2003

Environmental Financing Strategy for the Municipal Water and Wastewater Sectors in the Ukraine

Background Analysis

DEPA/DANCEE
Danish Environmental Protection Agency
Danish Cooperation for Environment in Eastern Europe

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Abbreviations and acronyms

COWI	COWI A/S, Denmark (contracted consultant for the project)
DANCEE	Danish Cooperation for Environment in Eastern Europe within the Danish Ministry of the Environment
DEPA	Danish Environmental Protection Agency
Derzhbud	State Committee on Construction, Architecture and Housing Policy of Ukraine (until March 2002)
Derzhzhytlokomun-gosp	State Committee on Housing-Municipal Economy of the Ukraine (former Derzhbud, instituted from March 2002)
EFS	Environmental financing strategy
EIU	
EU	European Union
EUR	Euro
FEASIBLE	Financing for Environmental, Affordable and Strategic Investments that Bring on Large-scale Expenditure
GDP	Gross domestic product
HH	Household
nHH	non-household
IFS	

IMF	International Monetary Fund
lcd	Litres per capita per day
MB	Mechanical-biological
MNREB	
NIS	Newly Independent States (former Soviet Union republics).
O&M	Operation and maintenance
OECD	Organisation for Economic Co-operation and Development
OECD EAP TF	OECD Environmental Action Plan Task Force
UAH	Ukraine Hryvna
USD	United states dollar
VAT	Value added tax
vs.	versus
WWTP	Wastewater treatment plant

1 Introduction

1.1 Background

This report constitutes the main output of the project "Urban Water Sector Financing Strategy for the Ukraine". The project has been implemented on request of the Government of the Ukraine, and the implementation has been made possible through funding from the Danish Ministry of the Environment /Danish Cooperation for Environment in Eastern Europe (DANCEE).

The project is closely related to the work programme of the OECD EAP Task Force and its Secretariat, which play a major role in the Environment for Europe process.

1.2 Purpose

The environmental financing strategy (EFS) elaborates on the need for expenditure following from policy targets for the municipal water service sector. The expenditure needs are contrasted with the available supply of finance and the "service" level which the country can support in the long run based on user charges and public budgets.

The EFS is based on cost modelling and quantitative analyses. For this purpose a computerised costing and finance decision support tool has been applied, the FEASIBLE model. All main results of the present strategy have been generated using FEASIBLE.

There are two immediate objectives of the financing strategy are:

- To serve as a realistic planning tool at national (strategic) level
- To be a vehicle for attracting additional finance for environmental purposes through the establishment of specified environmental targets and the quantitative illustration of the financing requirements to meet these.

1.3 Scope

This report analyses the water service sector of the Ukraine from the point of view of the communal water service enterprises. Data has been collected from

all cities with a population of more than 10,000, and in which water services are provided centrally. In the Ukraine. a little less than 500 cities meet these criteria, and in terms of population, they account for approximately 60% of the entire country.

This implies that approximately 40% of the Ukrainian population is left outside the analyses of this report. This concerns mainly people living in rural settlements in which water supply services are typically provided decentrally, i.e. from private wells and surface water, and in which no or only sporadic treatment of wastewater services takes place.

The methodology applied focuses on assessing expenditure needs for maintenance, rehabilitation and upgrading of existing infrastructure, rather than on valuing actual extensions to the infrastructure coverage.

The financing strategy originally covered wastewater services only according to the main agreement that was made between the Danish Ministry of Environment and the Ukrainian Ministry of Environment and Natural resources as basis for the project. during the process of analysis it was, however, decided to include water supply, as well (reference is made to the Steering Group meeting held in Lyngby, Denmark, on March 12, 2002). The reason for this decision was partly practical, as water supply data could be collected parallel to the already on-going data collection for the wastewater with relatively limited additional effort. But first of all, the integrated approach would provide further analytical depth to the strategy thereby improving and further substantiating the resulting recommendations.

1.4 Project interfaces

The concept of environmental financing strategies including the FEASIBLE decision support tool was developed within the framework of the project "Environmental Financing Strategies, Environmental Expenditure and the Use of Economic Instruments in the NIS". This project consisted of a number of studies and related activities concerning environmental financing strategies, environmental expenditure and the use of economic instruments in the NIS which were all undertaken by COWI on behalf of the OECD EAP TF and DANCEE.

The present "Environmental Financing Strategy for the Municipal Water and Wastewater Sectors in the Ukraine - Background Analysis" constitutes an integral component within the same project framework. The present strategy is the last in a row of four, as national environmental financing strategies have been prepared for Moldova, Georgia and Kazakhstan along the same methodological guidelines.

Whereas the basic approach to the EFS concept including FEASIBLE was developed within the larger project framework, FEASIBLE has been adapted to reflect the special case of the Ukraine, in particular, in the handling of input and output data. These alterations and adjustments are described in detail in the following chapters.

Furthermore, the project has been implemented in parallel with another DANCEE intervention in the Ukraine: "Ukraine national water sector strategy and action plan", also implemented by COWI.

The scope of both strategy projects is the national water and wastewater sector of the Ukraine, both projects being naturally anchored within the same institutions in the Governmental administration of the Ukraine, the newly restructured State Committee on Housing-Municipal Economy, Derzhzhytlokomungosp, and the Ministry of Environment and Natural Resources.

The approach to implementation differs significantly, however, despite the obvious similarities in the project frameworks. The water sector strategy analyses the broad issues and challenges facing the sector and thereby develops a wide range of technical, institutional and policy measures. The key focus of the EFS is on balancing the costs and financing of different strategic choices for the sector and has, as such, provided substantial input to the financial sections of the water sector strategy.

The two projects have been closely coordinated partly in order to optimise possible synergies and partly in order to avoid overlaps and disagreeing conclusions. Practically, the cooperation has meant that

- raw data has been exchanged between the two project teams
- analytical support has been provided both ways and
- discussions with the beneficiaries on the key issues of both strategies, i.e. setting political targets and establishing scenarios, have been conducted jointly.

1.5 Project organisation

The financing strategy has been developed in cooperation with the project steering group. The project steering group has been chaired by the Ministry of Environment and Natural Resources and included representatives of the State Committee on Housing-Municipal Economy, Derzhzhytlokomungosp (the former Derzhbud organisation), the Ministry of Economy and others[1]. Jointly, these authorities are considered the beneficiaries of the project.

The staff of these authorities, the relevant political management levels as well as interested donors constitute the target group of the EFS.

1.6 Acknowledgements and disclaimer

DANCEE and the OECD EAP TF Secretariat have entrusted COWI with the preparation of this report. Its principal authors are Ms. Oxana Popkova, Mr. Ashot Boghdasarean, Mr. Michael Jacobsen and Mr. Adam Elbæk-Jørgensen,

[1] Please refer to Annex 1 for further details

all COWI. However, many others have provided helpful comments and contributions[2]. These contributions not withstanding, all errors and omissions remain the responsibility of the authors.

The opinions expressed are those of the consultant. DANCEE, the OECD EAP TF and the beneficiary ministries may not agree with these opinions.

[2] In particular: Mr. Alexandr. A. Milner (Derzhzhytlokomungosp), Ms. Nataliya Karpenko (Ministry of Economy), Ms. Nina Korobova (former COWI, now DANCEE), Mr. Grzegorz Pezsko (OECD), Mr. Bogdan Pulavski (DANCEE), Mr. Karsten V. Hansen (COWI) and Mr. Alan Jacobsen (COWI)

2 Summary

2.1 Introduction

This environmental financing strategy for the municipal water and wastewater sectors in the Ukraine is an output under the DEPA / OECD project "Environmental Financing Strategies, Environmental Expenditure and the Use of Economic Instruments in the NIS". This project constituted a number of studies which have all been undertaken in five NIS countries by COWI on behalf of DEPA and the OECD Environmental Action Plan Task Force Secretariat.

At the same time, the water sector financing strategy for the Ukraine forms an integral part of the "Ukraine National Water Sector Strategy and Action Plan" which has been prepared by COWI for DEPA and the Ukrainian State Committee for Housing and Municipal Services (Derzhzhytlokumungosp). This strategy and action plan was reported in the so-called "White Paper" which was approved by the Scientific - Technical Council of the Derzhzhytlokumungosp on 24 December 2002. The main results of the financing strategy were reported in "Theme E: Financial Aspects" of the above mentioned White Paper.

The environmental financing strategy has been reported in more detail in the report "National Environmental Financing Strategy for the Urban Water Sector in the Ukraine", DEPA February 2003. This document summarises the findings of the environmental financing strategy. In doing so, it is fully consistent with the findings and recommendations of the White Paper. However, the financial aspects are highlighted and presented in greater detail.

2.2 Analytical method applied

The environmental financing strategies provide a simultaneous assessment of the water sector service level, the expenditure needed to maintain this level of service, the revenues currently available to the sector and possible additional sources of finance. In this way, the environmental financing strategies provide an anchor for water sector strategies and action plans - an anchor that is firmly rooted in available finance from users, from public budgets, from international financing agencies and (potentially) from commercial debt financing.

For the Ukraine, a detailed description of the existing infrastructure within water and wastewater services as well as the current physical operation of the in-

frastructure is stored in a database. This database has been developed in close co-operation with experts from the Derzhzhytlokumungosp and reflects an agreed description of the existing infrastructure and its current state of maintenance.

The so-called baseline expenditure is the expenditure necessary to operate this infrastructure at the current level of service. The baseline expenditure has been assessed based on generic cost functions which have been developed for the CEE countries as part of the "Environmental Financing Strategies, Environmental Expenditure and the Use of Economic Instruments in the NIS" project. These cost functions are an integral part of the computerised environmental financing strategy model called "FEASIBLE". FEASIBLE has been used for calculations of expenditure and for comparing expenditure and revenues. The cost functions have been adapted by Danish and Ukrainian specialists to fit the specific Ukrainian conditions.

The so-called baseline revenues are the revenues that can be assumed to flow to the sector in a situation with unchanged policies. The baseline revenues have been calculated based on data on current user fees, current public expenditure, known international financing and assumptions about future economic growth in the Ukraine, future allocation of public expenditure and future international grant and loan financing.

The baseline has been presented to and agreed with the project steering committee. The baseline implies a significant financing gap as the expenditure necessary to operate this infrastructure at the current level of service is much higher than the baseline revenues. At the same time, the baseline does not meet the requirement of approaching EU standards. Various policy options were analysed and described in so-called scenarios. The policy options differ in terms of the level of future service (coverage, reliability and quality) as well as in terms of financing (public expenditure, user fees, grants and debt financing). The main policy options have been presented in the approved White Paper.

2.3 Current service levels

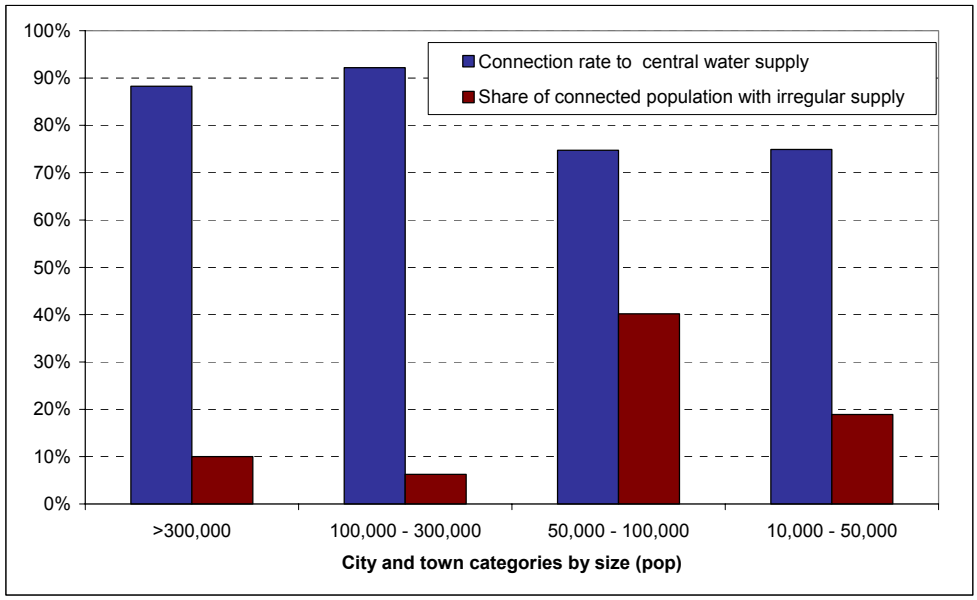
The environmental financing strategy for the municipal water and wastewater sectors covers cities in the Ukraine with a population of 10,000 or more.

2.3.1 Water supply

The connection rate to the centralised water supply network is relatively high in the cities of the Ukraine, as illustrated in Figure 2.1 below.

However, in the cities below 100,000 inhabitants, on average, one to two fifths of all households are affected by scheduled (i.e. irregular) water supply. Generally, families affected by scheduled water supply do not have water during the night. It is noted that the figures represent statistical means, and in a number of cities, the situation is considerably worse.

Figure 2.1 Water supply connectivity



Water losses are significant and average at about 30% of all the water supplied to the distribution network. It is likely that there are large additional losses due to poor maintenance of central installations within building complexes. The extent to which consumers actually receive water according to the (excessively high) consumption norms is not clear.

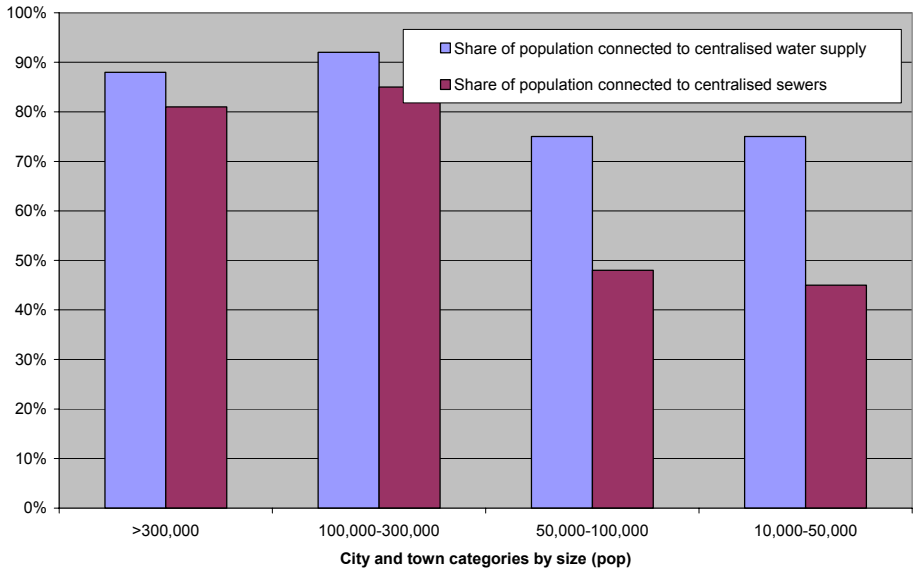
The per capita water production in the Ukraine is excessive relative to the water production and consumption in the EU and in Central European countries. The combination of large losses and excessive consumption leads to very high costs of extraction, pumping, etc.

As far as water quality is concerned, it is estimated that somewhere between one half and three quarters of all the considered cities and towns receive water of acceptable quality, as measured by European standards. In approximately one quarter to half of the remaining cities, the quality of the water supplied can be improved by implementating an asset rehabilitation programme. In the remaining 10%-15% of cities and towns, major infrastructure redesign and renovation are required to achieve acceptable standard levels.

2.3.2 Wastewater collection and treatment

The part of the urban population which is connected to a centralised wastewater system, ranges from a little less than half of the total population in small towns to well beyond three quarters of the total population in larger cities.

Figure 2.2 Water supply and wastewater connectivity



The overall system components, including pipes, collectors and treatment plants, are generally in a very poor condition. Most of the wastewater treatment plants were established in the period from 1960 to 1980. The age of plants ranges from 7 to 48 years, with an average age of about 25 years. The method of wastewater treatment is also subject to variation depending on the size of the area covered. In cities with a population above 100,000 people, about 80% of wastewater is estimated to undergo mechanical-biological treatment. In the smaller towns, the average is at about 45%. Many of the mechanical-biological treatment plants no longer work according to their design specifications and will need significant rehabilitation.

2.4 Supply of finance

Financing of water services in the Ukraine may come from the following sources:

- User charges
- Regional and local public expenditure (including environmental funds)
- Donors and international financing institutions (loans and grants)
- Private sources of equity or debt financing

2.4.1 User charges

User charges from households, industrial/commercial entities and budget organisations represent, by far, the largest share of total funds available to water utilities.

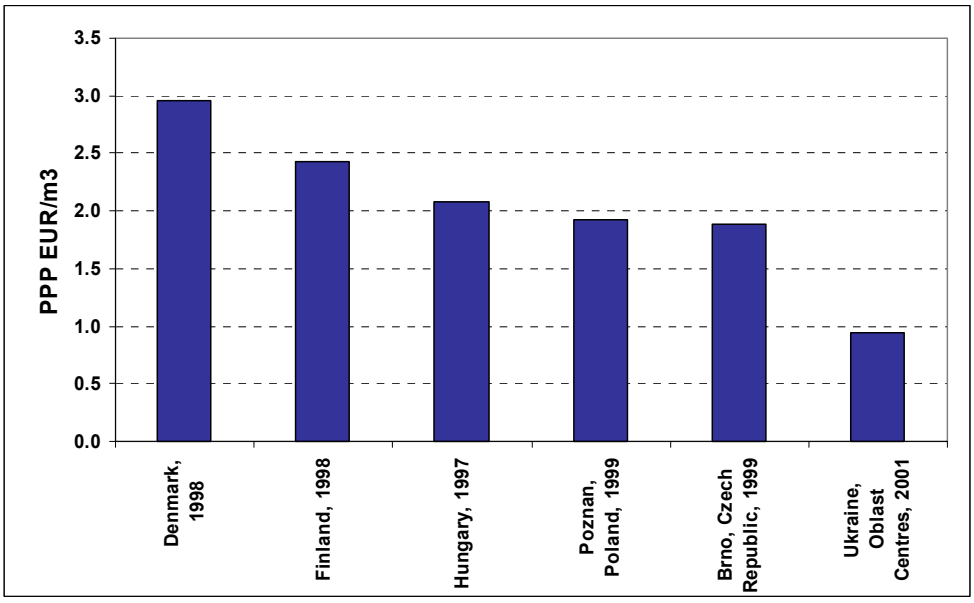
Using the historical revenue data and current trends in the sector, the total household user charges in 2003 were estimated at EUR 179 million for the part of the population, which is covered by centralised water and sanitation services.

The average collection rate for households is 80%, resulting in an actual cash inflow to the water sector from households at EUR 143 million. It effectively represents approximately 1.56% of per capita expenditure.

The revenue from non-households has been estimated at EUR 247 million in 2003. With collection rates for this group at around 70% and no in-kind payment or mutual settlement options, cash proceeds from non-households sum up to EUR 173 million.

Current regulation states that user tariffs should be set so as to ensure coverage of the expenses related to exploitation of the water resources (extraction) as well as the reliable functioning of centralised water supply and sewerage systems[3]. However, actual tariff setting is local and subject to regulation from the anti-monopoly authorities and subject to political influence. As a result household users in the Ukraine on average pay 28% (2002) of the total operational costs and do not contribute at all to necessary investments. Compared to other countries in Europe, consumers in the Ukraine pay lower tariffs. Figure 2.3 presents current level of average PPP[4] water tariff in Ukraine in comparison with other countries.

