which is paid if the volume of wastewater exceeds 30 000 m^3 in one calendar year. The fee shall be calculated as a multiple of the discharged wastewater volume and the rate of 0.1 per m^3 . Fees go to the Czech State Environmental Fund as revenues.

Sch 1: Scheme of services provided



2.3.2.2. Management Relationships

The description of particular payments by VaK Vyskov was mentioned in the previous chapter. The flow of the financial resources has to be completed by transfers and subsidies from government and other public resources. The Czech State Environmental Fund finances smaller investment projects on sewers. From the State Budget, money is provided for Ministry of Agriculture and Ministry of Environment programmes. These programmes include building pipelines, construction of sewage treatment plants ... etc. There is no money for infrastructure re-construction from these sources. The Czech Government also got a loan from the European Investment Bank. These resources are used for different purposes in the field of water management. The interest rate is paid by the Government.

Sch 2: Scheme of the Financial Flows**2.3.2.3. Regulatory Relationships**

The MU is a subject of regulation and control from different institutions. There is a hierarchy of water authorities which represents the governance of PWSS&S. This hierarchy is: „small districts“ – regions – Ministry of Agriculture. All of these water bodies imposes different obligation on PWSS&S. If the territory of a particular PWSS&S overlaps the territory of one “small district”, the regional office works as a local regulator in the first instance.

The regulation and control cover the following areas of activities:

I. Economic Regulation

1. According to Act No. 526/1990 Coll. on Prices, the price calculations of the MU only have to cover economically eligible costs and an adequate profit. In the interpretation of the Water Law it is stated that the cost of building pipelines or a sewer network can be included into the price calculation, if it is in a harmony with the Law on Prices. In the Financial Bulletin of the Ministry of Finance, the rules on the construction of all regulated prices (see the National Report) are published annually. The Ministry of Finance and its Financial Offices in regions are responsible for financial regulation..
2. According to Act. No. 274/2001 Coll. on PWSS&S, once a year the MU has to publish the clear and entire price calculation (water and sewage tariff) by 30 June the next year. There is no strict formula on how to meet this obligation. Usually, the company puts the calculation on its web site or displays it on a information board in the municipality.
3. According to the Water Act, the MU has to compile a Statement of Discharged Water and submit it to the water authority (region) by the 15th February the following year. In this statement, the MU has to specify the actual information regarding the number of pollution indicators subject to a fee, their concentration in the discharged wastewater and the volume of the discharged water. On the basis of this statement, the water authority assesses the fee for the previous calendar year and delivers the total sum to the MU, or the financial office and Czech State Environment Fund. The financial office of Ministry of Finance is responsible for collecting fees. The control of the wastewater quality and quantity is done intermittently by the Czech Environmental Inspection.

4. According to Act. No. 274/2001 Coll. on PWSS&S, the Regional Office is forced to develop the regional plan on the future development of pipelines and sewers by the end of 2004. This document has to be amended by the Ministry of Agriculture. It directly regulates new investments in the region, because construction offices are not allowed any further construction than that selected in the plan. Regions (as water authorities at the second stage) do this work for the Ministry of Agriculture which is responsible to ensure the development of PWSS&Ss in the CR as a whole. The plan is being processed in these days, so the practical functioning of this type of regulation has not been checked yet.
5. According to Act. No. 274/2001 Coll. on PWSS&S, the owner of the infrastructure (municipality) keeps documentation of the property and announces the annually updated information to the water authority (region). The records are kept on pipelines and the sewage network, water processing plants and sewage treatment plants. All information is centralized at the Ministry of Agriculture. The first deadline for this obligation is the end of 2004.
6. According to Act. No. 274/2001 Coll. on PWSS&S, the owner of the infrastructure has to keep functional (operating) evidence, which contains information on water resources, the drawn documentation of the infrastructure, price calculations, the plan of the control of the water quality ... etc. This data is also provided to the water authority (region) and aggregated at the Ministry of Agriculture. The first deadline for this obligation is also the end of 2004.
7. According to Act. No. 274/2001 Coll. on PWSS&S, the Ministry of Agriculture is allowed to conduct the technical audit of pipelines and sewerages. This large technical control starts from an impulse of the municipality, the Ministry of Finance or the Office for the Protection of Competition. The main task is to justify the cost of a particular network and to adopt measures for future development and repairs. The MU has to provide all data required by the special controllers.

II. Environmental Regulation

1. According to Act. No. 274/2001 Coll. on PWSS&S, the quality standards of the water withdrawn have to be met. Once a year, the MU has to provide all results of these measurements to the regional office. Czech Environmental Inspection controls these obligations. If the quality of the water is not sufficient the resource cannot be used.
2. According to Act. No. 274/2001 Coll. on PWSS&S, delivered drinking water has to meet the hygienic standards of water. The frequency and the process of controls is regulated by a special law of the Ministry of Health.
3. According to Act. No. 274/2001 Coll. on PWSS&S, the owner of the sewage network has to develop a sewage regulation plan in which the maximum level of pollutants in wastewater is stated. This document has to be approved by the water authority ("small district"). The operator (or the owner) of the sewage network has to regularly measure the pollution of wastewater.

2.3.3. Identification of Conflicts among MU, RU and SUs

General conflicts are described in Chapter 9 of the National Profile. In brief, the following problems arise:

- a) the price regulation of the MU is mostly a formality,
- b) the recording of the MUs (no. of companies, calculations) should be done by the Ministry of Agriculture, but it is not. The Ministry monitors about 120 of the largest MUs (including VaK Vyskov), but there are about 800 small ones with concessions and another 1000 subjects without any permission to run the service, which are not recorded at all,

-
- c) municipalities put the political pressure on service providers to lower the prices of services, which leads to infrastructure degradation and no provision for replacement,
 - d) municipalities should not sell the infrastructure, but the only regulatory tool is the government „golden share“ in particular joint-stock companies (PWSS&S), whose power is limited. The current trend is a great deal of pressure on municipalities that is done by large private investors, especially in town with more than 10 000 inhabitants, to sell or privatize the operation and ownership of the water system.

3. Current Operating Accounts of MU

Before describing MU current accounts of, it is important to emphasize, that in the Czech Republic in price calculations, the current and capital accounts are not clearly distinguished and they cannot be analyzed separately. Every company can also include different types of cost into particular account categories (especially into „other direct cost“ and „production overheads“), which do not enable a ready comparison between calculations.

3.1. Product Quality and Quantity

3.1.1. Water Production

In 2002, VaK Vyskov produced 3 869 696 m³ of water, from which 2 100 379¹ m³ were from the large reservoir Opatovice. That means MU withdraws about 54.3% from surface water and 45.7% from groundwater. Particular resources are listed in Table 2.

Table 2 Aggregated Data on Water Resources of VaK Vyskov in 2002

Name of the Withdrawal	Groundwater m ³	Surface water m ³
VaK Vyskov Manerov	195 900	x
VaK Vyskov-Dedice SV (HV 114, 117, 117, 4)	394 200	x
VaK Vyskov-Drnovice	825 300	x
VaK Vyskov-Kasparov	77 700	x
VaK Vyskov-Koberice	33 900	x
VaK Vyskov-Krasenko	9 600	x
VaK Vyskov-Milesovice	10 200	x
VaK Vyskov-Moravske Malkovice	44 400	x
VaK Vyskov-Moravske Prusy	23 500	x
VaK Vyskov-Nemcany	15 100	x
VaK Vyskov-Olsany	25 600	x
VaK Vyskov-Opatovice (VN)	x	2 142 100
VaK Vyskov-Racice	34 200	x
VaK Vyskov-Rasovice	13 300	x
VaK Vyskov-Slavkov Ligary	8 200	x
VaK Vyskov-Slavkov:HV2	10 300	x
VaK Vyskov-Svabenice Detkovice	28 800	x
TOTAL groundwater/surface water	1 750 200	2 142 100
TOTAL	3 892 300	

Source: River Board Morava statistics

Water resources of the Vyskov district are currently employed at 70% of capacity. There are no plans to build other reservoirs and discovering additional groundwater resources is also unnecessary. For these reasons, development will be made through investments to infrastructure and enlarging the existing pipelines to connect other villages nearby existing infrastructure (if decided by local PWSS&S and stated in the development plan by the Ministry of Agriculture).

¹ according to VaK Vyskov data

3.1.2. Water Processing/Cleaning

VaK Vyskov owns 3 water processing plants, which are situated at Manerov, Dedice and Lhota (for the Opatovice reservoir). Unfortunately, there are no additional data of the level of processing or the operational financial conditions and remaining service life of the current equipment.

3.1.3. Water Distribution

VaK Vyskov operates on 476.5 km of pipelines, from which 389.3 km is in the ownership of the joint-stock company and the rest (18%) is used on the basis of contracts with pipeline owners. The length of a company's pipelines has been stable over the last 4 years. In 1998, there was a large increase from 304 km to 377 km of pipelines. There is one large pipeline, the "Composite Pipeline Vyskov", then the second largest is an independent pipeline Pustimer-Ivanovice (see Map 2) and about 10 small technically (not financially!) independent pipelines.

Total water loss represented about 16% of the water produced. The loss from the pipelines was about 13% from the water produced and it slowly increases over the time as is visible from Table 3. In comparison with the national average (23%), VaK Vyskov infrastructure is in good technical condition.

Table 3 Loss in Pipelines of VaK Vyskov

Year	1998	1999	2000	2001	2002
Loss in pipelines in %	14.30	11.70	12.11	12.96	13.41

Source: VaK Vyskov

There are about 58 200 inhabitants connected to the water supply, which is about 67.4% of the total population of the district. This is below the national average (89.9% according to CZSO). Changes in the number of people connected showed an abrupt decrease in 1998, although during the same year the length of pipelines was largely increased. During the conversation with the VaK Vyskov managers these changes were not explained.

Table 4 Population Connected into VaK Vyskov Pipelines

Year	1996	1997	1998	1999	2000	2001	2002
No. of inhabitants	60 960	69 959	56 159	57 982	58 122	58 336	58 237

Source: VaK Vyskov

3.1.4. Water Purchased

In 2002, VaK Vyskov invoiced 3 234 311 m³ of water. This number corresponds to water production lowered by the total loss. From the total water invoiced about 58% belonged to households and 42% to 400 businesses connected into the public water supply.

The total revenues from the water supply was about 73 700 thous. CZK, according to the VaK Vyskov accounts. The water tariff was 22.8 CZK/m³ without VAT in 2002.

In 2002, the total leakage was about 16% from the water produced, which means 635 404 m³.

3.1.5. Water Consumption

About 58% of water delivered is consumed by households and about 42 % by industry. The consumption is slowly decreasing over time. For the unit consumption of particular SUs, see Chapter 5.