Figure 2.3 Tariff levels in selected countries/cities (PPP EUR/m3)



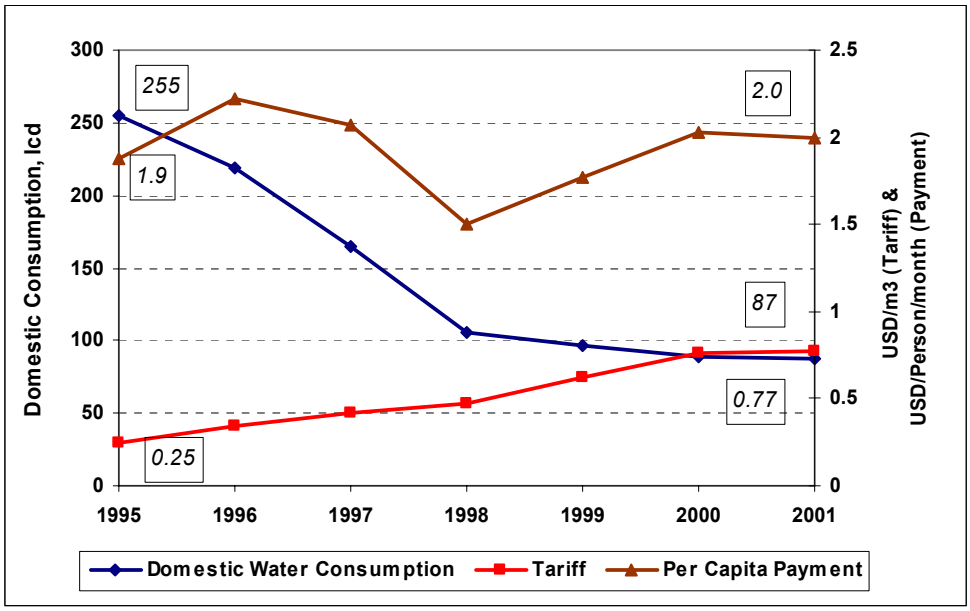
Low user charges reflect - among other things - political concern about affordability and social equity. In this regard, it is sobering to note that the existing exemptions and privileges generally do not contribute to greater equity, since the groups who get privileges typically have incomes and a distribution of in-

[3] Law on Potable Water and Potable Water Supply, adopted by Verkhovna Rada on January 10, 2002

[4] These figures differ from actual, observed tariff levels in countries, as they are corrected to account for Purchasing Power Parity (PPP).

come that is similar to the groups that do not get privileges. Furthermore, it is interesting to note the experience of Central European countries in relation to increased tariffs. Very often consumers reduce their consumption when tariffs are increased, and as a result, the cost to households changes only little. The figure below illustrates the experience in the city of Klaipeda.

Figure 2.4 Tariff, water conservation and resulting cost to consumer, Klaipeda 1995 -2001



2.4.2 Public expenditure

Prior to 1990, water utilities in the Ukraine had a steady flow of large revenues from their industrial customers. As a result, water utilities were often rich enterprises. This is no longer the case. Today, most water utilities cannot even meet their operational expenditure, and they all face a large backlog of necessary maintenance and urgent rehabilitation investments.

Public budget expenditure in the Ukraine for the water sector in the year 2000 constituted approximately EUR 48 million or 0.4% of the total budget expenditure (0.15% of the GDP). Adding funding from environmental funds brings the total public expenditure to approximately EUR 60 million of total public expenditure. This is very low compared to other countries in the region.

Public sector expenditure for the water sector is important for two reasons. First it may provide a source of funds for the urgent rehabilitation measures that are necessary to deal with a decade of deferred maintenance. It may be possible to increase tariffs for water consumers to cover the operational costs and even, in the long run, maintenance costs. However, it is not realistic to assume that utilities are able to finance large-scale investment measures here and now based on revenues from consumers. Therefore, the public expenditure has a second and

crucial role to play, namely to leverage fund from other funding sources such as international financing institutions.

2.4.3 Donors and international financing institutions

The aggregate data on sector financing by international financial institutions (IFI) and donors is not readily available. It has been estimated, however, that the total annual disbursement of funds from IFI and donor loans and grants does not exceed 0.1% of the overall expenditure needs.

The implementation of the World Bank Lviv water utility rehabilitation and the EBRD Zaporizhiya water utility project have been very slow due to various administrative, technical and political problems. The progress, however, picked up in late 2002 and, if successfully completed, could open the way for a larger inflow of foreign funds into the sector.

However, donor grants and funding from international financing institutions will - even in the best of cases - only constitute supplementary finance for the sector.

2.4.4 Private equity or debt financing

At the moment, there is no such financing. This reflects the legal framework for the sector, the uncertainties related to the possible role of private sector operators as well as the way the tariff setting works. However, in a twenty/year perspective, private sector operations could certainly be a source of finance.

2.5 Baseline scenario for the water sector

The baseline scenario is basically a scenario which illustrates what will happen in the event of unchanged policies. Policies will be changed. Therefore, the baseline scenario is not a prediction of how the water sector in the Ukraine will develop over 20 years, but purely a reference scenario for the subsequent analysis of policy options.

The following assumptions have been made in the baseline scenario:

Expenditure

- The water and wastewater sectors will require expenditure to cover operational expenses (power, labour etc.) to maintain the current service level

- The water and wastewater sectors will require a level of replacement of parts (maintenance) which is just sufficient to keep services at their present level

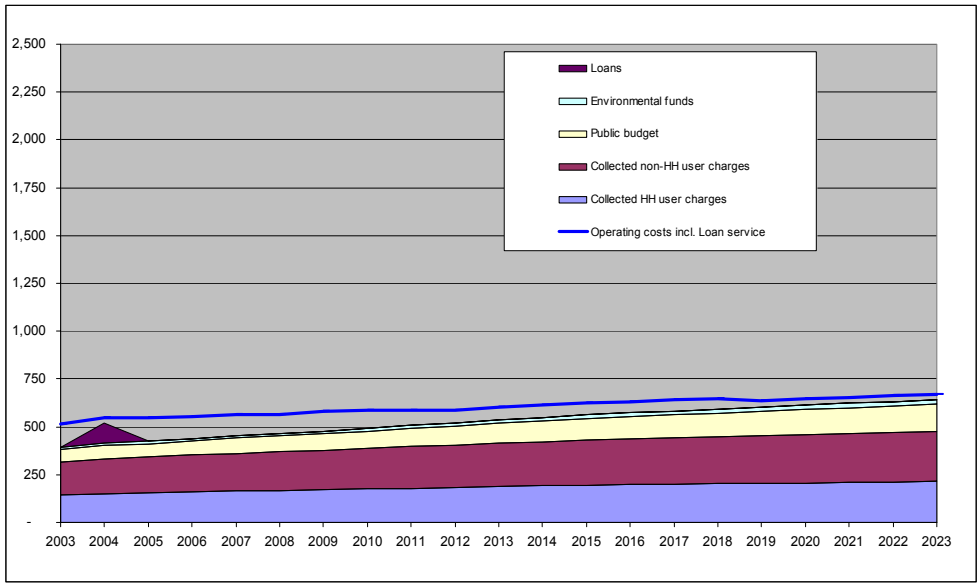
- Loans that have already been signed and become effective (for example World Bank for Lviv and EBRD for Zaporizhiya(will have to be serviced

Revenues

- The real GDP increases by 5% per year for the period 2003-2018 and thereafter by 3% per year
- The ratio of total public expenditure to GDP stays constant at 36%
- The share of water and wastewater expenditure in public expenditure (including environmental funds) stays at 0.5%
- The revenues from households and non-household users increase at the same rate as the cost of production (according to the tariff calculating formula)
- The international financing already committed is disbursed

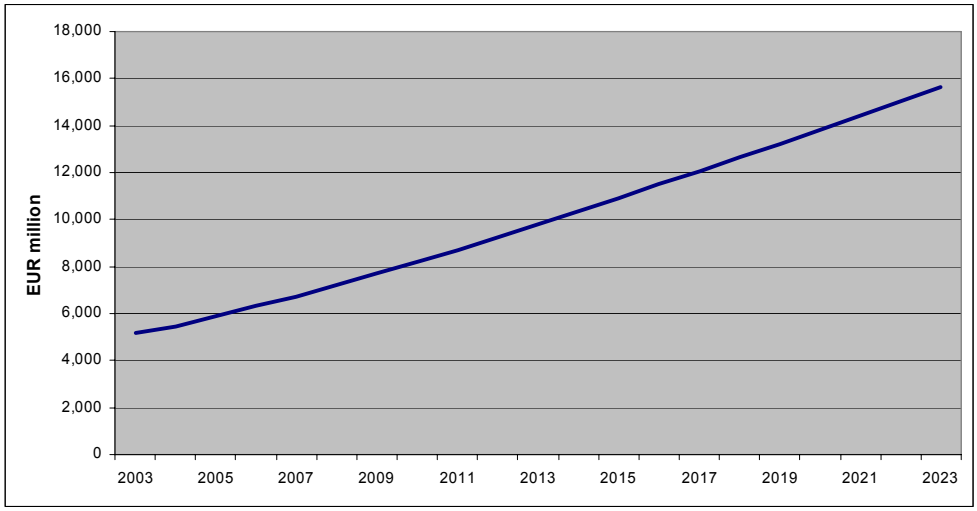
The resulting baseline scenario supply of finance is illustrated in Figure 2.5 below.

Figure 2.5 Baseline supply of finance EUR million 2003 - 2023



Further analysis of the baseline scenario demonstrates a significant shortage of funds. If the existing supply of finance is compared with the expenditure needed to sustain the design service level of the infrastructure, the total annual supply of finance, let alone user charges, is not enough to cover even the operating costs of the services. User charges, on average, provide only 65% of the operating expenditure needs and less than 35% of the operating and maintenance (O&M) costs. The cumulative maintenance gap, including backlog from the past, reaches over EUR 15 billion by the end of the period (see figure below).

Figure 2.6 Total maintenance backlog including backlog from the past



This is clearly not sustainable and indicates further significant depletion of the network infrastructure and assets. Unless there is a policy change, the water and wastewater infrastructure in many cities will break down before the year 2023.

2.6 Water sector vision and strategy

The Derzhzhytlokumungosp of the Ukraine recognises that the water sector is in a critical state, at the brink of collapse of the physical infrastructure systems. It recognises that there is inferior and ever deteriorating service delivery in terms of the reliability, quality and safety of water services to the Ukrainian population. In light hereof, the Derzhzhytlokumungosp has agreed on a vision for the water sector. The vision is formulated as follows:

> *"Meeting the demand of all water users for affordable potable water and sanitation services at appropriate service levels and a quality approaching EU standards".*

In support of this vision, the Derzhzhytlokumungosp has developed a strategy with a number of guiding principles, viz.:

- Cost recovery and financial viability of the service providers;
- Sustaining an affordable level of service;
- Cost effective utilisation of scarce resources;
- Customer service orientation; and
- EU harmonisation

2.7 Policy options and scenario analysis

The policy options in the environmental financing strategy presented below are all consistent with this strategy. The scenarios illustrate various levels of ambitions and different policy options.

2.7.1 EU scenario

In this scenario, the water and wastewater sectors are brought close to compliance with EU water and wastewater utility standards. Household water demand and network water losses consistently decline. Water loss savings, demand reduction and reduction of infiltration as well as the investments in more energy efficient equipment, result in reduced operation cost and some reduction in capital repairs, in the long term.

An urgent rehabilitation programme is initiated and implemented during the period 2003 - 2013. Water and wastewater networks are repaired, and urgent rehabilitation of pumping stations, water treatment plants and wastewater treatment plants is carried out. The total cost of the urgent rehabilitation programme is estimated to be approximately EUR 4 billion.

In addition, a new investment programme is envisaged which ensures that the connection rates to water supply and sanitation services reach 95%. Full biological treatment complying with EU standards is used for all townships with over 2,000 inhabitants.

Finally, it is assumed that, from the year 2013, full maintenance will be carried out to retain the infrastructure at the new (and much higher) service level attained during the preceding decade. Each year until 2013, full maintenance will be carried out to retain the infrastructure at whatever service level has been attained in the previous year.

On the revenue side, it has been assumed that:

- Tariffs from household users will increase from 1.56% to 4% of the average household income. Since households are likely to respond by reducing their consumption this implies more than a trebling of the tariff per m^3. The increase in tariffs is assumed to be phased in during the period 2003 - 2007. It is assumed that collection rates will increase from 80% in 2003 to 95% in 2008

- Tariffs from non-household users will increase to the level equivalent to full per m^3 cost of operation and maintenance. Similarly to what is assumed for households, it is assumed that the payment discipline will improve from the current level of 70% and reach 95% in 2009

- It is assumed that some of the new investments will be financed by additional funding from public budgets. However, in view of the policy pronouncements of the Government of the Ukraine, this additional funding from public budgets is assumed to be moderate reaching a level of 0.5% of total public budget expenditure in 2007 (the current level is 0.4%, approximately)

- Figure 2.7 below does not include any additional IFI or grant financing compared to the baseline scenario

Figure 2.7 EU scenario expenditure and supply of finance, EUR million 2003-2023

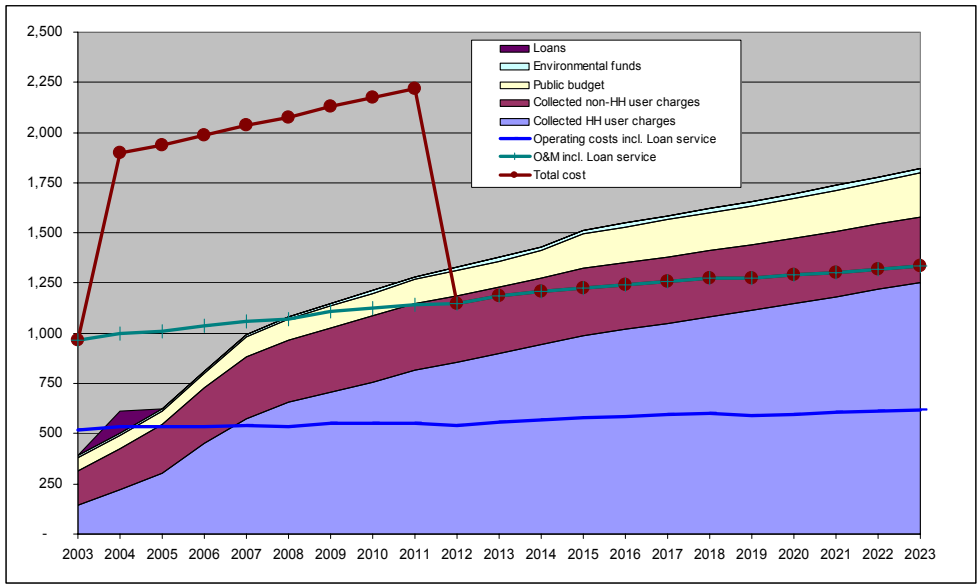
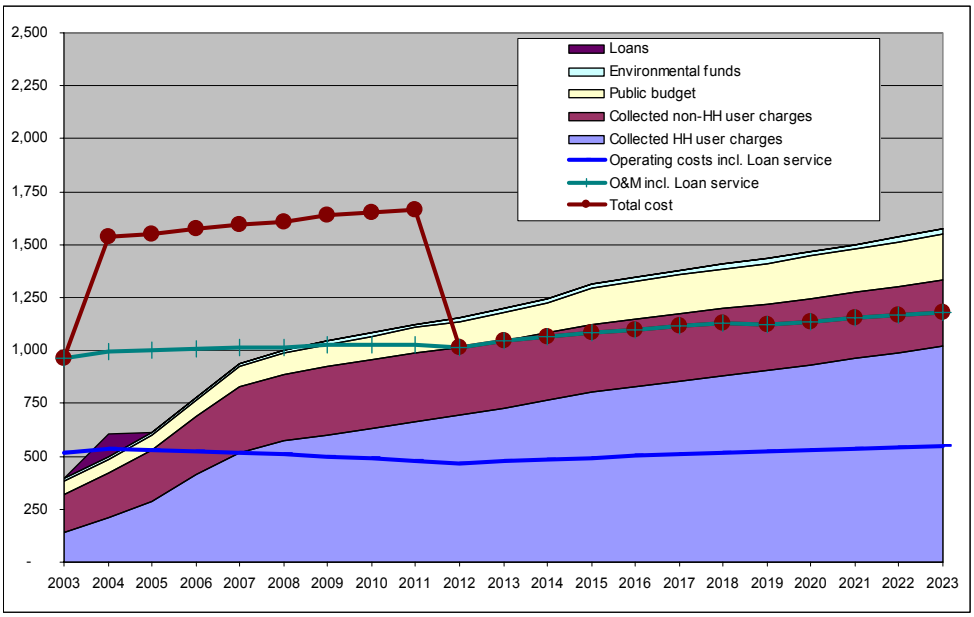


Figure 2.7 illustrates that additional financing will be required compared to the assumptions made in order to achieve the EU scenario. A combination of grants, loans and budget financing of more than 1,000 million EUR per year for ten years will be required in order to finance the investment programme envisaged. This will require a very marked change of public expenditure priorities increasing the ratio of public expenditure for the sector from 0.5% to approximately 10% of the total amount per annum.

2.7.2 Operational safety scenario

This scenario focuses on approaching EU requirements through the combination of the urgent rehabilitation programme and focus on the maintenance of existing assets. Thus, while the technical EU harmonisation is initiated immediately, it is completed over time when resources become available and as agreed with the EU during negotiations. Technically, we have not included any extension of service coverage in this scenario. The scenario is illustrated below.

Figure 2.8 Operating safety scenario expenditure and supply of finance, EUR million, 2003 - 20023



Compared to the EU scenario, the total expenditure has decreased by the amount of new investments. As a result there is a consequent reduction in necessary maintenance of the newly installed networks and equipment. Thus in comparison to the EU scenario, maintenance costs have been slightly reduced. Similarly, the operating costs of running the utilities have been reduced.

Revenues are also slightly lower in this scenario. Again, this reflects the fact that coverage is not extended. Thus, there are no revenues from new consumers.

In comparison to the baseline scenario, changes in policy instruments have resulted in dramatic improvements in the supply of finance profile. The total collected user charges are sufficient to cover the operating expenditure already in 2005. In total, all funds available to the sector are sufficient to achieve the current year's operation and maintenance expenditure needs from 2009 and onwards. Moreover, the area above the O&M curve after 2009 represents a surplus of financing available and this is growing over time[5]. It could in principle be used to close the accumulated investment backlog.

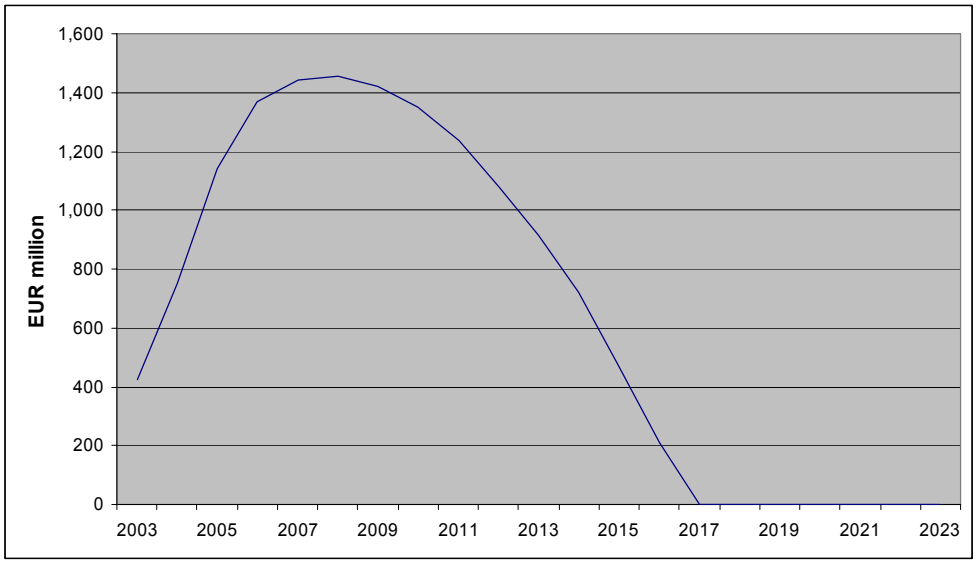
2.7.3 Urgent rehabilitation and financing action plan scenario

However, there is still a significant funding gap which occurs in the early years of the operating safety scenario. Total additional funding needs in the period between 2003 and 2012 amount to EUR 6.2 billion and are represented by the

[5] The main source of such surplus is the increasing user charges. It has been assumed that household user charges will reach the 4% affordability rate by 2007 and stay at that level. This provides the water sector with future funds to finance the backlog of maintenance, short- and medium-term borrowings, and potential private investments.

area between total cost and total supply of finance curves. As a result, it will either be necessary to further increase the financing in the short run - or to accept that some necessary maintenance is deferred until after 2009 when there is a surplus of financing. The volume of deferred maintenance is illustrated below.

Figure 2.9 Accumulated maintenance gap since base year for operating safety scenario, EUR million, 2003 - 2023



Since the volume of deferred maintenance (the maintenance gap) corresponds to approximately 1.2% of the average annual forecasted GDP or 3.4% of the average annual consolidated public budget expenditure, it is difficult to see any possibility to obtain additional finance for the full amount.

The main reason for the remaining funding gap is the large backlog of maintenance from the past, which is designed to be addressed through an urgent rehabilitation programme. Most of the assets under this programme are in the "near-to-collapse" state, and repairs are classified as "urgent". Further postponing their rehabilitation will lead to increased disruptions of the quality and quantity of services. Unless additional financing becomes available to adequately address the urgent investment programme, an apparent solution is to accept the actually obtainable supply of finance profile and design a programme which prioritises annual expenditure needs to fit the funding profile constraint.

It is suggested that such prioritisation plan could be drawn up as follows:

1 Throughout the whole period, user charges are used to cover operating costs first

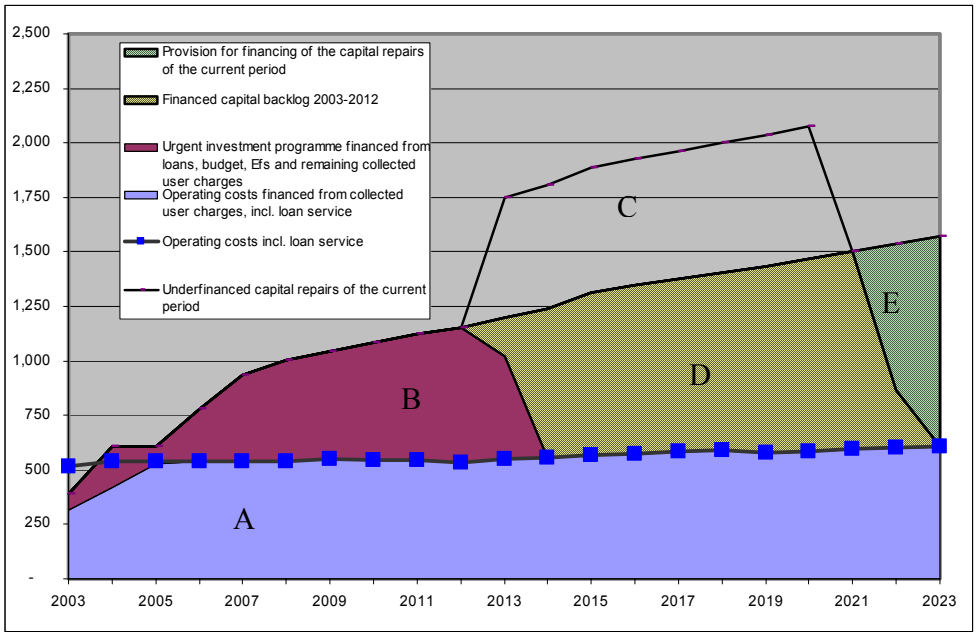
2 Any further surplus from user charges should be directed towards urgent rehabilitation programme, rather that current asset maintenance

3 Current asset maintenance is accumulated as a backlog of maintenance and postponed to subsequent years until the rehabilitation programme has been completed

4 Once the rehabilitation programme has been completed, the available funds are used, in the order of priority, to cover operation costs, maintenance backlog from the early years of strategy implementation and, lastly, normal maintenance of the current year

The implementation of such a programme is depicted graphically in Figure 2.10.

Figure 2.10 Supply of finance profile scenario



User charges are used, first, to close the operating cost needs. All the remaining sources are then directed towards rehabilitation programme (B area on the figure) which is completed by 2014. Starting from 2012, resources are gradually allocated to closing the maintenance backlog of the early years of restructuring (area D). While such backlog continues to be closed in subsequent years, another backlog of maintenance for the years 2012-2023 accumulates (area C), which can then only be addressed starting from 2021. The iterative process continues until all the past maintenance backlogs are fully closed, and normal maintenance of the current year becomes possible.

2.8 A note on regional challenges

The above considerations have all been made on a national scale. Naturally, there is great variation from city to city and from utility to utility. Thus, the above picture may, in principle, cover both cities where revenues can quickly be increased to a level which is sufficient to both rehabilitate and maintain cur-

rent assets and cities where this will be next to impossible, even over a twenty year period, under the assumptions made.

We have analysed the underlying data and present some observations related to regional variations in this chapter. We have collected data from more than 400 cities - in particular related to the quality of the infrastructure. It is possible to present certain observations rooted in the actual data collected. However, the collection of data related to variations in the supply of finance among cities and the process of data verification reflect the fact that the financing strategy was intended to be a national level strategy and that the volume of resources available has been similar to the volume of resources for other, much smaller, countries (such as Georgia and Moldova). Therefore, we have chosen not to quantify any of the observations in this chapter. In order to have appropriate quantification, it would be necessary to prepare a strategy similar to this for the region in question.

The data collected indicates that the renovation needs seem to decrease concurrently with the size of the city (in terms of population). The smaller the city, the larger the renovation needs, relatively speaking. This is true for both water supply and wastewater.

At the same time, the revenue base is typically more solid in the large cities.

Various options exist to deal with these imbalances. The Donetsk region is in the process of establishing a region-wide water utility. This would enable funds to be transferred from richer agglomerations to poorer ones and to address the most urgent rehabilitation needs, even when these occur in small cities with very limited revenue and limited or no access to foreign funding. In the medium to long term, such large regional water utilities may also become attractive financing objects for private investors and thus further contribute to alleviate the funding gap.

3 Policy context

The aim of this chapter is to present a brief outline of the overall policy context of the municipal water service sector in the Ukraine. The organisational framework is addressed in section 3.1 and the legal framework in section 3.2. Finally, section 3.3 provides an overview of the strategic planning of relevance to the development in the water service sector in the Ukraine.

3.1 Organisational framework

The main entities involved in the water sector are briefly presented in the following.

The **Derzhzhytlokomungosp** was established in March 2002 as a result of the restructuring of the former Derzhbud (State Committee on Construction, Architecture and Housing Policy). The Derzhzhytlokomungosp is currently acting as the body responsible for the effective management and development of the water and wastewater sectors in the Ukraine, as this role is defined in the Act on Potable Water and Potable Water Supply. As such, the organisation deals with methodological guidance and monitoring of water and wastewater utilities, tariff policy formulation, sector programming including coordination with other relevant authorities, annual state-of-affairs reporting for the sector and similar. The Derzhzhytlokomungosp has an advisory role in terms of the infrastructure investment planning within the framework of the Ministry of Economy.

The **State Committee on Water Economy** is mainly responsible for certain specific issues related to water resource management, in particular surface water resources. The committee, however, also undertakes inspection of the quality of groundwater resources, although the main responsible in this respect lies within the **State Committee on Geology and Use of Groundwater**. The responsibility of the Committee on Water Economy in terms of monitoring water quality is limited to the hydro-chemical quality, as biological water quality monitoring is undertaken by the health authorities. Furthermore, the committee owns and operates a number of rural water supply systems.

As mentioned previously, the **Ministry of Environment and Natural Resources** is responsible for protecting and sustaining the water resources of the Ukraine. The ministry enforces the regulation in the water sector. Hence, the ministry is responsible for issuing permits and setting charges for activities polluting water resources as well as for water abstraction. Also, the ministry co-

ordinates the monitoring and control of all raw water resources performed by various organisations, in particular in respect of water quality..

With the adoption of the Act on Local Self-Governance in the Ukraine[6], the responsibility for operating the **water utility companies** was placed at the territorial community administrational level, i.e. town, townships and village councils. In a number of cases the community level, however, decided to delegate the responsibility to a higher level of governance, typically the oblast level. Water utilities can be either entirely owned by the community, jointly owned by the community and the relevant higher levels of governance (oblasts or rayons) or they can be entirely state owned. Finally, the enterprise may also have been privatised to some extent, typically in the form of a joint stock company or some other limited ownership form. The privatisation of water utilities is regulated by the Act on Potable Water and Potable Water Supply, but the act does not make allowance for privatisation of operational capital assets such as pipes, wastewater treatment facilities and similar. The "typical" vodokanal in the Ukraine is owned by the local municipality or by the municipality and the oblast in common.

3.2 Legal framework

There are two main acts regulating water and wastewater issues in the Ukraine, i.e. the Water Code of the Ukraine[7] and the recently approved Act on Potable Water and Potable Water Supply[8].

The Water Code mainly deals with the management of water resources, as it defines the principal ownership of water resources and establishes some of the principal roles and responsibilities in relation to the regulation of water resources in the country. According to the Water Code, the Ministry of Environment and Natural Resources plays a key role in the management of water resources, as the Ministry is empowered with the state control of the use, protection and recovery of water resources. The Water Code, furthermore, establishes principal conditions for concerning payment for water.

The Act on Potable Water and Potable Water Supply deals more directly with regulation of the provision of water and wastewater services in the Ukraine. The act defines responsibilities in relation to the provision of water and wastewater services among the various administrational levels of the Ukraine. The main state executive power in regulation of this field has currently been entrusted to the Derzhzhytlokomungosp organisation. The act, furthermore, effectively regulates the setting of tariffs for water and wastewater services. The municipal executive bodies (i.e. local administrations) are responsible for tariff setting. According to the act, tariffs should be set so as to cover the expenses related to exploitation of the water resources (extraction) as well as reliable functioning of centralised water supply and sewerage systems. It seems not

[6] Adopted in 1997

[7] Adopted by the Verkhovna Rada on June 6, 1995

[8] Adopted by the Verkhovna Rada on January 10, 2002

clear exactly how this latter expression is interpreted in practice, e.g. whether it covers costs of rehabilitation and renovation.

Apart from these two main acts, a number of related legislative acts have direct or indirect implications for the regulation of the provision of water and wastewater services.

Hence, the Ministry of Environment and Natural Protection administrates legislative acts with relevance to the sector, in particular the Act on Environmental Protection[9]. Also, the Ministry of Health has issued several important acts in this respect, foremost the Act on Ensuring the Sanitary and Epidemiological well-being of the Population[10]. Furthermore, as water and wastewater service providers typically by nature act as monopolies within the local settings, the pricing of services rendered - i.e. tariff setting - is subject to regulation from the anti-monopoly authorities. The basic legislative act in this respect is the Act on Natural Monopolies[11].

Finally, it should be noted that, in 1994, the Ukraine entered a partnership agreement with the European Union, by which the Ukraine is gradually to adopt EU legislation in national legislation within selected areas. An intergovernmental council on adaptation of EU legislation has been established in order to manage and follow this process. The council has established a list of EU regulation that is to be adapted in national legislation throughout the period 2002-2004. This list contains several items of relevance to the water and wastewater sector, in particular the Water Framework Directive 2000/60, but also various regulation concerning procurement, metering and similar.

3.3 Strategic planning

Over the years, policy formulation in the sector has been supported by the adoption of targeted development programmes. These programmes have been and are still supporting existing legislation in the identification of political targets as well as the means to achieve these.

Within the last decade, at least four programmes have been established in order to impact and control the development of various aspects within the water and wastewater sector in the Ukraine.

The **National Programme on Providing the Population of the Ukraine with Potable Water of High Quality** was established as a draft development programme in 1995, but never received official status as the Cabinet of Ministers of the Ukraine never approved it. The programme was, nevertheless, reportedly used by some of the relevant organisations (Derzhbud) as a guidance document in the daily operational planning. The main focus area was the increasing pollution of water bodies, in particular issues related to wastewater treatment in ac-

[9] Adopted by Verkhovna Rada on June 25, 1991
[10] Adopted by Verkhovna Rada on February 24, 1994
[11] Adopted by Verkhovna Rada on April 20, 2000

cordance with the existing state standards and norms, at that time, and the implications the inadequacies would have for human health. It appears to have been an attempt to address the mismatch between, on one side, a set of very ambitious environmental targets as formulated by standards and norms and, on the other side, an actual state-of-affairs very far from resembling same targets. The state of deterioration of the physical infrastructure as well as the general economic turmoil following the collapse of the Soviet Union made the existing environmental targets increasingly more unrealistic in this period. The programme seemed to lack detailed descriptions on financial funding - in particular funding sources - of the anticipated developments.

The **Water and Wastewater Development Programme** issued in 1997[12] addressed a number of important problems related to insufficient financing available for the development and even pure maintenance of existing physical infrastructure in the water and wastewater sectors in the Ukraine. A number of structural legal and managerial problems faced by the sector were also addressed. The programme officially ended in 2001, but it has been prolonged until 2005[13]. It appears that the main area of attention of the programme has been to resolve some of the acute problems of frequent breakdowns in the deteriorated physical infrastructure. The number of such incidents has increased rapidly increasing during these years. The means to resolve some of these problems in the programme included a tariff reform, development of monitoring and inspection systems, improvement of the legal basis and similar, but also a focussed effort to attract international funding for implementation of the programme. In the extension of the programme running from 2002 until 2005, more than 70% of the funding not covered by the water utilities or local budgets is supposedly to be covered by foreign investments.

The **National Programme on Water Sector Development** was adopted only in 2002[14] and focuses on creating safe conditions for human life and activity. The main organisations expected to be involved in the implementation of the programme are the Ministry of Environment and Natural Resources, the Ministry of Agricultural Policy and the State Committee on Water Economy. The main objective of the programme is environmental protection, but the means to achieve the objective includes a number of interventions specifically related to water supply issues with a view to securing future supplies. The programme was only recently adopted and not much experience has been gathered so far in relation to its implementation, but it appears from the list of anticipated interventions that the approach will concentrate on hardware, i.e. on maintaining the physical networks and pipe systems. Thus, attempts to impact water demand do not seem to be part of this approach to water protection. In any case, the programme foresees most of its investments in the physical infrastructure of the water service sector. Is not clear to what extent the Derzhzhytlokomungosp will and can be involved in the detailed prioritisation of these investments.

[12] Approved by decree of the Cabinet of Ministers in November 1997
[13] Prolongation approved by decree of the Cabinet of Ministers in June 2002
[14] Issued as an act and approved in January 2002

The **Programme for Reforming and Developing the Housing-Municipal Economy**[15] which covers the period until 2010, is also of relevance for the development of the water and wastewater service sectors and could, in some ways, conform very well to the line of thinking of the present financing strategy. The housing-municipal economy covers a range of the more traditional providers of utility services, such as housing, energy, roads as well as water and wastewater. The programme aims at introducing market-like conditions in public service provision through de-monopolisation, structural reforms of the framework for tariff setting, institutional and managerial reforms and similar. Also, credible loan financing mechanisms for vodokanals are to be established towards the year 2005. The programme puts forward a number of interesting financial principles for service provision. Thus, according to the programme, investments and services should not only be affordable and transparent, the provision of services should also be fully paid by consumers. The programme does not, however, include details as to the funding sources for the activities envisaged in the programme.

[15] Approved by resolution of the Cabinet of Ministers in February 2002

4 Macroeconomic outline

A substantiated assessment of the macroeconomic performance of the Ukraine is important in order to estimate the funds potentially available for financing within the water service sector in the future. This section provides an overview of the economic outlook of the Ukraine. The section contains a brief discussion of past and current trends and provides an overview of relevant existing strategies and programmes. Finally, a number of detailed macroeconomic indicators of relevance to the water and wastewater sectors are presented[16].

Following the break-up of the Soviet Union, the Ukraine experienced an undisrupted economic decline up until the year 2000. While policies of economic liberalisation, privatisation and fiscal stabilisation were quickly formulated and formally brought forward in the initial phases of the transition process, the practical implementation remained poor throughout most of the 1990'ies. The reasons for this are obviously very complex, but central issues were the inadequate institutional reform structures that were established to manage the process, as well as an ineffective legislative framework. Furthermore, the process was complicated by the overwhelming bureaucracy which was inherited from the old system, including a complex of un-transparent economic interests.

As a result, the Ukraine has experienced a fall in GDP, generally high inflation, increasing budget deficits and declining personal income levels. These factors have significantly restrained the resources available to the economic sectors, among these public utilities and municipal infrastructure services companies.

The initial years of economic reform brought a dramatic fall in GDP (drop by over 60% compared to the level of 1990). There were clear signs of hyperinflation and significant currency depreciation at certain times throughout this period. The average annual budget deficit amounted to approximately 9% in this period.

The division of the former Soviet economy into a number of separate economies was troublesome in various aspects. One of the issues that appeared relatively early was the dependency of the Ukraine on the Russian oil and gas export. Furthermore, a new national currency replacing the Soviet rubel was in-

[16] The macroeconomic statistical information used is based on EIU resources, IMF country reports, national publications, and World Bank and EBRD country strategies. Please refer to the literature list appended to the report for details.

troduced in 1992, and the price liberalisation continued throughout the period. These factors combined with relatively loose monetary and fiscal policies altogether fuelled a significant inflationary pressure on the national economy of the Ukraine.

A new economic and structural reform strategy was drafted in 1994 based on the experience of the early years of the reform process, and this eventually resulted in a comprehensive stabilisation programme, which was supported by IMF loans. The new programme proved relatively successful in lifting price control and eliminating export quotas. Furthermore, subsidies on a range of consumption products and public utility services were furthermore reduced. The programme thus achieved a relative reduction of the inflation rate as well as a consolidated budget deficit (around 400% and 9% correspondingly in late 1994). The strategy, however, failed to consistently address structural reforms. Especially, the programme fell short of meeting the targets that were put forward for large-scale privatisation.

Table 4.1 Gross domestic product

	1996	1997	1998	1999	2000	2001	2002
Total (USD Billion)							
- at current prices	44.6	50.2	41.9	30.8	31.8	36.6	41.0
Real GDP Growth (%)	-10.0	-3.0	-1.9	-0.2	5.9	9.2	4.6
Total (UAH Billion)							
- at current prices	81.5	93.4	102.6	127.1	173.0	196.8	217.2
- at constant 1993 prices	904.0	877.0	860.0	858.0	907.0	1,022.0	1,119.0
Per capita (UAH)							
- at current prices	1,588.0	1,835.0	2,032.0	2,509.0	3,442.0	4,014.0	4,493.0
- at constant 1993 prices	17.6	17.2	17.0	17.1	18.4	20.1	23.0

Source: National statistical sources, National Bank of the Ukraine, EIU, Euromonitor

Revised versions of the stabilisation programme were approved and implemented in 1996 and 1997. Budgetary measures and associated legislative changes were thus made with main purpose of further reducing the budget deficit and inflation rate. By the end of 1997, the annual inflation rate had been reduced to 11% and the consolidated budget deficit stood at 5% of GDP. All of these measures have resulted in substantial foreign interest in the government debt market, which in turn allowed the government to significantly reduce its National Bank borrowings.

Table 4.2 Consolidated budget revenues and expenditure by source (% of GDP)

	1998	1999	2000	2001
Total revenue	39.8	37	40.4	38.2
VAT	7.66	7.1	6.1	5.4
Profit tax	6.7	5.6	5.3	4.6
Excise tax	1.3	1.5	1.4	1.4
Chernobyl tax	1.5	0.2	0.1	0
Income tax	3.8	3.7	4.1	4.6
Pension fund	9.8	9.5	9.3	9.5
Others	9.0	9.4	14.1	12.7
Total expenditure	41.9	38.4	39.2	37.6
Economy and trade	6.7	6.5	5.5	4.8
Education, health, culture	9.7	8.3	8.8	9.4
Foreign debt service	0.8	1.5	1.9	1.3
Social transfers	15.2	12.9	12.8	13.3
Defence and police	4.5	4.2	5.6	5.8
Others	5.0	5.0	4.6	3.0
Total balance	-2.1	-1.4	1.2	0.5

Source: EIU, UEPLAC, Ukrainian Economic Trend
Note: Data in the table are based on UEPlAC income based methodology, which leads to slight difference of reported figures from officially reported data utilised in the rest of the report

By 1998, the Ukraine had managed to restrain its budget deficit and avoid radical fiscal reforms due to the availability of foreign borrowings. However, throughout the year of 1998, these sources of financing steadily dried out as a result of widespread regional economic recession. The government was forced into accumulating payment arrears and unfulfilled budgetary obligations in order to maintain the reduced budget deficit. This policy was, however, not sustainable as arrears were accumulating very quickly, by 1999 reaching 3% of the GDP.