3.1.6. Wastewater Production

In 2002, VaK Vyskov collected and treated about 3 842 848 m³ of wastewater, from which 2 967 352 m³ was wastewater produced by households (56.86%) and businesses. 675 642 m³ was storm water estimated and invoiced according to a special formula (in the Law on PWSS&S there is a formula how to charge storm water to customers), and the rest (199 854 m³) was public (unidentified) wastewater.

3.1.7. Wastewater Collection

VaK Vyskov operates on 391 km of sewers, from which 363.9 km is in the ownership of the joint-stock company and the rest (7.4%) is used on the basis of contracts with their owners. The length of the company's sewers has remained stable over the past decade.

There are about 58 200 inhabitants connected to the sewer network, which is about 67.3% of the total population of the district. This is also below the national average (77% according to CZSO). The number of people connected had the same evolution as in the case of pipelines and is displayed in Table 5.

Table 5 **Population Connected to VaK Vyskov Sewerages**

Year	1996	1997	1998	1999	2000	2001	2002
No. of inhabitants	60 910	60 850	56 120	57 915	58 100	58 250	58 200

Source: VaK Vyskov

3.1.8. Wastewater Processing

VaK Vyskov owns 7 wastewater treatment plants (WWTP), from which only 1 is mechanical and the rest of them are bio-mechanical. The largest treatment plant is situated in the town Vyskov.

3.1.9. Wastewater Effluent

Table 6 represents particular places of wastewater discharge and the volume of discharged water. The abbreviation „VK“ indicates a sewage system without treatment.

Table 6 Aggregate Data of VaK Vyskov Discharges in 2002

Place of the discharge	Discharged water in m ³
VaK Vyskov – Ruprechtov WWTP	105 100
VaK Vyskov – Pistovice WWTP	133 600
VaK Vyskov – Rousinov WWTP	155 300
VaK Vyskov – Vyskov WWTP	2 449 000
VaK Vyskov – Nemcany VK	27 400
VaK Vyskov – Otnice VK	29 600
VaK Vyskov – Krasensko WWTP	36 600
VaK Vyskov – Bucovice WWTP	360 000
VaK Vyskov – Hrusky WWTP	71 700
TOTAL	3 368 300

Source: River Board Morava Statistics

Data on the effectiveness of treatment of particular WWTP is not available. Information about the No. of population connected to every plant is also unavailable. In 2002, the Czech average effluent charge was 0.48 CZK/m³, which is about 3% of the sewage tariff.

3.2. Prices and Other Financial Information

3.2.1. The Construction of Prices

Prices (water and sewage tariff) are constructed according to the instructions of the Ministry of Finance under the special regime of regulation („factually rectified“ prices). The calculation includes items which have to be published annually. From 2003, there is a new form, which has to be filled in, through which the Ministry of Agriculture tries to ensure better comparison between calculations from different MUs. This new form was published in the Financial Bulletin of the Ministry of Finance.

The MU sets out the results of price calculation per m³ for a given year. These prices are invoiced in the whole period. Subsequently, it compares the real operating cost with this calculation. If there are differences, the surplus or the shortage has to be given back (or invoiced) to consumers. The clearing is done once a year.

In VaK Vyskov in 2002, the prices were as shown in Table 7

Table 7 Price Calculation of VaK Vyskov in 2002

Item	Water rate CZK/m ³		Sewage Charge CZK/m ³	
	Planned	Actual	Planned	Actual
Direct Material	4.16	4.12	0.45	0.30
Direct Wages	2.25	2.31	1.12	1.11
Other Direct Costs	9.68	9.59	9.22	9.92
Production Overheads	1.94	2.06	0.71	0.76
Administration Costs	2.06	2.10	1.06	1.02
TOTAL Cost	20.09	20.18	12.56	13.11
Profit	2.67	2.58	1.82	1.27
Price without VAT	22.76	22.76	14.38	14.38

Source: VaK Vyskov

Prices include only economically eligible costs and an adequate profit (given by the law which is used for dividends of shareholders or for investment of the PWSS&S). Other Direct Costs means e.g. depreciation and repairs to the property, electricity, charges on groundwater and surface water, social insurance of employees... etc.

3.2.2. Sales

In 2002, VaK Vyskov invoiced about 3 234 311 m³ of water and 2 967 352 m³ of wastewater. Revenues from these categories are listed in Table 8 Considering the price of 22.8 CZK per m³ of water, there is an inconsistency in data: 70 335 000/22.8 = 3 084 868, which means that the payment of more than 100 000 m³ is missing. There is no such large a difference in the case of wastewater.

Table 8 Structure of Revenues of VaK Vyskov in 2002

Revenues	Thous.CZK	%
Water rate	70 335	57.5
Sewage charge	42 201	34.5
Rent of the infrastructure	24	0,0
Other services	9 762	8.0
TOTAL	122 322	100.0

Source: VaK Vyskov

3.2.3. Costs or Purchased Inputs

See section 3.2.1.

3.2.4. Grants or Transfers

There are no grants or transfers associated with the current operating accounts of VaK Vyskov.

3.2.5. Existing Contracts

There are about 58 237 inhabitants connected to VaK Vyskov pipelines and about 58 200 inhabitants connected to the sewers. For the purpose of the model these data were divided by 2.5 inhabitants that

is the average household in the Czech Republic. Assuming that the consumption of every household is metered and separately invoiced, there are about 22 495 households connected. About 56.6% of people live in flats rather than in houses². For Vyskov it means 9 763 households living in houses and 12 732 households living in flats. Besides there are only about 400 households using only the water supply and the same number of households using the sewers only (they are supplied by a different drinking water MU to the east).