A new reformist government was appointed in late 1999, and it brought forward several immediate measures for structural fiscal reforms. Hence, the collection of enterprise taxes was more strongly enforced and also the use of mutual settlements was severely restrained. Further improvements followed within the privatisation area, and measures were taken to restructure the banking and public administrative sectors. Furthermore, in this period Ukraine's external markets developed unusually well due to a significant increase in the demand for Ukrainian goods from some of the traditional main trade partners of Ukraine, most notably Russia.

All of this has brought positive changes to the economy of Ukraine in the recent years. The GDP growth was higher than estimated in this period, and the consolidated budget for 2000 and 2001 proved a surplus - the first of its kind since the break-up of the Soviet Union. By mid-2002 inflation rates have reached record low level of 2% year on year. Together with rising productivity and overall tendency towards economic recovery, this has resulted also in real wage increases. By the mid-2002 real wages increased by more than 20% year on year (see Table 4.3). The average monthly wage, however, still remained very low.

Table 4.3 Prices and earnings (y-o-y, % change)

	1997	1998	1999	2000	2001
Average consumer prices	15.9	10.6	22.7	28.2	12
Year-end consumer prices	10.1	20	19.2	25.8	6.1
Average nominal wages	13.7	7.2	15.7	29.6	35.4
Real wages	-2.1	-3.1	-10	1.9	20.1

Source: EIU, National Bank of Ukraine, IMF, IFS

The economic expansion, slowed down significantly in 2002, however. Initial estimates show an annual real GDP growth at 4.1% only, compared to 9.1% in 2001. The pace of policy changes has been reduced, following - among other things - the very extensive pre- and post-election policy debates. External fund disbursements have been delayed due mostly to VAT reimbursement delays. Industrial and agricultural growth has stagnated and, similarly, the inflow of foreign directed investment is less than expected. The difficulties seem to be of a structural character. Vested interests of political groups are probably also playing a significant role. Nevertheless, a significant policy shift away from the reform path is unlikely to occur, and the average economic growth is estimated to stay at around 5% annually over the short and - perhaps - medium term[17].

[17] EIU; Ukraine Country Report; 2001-2002; London, UK and IMF; International Financial Statistics; Washington D.C.

5 Baseline costing and supply of finance

This chapter provides a description of the existing situation in the municipal water services sector in the Ukraine as of the beginning of 2003, as well as a baseline forecast of the expenditure need and available financing for the sector during 2003-2022.

The definition of the baseline forecast is given in section 5.1, and the data collection process is briefly accounted for in section 5.3. Section 5.4 gives an overview of the existing situation with regard to municipal water services and a baseline forecast of expenditure need.

5.1 Definition of the baseline

Generally, a baseline is defined as one in which there are "no policy changes compared to the present situation". In the Ukrainian case, the baseline shows the situation where the service level of the municipal water services deteriorates further due to the lack of attention to the sector.

This means that, just like previous years, only the expenditure required to operate the water and wastewater systems before, is included in the calculated expenditure needs in the baseline.

In terms of finance, the major sources of supply of finance are public budgets (public expenditure for water and wastewater services) and household incomes (user charges). In the baseline, these variables have been adjusted according to the real growth of the vodokanals costs[18] which was caused partially by changes in the local real prices of electricity, labour, materials, equipment and spare parts and partially by the increasing level of current repairs and electricity consumption due to a rising number of emergency break-downs and more leakages and water losses in the distribution network.

The baseline shows the resulting financing gap, that is, the difference between the expenditure needs and the available financing.

[18] This assumption is made based on the provisions of the Act on Potable Water and Potable Water Supply

5.2 Use of FEASIBLE

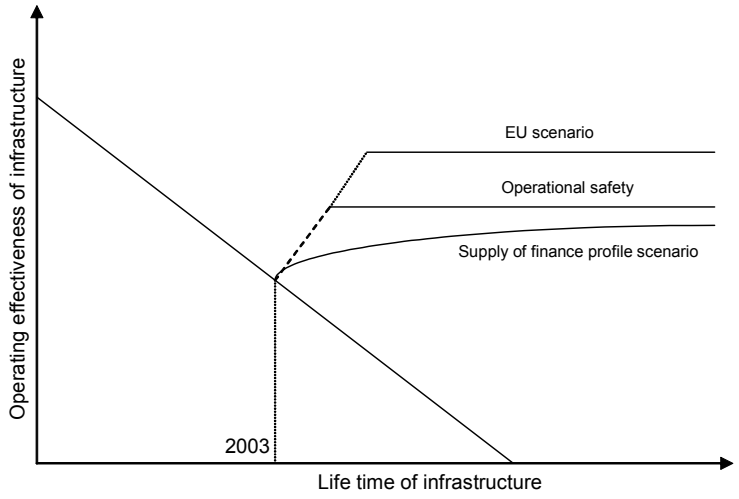
The financing strategy was developed using the FEASIBLE model. This model relies on generic cost functions and water utility specific data from a large number of water utilities to generate information on expenditure needs. This information is then aggregated and compared to available sources of funding to determine the share of expenditure needs that can be financed. FEASIBLE generates information on alternative specifications of the financing gap and assesses affordability.

Definition of expenditure for capital reinvestment (repair)
For a well-operated and well-maintained system, the annual capital reinvestment expenditure is defined to include the capital repairs necessary to maintain the technical ability of the system to perform at the same level over time. This would, for example, include the cost of replacing 1 km of pipe once the existing pipe has reached the end of its effective or serviceable lifetime.

Definition of operation expenditure
Operation expenditure includes daily operation expenditure, such as chemicals, labour, etc. as well as current repair of the system.

The above means that, if only operation expenditure is provided for, the value of the system will decrease. This will, in turn, lead to a reduced service level - with some time lag. The sustainable capital reinvestment level is thus defined as the expenditure needed to keep the system at a constant level over time - where constancy applies to the value of the system and its operational effectiveness.

Figure 5.1 Principles of rehabilitation, capital reinvestments and operating expenditure



Source: The FEASIBLE Model, Manual/Documentation, COWI 2001

Renovation
The figure illustrates that, if the system is not properly maintained, its value will decrease. Consequently, investments will be necessary to bring the level back to the starting point. Such investment expenditure is labelled renovation expenditure or rehabilitation expenditure.

Backlog of capital reinvestment
If capital reinvestment is less than what is required to keep the value of the system constant, the service level is likely to drop - but with a certain time lag. We have named the accumulated lack of capital reinvestment: "the capital reinvestments backlog". The size of the capital reinvestment backlog gives an indication of the reduction in service level that is likely to occur as a consequence of deferred capital reinvestments.

However, prior to the service deterioration, the lack of capital reinvestments is likely to result in increased operation expenditure. This can be due to, for example, increased leakage or lower pumping efficiency. However, the relationship between the lack of capital reinvestments and the effect on operation expenditure is very enterprise-specific. Exact knowledge on the relation would require exactly information as to which type of equipment and machinery would not be maintained.

Current service level as starting point
When defining the current service level and thus the capital reinvestment expenditure required to "continue to perform at the same level", we take the current service level, not the design service level, as the starting point. Thus, if for example, a wastewater treatment plant was built to provide mechanical and biological (MB) treatment, but has deteriorated to a point where it only provides mechanical treatment, we have included this fact in the description of the current situation and in FEASIBLE as a mechanical treatment plant. This means two things: O&M expenditure is lower than it would have been for an MB plant. However, to achieve MB service level, a new investment (equivalent to the extra investment to move from M to MB plant) is needed.

Other assumptions
In terms of model forecasts, the estimation of O&M expenditure rests on two important assumptions. First, it is assumed that capital reinvestments expenditure is invariable in constant real prices, i.e. equivalent to linear depreciation of the infrastructure. Second, it is assumed that the operational expenditure increases or decreases, subject to lacking or increasing capital reinvestments.

5.3 Data collection

In order to carry out the gap and affordability analyses for the baseline scenario, three types of information were used in FEASIBLE:

- technical indicators of the current and targeted service levels to calculate expenditure in the sector,

- macroeconomic indicators and price correction data, and
- information on the supply of finance.

Water utility specific data
A major data collection effort was required to develop baseline inputs for expenditure needs and certain sources of supply of finance. A model-specific questionnaire on the current service levels and present condition of the vodokanals assets was filled in by two teams of local consultants appointed by the Derzhitlocomungosp. The questionnaire covered technical data, such as installed and utilised capacities for water supply and wastewater treatment services, sources of water supply, actual supply and treatment volumes, lengths and coverage of supply distribution pipelines and waste collection networks.

Altogether, 472 Ukranian cities, towns and townships with a population of over 10.000 inhabitants were included in the original questionnaire. With 4.2 billion m^3 of water supplied per year, they represent 75% of the Ukranian municipal water supply and sanitation. Following the completion of the data collection exercise, input data sheets for 78% of the water supply and 69% of the sanitation system originally covered by the questionnaires were prepared (measured by the number of cities). The data collected represents 94% of the water supplied and 93% of the wastewater collected for the cities of over 10,000 inhabitants.

National level data
Data on national financing for municipal water and wastewater has been collected by the team from the following sources:

- the break-down of the consolidated state budget for 2000 by spending items, including current and capital expenditure in water supply and sanitation from the Ministry of Finance;
- the break-down of environmental funds expenditure from the MNREP,
- information on structure of costs and revenues of vodokanals on the oblast-basis from the Derzhitlocomungosp (monitoring reports)
- information from donors and IFIs on investment funding of vodokanals (grants, loans).

Furthermore, macroeconomic data has been gathered from published statistics, as well as the official forecast of macroeconomic development by the Ministry of Economy and the Ministry of Finance. The team received this forecast at the beginning of 2001.

5.4 Existing situation

This section presents an overview of the existing situation, as it can be understood based on the data collected.

5.4.1 Municipal water supply

The cities and towns included in the analyses have been grouped around two classification parameters which bring together cities and towns with similar infrastructure:

- the size of the town measured by the size of population, with 3 size groups: 10,000-50,000 inhabitants, 50,000-100,000 inhabitants and 100,000-300,000 inhabitants;

- the technological complexity of the renovation problem of water supply assets, with 4 groups of problems complexity for 2 types of initial water quality:

    - compliant water quality, the system requires general renovation not leading to water quality improvement;

    - non-compliant water quality, the system requires renovation that will lead to the required quality improvement;

    - non-compliant water quality, the system requires expensive renovation (the design is not fit to deal with the problem);

    - non-compliant water quality, the system requires general renovation and improvement of iron and magnesia treatment that will lead to the required quality improvement.

The number of cities placed in each category is as follows:

Table 5.1 Grouping of cities (number of cities in each category and average population in 1,000 inhabitants in parenthesis)

Technical categorisation	Size of cities ('000 inhabitants)		
	10-50	50-100	100-300
Compliant water quality, the system requires general renovation not leading to water quality improvement	207 (20)	25 (67)	15 (169)
Non-compliant water quality, the system requires renovation that will lead to the required quality improvement	-	-	5 (216)
Non-compliant water quality, the system requires expensive renovation (the design is not fit to deal with the problem)	77 (21)	8 (67)	7 (138)
Non-compliant water quality, the system requires general renovation and improvement of iron and magnesia treatment that will lead to the required quality improvement	84 (20)	20 (80)	4 (255)

Furthermore, the infrastructure of the following 20 cities with a population of over 300.000 inhabitants has been analysed separately:

Table 5.2 Major cities analysed separately

Kyiv	Lugansk
Harkov	Vinnitsa
Dnepropetrovsk	Makeevka
Donetsk	Herson
Odessa	Sevastopol
Zaporozhe	Simferopol
Lviv	Gorlivka
Krivy Rig	Poltava
Nikolaev	Chernigiv
Mariupol	Cherkassy

The following main production and service level parameters of the municipal Ukrainian water supply system have been analysed:

- connection rate to the centralised water supply systems;
- source of water supply;
- total water production covering water consumption by households and others, water losses in the distribution network and unaccounted-for-water;
- total water losses and unaccounted-for water;
- regularity of water supply, defined as supply for more than 10 continuous hours per day;
- distribution of population by the quality of water it receives;
- estimated technological renovation need of the water supply assets.

The aggregated parameters for the main characteristics of the existing service level are presented in the table below.

Table 5.3 Municipal water supply: Levels of production and water losses

Item	Share of total supply from groundwater sources	Total water production	Water loss in the distribution network and unaccounted-for water	
Size of municipality	% of total pop.	lcd	% of total production	m^3/km/day
>300,000	12%	559	27%	78
100,000 - 300,000	22%	443	32%	50
50,000 - 100,000	18%	472	34%	28
10,000 - 50,000	49%	348	23%	13

Source: Questionnaires to vodokanals

The aggregated parameters for the main characteristics of the existing service level are presented in the table below:

Table 5.4 Municipal water supply: existing service level

Item	Share of population in the total sample	Connection rate to central water supply	Share of connected population with irregular supply	Estimated renovation need for network	Share of population in different water quality groups		
Size of municipality	% of the sample's total population	% of total population	% of total population	% of total replacement value	Acceptable drinking water quality	Poor quality, improvements are possible at reasonable costs	Poor quality and major renovation needed
>300,000	61%	88%	10%	38%	48%	39%	13%
100,000 - 300,000	19%	92%	6%	42%	58%	31%	11%
50,000 - 100,000	8%	75%	40%	46%	48%	42%	10%
10,000 - 50,000	13%	75%	19%	52%	68%	19%	14%

Source: questionnaires to vodokanals

The municipal water supply system has the following characteristics:

Service levels

- nearly 2/3 of the population with water supply from centralised sources live in 20 towns and cities with a population of over 300,000 inhabitants

- the connection rate to the centralised water supply system is rather high, ranging from 75% in small towns to 92% in the towns with a population between 100,000 and 300,000

- the regularity of water supply is especially problematic in the small towns up to 100,000 inhabitants, where 20%-40% of the population has irregular supply

- the regularity problem obviously comes along with the poor condition of the infrastructure, which is worst in the small towns

- although assets have deteriorated more in small towns, that is also where the population receives drinking water of an acceptable quality (defined by the Derzhzhytlokomungosp), and this trend seem to correspond with the share of water supplied from groundwater sources. Apparently, the groundwater in the Ukraine is of higher quality than surface water

- some 50-70% of the towns are supplied with water of an acceptable quality, while in the remaining 30-50%, the water quality can be improved by renovation of assets. However, in 10%-15% of the towns, such renovation requires major redesign of the water treatment system, since the present design can no longer address the local water quality problem.

Figure 5.2 Water supply connectivity

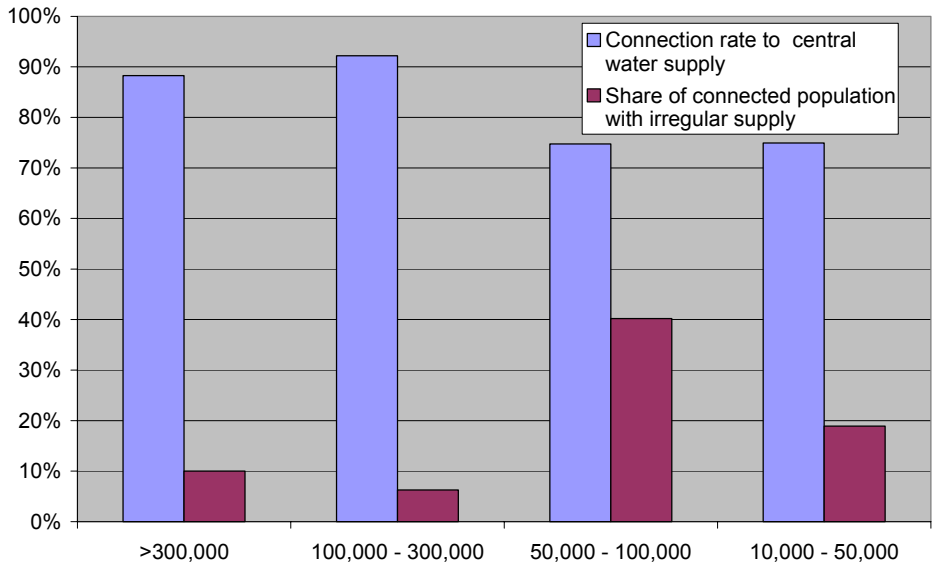
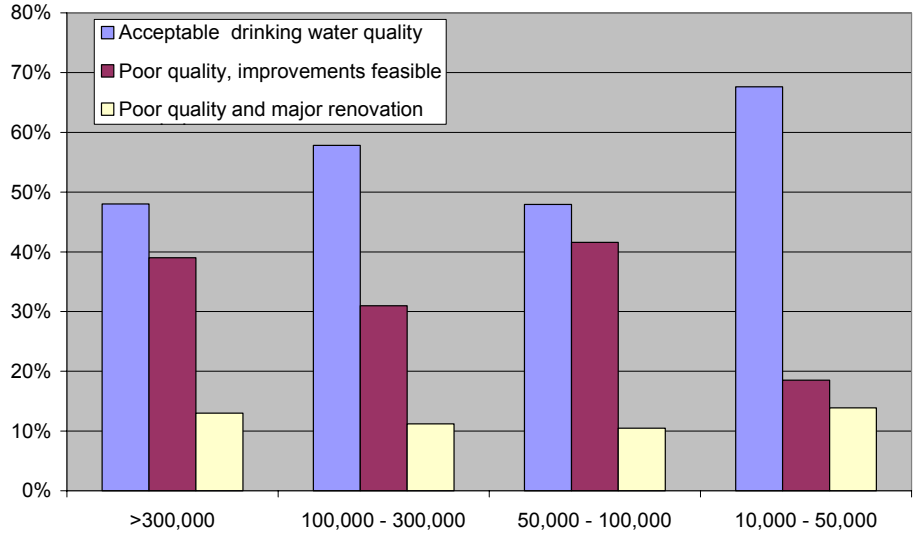


Figure 5.3 Water quality



Production levels

- in terms of production, the level in cities above 300,000 inhabitants is as high as 559 lcd. The production level goes down with size of the town, but still remains excessively high even in the small towns (348 lcd in the towns of 10,000-50,000 inhabitants). Such a high level of production clearly implies a very high share of energy in the total O&M cost (32% in 2000, according to the Derzhzhytlokomungosp)

- the high level of losses in the distribution network is consistent with the high production level. According to the records, some 30% of the water supplied to the distribution network is lost. Supposedly, this is an underestimation, since more losses may be hidden in the excessively high norms of consumption of the population.

- the losses per kilometre of the distribution network fall with the size of the town, which is, to some extend, justified by the decreasing average diameter of the pipeline. However, the difference is too significant (78 m^3/km/day in the cities over 300,000 inhabitants and 13 m^3/km/day in the smallest cities) and that questions the validity of the data.

Figure 5.4 Losses in water production

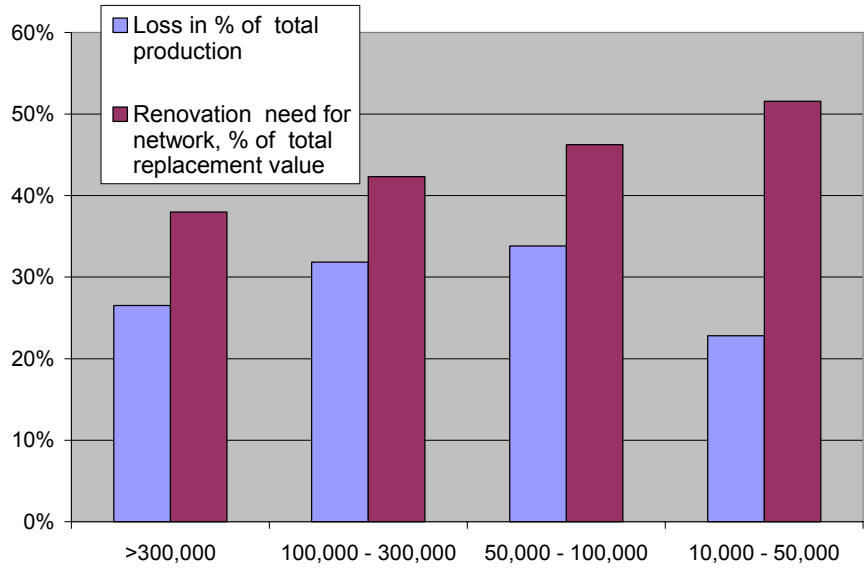
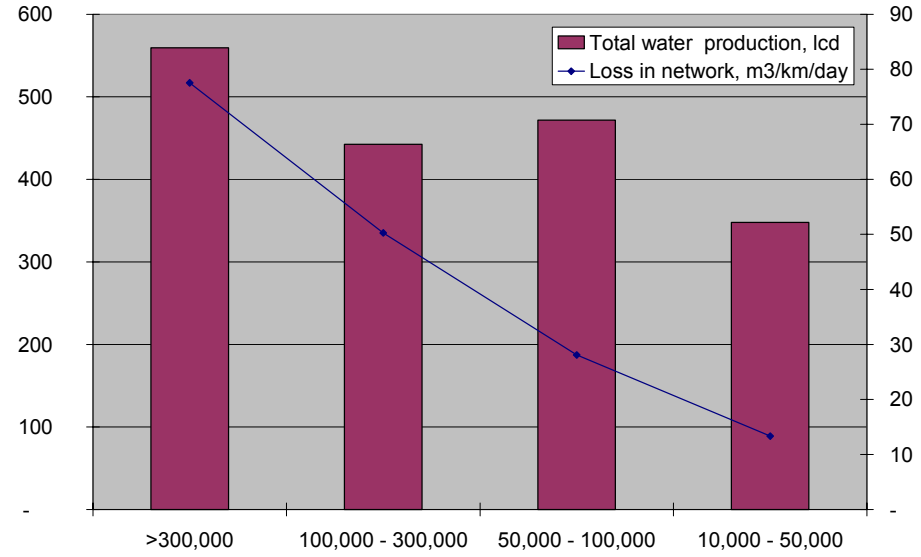


Figure 5.5 Water production



5.4.2 Wastewater collection and treatment

Wastewater collection and treatment data has been grouped in the following categories:

Table 5.5 Treatment categories

Category 1	Population of 100,000 - 300,000, MB treatment
Category 2	Population of 50,000 - 100 ,000, MB treatment
Category 3.1	Population of 10,000 - 50,000, MB treatment
Category 3.2	Population of 10,000 - 50 ,000, M treatment
Category 3.3	Population of 10,000 - 50,000, without treatment

The categories have been grouped around two classification parameters which bring together cities and towns with similar infrastructure:

- the size of the town measured by the size of population, with 3 size groups: 10,000-50,000 inhabitants, 50,000-100,000 inhabitants and 100,000-300,000 inhabitants;
- the technological complexity of the wastewater treatment approach with 2 types of treatment: mechanical (M) and mechanical-biological (MB).

Furthermore, the 20 cities named in the water section above have been analysed separately in terms of wastewater collection and treatment, as well.

The following main production and service level parameters of the municipal Ukrainian sanitation system have been analysed:

- the connection rate to the centralised sewers;
- the technology applied for treatment of the collected wastewater;
- the net infiltration in the collection network (reflected in the concentration of pollutants at the inlet to the wastewater treatment plant);
- the total wastewater production covering wastewater production by connection to centralised sewers;
- the estimated technological renovation need of the wastewater system assets.

The aggregated parameters of the main characteristics of the existing service level are presented in the table below:

Table 5.6 Municipal wastewater collection and sanitation: main characteristics

Item	Connection to centralised sewers	Typical treatment	BOD concentration in in-flow to WWTP
Size of municipality	%	M or MB	mg/l
>300,000	81%	MB	166
100,000 - 300,000	85%	MB	160
50,000 - 100,000	48%	MB	190
10,000 - 50,000	45%	MB	204

Source: questionnaires to vodokanals

The municipal sanitation system has the following characteristics:

- the connection rate to the centralised wastewater system is rather high, but not as high as the connection rate to the water supply system: ranging from 45% in smaller towns (75% is connected to water supply) to 85% in the towns with a population between 100,000 and 300,000 (95% is connected to water supply);
- the deterioration of assets in the sanitation systems is similar to that of the water supply systems (40-50% of replacement values);
- although the assets have deteriorated more in small towns, even there, the main treatment technology is mechanical-biological treatment.
- the high level of net infiltration (reflected in a low concentration of BOD5 at the inlet of the WWTPs) is consistent with the high production level.

5.5 Definition of expenditure categories

In FEASIBLE, expenditure needs are calculated separately for water supply, wastewater collection and wastewater treatment[19].

For **water supply,** the service level is specified in terms of water source (groundwater vs. surface water of normal quality vs. surface water of poor quality), the quality of water supplied to the consumers and the population covered by piped water supply (both household connections and standposts in the street).

For **wastewater collection,** the service level is specified in terms of the population connected to and the acreage covered by a piped sewer system and the type

[19] The calculation method is described in detail in COWI (2001): Model documentation, Copenhagen May 2001.

of storm water collection[20]. This leads to requirements for a specific length and dimension of sewers.

For **wastewater treatment,** the service level is specified in terms of treatment of a specified inflow wastewater quality and volume to a given effluent quality. These requirements lead to a particular wastewater treatment plant technology.

Capital reinvestments expenditure
The cost of maintaining water abstraction, water treatment and water distribution facilities is based on the physical structures required to perform a given service level, their estimated lifetime and their price (replacement price as new). The assessment is broken down by main components such as land, buildings and machinery. The estimates of the required physical structures and their lifetime are based on international experience as documented in the model documentation paper[21]. The cost of capital reinvestments in the wastewater collection system and the wastewater treatment plant is assessed in a similar way. The prices reflect local conditions, though.

Operational expenditure
The cost of operating the wastewater or water supply systems is also based on the consumption of physical volumes (labour, power, chemicals etc.) and their price. The estimates of the required physical volumes are based on international experience as documented in the model documentation paper.

Correction of prices and productivity
When calculating expenditure, FEASIBLE utilises the prices of various factors of production based on international prices. These are then corrected to reflect the level of prices in the Ukraine using the following indicators.

Table 5.7 Key prices, relative prices and relative input intensities for the Ukraine compared to international prices and input intensities (constant 2002 prices)

Key prices	Units	2003	2023
Electricity consumption at local water utilities per m3 of water relative to the average international level	times	1.8	1.0
Labour consumption per unit of output in construction, water utilities, engineering design relative to the average international level	times	2.0	1.0
Average price of water supply equipment	% of international level	40%	70%
Average price of wastewater equipment	% of international level	40%	70%
Average price of construction materials	% of international level	40%	70%
Average wages of a construction worker	UAH/month	450	1009

[20] The tool distinguishes between the following four technologies: Single pipe separate system, single pipe open channel, combined system and double pipe separate system. It is possible to specify more than one technology for a given city.
[21] Please refer to COWI (2001)

Key prices	Units	2003	2023
Average salary for design and administration	UAH/month	550	1233
Average salary at public utilities	month	350	785
Opportunity price of land	UAH/m²	0.00	0.00
Electricity border price	UAH/kWh	0.18	0.26
Average price of water treatment chemicals	% of international level	40%	70%
Average price of wastewater treatment chemicals	% of international level	40%	70%

Source: Consultant estimates of typical values for Ukraine relative to the price and input intensity used for the cost functions (based on Western European cost and levels of intensity).

Two types of corrections are made.

Price corrections are made to reflect the difference in the price of electricity, labour and other inputs in the Ukraine as compared to the international (EU) prices used in the cost functions. A 2003 labour price correction factor of 0.5 means that the salary/wages in the Ukraine is 50% of the average European salary in certain sectors of economy (construction, engineering consultancy, public utilities). Similarly, a 2003 energy price correction factor of 0.7 means that the electricity price in the Ukraine is 70% of the international electricity price

The **productivity** of labour and pump (energy) efficiency can be corrected to reflect the national productivity/efficiency relative to the international (EU) level used in the cost functions. The correction factors are defined in terms of input intensity. Thus, a 2003 labour productivity correction factor of 2 means that one unit of EU labour is equivalent to 2 units of Ukrainian labour. Similarly, in 2003 it took around 1.8 times more kWh of energy to deliver 1 m^3 of water to the user (or, for that matter, to collect and treat 1 m^3 of wastewater) in the Ukraine than it did, on average, in the Western European countries.

The resulting labour and energy correction factors are the product of the price correction factors and the productivity/efficiency correction factors. The starting 2003 price and productivity corrections were made by the wastewater and water supply experts of the team by comparing the average international indicators suggested by the cost functions with indicators reported by the sample water companies. The 2023 correction factors resulted from assuming the real price growth and efficiency gains in the Ukraine in the next 20 years, assuming that the Ukraine will increasingly draw near the European and international economies. See the forecast of real price growth by years in section 5.7.1.

Table 5.8 Correction factors for water supply and sanitation expenditure in 2003 and 2023

Correction factors	2003	2023
Investment, rehabilitation, and maintenance cost		
Equipment	0,4	0,7
Civil works, of which:		
Materials	0,4	0,7
Labour	0,1	0,2
Consultancy and administration	0,1	0,1
Other cost, of which:		
Contingencies	0,5	0,5
Operational cost		
Energy	1,2	1
Materials	0,4	0,7
Labour	0,1	0,1
Other	0,5	0,5

Source: Consultant's own estimate

It should be noted that the cost functions assume that systems are operated according to their operational specifications. Thus, inadequate operations (for example depressed use of chemicals for water treatment due to liquidity constraints) cannot lead to operational savings in FEASIBLE[22]. This reflects the basic assumption that a given service level is explicitly linked to a particular technology.

In the Ukraine, there may be differences in costs due to unique local circumstances (such as regional differences in the price of power or wages). However, such differences are not reflected in the correction factors. FEASIBLE operates with pan-territorial prices.

The real prices of various inputs are very likely to change in the long-term perspective. The correction factors calculated for the Ukraine (including a few key prices that are entered directly into FEASIBLE), both at present and in the long-term perspective, are summarised in Table 5.7.

In the baseline, the expenditure needs will be changing from year to year only due to the real price increase. This reflects the characteristic of FEASIBLE in that the generic cost functions have a linear capital reinvestments cost that depends only on the current service level (and the corresponding required technology).

[22] In recognition hereof, the water utilities chosen for the analyses of the appropriate correction factors have been water utilities that were operated properly in accordance with their design standards.

5.6 Supply of finance

In order to develop a comprehensive understanding of the existing situation, it is important to have a clear view of the currently and potentially available supply of finance. Funding of water and wastewater utility services in the Ukraine is, in principle, possible from the following main sources:

- Service provider internal funds generated from user charges (tariffs);
- Public funds from both national, regional and local budgets;
- Environmental funds financing;
- External sources from international financial organisations (IFIs) and donors;
- Foreign and domestic private investment sources; and
- Domestic finance sector borrowing schemes.

Reliable information and analysis of the availability of each of the sources are important to create a realistic view of the current position of the sector. Such baseline supply of finance analysis is presented in this chapter. It will serve as a background for further scenario analysis and policy options to close the financing gap which are presented in the following sections of this report.

5.6.1 User charges (tariffs)

Long-term financing of the water and wastewater sectors will mostly depend on the funds generated by vodokanals through user charges. Three main categories of users are distinguished in the Ukraine: households, budget organisations and industrial/commercial enterprises. For the purpose of this report, however, two groups of users will be considered, namely households (HH) and non-households (nHH). It is important to note that the budget organisations are typically charged tariff rates which are more comparable to those of households rather than those of industrial/commercial entities. Therefore, combining these two user categories will affect average tariff rate calculation for the non-household group, slightly biasing it downward.

Data on the revenues of each group has been complied from the "Monitoring" bulletin - regular publication of the State Committee for Construction, Architecture and Housing Policy of the Ukraine. The bulletins publish information on a quarterly and annual basis and contain detailed specification of billed and collected service revenues by user groups and oblasts, as well as aggregated figures for the entire Ukraine. While the data is, most likely, the best available of its kind, it is not without shortcomings. First, it is based on the vodokanal standard accounting information and practices, which are not fully consistent with the international standards of enterprise accounting. Second, due to lack of metering revenues are determined on the basis of consumption norms rather than actual water demand.

For the entire Ukraine, billed revenues from centralised water and wastewater services accounted for EUR 507 million in 2001. The figure has been adjusted to reflect the fraction of the population covered by the model with a resulting total revenue in 2001 of EUR 385 million (Adjustment by down 25% for all consumer groups). Table 5.9 below presents summary information on the user charges by customer categories which was used as the starting level for derivation of baseline scenario revenues.

Table 5.9 User charges, 2001 (000' EUR)

Users	Billed	Collection Rate	Collected
Households (HH)	161,675	80%	129,340
Non-Households (nHH)	223,073	70%	156,151
Total/Average	384,748	75%	285,491

The total household charges in 2001, as show in table above, are in the range of EUR 162 million for the fraction of the population covered by centralised water supply and included into the model calculations. In order to derive the starting baseline level of HH revenues, this figure has been adjusted to reflect the real growth rate in 2002-2003 and the inflation rate in 2002. The resulting total HH user charges in 2003 stand at EUR 179 million (in 2002 prices). With the collection rate of 80% for households, this results in an actual revenue inflow to the sector in the amount of EUR 143 million. This represents an actual cash inflow into the water and wastewater sectors, assuming that there is no barter or other type of non-monetary settlement. This figure has been used as the HH user charges level for the 2003 start year for baseline scenario calculations.

Total non-household group charges in 2001 stand at the level of EUR 223 million. With a group rate of real growth and inflation adjustment similar to that of th HH group, a 70% collection rate and an assumption of all cash payments, the resulting revenue from this group in 2003 ends at EUR 247 million. Table 5.10 presents a summary of the user charges in 2003 used as the starting level of baseline scenario revenue calculations.

Table 5.10 User charges, 2003 (000' EUR)

Users	Billed	Collection Rate	Collected
Households (HH)	179,157	80%	143,326
Non-Households (nHH)	247,214	70%	173,050
Total/Average	426,371	75%	316,376

User charges are determined on the basis of a "cost plus" formula. The practices for establishing user tariffs have been amended recently by several regulatory documents, among which the "Procedure for Pricing Centralised Water and Wastewater Services" is the most essential. It was developed by the State Committee for Construction, Architecture and Housing Policy of Ukraine together with Anti-Monopoly Committee, and it is targeted to introduce elements of economic efficiency and equity into revenue requirement determinations. The new procedure targets full cost recovery of economically justified costs and allows recovery of the operating expenses, financial costs, and investment cost components of the utility. Utilities (vodokanals) can initiate tariff revision, which is then further subject to assessment and approval by the municipality.

Existing rules and procedures do not clearly specify mechanisms for allocating calculated revenue requirement to user categories. Typical practice is to distribute the total billable revenue according to the services consumed by each category. The service consumption is, however, based on the state norms rather than on actual demand, mostly due to the lack of metering capacity. Furthermore, the initial allocation of revenues according to consumption levels is frequently modified, reflecting mostly political and social considerations. This has resulted in a significantly differentiated tariff system in the Ukraine where industrial and commercial entities usually pay several times more per m^3 of consumed water than households. In addition, there is a widespread practice of service payment exemption or discounts for privileged groups of customers. In many cases, however, eligibility for such reductions is not determined by the level of personal disposable income, but rather the association with a specific social group. Overall, the revenue requirement allocation between customers is assessed to be inefficient and unfair, and several documents and procedures are on the way to:

- Gradually eliminate cross-subsidisation among users; and
- Replace the current system of subsidies and privileges with targeted cash assistance to families on the basis personal income levels.

5.6.2 Public funds

In order to calculate the funds publicly available to the water sector, we have analysed the macroeconomic development in the country over the last two years, evaluated government budgets and their execution over the same period of time, estimated current and potential consolidated public expenditure as a share of the GDP, and, similarly, assessed the share of expenditure allocated for investment in the water and wastewater sectors.

The macroeconomic development in Ukrainian economy over the last two years were very positive. As discussed before, GDP has grown with impressive 9.2% in year 2001, and, although, has slowed down in 2002, is estimated to have increased by 4.6%. Consolidated public expenditure amounted to approximately EUR 12 billion in year 2000 and EUR 13.7 billion in 2001, what have constituted 35.3% and 34.2% of corresponding annual GDP. Although the

final figures are not yet available, it is estimated that the fiscal stance has improved in 2002. However, in light of the falling enterprise profit tax, lower than expected privatisation proceeds, recent cabinet reshuffle, and significant differences over budget between parliament and government, it is still early to talk about fiscal stabilisation. Therefore, for further analysis and scenario calculations a conservative 36% of consolidated public expenditure as share of GDP has been assumed. With average forecasted GDP in 2003 at EUR 45 billion, this results in consolidated public expenditure at EUR 16 billion.

At the next step, the share of water and wastewater expenditure in total public funds was assessed. Such data has, in general, been very difficult to obtain. Moreover, information from different sources represented significant variation in estimates. Therefore, for the purpose of this analysis, the decision was made to utilise data obtained from the State Committee for Construction, Architecture and Housing Policy, which was regarded as the most reliable source. According to this data, a total of EUR 48 million was available for water and wastewater service providers from public funds in 2000[23]. This represented 0.4% of the public expenditure of the corresponding year, or 0.15% of the GDP. The amount is significantly lower than the similar figure for comparable economies in the region. Therefore, formally, there is room for increased contributions to the sector from the budget. Diverse discussions with sector officials and specialists, however, indicated that such increase is highly uncertain, at least in the short to medium terms. As a result, only a modest increase in the share of the water sector in total public expenditure was assumed, totalling 0.4-0.5% in the medium and 0.6% in the longer term. Given previously estimated EUR 16 billion of consolidated government spending in 2003, thecorresponding amount of water sector funds to be used as a baseline scenario is EUR 65 million. Table 5.11 below summarises the discussion of public funds for baseline scenario calculations.

Table 5.11 Public funds available to the water sector, baseline scenario

EUR million, 2002 prices	2000	2001	2002	2003
Real GDP	33,994	40,058	42,900	45,000
Share of public expenditure	35.30%	34.20%	35.00%	36%
Total public expenditure	12,000	13,700	15,015	16,200
Share of water and wastewater sectors in public expenditure	0.40%	0.40%	0.40%	0.40%
Total water and wastewater sector expenditure	48	54.8	60.06	64.8

Source: Country data, EIU, IMF

[23] It is important to note that this figure includes not only direct capital (investment) allocations, but also operational subsidies to water utilities from national and local public budgets.

5.6.3 Environmental funds

Sufficiently accurate data on financing of the water sector from environmental fund resources is not available. The information presented below is a result of data compilation from many different sources (including data from the Ministry of Environment and Natural Resources and the State Committee for Construction, Architecture and Housing Policy of the Ukraine) and, as such, it should be treated with caution. In addition, only aggregate data for the year 2000 was made available to the team.

The total amount of environmental funds financing in the year 2000 is estimated at around EUR 14 million. Of this amount, approximately EUR 7.8 million was allocated to water and wastewater projects, which represents 56% of the total eco-funds financing available. Approximately 30% of the amount allocated from the State Environmental Fund, with the rest coming from the environmental funds of local/oblast level.