There are about 400 businesses connected to VaK Vyskov networks. The division between small and large industries is estimate based on the personal judgment. There are about 364 small businesses and 36 large businesses. The consumption of water is the criteria for such a division (see Chapter 5).

² According to the CZSO

4. Current Capital Accounts of MU

As mentioned in the previous Chapter 4, the capital accounts of VaK Vyskov had to be derived from given calculations and partly assumed.

In general, establishing the real value of the infrastructure and operational property is very complicated. The baseline came from the evaluation during the privatisation and in many cases the book value after the depreciations is zero, although the property still has an additional 10 years or more of economic life. To deal with „old“ prices from 1993, a high inflation of more than 10% should also be considered.

4.1. Infrastructure – Plant and Equipment

There is a shortage of data related to the infrastructure of VaK Vyskov, so the division between particular categories (production, processing, collection) could not be developed. For the purpose of the spreadsheet model, several assumptions based on the country averages were accepted.

The joint-stock company Vyskov has got 404 900 000 CZK of corporate stock, which represents the value of issued shares. Every share has got a value of 1000 CZK. The total sum represented the present value of the property in 1993.

Municipalities of the Vyskov district own about 92.2% of these shares („registered shares“), they can be sold only with the agreement of the Shareholders Meeting. About 7.8% are „bearer shares“ and they are owned by the private sector. There is also 1 „golden share“ of the National Property Fund of the CR.

The current capital of the company is about 526 140 000 CZK. The annual depreciation is 88 088 000 CZK. The cumulative amortization between 1993 – 2002 is 158 936 000 CZK. The cumulative repairs of the property between 1993 – 2002 are 72 190 000 CZK, and cumulative investments are 249 093 000 CZK.

From these data and further consultations with experts, the following numbers can be estimated:

- functioning (operational) property of VaK Vyskov is about 31 798 000 CZK (value of bearer shares that went to the voucher privatisation)
- the assumed present value of the infrastructure is 500 057 000 CZK (404 900 000 – 158 936 000 + 249 093 000), from which 60% is related to water supply and 40% to wastewater production.

Table 9 Property of the VaK Vyskov

Type of property	Current value CZK	Residual lifetime Years
Pipelines	240 027 360	15
Water processing plants	60 006 840	10
Sewers	120 013 680	15
Sewage treatment plants	80 009 120	5
TOTAL	500 057 000	-

Source: Assumptions

4.2. Valuation of Infrastructure

See Chapter 4.1.

4.3. Capital Accounts

In VaK Vyskov, most investments are covered by revenues arising from the “depreciation” costs. These investments include reconstructions and repairs to the property. In 2001, a two-year long large reconstruction with the up-grade of the Vyskov treatment plant began. This project represented about 93% of investments in 2001 and 90% in 2002. Resources for the self-financing come from the profit and other direct cost, where the depreciation cost is included.

There is no debt service at present, although VaK Vyskov is applying for a loan from the European Investment Bank for new pipeline construction. Czech public budgets are not considered as accessible resources for the future development of the company.

In the future, the town of Rousinov and other municipalities (about 8000 population equivalent in total) are going to ask for a grant from the EU Cohesion Fund. The purpose is to build a new sewage treatment plant to meet EU requirements on wastewater treatment. The project costs should be about 1 200 000 thous. CZK, co-financing from their own resources (the budgets of the town) will be about 20%. The WWTP would be operated by VaK Vyskov which is supposed to cover operating cost of the new facility entering its network.

For the purpose of the model we assume:

- The construction will last about 5 years and it will start in 2006.
- From the total sum, 840 000 thous. CZK is for constructing the plant and 360 000 thous. CZK is for building additional sewers.
- The lifetime of the investment is 40 years for the network and 20 years for the sewage treatment plant.
- The construction affects about 3 200 households (1 000 living in flats and 2 200 living in houses).
- Due to the new treatment plant, operating costs will rise in two categories: direct material to 0.35 CZK/m³, and other direct costs to 10.55 CZK/m³.

5. Current and Capital Accounts of SU

In the Czech Republic, customers (SUs) are supplied on the basis of a contract, which is concluded with the owner of the property connected or with the Association of flat owners (if there is a block of private flats).

The sealed water meter measures the consumption of every contracted customer and is read quarterly. If there is a severe inconsistency in time series data (e.g. meter error), the average consumption from previous periods is used. In the case of a block of flats, the consumption in particular apartments is usually metered, too. If there is a difference between the central water meter for the whole building and the sum of individual meters (e.g. water leakage in service pipes), it is distributed among households.

The amount of wastewater discharged is usually assumed according to target figures set by a special law. The formula is based on the consumption of drinking water.

5.1. Current Accounts for Customers

As mentioned in Chapter 3.2.5, there are 6 categories of users. The diversification, services provided and the amount of water and wastewater consumed are stated in Table 10. According to VaK Vyskov data, the annual average water consumption is 109 m³ per household and 3 650 m³ per industry. Water use within groups of SUs is based on assumptions.

There is a special category of entities paying for storm water. This annual amount of about 675 642 m³ of wastewater is invoiced separate to the SU accounts. For the purpose of the ASTEC model, the municipality is considered as the payer.

Table 10 Classification of SU in VaK Vyskov

SU	Type of service	Number of entities	Annual water consumption m ³	Annual wastewater production m ³
Households - houses	W S	9 763	87	77
Households – flats	W S	12 732	78	71
Households – w/o sewers	W	400	83	0
Households – w/o water supply	S	400	0	77
Industry – small	W S	364	1 926	1 810
Industry - large	W S	36	18 358	17 260
Entity paying for storm water	S	1	0	675 642

Source: VaK Vyskov + Assumption

From the year 2000, there is only one price level for all categories of users. In 2002, the water tariff was 22.8 CZK/m³ and the sewage tariff was 14.4 CZK/m³.

Analyzing the current account of households, the average wage in CR in 2001 was 14 633 CZK per month and in the Vyskov district it was about 12 181 CZK per month. There were about 1.2 economically active persons per household.³

The Czech average net income was 93 153 CZK per year per person in 2002, which means 232 883 CZK per household per year⁴. To count the household's expenses on water supply and sewage services, prices with VAT % have to be used (23.9 CZK/m³ water rate, 15.1 CZK/m³ sewage charge). It means that the average household pays annually about 1 984 CZK for water consumption and 1 163 CZK for sewage services. The sum is 3 147 CZK per household per year and it is about 1.4% of their average net income.

5.2. Capital Accounts for Customers

5.3. Profile of the Potential Customers

There are about 28 000 inhabitants of the Vyskov district which are not connected to VaK Vyskov networks. These people mostly live in smaller villages with an average of 400 inhabitants in the case of water service and with an average of 700 inhabitants in the case of sewers. These people are served by small local MUs.

³ according to the CZSO

⁴ according to the CZSO

6. Regulatory Units

See Chapter 2.3. or Chapter 2.4. of the National Profile.

7. Tests of the Baseline Model (S1)

We began the case study simulations by testing the ASTEC spreadsheet model with VaK Vyskov data using the simplest modelling option: This we call the “baseline” scenario and all data entries (accounts, tariffs, consumption, costs) remain the same as estimated for current Vak Vyskov PWSS&S. The result allows us to estimate revenues available, at current tariffs, to pay for the present system and level of service. This baseline model runs without optimization (minimization of tariffs subject to various constraints). This means that there are no requirements for marginal cost pricing, full cost recovery, etc.

Results:

Consumption: the same (water supply: 3 237 629 m³/year, wastewater discharge: 3 642 356 m³/year)

Water tariff: 22.8 CZK/m³

Sewage tariff: 14.4 CZK/m³

Balance of accounts: - **2 212 thous. CZK/year**

The results suggest that the implementation in ASTEC parallels the present Vak Vyskov system and that the system is in rough short-term financial balance. The loss of about 2 212 thous. CZK is less than 2% of the gross revenues. This balance is at least partly a consequence of the price calculation and re-calculation of PWSS&S as described in 3.2.1. It suggests that there will be a short term financial balance if current tariffs are raised by about 2%.

8. Prospective Policy Developments in VaK Vyskov and their Representation in the ASTEC Models

Using the simple spreadsheet model calculation we demonstrated that VaK Vyskov is in a rough short term financial balance. Now we examine the direct impacts of additional costs when introduced into the company's prices. Using different scenarios, 2 circumstances will be investigated:

1. the impact of new investment,
2. the impact of real depreciation of the infrastructure.

8.1. Short-Term Scenario with „Sunk Cost“ + Price Calculation of VaK Vyskov

In the short-term scenario with “sunk cost” (past investment costs do not have to be repaid and are considered equal to 0), only the current annual depreciation of 88 088 thous. CZK is considered as the cost of maintenance of the infrastructure. This sum is included into price calculations in “Other direct cost” category. The VaK Vyskov calculations of the water and sewage tariffs are used as a data entry, although such a division between operating and fixed cost is misleading (e.g. other direct cost are considered as operating cost, although they includes the annual depreciation which reflects change in the value of fixed assets that is for the most part only modestly related to increase or decreases in consumption levels). Results of this scenario are introduced in the following sub-chapters.

8.1.2. Cost Recovery with Only Commodity Charges (S2)

During cost recovery commodity charges change so as to assure full cost recovery. Clusters of user accounts distributed costs to three groups of customers: households, small industry, large industry. For each of these 3 groups a different water and sewage tariff was calculated according to consumption and cost assigned to that group.

Results:

Consumption charges (tariffs per unit of water consumed) increased slightly. In all groups of users actual consumption declined slightly given the increase in tariffs and the demand elasticity used in this application. Total water production and wastewater discharge also slightly decreased.

Table 11 Water and Sewage Triffs (CZK/m³):

SU	Water tariff	Sewage tariff
Households - houses	23.57	15.63
Households – flats	23.57	15.63
Households – w/o sewers	23.57	0.00
Households – w/o water supply	0.00	15.63
Industry – small	23.58	15.64
Industry – large	22.70	15.06

Balance of accounts: **2 965 thous. CZK/year.**

As a consequence of cost recovery, the increase of both tariffs for all users is visible (except the water tariff for the category of large industry). In general changes in tariffs to achieve full cost recovery were not very large - which is the result suggested by the baseline scenario described in Chapter 7.

8.1.3. New Investment and With Cost Recovery (S4, S5)

The construction of the new sewage treatment plant is incorporated into the cost calculations (data from the Chapter 4.3.). There are 2 new categories of users (households-houses-NI, households-flats-NI) which are directly associated with the new investment. Costs are distributed as in the previous option, which means 3 groups: households, small industry, large industry.

Results:

Consumption: total water supply is 2 865 268 m³/year and total wastewater discharge is 3 301 749 m³/year – decreases from the other scenarios..