The environmental funding system in the Ukraine is still at the initial stage of its development. The funds are, typically, not independent legal entities and do not have their own administrative structure. They are rather a budget line with revenues accumulated from pollution charges and fines. Funds are typically distributed according to the financing strategies and spending allocation plans which specify priority areas and projects. We have assumed that the funds allocation priorities will be retained in the near future and that water sector projects will receive a constant share of 56% from the total funds available. The absolute amount of the funds from the year 2000 has been adjusted for the real growth in 2002-2003 and inflation in 2002, and it is assumed to grow further with the rate of real GDP growth. As a result, the total environmental funds revenues in the Ukraine have been estimated to reach EUR 18.5 million in 2003. The corresponding expenditure for the water sector amounts to EUR 10.4 million. This figure has been used as the baseline supply of finance from eco-funds. Table 5.12 below summarises the discussion.

Table 5.12 Environmental funds financing, baseline scenario

EUR million, 2002 prices	2000	2001	2002	2003
Total environmental funds	14.0	16.7	17.6	18.5
State EF	4.2	-	-	-
Local EF	9.8	-	-	-
Water and wastewater sector expenditure	7.8	9.4	9.9	10.4
Share of water and wastewater sector	56%	56%	56%	56%

Source: Ministry of Environment and Natural Resources, State Committee for Construction, Architecture and Housing Policy

5.6.4 External financing (international financial organisations and donors)

Financing from international financial organisations and donors is available to the Ukraine. Aggregate data on such funding for water and wastewater sector projects is not readily available. It has, however, been estimated that, on an average annual basis in recent years, the amount of IFI and donor loans and grants has not exceeded 0.1% of the overall water and sanitation sector expenditure. This, in itself, indicates that while further effort should be put into attracting bilateral and multilateral international financing to the sector, it will address only a small fraction of the ongoing investment needs. The review below briefly describes international funding for the Ukraine in recent years and, where possible, identifies direct financing of water sector projects[24].

EU

The indicative programme approved within the TACIS framework at the end of 2001 has allocated funds at a total amount of EUR 115 million for the period 2002-2003. The priority areas of financing have been identified as: institutional, legal and administrative reform; support to private sector development; and addressing social consequences of reforms. In total, in the ten/year period 1991-2001, the Ukraine received EUR 1,072 million under different programmes financed by TACIS. In terms of the water sector, TACIS has provided USD 1.5 million for the Water and Wastewater Utility Project in Mariupol.

World Bank

As of the first quarter of 2002, the total World Bank commitment to the Ukraine reached USD 3.22 billion with the net disbursement totalling at USD 2.4 billion. Currently, in implementing the Country Assistance Strategy, two scenarios have been identified: the Base Case and the Low Case, with corresponding funding of USD 1.8 billion and USD 461 million, respectively, in the period 2001-2003. In terms of infrastructure development projects, this has resulted in USD 24.2 million being allocated for the Lviv Water and Wastewater project. The funds were approved in June 2001.

EBRD

The total cumulative financing committed to the Ukraine by the EBRD stands at EUR 1.42 billion. Of this amount, only USD 27.9 million has been committed to the water sector, namely the Zaporizhiya Water Utility Project. The project implementation has been very slow, but was picking up in late 2002. This could create positive ground for success in two other water sector projects - Kherson and Mariupol. Furthermore, the Country Strategy approved at the end of 2002 indicates that "in near terms bank's activities in the sector will revolve around the second phase of the Municipal Utilities Development Programme involving water utilities in 2-3 secondary cities".

[24] For use in the model calculations, all figures not quoted in EUR in this section have been converted to EUR using the relevant end 2001 exchange rates. Throughout the report, however, figures quoted in UAH have been converted using an average exchange rate for 2002.

Bilateral Assistance
In terms of bilateral agencies the largest volumes of funding are provided by USAID (USA), CIDA (Canada) and Transform (Germany). The USAID budget for 2002 amounts to USD 72.1 million. The agency has supported water supply and sanitation sector actively since 1995 with total of USD 10 million in grants. USAID runs the Tariff Reform and Communal Services Enterprises Restructuring project, which specifically addresses, among other municipal infrastructure, issues related to water supply and sanitation. No water sector financing has been identified in funds provided by CIDA and Transform. These agencies prioritised projects in aimed at strengthening institutional support for reform, governance, foundations of civil society as well as consultancy support for the presidential administration. Transform also provides training funds for civil servants and SME managers.

Among other bilateral support programmes, it is important to mention Denmark with assistance provided through DANCEE since 1991. The total support allocated in grants amounts to DKK 172 million, of which approximately 50% have been directed to the water supply and sanitation sectors. Through FINIDA, Finland has provided co-financing at the amount of DKK 15 million to the Kyiv Vodokanal sewer rehabilitation project. The Ukraine is one of the prioritised countries in Swedish development assistance programmes. The support is mainly coordinated by SIDA which had a budget of SEK 64 million for the Ukraine in 2001. SIDA is a co-financer of the Lviv Water and Wastewater Project and has committed SEK 48 million for the project. The Swiss assistance is close to USD 6 million a year. It is coordinated by SDC and focuses on following key areas: energy, environment and the banking sector. So far, SDC has invested USD 5.9 million in the Mariupol Water and Wastewater Project - pumping station rehabilitation.

Other bilateral donors are the Netherlands (total of EUR 59.4 million in the last decade), Japan (total grants of USD 115.3 million and USD 200 million of united loans), the United Kingdom (approximate budget of GBP 9 million annually managed by DFID), France (total funds in 2000 of EUR 4.6 million), and Italy (USD 1 million budget for year 2000). However, our detailed analysis has identified no water sector financing from these sources.

To summarise, the total amount of identified financing for water and wastewater sector projects is in the range of EUR 109 million in the baseline scenario. It is important to note that, while committed, not all of these funds have yet been disbursed. Also, not all of those funds have been used for direct capital investment projects. A significant share has been utilised for technical assistance, project preparation, feasibility studies, etc. We have, however, used this figure as potentially available financing already in 2004 from all available IFIs and donors.

5.6.5 Private sector participation

In many countries in the region, privatisation of water supply and sanitation services has frequently lagged behind other sectors in the economy. This is par-

tially explained by the vision of the sector as part of the public obligation of the authorities as well as, typically, the "limited profitability" status of the business. The situation is no different in the Ukraine. While the privatisation of other infrastructure utilities such as energy and telecommunication is well on the way, potential private participation in water sector services is only starting to be considered.

Given the current state of the water utilities, significant investment needs to rehabilitate existing assets, lack of the proper legal and institutional framework guaranteeing collection of user charges, unclear relationship between stakeholders, lack of proper price regulation, and long payback period of potential investments, it is reasonable to conclude that private investment potential for water sector projects in Ukraine is low. This does not necessarily mean that water utilities in selected, especially large cities, cannot be in the focus of domestic and foreign private investors. Such financing, however, will be small compared to the overall sector financial needs.

Besides, it is very difficult to forecast private investment availability. Data from other countries does not provide consistent ground for benchmarking as their success in attracting private investment in water services varies significantly. Further scenario analysis has, therefore, been conducted bas on the assumption that no private financing will be available for water infrastructure projects.

5.6.6 Domestic financial markets

The potential financing available for water sector projects from domestic financing sources is limited. This is partially due to the low creditworthiness of water utilities, but it is also related to the slow pace of reforms in the banking and financial sectors in the country.

The banking system in the Ukraine is two-tiered, with the National Bank playing the legislatively assigned supervisory role. In early 2002, 189 commercial banks were registered in the country, of which 6 had 100% foreign capital and another 22 a foreign capital share. The seven largest banks accounted for 50% of all banking assets. In the same period (early-2002), about 35 commercial banks were in the liquidation.

The positive development in the overall macroeconomic situation in the country during recent years has been reflected in certain improvements in the Ukrainian banking sector. Banking activity in terms of deposits, credits and profitability increased in 2001 and 2002. The volume of deposits rose by approximately 50% year by year in nominal terms in 2001. Long-term bank lending increased by 60% in nominal terms, in the same year. In general, this trend is expected to continue, supported by the relative macroeconomic stability and recently implemented and upcoming changes in banking legislation. It is, however, important to note, that the high percentage increases above reflect an initial very low base level. Overall, the degree of banking activities in the real sector of economy and the volumes of deposits and credits remain significantly lower than in other central and eastern European countries. Despite the above

mentioned substantial growth in credit volumes, for example, total bank credits are equal to little more than 13% of the GDP. The total assets make up just 21% of GDP. Given these factors and also taking into account high the lending rates for bank credit, it is realistic to assume that the availability of bank financing for water sector projects will, in short to medium term, be rather limited and probably materialise only in the relatively long term, only.

The pension funds system is still in its early stages of development. While, in the long term, pension fund resources could be important factor in leveraging financial products offered by banks, their contribution in the short and medium terms will, most likely, be only marginal. Furthermore, the capital markets in the country are illiquid, trading is non-transparent and it will not provide any stable flow of project financing to the water sector.

Given the above arguments, we have assumed that water utilities will find it difficult or too costly to enter into credit arrangements with domestic financial sector. It has, therefore, been assumed, in the baseline scenario as well as in the further scenario analysis, that these markets will not contribute to water sector financing.

5.7 Baseline "business-as-usual" scenario

This section provides a summary of the discussion above concerning supply of finance sources for the water sector. It is further extended to include the baseline scenario profile over the entire model calculations period. Furthermore the baseline costs are estimated using FEASIBLE and a preliminary analysis of the resulting financing gap and accumulated maintenance backlogs is provided. The table below summarises our discussions of baseline supply of finance using 2003 as the base year for our calculations.

Table 5.13 Summary of baseline supply of finance, EUR million

Item	Baseline funds	Targeted use
Household user charges	143	Operation and maintenance expenditure
Non-household user charges	173	Operation and maintenance expenditure
Public funds (including recurrent financing)	65	Capital investment (15%) + Operation/maintenance (85%)
Environmental funds	10	Capital investments, rehabilitation
IFIs and donors (total amount available over the period 2003-2005)	109	Capital investments, rehabilitation
Private investment	0	Capital investments, rehabilitation
Domestic financial markets	0	Capital investments, new investments
Total	500	

The period of analysis used in FEASIBLE is 2003- 2023. In order to derive values of the baseline scenario financing sources, the assumptions made in relation to each financing source are described in the following sections.

5.7.1 User charges

In order to derive a profile of the development of user charges in the baseline scenario, it was assumed that baseline revenues from both households and non-households will increase together with the real cost changes in production input prices (for example, energy prices). This basically implies that the "cost plus" mechanism of tariff formation is consistently applied and all the variations in economically justified cost elements are timely reflected in user charges. Real practice demonstrates, however, that in many regions such consistent application of tariff revision procedures does not take place due to diverse administrative, social and political considerations. Therefore, in our analysis, total financing gap will be slightly underestimated, depending on the extent of departure from consistent and timely revision of tariff procedures.

The values of cost adjustment factors, further reflected in the user charges for the baseline scenario are presented in Table 5.14 below. They were estimated based on the real price and efficiency correction factors which are expected to change in the period 2003-2023 (see section 5.5).

Table 5.14 Real cost adjustment factors (percentage annual increase)

	2003	2004	2005	2006	2007	2008	2009	2010	2011-2023
Real cost adjustment factors	0%	6%	8%	11%	14%	17%	19%	22%	25-50%

Source: Consultant's estimates

Given such adjustment and assuming no other increase in user tariffs and no improvements in payment discipline (constant collection rate as in 2003), the baseline user charges profile is as presented in Table 5.15 below.

Table 5.15 User charges profile for baseline scenario, EUR million

	2003	2004	2005	2006	2007	2008	2009	2010	2011-2023
Household user charges	143	151	155	159	164	168	171	175	2,581
Non-household user charges	173	183	187	192	198	202	207	212	3,116
TOTAL	316	334	342	352	362	370	378	387	5,698

Source: FEASIBLE

5.7.2 Public funds

The baseline scenario profile has been derived on the basis of following assumptions:

- based on detailed analysis of forecasts by national, government, and international organisations of the macroeconomic development in the country a relatively conservative estimate has been made by which the GDP growth in real terms will be 5% for the next 15 years and then gradually go down to 3% in 2023;
- the ratio of total public expenditure to GDP has been assumed to remain constant at 36%;
- the share of water and wastewater related projects in total government expenditure was fixed at the 2003 level of 0.4%[25];

The resulting amoun of public funds available for water supply and sanitation is summarised in Table 5.16 below.

Table 5.16 Public funds profile for baseline scenario, EUR million

	2003	2004	2005	2006	2007	2008	2009	2010	2011-2023
Real GDP growth	5.0%	4.5%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5%-3%
GDP	45,029	47,055	48,937	51,384	53,953	56,651	59,484	62,458	1,092,482
Ratio of public expenditure to GDP	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%
Public expenditure	16,210	16,940	17,617	18,498	19,423	20,394	21,414	22,485	393,294
Share of water funds in public expenditure	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
Water and sanitation public funds	65	68	70	74	78	82	86	90	1,573

Source: FEASIBLE

5.7.3 Environmental funds

Water-related projects constitute more that half of the environmental funds expenditure. In 2003, as estimated before, the total financing for water projects will reach EUR 10.4 million. To calculate baseline scenario profile, it was as-

[25] While already mentioned before, it is important to note again that the public funds figure includes not only direct capital investments, but also the operational subsidies to vodokanals. The level of operational subsidies will most likely be reduced over time and eventually phased out. It is, however, assumed that the subsidies will be replaced by additional budget funds for capital investment programmes and, thus, the share in total public expenditure for water projects will be kept constant in the baseline scenario and increase slightly in the main scenarios analysis.

sumed that the collected pollution charges and fines will be increasing together with the rate of real GDP growth, and the share of water projects will remain constant. The resulting figures are presented in the table below.

Table 5.17 Environmental funds resources for baseline scenario, EUR million

	2003	2004	2005	2006	2007	2008	2009	2010	2011-2023
Environmental funds expenditure	18.5	19.4	20.1	21.1	22.2	23.3	24.5	25.7	449.3
Share of water & sanitation projects	56%	56%	56%	56%	56%	56%	56%	56%	56%
Water and sanitation expenditure	10.4	10.8	11.3	11.8	12.4	13.0	13.7	14.4	251.6

Source: FEASIBLE

5.7.4 IFI and donor funds

Based on the analysis of different sources of external grants and credits for water sector projects, we have estimated that an amount of EUR 109 million in either committed or disbursed money will be available in the within the next several years. This amount has been assessed based on analysis of the international funds available to the sector during the previous five years. It should be noted that data on the annual disbursements of funds is not available and hard to forecast. For that reason, the entire amount of forecasted funds is allocated to the year 2004. Given the relatively small absolute value of the figure in comparison to other financing sources, this does not have any material impact on the calculation results or their policy implications and interpretations.

5.7.5 Baseline supply of finance profile

The total funds available to the water sector in the baseline scenario are summarised in Table 5.18 below.

Table 5.18 Baseline scenario supply of finance, EUR million

	2003	2004	2005	2006	2007	2008	2009	2010	2011-2023
Household user charges	143	151	155	159	164	168	171	175	2,581
Non-household user charges	173	183	187	192	198	202	207	212	3,116
Water and sanitation public funds	64.8	67.8	70.5	74.0	77.7	81.6	85.7	89.9	1,573.2
Environmental water and sanitation funds	10.4	10.8	11.3	11.8	12.4	13.0	13.7	14.4	251.6
IFI's and donor funds		109.0							
Total	391.6	521.7	423.3	437.7	452.3	464.5	477.4	491.1	7,522.4

Source: FEASIBLE

5.8 Gap analysis for the baseline scenario

This section presents the financial gap analysis with respect to the baseline scenario. For this purpose, FEASIBLE has been used to estimate the expenditure needs of the water sector and provide a breakdown of the total expenditure in relation to operation, maintenance and rehabilitation and investments in new connections. It is important to note again that the "business-as-usual" or baseline scenario, in fact, implies that the system will be operated at the absolute minimum level of maintenance for the next 20 years. Even the optimum level of operating cost will not been achieved. That will lead to an increase of O&M costs due to the continuously deteriorating state of the infrastructure and irreversible deterioration of the service level: increased losses and infiltration, deterioration of water quality in treatment and networks and major regularity problems.

Table 5.19 Baseline scenario supply of finance, design service level expenditure, gaps and backlogs, EUR million

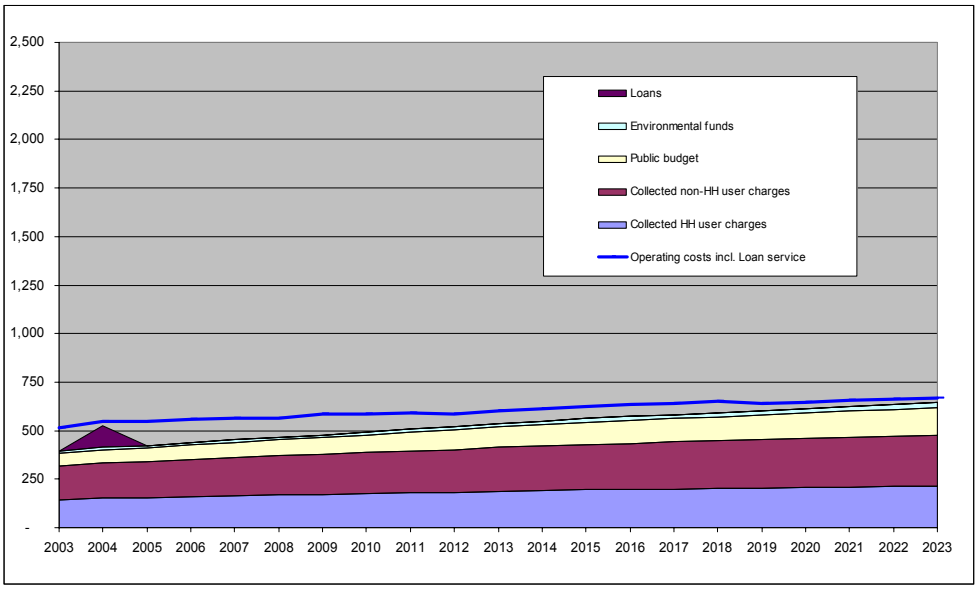
	2003	2004	2005	2006	2007	2008	2009	2010	2011-2023
Total operating expenditure and loan service*	517	546	549	556	562	564	583	586	8,208
Total maintenance expenditure	446	471	482	496	511	522	533	546	8,036
Total rehabilitation costs	0.0	547.8	560.0	576.9	593.7	606.3	619.7	634.1	649.6
New investments	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total expenditure need	963.2	1,564.9	1,590.4	1,628.7	1,666.4	1,691.4	1,736.2	1,765.5	16,892.7
Total supply of finance	391.6	521.7	423.3	437.7	452.3	464.5	477.4	491.1	7,522.4
Financing gap	571.6	1,043.2	1,167.1	1,191.0	1,214.1	1,227.0	1,258.9	1,274.4	9,370.3
Total maintenance backlog, including backlog from the past	5,171	5,468	5,881	6,307	6,742	7,184	7,686	8,199	157,448
Non-HH fraction of O&M expenditure	297.0	305.3	307.4	309.6	311.7	314.0	322.7	325.3	4,131.1

Source: FEASIBLE
NOTE: loan terms assumed: maturity - 15 years, grace - 5years, 5% - real interest rate.

Figure 5.6 below represents the same information graphically. Compared to the design service level expenditure needs, the current supply of finance is not even sufficient to cover the operating expenditure needs. In practice, it is likely that some regional and municipal utilities might be able to fully finance their oper-

ating costs. However, the "average" picture presented below demonstrates that the water sector is in significant shortage of funds.