Table 12 Water and Sewage Tariffs under Scenario S4- (CZK/m³):

SU	Water tariff	Sewage tariff
Households – houses	23.06	45.11
Households – flats	23.06	45.11
Households – w/o sewers	23.06	0.00
Households – w/o water supply	0.00	45.11
Industry – small	23.04	15.36
Industry – large	23.34	15.56
Households–houses-NI	23.06	45.11
Households-flats-NI	23.06	45.11

Balance of accounts: - **820 thous. CZK**

From the results, it is obvious that the cost of the new investment constitutes a large burden for the SUs, although about 80% of it will be financed by the grant. The price for wastewater discharge more than doubled in the case that all households pay the same tariff. If only these 3 200 households connected to the new WWTP, bore the burden, the sewage tariff would be about 294 CZK/m³ which can be considered as an untenable price and maybe not to build the WWTP according to the current design.

If we consider only one consumption charge level of tariffs, there will be the following impact on cost of the new investment:

Table 13 Water and Sewage Tariffs under Scenario S5 CZK/m³):

SU	Water tariff	Sewage tariff
Households – houses	23.33	27.33
Households – flats	23.33	27.33
Households – w/o sewers	23.33	0.00
Households – w/o water supply	0.00	27.33
Industry – small	23.33	27.33
Industry – large	23.33	27.33
Households–houses-NI	23.33	27.33
Households-flats-NI	23.33	27.33

Regarding these tariff changes, we can conclude that the plan for such a construction of the new WWTP is more the political declaration of the Mayor than a reasonable investment, because the benefits are very limited but the wastewater tariffs go up substantially. For a further discussion of this topic, see the final Chapter 9.

8.2. Short-Term Scenario with „Sunk Cost“ + New Price Calculations

According to consultations with water management experts the following hypothetical price calculation of VaK Vyskov costs was developed. This calculation is based on the following guidelines:

- the direct material and direct wages remain unchanged
- the capital (fixed) costs have to represent about 60% of total costs
- for the calculation of amortization and repairs per m³, real data from VaK Vyskov were used.

Table 14 New Calculation of Operational and Fixed Costs of VaK Vyskov Services

	Water tariff CZK/m ³	Sewage tariff CZK/m ³
Operational Costs		
Direct Material	4.12	0.30
Direct Wages	2.31	1.11
Electricity + Other direct costs	1.64	3.35
Effluent charge	-	0.48
Fixed Costs		
Repairs	1.7	1.7
Amortization + Others	10.41	6.17
TOTAL Cost	20.18	13.11
Profit	2.58	1.27
Price without VAT	22.76	14.38

Source: VaK Vyskov + Assumption

This calculation became an input for the following scenarios.

8.2.1. Baseline (T1)

Results:

Consumption: the same

Water tariff: 22.8 CZK/ (original value)

Sewage tariff: 14.4 CZK/ (original value)

Balance of accounts: - **12 989 thous. CZK/year**

There is a higher financial loss of the system than in the case of the previous Baseline scenario, which means that the roughly balanced budget in S1 probably is the result of underinvestment in the system.

8.2.2. Cost Recovery with Only Consumption Charges (T2)

As a result of the larger loss of about 13 million CZK, the modelling option with cost recovery gave us higher tariffs. Again, cost clusters of users were distributed as follows: households, small industry, large industry. For each of these 3 categories a different water and sewage tariff is calculated according to their assigned costs and consumption.

Results:

Table 15 Water and Sewage Tariffs (CZK/m³):

SU	Water tariff	Sewage tariff
Households - houses	24.35	17.35
Households – flats	24.35	17.35
Households – w/o sewers	24.35	0.00
Households – w/o water supply	0.00	17.35
Industry – small	24.30	17.31
Industry - large	24.89	17.73

Balance of accounts: -**937 thous. CZK**

The increase in tariffs are about 10 – 15%.

8.3. Real Investments

Developing the new price calculation of VaK Vyskov enabled us to clearly distinguish between fixed and operational costs of services. According to the assumptions of the current value of the property and the residual lifetime from Table 9, a more realistic situation of the company can be calculated in following scenarios.

8.3.1. Costs Repair and of Infrastructure Replacement Included (U1)

Into the scenario spreadsheets, following fixed cost entered:

- a) annual depreciation, repairs and other fixed cost (as in T1).
- b) current value of the infrastructure (pipelines, water processing plants, WWTP and sewerages) as assumed in Table 9 First, the effect of the real investment (= annual financial needs to run the system sustainable) caused a high loss of the system. It means that current price calculations of VaK Vyskov do not cover the real investment needs, so the property slowly depreciates.

Results:

Consumption: the same

Water tariff: 22.8 CZK/ (original value)

Sewage tariff: 14.4 CZK/ (original value)

Balance of accounts: - **54 663 thous. CZK**

The impact of this financial loss on tariffs will be investigated in following scenarios.

8.3.2. Cost Recovery with Only Consumption Charges (U2)

The cost recovery scenario without marginal cost pricing calculated the new level of commodity charges to cover the total costs of the company. So, to create a sufficient amount of resources for repairs, the water tariff should be about 32 CZK/m³ and the sewage tariff about 27 CZK/m³. Clusters were distributed into 3 groups: households, small industry, large industry, but the difference between tariffs for particular groups is negligible.

Results:

Consumption: total water supply is 2 792 335 m³/year and total wastewater discharge is 3 237 594 m³/year.

Table 16 Water and Sewage Tariffs (CZK/m³):

SU	Water tariff	TOTAL CZK/year	Sewage tariff	TOTAL CZK/year
Households - houses	32.97	2 868.39	27.30	2 102.10
Households – flats	32.97	2 571.66	27.30	1 938.30
Households – w/o sewers	32.97	2 736.51	0.00	0.00
Households – w/o water supply	0.00	0.00	27.30	2 102.1
Industry – small	32.89	63 346.14	27.23	49 286.30
Industry - large	33.57	616 278.06	27.80	479 828.00

Balance of accounts: - **672 thous. CZK**

The tariff increase is about 45 – 50 % in comparison with original values (22.8 water tariff and 14.4 sewage tariff).

8.3.3. Full Cost Recovery with Mrginal Cost Pricing (U4, U5)

The clearer division between fixed and operational cost enables us to develop a scenario in which 2-composite tariffs are calculated. It means that operating costs are covered by the commodity charge and fixed costs by the fixed tariffs under the condition of full cost recovery. Clusters of users were distributed as follows: households, small industry, large industry.

Results:

Consumption: total water supply is 4 135 203 m³/year and total wastewater discharge is 4 453 168 m³/year – increase.

Table 17 Water and Sewage Tariffs (CZK/m³):

SU	Water tariff			Sewage tariff		
	Fixed t. CZK/year	Comm. charge CZK/ m ³	Average Account Expenditu re CZK/year	Fixed t. CZK/year	Comm. charge CZK/ m ³	Average Account Expenditu re CZK/year
Households - houses	1 685.72	10.65	2 612.55	1 378.28	6.99	1916.51
Households – flats	1 685.72	10.65	2 516.42	1 378.28	6.99	1874.57
Households – w/o sewers	1 685.72	10.65	2 569.67	0.00	0.00	0.00
Households – w/o water supply	0.00	0.00	0.00	1 378.28	6.99	1916.51
Industry – small	39 619.74	10.65	60 131.64	33 949.35	6.99	46 601.25
Industry – large	280 133.34	10.65	475 646.04	240 147.36	6.99	360 794.76

Balance of accounts: **0 CZK**

Comparing total annual payments of particular SUs, establishing 2-composite price results in lower payments in all categories. This is possible thanks to the much higher consumption of water, through which fixed costs are split up into more units (= the water is cheaper).

From the environmental point of view the higher consumption of water (and higher production of the wastewater) can be considered as a negative feature. But considering the low average water consumption in the CR per person (about 90 l per day), this increase would not cause over-consumption in the scale of international level.

Generally, this option can be considered as an optimum, because costs of the system are covered appropriately. Further, if we suppose industry to cause much higher fixed costs than particular households, this system is correct, because the industry pays a much higher annual fixed tariff.

If it is not so (and we do not want to consider any social redistribution to households), we can analyze the effect on average payments while using only one cluster. Through this option, the annual fixed tariff is the same for every SU.

Results:

Consumption: total water supply is 4 013 205 m³/year and total wastewater discharge is 4 341 333 m³/year – increase.

Table 18 Water and Sewage Tariffs (CZK/m³):

SU	Water tariff			Sewage tariff		
	Fixed t. CZK/year	Comm. charge CZK/ m ³	Average Account Expenditu re CZK/year	Fixed t. CZK/year	Comm. charge CZK/ m ³	Average Account Expenditu re CZK/year
Households – houses	2 708.78	10.97	3 663.17	2 256.12	8.40	2 902.92
Households – flats	2 708.78	10.97	3 564.44	2 256.12	8.40	2 852.52
Households – w/o sewers	2 708.78	10.97	3 619.29	0.00	0.00	0.00
Households – w/o water supply	0.00	0.00	0.00	2 256.12	8.40	2 902.92
Industry – small	2 708.78	10.97	23 873.00	2 256.12	8.40	17 460.12
Industry – large	2 708.78	10.97	204 096.04	2 256.12	8.40	147 240.12

Balance of accounts: **2 081 thous. CZK**

This system of pricing increases the average unit payment for households (water tariff: 42 CZK/ m³) and decreases the cost of industry (water tariff: 12 CZK/m³). Large consumers can distribute the fixed payment into more units consumed.

9. Pilot Case Study Results – Issues and Policies

The main purpose of the final chapter is to summarize the results of the modelling and to integrate the tariff calculation with the institutional and legislative framework of the Czech Republic. For the overall picture of water and wastewater management, Chapter 9 of the National Profile contains the necessary background material.

9.1. Charges Reform as a Result of Using the Model

Considering water and sewage tariff reforms, the current trends in pricing policies have to be taken into account. These trends are as follows:

- a) one level of pricing for all SUs (no preference to household users as in the past),
- b) one-composite price in most PWSS&S (no fixed charge).

9.1.1. Impact of the New Investment

The issue of new construction reflects the situation in the CR the moment before drawing upon the financial subsidies from EU resources (Structural Funds). This aid will be available from 2004 for municipalities of more than 2000 population equivalent and the main purpose is to build sewage treatment plants according to the requirements of the EU directive (91/271/EEC).

From interviews with Czech officials and the management of VaK Vyskov, there is a fear that selecting the project applying for EU resources will be created by a political decision of the mayors. To suggest such construction without a deep analysis of their own financial resources and the future impact on operational costs, constitutes a serious risk for the efficiency of the whole system (e.g. VaK Vyskov).