Figure 5.6 Baseline "Business as usual", operating expenditure and supply of finance, EUR million, 2003-2023



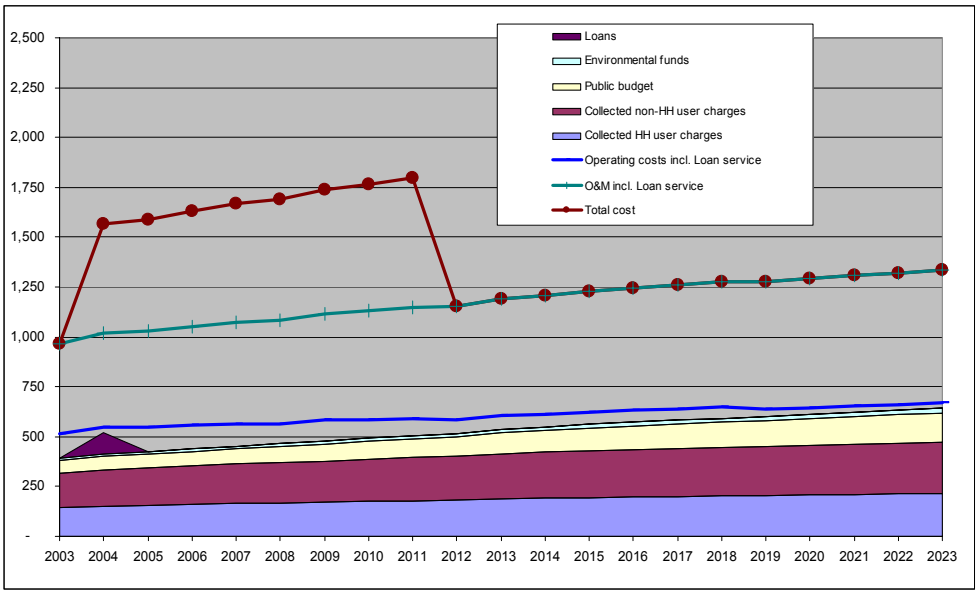
Apart from the supply of finance expectedly available in the baseline scenario, Figure 5.6 only depicts the operating expenditure, but not expenditure for maintenance or rehabilitation. From a generic point of view a baseline scenario covers only the anticipated level of activity corresponding to the situation today, i.e. including operating expenditure and expenditure for maintenance. Hence, any kind of a rehabilitation or investment programme would not belong in such a baseline scenario, as it basically would represent a shift from today's activity level.

However, in the case of the Ukraine it can be argued that this generic baseline scenario is not of much relevance, as it describes a situation that is not very likely to happen in practice. Due to years of under-financing in the sector, the Ukraine in reality faces a huge backlog of investments in infrastructure. This investment backlog represents negligence in previous years of proper maintenance of the infrastructure, and, in terms of expenditure needs, it adds on top of the usual running costs for maintenance. If the mal-maintained physical structures underlying the investment backlog are not addressed properly, they will not just deteriorate further, but, in many cases, simply stop functioning. This, again, will imply a dramatic drop in service levels. In a situation where financial resources are scarce, it must be expected that these resources are prioritised so that the infrastructure which is in the poorest condition is addressed first. And this will most likely constitute the backlog.

So, in other words, addressing the backlog is not optional, provided that the objective is to sustain the original design service level, or even just current service levels. A baseline scenario that does not reflect the real issues at stake may

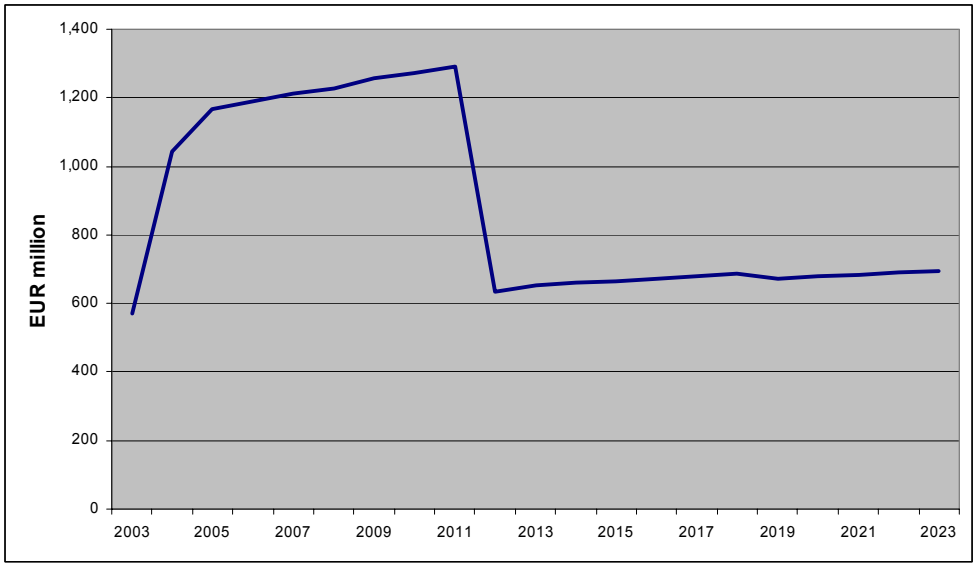
not - as mentioned previously - be of much more than purely academic relevance. Figure 5.7 below illustrates these considerations. It presents the total expenditure needs of a "substantiated" baseline, i.e. including expenditure needs to address the backlog (rehabilitation). The supply of finance is unchanged in this situation. It should be noted that, for practical reasons, the rehabilitation costs have been spread out over the years up until 2010. The entire backlog is, in fact, "due" from day one.

Figure 5.7 *Finance of a "substantiated" baseline scenario as compared to the total expenditure needs to sustain the original design service level, EUR million, 2003-2023*



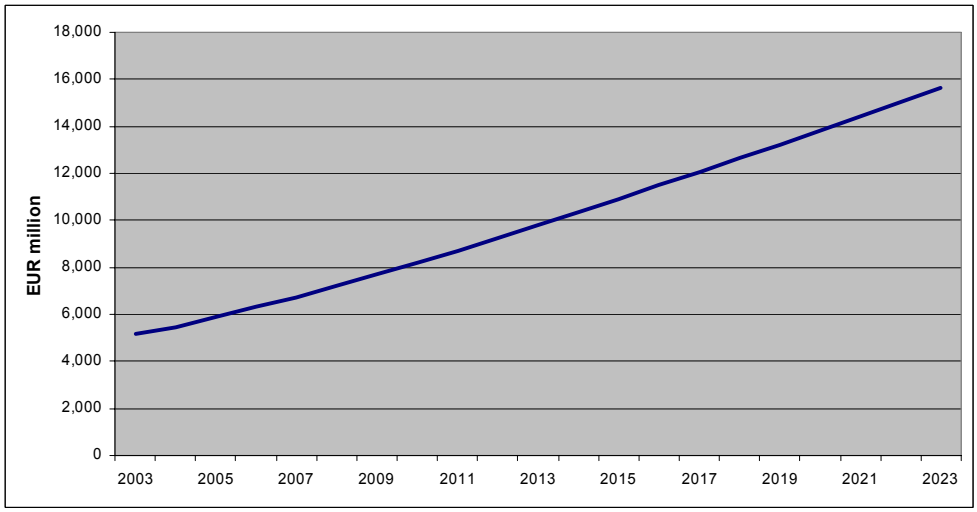
The difference between the total cost curve and the total supply curve is significant and growing in the period 2003-2011, when the capital investments for an urgent rehabilitation programme are necessary. It falls thereafter, however, remaining positive for the entire period under consideration. The absolute values of the financing gap are presented in Figure 5.8 below.

Figure 5.8 Financing gap, 2003-2023



This graph may, however, be misleading as it could seem that the actual financing gap first increases and then falls over time. In practice, each point on the graph represents the absolute value of the gap for that particular year. It does not indicate whether the total expenditure needs of the sector have been properly met in the previous years. The next Figure 5.9, serves such a purpose in representing the total maintenance backlog, including the backlog from the past, over the entire analysis period.

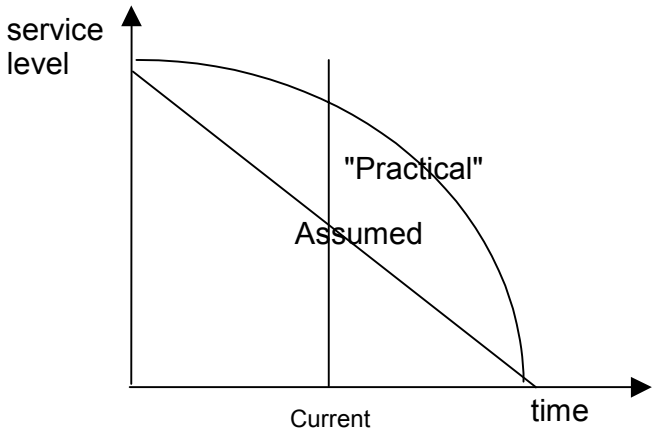
Figure 5.9 Total maintenance backlog including backlog from the past



The cumulative maintenance gap reaches over EUR 15 billion by the end of period. This is clearly unsustainable and indicates significant depletion of the infrastructure and assets unless additional funds are provided. During many discussions with sector specialists, it was indicated that, currently, over 50% of

the assets are already in a critical conditions. Water and wastewater networks, treatment plants and pumping stations all are in urgent need of rehabilitation money. Moreover, it is important to note that, in current calculations, linear deterioration of assets and infrastructure was assumed. In practice, it is more likely that deterioration levels are less significant at the beginning of exploitation period and follow more sharply falling pattern towards the end of the period.

Figure 5.10 Practical and assumed deterioration pattern of the service level without proper maintenance



Therefore, it is likely that the deterioration of service levels will take place more rapidly than is estimated in calculations. This would lead to a complete collapse of the water supply and sanitation services in the Ukraine.

6 Scenario analysis and policy options

6.1 Introduction

The previous section presented the baseline scenario of water sector development where most of the financing sources remain constant or change only with the real growth rates of the GDP. The immediate conclusion of the analysis is that the financing gap and maintenance backlog are not sustainable, and maintaining the conditions of finance supply described in the baseline will lead to a significant drop in service level and the eventual collapse of the entire system.

Thus, radical policy changes should be implemented to prevent this undesirable outcome. Concrete policy instruments should be identified and the feasibility of their application in a Ukrainian context has to be assessed. This section of the report provides such an analysis. The discussion evolves around three main policy instruments that could potentially be used to leverage additional funds to the sector:

- Household and non-household user charges (in the policy context, this refers to tariff setting and regulation procedures which should lead to increased revenues from all groups of customers and measures to improve payment discipline);
- Public funds; and
- External credit sources.

We demonstrate that user charges increasing to the estimated affordability levels will address only a fraction of the total expenditure needs. We further demonstrate the needed increase in public funds, external borrowings and both to be able to cover the remaining gap. It is concluded that such an increase will most likely be unfeasible. As a result, we consider a possible scenario of sector development where the expenditure will have to be structured to meet the profile of available finances. In such circumstances, proper prioritisation of expenditure needs is essential to retain the maximum operational level of the infrastructure and assets and, correspondingly, to provide the best possible service level to customers. Such prioritisation of available funds is suggested.

6.2 Alternative scenarios

Three alternative scenarios for the sector development are considered:

1. "EU scenario": The water and wastewater sector's are brought close to compliance with EU water and wastewater quality standards. Household water demand and network water losses consistently decline over the period analysed. The general service level improves as a result of a rehabilitation programme which runs in the period 2004-2011. Water loss savings, decreasing demand and reduced infiltration as well as investment in more energy efficient equipments, will result in lower operation costs and some reduction in capital repairs, in the long term. A new investment programme is envisaged which will bring the connection rate to water supply and sanitation services to 95%[26]. Furthermore, as a result of such investments, full biological treatment complying with the EU standards is used for all townships with over 2,000 inhabitants. Capital reinvestment (repair of existing assets) is carried out throughout the whole planning period (2003-2023).

2. "Operational safety scenario": The existing water and sanitation systems are improved to a level where operational safety can be maintained. Household water demand and network water losses decline. Non-household water demand increases. The extensive rehabilitation programme is implemented in the period 2004-2011 as a result of which operational safety is achieved. Water loss savings, recreasing demand and reduced infiltration as well as investment in more energy efficient equipment, will result in lower operation costs and some reduction in capital repairs, in the long term. There are no new investments in new connections. Capital reinvestment (repair of existing assets) is assumed throughout the entire planning period (2003-2023).

3. "Urgent rehabilitation and financing action plan scenario": The structure of the expenditure and its prioritisation depend on the amount of financing available in the particular period. However, the expenditure phasing changes: annual operating cost followed by the urgent rehabilitation programme gets the upper hand. User charges are initially used to cover all operating expenditure. The remaining surplus and all the other funds initially allocated for replacement of assets fully depreciated in the current period, are directed towards the implementation of an urgent rehabilitation programme until all the assets classified as "urgent" have been replaced. Upon the completion of the rehabilitation programme, the available funds are used, in the order of priority, to cover the maintenance backlog from early years as well as normal maintenance of current period. The latter is financed only to the degree the financial envelope allows, implying that some maintenance needs remain unsatisfied. Postponing capital maintenance raises the price of it: in the future regaining the lost service level will cost more that it would otherwise cost to sustain it in its due time.

[26] In total, that implies an increase in connected inhabitants from 25.7 million to 29.6 million for water supply and from 22.4 million to 29.6 million for sanitation.

Of these scenarios, the "EU scenario" is most demanding, most expensive and hardly feasible in short to medium term. It is, however, included in our analysis to compare the cost implications of EU compliance in terms of water and wastewater quality and service standards with other alternative scenarios. The "Operating safety scenario" is less ambitious. Even in this case, however, as will be demonstrated further, a significant amount of additional public funds and external credits will be needed to fully meet the expenditure profile. As a compromise, the "urgent rehabilitation and financing action plan scenario" is suggested. However, the implications of implementing such a scenario on asset/infrastructure conditions, service levels and standards, as well as implications on, for example, human health are difficult to quantify and remain highly uncertain.

Additionally, both the "operational safety scenario" and the "EU scenario" have the following characteristics:

- Over the same period of time, block and individual meters are installed by those households and other consumers who presently do not have them. The cost of the meter installation programme is not included in the scenario. It is deemed private and imposed by critical tariff growth and, possibly, water saving campaigns.

- The expected result of the meter installation programme and water saving campaigns would be significant water savings at households. The average consumption is expected to drop from 231 lcd to 160 lcd, resulting in savings of over 30% at the households already connected. Counting in new connections to the water supply networks will result in total savings of 440 million m^3 of water in the household water consumption by 2011, or 17% of the total household consumption of the target year. As to non-household consumers, it has been assumed that even tariff increase and additional meters installation will not outbalance the economic revival effect on their water use which will grow by 0.5% annually in the period 2004-2011.

- The major network renovation programme covered by the "EU scenario" and the "operational safety" scenario would result in priority replacement of 22% of the water supply pipelines and 21% of the sewers in the worst state of disrepair over the period 2002-2011. Some 20% of the remaining water supply and sanitation assets requiring immediate attention would also be replaced over the period 2004-2011, with special emphasis on energy-saving equipment which will improve the energy efficiency of the equipment by some 50%. Additionally, over the 20-year planning period (2003-2023), normal capital replacement of pipes and other assets has been envisaged. For comparison, some 40% of pipes have to be replaced over the 20-year period, on top of the urgent rehabilitation programme outlined above.

- The urgent rehabilitation of the assets will reduce the cost of operation and current repair and maintenance. For example, water networks rehabilitation will yield water savings of 212.1million m^3/year, or nearly 20% of the distribution loss of the base year, and a likely proportional downscaling of the

operating cost in relation to pumping, magnified by the improved energy efficiency of the pumps and other energy-saving equipment. The same effect is expected in sanitation with a reduction in infiltration. On the performance side, another main improvement assumed is increased labour productivity.

- It is also expected that the service levels will grow much closer to EU standards, i.e.:

  - The quality of drinking water will, in most cases, comply with EU water quality regulations (which are less strict than the Ukrainian GOST) as a result of the renovation. Although, in 10-15% of the towns, the water quality problem will not be addressed fully, since the present technological design is not fit to deal with the quality problem, and major reconstruction is required.

  - The water supply will become regular.

6.3 Policy instruments to increase the supply of available finance

In this section, we discuss available policy instruments to leverage the supply of finance. Three main options are considered, namely potential increases in user charges, public funds and external credit.

6.3.1 User charges

The potential for increased user charges depends largely on the applied policy for tariff setting and regulation. Full cost recovery tariffs are widely propagated in the Ukraine as the only feasible solution for the sector, in the long term. Such tariffs will, however, be significantly restrained by the ability of the population to accommodate higher payment rates. Thus, the affordability constraint plays an important role and should be carefully analysed before any further increase user charges is proposed.

Estimates based on official publications of the Ukrainian National Statistical Office show that the average urban household expenditure in 2001 amounted to about UAH 625 (EUR 120) per month. With average number of members in each household of 2.68 and after adjusting for inflation (2002) and real growth rate (2002-2003), this equals amounts to UAH 258 (EUR 50) per person per months in 2003 (2002 prices). Using this information and data on water bills estimated by FEASIBLE, the current levels of water charges are assessed to make up about 1.56% of the per capita expenditure in 2003. Assuming a threshold level of affordability for water payments at 4% of the household income, the figure of 1.56% demonstrates significant room for increasing water utility revenues from user charges. It is important to note here that affordability and willingness to pay for water services are issues that inevitably need to be scrutinised on an individual case-by-case basis. It is very likely that, in some cities and municipalities, the willingness to pay for improved service levels will

be above the 4% threshold. Similarly, in other regions, the willingness to pay may prove lower than conventionally assumed affordability rates. In this respect, FEASIBLE operates with the aggregated data and, therefore, presents judgments based on country-wide average figures. Finally, it might be added that the 4% threshold mentioned above does not constitute anything but a loose rule of thumb commonly used by some of the major international organisations. Hence, the 4% threshold does not necessarily represent the real (socio-) economic value of well-functioning water services, as it may, in practice, be considerably higher (or lower, in principle).

The approach suggested in this report is to gradually increase the average household user charges to the level of 4% affordability by 2007 and retain them at that level thereafter. We have assumed that the personal income will increase in line with the real GDP growth. Thus, retaining household tariffs at 4% of the personal income will provide a growing profile of user charges to the sector.

Furthermore, we have assumed that gradual improvements in payment discipline can be achieved. Starting from the 80% in 2003, the collection rate is presumed to increase to 90% in the medium- and 95% in the long-term horizon. Experience from other countries suggests that such increases in collection rates are feasible, although they require substantial efforts. Increased collections will be possible only if:

- Effective, secure and transparent billing and collection systems are in place;
- Measures for effective action against non-payers are legislatively provided and administratively enforced;
- Rates are structured in such a way that they are perceived as fair and reasonable by consumers compared to the services levels.

The resulting profiles of household user charges for the "EU scenario" and the "operating safety scenario" are presented in Table 6.1.