The case of a large construction of a sewage treatment plant in Rousinov is an excellent example of such a possible waste of resources and the serious impact on tariffs. From the analyses (Chapter 8.1.3.), we can see the following results:

Table 19 Impact of the New Investment (NI) on the Sewage Tariff (in CZK/m³)

SU	Original value	Impact to household connected to NI	Impact to all household	Impact to all SUs
Households - houses	14.40	14.91	45.11	27.33
Households – flats	14.40	14.91	45.11	27.33
Households – w/o water supply	14.40	14.91	45.11	27.33
Industry – small	14.40	14.91	15.36	27.33
Industry - large	14.40	14.91	15.56	27.33
Households–houses-NI	14.40	293.56	45.11	27.33
Households-flats-NI	14.40	293.56	45.11	27.33

In the third column of Table 19, we can see an enormous increase in the sewage charge for customers directly connected to the new investment. In the following columns this burden is redistributed to other SUs, but still the operational and fixed costs of the investment are almost double the original value even with 80% grant financing of the investment.

Fortunately, there are some controlling mechanisms, which can influence the final decision-making of local officials. First, the co-financing of every investment from EU resources (20-40%) is necessary. This is mostly impossible to be done from the municipal or company resources, so they have to ask e.g. for a favorable loan from the Czech government (that serves as an intermediary for the EIB loans). The government evaluates the efficiency or propriety of an investment.

Second, to any investment financed by the EU, the standpoint of the Czech institutions (Ministry of the Environment, .. etc.) has been developed. From this standpoint the Ministry should not agree with a costly and low priority investment. The national plan (or a list) of sufficient construction of sewage treatment plans will be elaborated at the Ministry of the Environment.

9.1.2. Impact of the Real Depreciation of the Infrastructure

The second important issue related to the financial stability of PWSS&S is: How to persuade/force owners of the infrastructure to run the system sustainable?.

The problem is that due to the inefficient price regulation the full, real depreciation of the infrastructure is not included in current tariffs. Because most of the PWSS&S property has been formally depreciated (through book depreciation in the past), there is no tool to create a financial reserve for future reconstructions. Although companies are in short term financial balance at present, in 10 or more years they could get into trouble.

Under our assumptions regarding real depreciation (because VaK Vyskov was not able to provide real data), the impact on current prices was investigated. Considering tariffs per unit, the increase from 22.80 to 33.00 CZK/m³ in the case of the water tariff and the increase from 14.40 to 27.00 CZK/m³ in the case of the sewage tariff would ensure the sustainability of the system. In relative numbers, it is a 45% increase of the water tariff and 88% increase of the sewage tariff.

Further analysis was done by the investigation of two-composite tariffs, where the commodity charge covers operational costs and the fixed annual tariff covers the system's fixed costs. Results are summarized in the Table 20

Table 20 Annual Average Payment per Account of SUs (in CZK/year)

SU	Water tariff			Sewage tariff		
	One-composite tariff	Two-composite tariff I.*	Two-composite tariff II.**	One-composite tariff	Two-composite tariff I.*	Two-composite tariff II.**
Households - houses	2 868.39	2 612.55	3 663.17	2 102.10	1916.51	2 902.92
Households – flats	2 571.66	2 516.42	3 564.44	1 938.30	1874.57	2 852.52
Households – w/o sewerages	2 736.51	2 569.67	3 619.29	0.00	0.00	0.00
Households – w/o water supply	0.00	0.00	0.00	2 102.1	1916.51	2 902.92
Industry – small	63 346.14	60 131.64	23 873.00	49 286.30	46 601.25	17 460.12
Industry - large	616 278.06	475 646.04	204 096.04	479 828.00	360 794.76	147 240.12

*) fixed tariff is different for household, small industry and large industry

**) fixed tariff is the same for every SU

As an optimal option, which imposes the lowest payments for all types of SUs, the option with two-composite tariffs I. can be chosen. In this option, fixed and operational costs of VaK Vyskov are covered by separate payments. The fixed part of the tariff differs between particular consumers.

9.2. Burden Indices of SUs

The further analysis of SU accounts helps us to assume the possible impact of particular tariff reforms the on households' standard of living. There are 2 possibilities how to express such an impact:

- a) costs as a portion of GDP/household,
- b) costs as a portion of the net average income.

According to CZSO statistics, the following data will enter Table 21:

- GDP in 2002: 2 275 600 mil. CZK
- no. of inhabitants in 2002: 10 208 438
- GDP per capita in 2002: 223 000 CZK
- average annual net (=disposable) income per capita in 2002: 93 153 CZK⁵
- average annual net income of the first decile of households: 51 831 CZK

Table 21 Burden Index Analyses for Households

Indicator	Year 2002		
	Baseline	S4 (Table 11)	U2 (Table 16)
Water and wastewater absolute annual costs (CZK per year)	3 147	5 633.5	5 219
Absolute change in annual costs over the Baseline (CZK per year)	-	2 486.5	2 072
Percentage Change in annual costs over the Baseline (percent change per year)	-	79 %	66%
Annual cost as a percentage of GDP per household	0.56 %	1.01%	0.94%
Annual cost as a percentage of net average income	1.4%	2.4%	2.2%
Annual costs as a percentage of net average income of the first decile of households	6.1%	11%	10.1%

From the absolute values we can see, that both changes of tariffs (due to the new investment or the real pricing) results in large increases in the cost of water and wastewater services. For the average household the payment for these services does not represent an exorbitant expenditure, but it has to be considered in relation with other cost of households on housing (e.g. electricity, gas, rent ... etc.). All these cost are increasing almost every year. The impact on low-income families can be considered as an especially high burden.

⁵ For the purpose of the analysis GDP per capita and average annual net income per capita were recalculated per households (that means multiplied by 2.5)