Table 6.1 Household user charges at affordability rate, EUR million

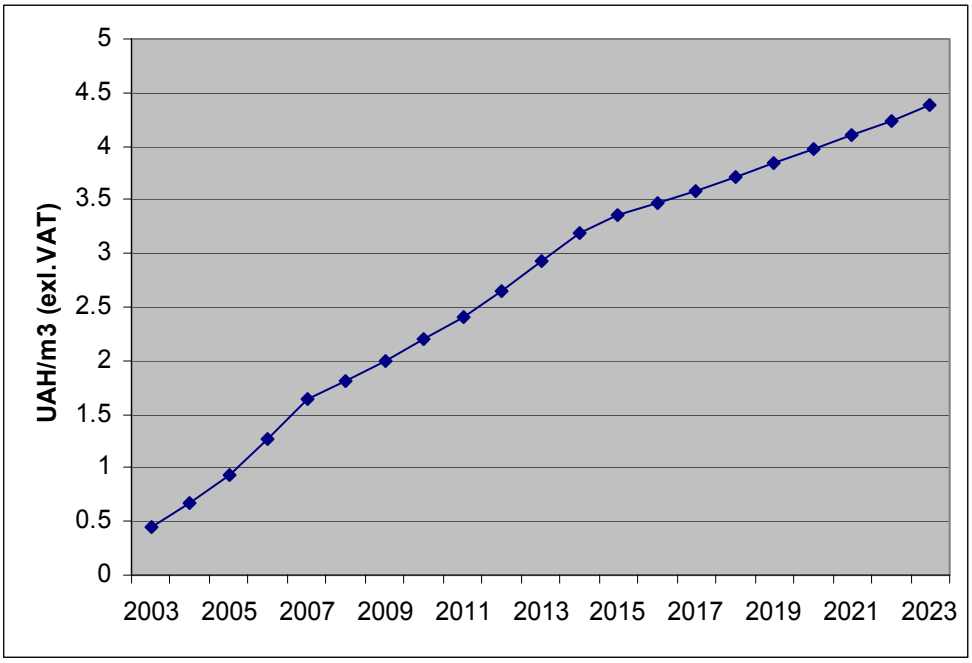
	2003	2004	2005	2006	2007	2008	2009	2010	2023
"EU scenario" with new connections									
Baseline household user charges	143	151	155	159	164	168	171	175	214
Proposed affordability rate structure	1.56%	2.17%	2.78%	3.39%	4.00%	4.00%	4.00%	4.00%	4.00%
Collection rates	80.00%	80.00%	80.00%	90.00%	90.00%	95.00%	95.00%	95.00%	95.00%
Additional household user charges*	0	67	148	291	411	487	533	583	1,040
Total household user charges available	143	218	302	450	575	654	704	758	1,255
"Operating safety" no new connections									
Baseline household user charges	143	151	155	159	164	168	171	175	214
Proposed affordability rate structure	1.56%	2.17%	2.78%	3.39%	4.00%	4.00%	4.00%	4.00%	4.00%
Collection rates	80.00%	80.00%	80.00%	90.00%	90.00%	95.00%	95.00%	95.00%	95.00%
Additional household user charges*	0	61	131	255	351	404	429	455	804
Total household user charges available	143	212	286	414	516	571	600	630	1,018

Source: FEASIBLE
** NOTE: The difference in the additional user changes occurs due to the additional connections assumed in the EU scenario*

The table shows a significant gain in household user charges, year by year. In both of the scenarios, the additional household user charges exceed the baseline household revenues starting from 2006. Such a dramatic increase in available finances should, in principle, ease the annual financing gap. As demonstrated further during scenario analysis, this indeed helps to cover almost totally the operating and maintenance costs in both of the scenarios, in the long term.

Finally, it is interesting to see the tariff implications of setting user charges at the 4% affordability rate. Figure 6.1 below shows the resulting average tariff profile.

Figure 6.1 Household tariff profile at the 4% affordability level



The non-household users are defined as budget organisations and industrial/commercial entities. Currently, this group of users is paying a significantly higher water tariff per m^3 than households. Diverse studies and practice of many other countries have demonstrated that such cross-subsidisation is not effective as it distorts the incentives of water utilities as well as consumers. One potential approach would be to eliminate such practice and set tariff rates to reflect the cost of the service for corresponding customer groups. The suggested policy in this report is that non-household tariff should reach full recovery of operation and maintenance cost by 2007 and, thereafter, retain such policy (see Table 6.2).

Table 6.2 Non-household user charges at full O&M cost recovery, EUR million

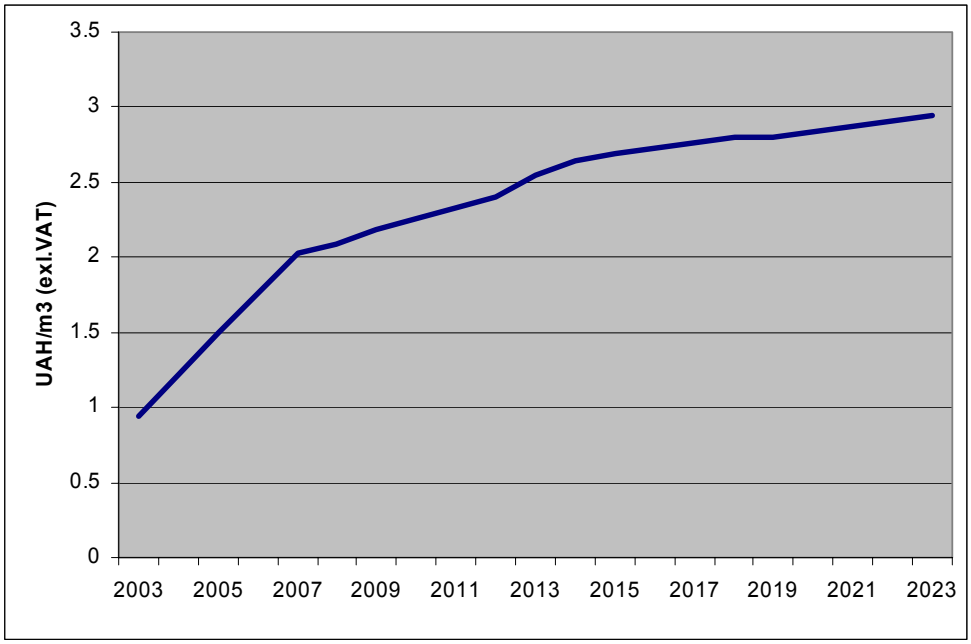
	2003	2004	2005	2006	2007	2008	2009	2010	2023
"EU scenario"									
Baseline non- household user charges	173	183	187	192	198	202	207	212	259
Additional non-household user charges*	0	25	55	83	112	112	117	117	66
Total non-household user charges available	173	207	242	276	310	314	324	329	325

	2003	2004	2005	2006	2007	2008	2009	2010	2023
"Operating safety"									
Baseline non-household user charges	173	183	187	192	198	202	207	212	259
Additional non-household user charges*	0	25	56	85	114	112	116	114	54
Total non-household user charges available	173	208	242	277	312	314	323	325	313

Source: FEASIBLE
** NOTE: the difference in the additional user changes occurs due to the additional connections assumed in the EU scenario*

Correspondingly, the tariff profile for non-household users is presented in Figure 6.2.

Figure 6.2 Non-household tariff profile at full O&M cost recovery



6.3.2 Public funds

The financing for the water supply and sanitation sector from public budgets of all levels amounts to approximately 0.4% of the total government expenditure or 0.15% of the GDP. Compared to other countries in the region, this is relatively low and indicates a potential for increased budget funding. However, many discussions with sector specialists and officials have indicated that any significant increase in the funds publicly available to the water sector is highly uncertain. We have, therefore, assumed, as a feasible policy instrument option, only a moderate increase in budget funds from its current level of 0.4% of public expenditure to 0.5% in medium- and 0.6% in long-term perspective. As the

table below indicates, even such moderate change will provide additional funds to be utilised for the capital investment and rehabilitation programmes.

Table 6.3 Public funds with increased share of water financing, EUR million

	2003	2004	2005	2006	2007	2008	2009	2010	2023
Real GDP growth	5.0%	4.5%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	3%
GDP	45,029	47,055	48,937	51,384	53,953	56,651	59,484	62,458	100,961
Ratio of public expenditure to GDP	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%
Public expenditure	16,210	16,940	17,617	18,498	19,423	20,394	21,414	22,485	36,346
Share of water funds in public expenditure	0.4%	0.4%	0.4%	0.4%	0.5%	0.5%	0.5%	0.5%	0.6%
Baseline public funds	65	68	70	74	78	82	86	90	145
Additional public funds	0	0	0	0	19	20	21	22	73
Total new water and sanitation public funds	65	68	70	74	97	102	107	112	218

Source: FEASIBLE

6.3.3 External credit financing

As noted before, estimating the potential future increase in external credit and grant financing from International Financial Institutions and donors to the water sector in the Ukraine is a highly uncertain exercise as there is little publicly disclosed information on such plans. We will, therefore, approach this source of financing potential from a different angle. After a detailed account of all the feasible sources of finance, we will estimate the total remaining funding gap. We will then analyse the loan financing required to cover the remaining gap and assess options to raise the required amount, as well as the ability of the water sector to generate enough revenue to service such debt.

In order to raise any additional external debt, however, specific policy conditions have to be fulfilled to attract potential lenders:

- The legal and institutional framework should be provided to safeguard debtors' claims;
- Conditions should be provided for water utilities to be able to generate a sufficient amount of user charges to service their debt;
- Macro- and micro-economic measures to reduce credit risk have to be enacted;
- The exchange rate risk has to be reduced through appropriate macroeconomic policy instruments;

- State guarantees should be advanced or, potentially, a state guarantee agency could be created to mitigate domestic and foreign lenders' risk.

6.4 EU scenario

As already mentioned, the EU scenario presumes full rehabilitation of the infrastructure, bringing the water sector up to EU water and wastewater quality standards by increasing the coverage of water supply and sanitation to 95%, and achieving full biological treatment for the townships over 2000 inhabitants. The existing infrastructure and assets rehabilitation programme runs for eight years starting from 2004. The new investments are implemented during the same time-frame.

6.4.1 Expenditure needs

The components of the expenditure needs for this scenario have been calculated by FEASIBLE and are presented in Table 6.4. The operating costs are affected in two different ways. The implementation of the rehabilitation programme reduces operating costs, while the extension of the services in terms of new connections and additional biological treatment facilities increases them. The net effect is slightly lower operating costs as compared to the baseline scenario calculations.

6.4.2 Supply of Finance

In order to derive the total supply of finance available for the "EU scenario", we have assumed a gradual increase in the household tariff to the 4% affordability rate in 2007. Additionally, the payment discipline has also improved, as collection rates are assumed to increase from the current level of 80% to 90% in the short and medium term and 95% in the long term.

The tariffs for non-household users will also increase. It is assumed that they will reach full recovery of operation and maintenance cost by the year 2007 and will stay at that policy level thereafter. Similarly, the household user group, the payment discipline of non-household users is assumed to improve. Collection rates are set to increase slowly from the current level of 70% and reach 95% in 2009.

Table 6.4 EU scenario expenditure need, EUR million

	2003	2004	2005	2006	2007	2008	2009	2010	2023
Water supply									
New investments	0	97	99	102	105	107	110	112	0
Renovation	0	232	237	244	252	257	263	270	0
Maintenance	219	226	233	242	250	258	265	273	339
Operation	359	372	369	368	367	363	359	355	403

	2003	2004	2005	2006	2007	2008	2009	2010	2023
Wastewater									
New investments	0	270	277	285	293	300	307	314	0
Renovation	0	303	310	319	329	336	344	352	0
Maintenance	227	235	244	256	267	277	288	299	378
Operation	158	163	166	169	172	175	177	180	216
Water sector total									
New investments	0	367	376	387	398	407	417	427	0
Renovation	0	535	547	564	580	593	607	622	0
Maintenance	446	462	478	497	518	535	553	572	716
Operationa	517	535	534	537	540	538	536	534	619
Total	963	1,898	1,935	1,986	2,036	2,074	2,113	2,156	1,335

Source: FEASIBLE

Compared to the baseline scenario level, additional funding from the public budgets at all levels is available as a result of a moderate increase in the share of water and wastewater project financing in the total consolidated government expenditure. Resources from environmental funds and external credits remain at the levels of the baseline scenario calculations.

Table 6.5 below summarises the supply of finance available in the "EU scenario".

Table 6.5 EU scenario supply of finance, EUR million

	2003	2004	2005	2006	2007	2008	2009	2010	2023
Total household user charges available	143	218	302	450	575	654	704	758	1,255
Total non-household user charges available	173	207	242	276	310	314	324	329	325
Water and sanitation public funds	65	68	70	74	97	102	107	112	218
Environmental water and sanitation funds	10.4	10.8	11.3	11.8	12.4	13.0	13.7	14.4	24.3
IFIs and donor funds		109.0							
Total scenario financing	392	613	626	812	995	1,083	1,149	1,213	1,822

Source: FEASIBLE

6.4.3 Policy conclusions and remaining gap analysis

We can now proceed to analyse the effect of the changes in the policy instruments (user charges and public funds) in terms of covering the expenditure needs in the "EU scenario".

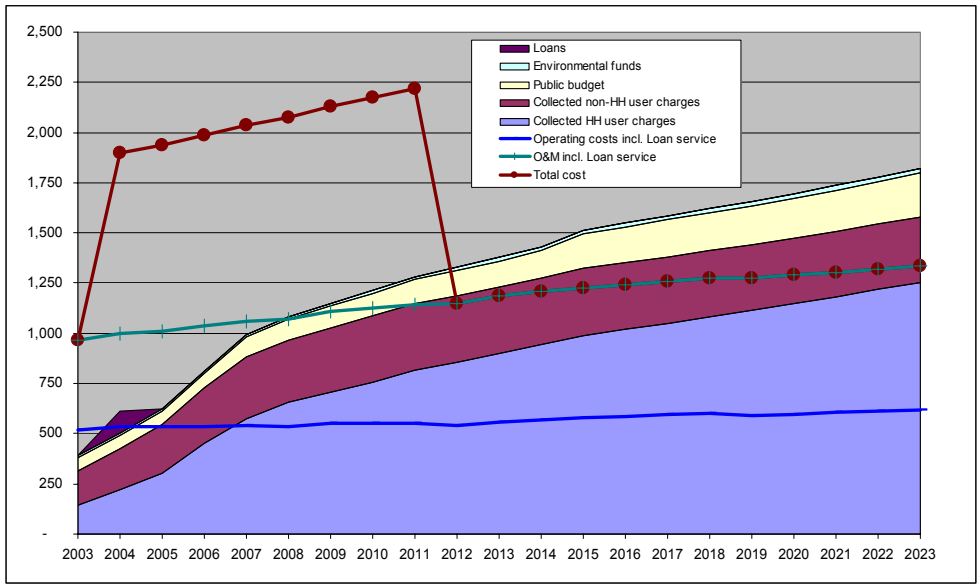
Table 6.6 EU scenario expenditure needs, supply of finance, gaps and backlogs, EUR million

	2003	2004	2005	2006	2007	2008	2009	2010	2023
Total operating expenditure and loan service*	517	535	534	537	540	538	554	552	619
Total maintenance expenditure	446	462	478	497	518	535	553	572	716
Total rehabilitation costs	0.0	534.7	547.3	563.8	580.4	593.5	607.3	621.9	0.0
New investments	0.0	367.0	375.6	386.9	398.3	407.3	416.8	426.8	0.0
Total expenditure need	963.2	1,898.0	1,934.9	1,985.6	2,035.9	2,073.6	2,131.2	2,173.3	1,335.2
Total supply of finance	391.6	613.4	625.7	812.1	995.1	1,083.2	1,149.2	1,213.3	1,822.1
Financing gap	571.6	1,284.6	1,309.3	1,173.5	1,040.8	990.5	982.0	959.9	-486.8
Maintenance backlog	422.3	749.6	1,135.5	1,357.8	1,419.3	1,408.4	1,365.8	1,276.4	-2,882.4
Non-HH fraction of O&M expenditure	297.0	301.4	304.0	307.0	310.2	313.9	324.1	328.7	325.0

Source: FEASIBLE
NOTE: loan terms assumed: maturity - 15 years, grace - 5years, 5% - real interest rate.

The user charges collected from households cover operating and loan service costs starting from year 2007. For all the preceding years, subsidies to households are required to compensate utilities for the household affordability constraint. This is more clearly illustrated in Figure 6.3 below, representing the "EU scenario" calculations results graphically.

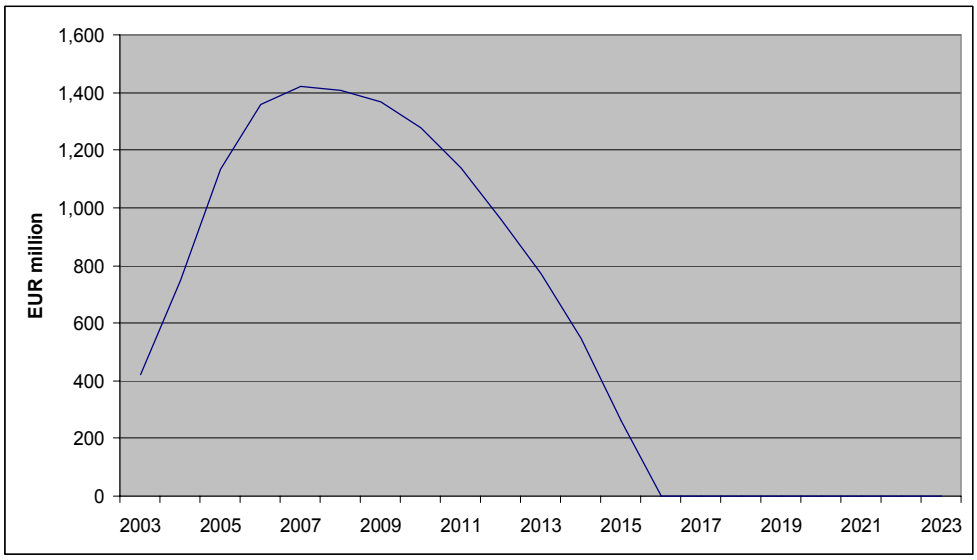
Figure 6.3 EU scenario expenditure and supply of finance, EUR million



In comparison with the baseline scenario, changes in policy instruments have resulted in a substantial improvement in the supply of finance profile. The total amount of user charges collected is sufficient to cover operating expenditure already in 2005. The total of all the funds available to the sector is sufficient to achieve the current year's operating and maintenance expenditure needs in 2008. Moreover, the area above the O&M curve after 2008 represents a surplus of financing available and is growing over time[27]. It could, in principle, be used to close the current maintenance backlog (see Figure 6.4).

[27] The main source of such surplus is increasing user charges. It has been assumed, as discussed before, that household user charges will reach the 4% affordability rate by 2007 and stay at that level, at least up until the end of considered period. This provides the water sector with future funds to finance the backlog of maintenance, potential short- and medium-term borrowings or a reasonable return on possible private sector investment.

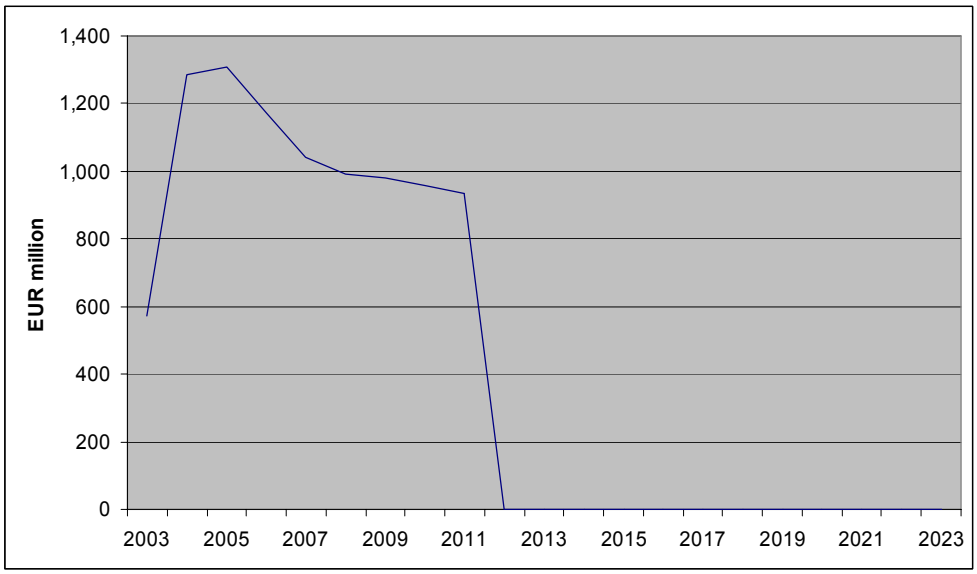
Figure 6.4 Current maintenance backlog in the EU scenario



However, the significant funding gap in the early years of strategy implementation remains. The total additional funding need in the period between 2003 and 2012 equals some EUR 9.2 billion and is represented by the area between the total cost and total supply of finance curves (see Figure 6.3). The annual average additional funding need is around EUR 1 billion. Figure 6.5 demonstrates graphically the profile of the remaining financing gap.

Part of the total additional financing need, in the period 2003-2008 represents uncovered operation and maintenance costs. The absolute amount of this gap is EUR 1.6 billion, and it is a result of a tariff policy which does not provide full cost recovery through user charges alone. It is partially explained by household affordability constraints, and, as the practice of other countries in the region shows, it is typically financed through public subsidies. Assuming that the calculated amount of EUR 1.6 billion was to be recovered through a subsidy, this would presume average annual subsidy allocations in the amount of EUR 320 million, which is significantly more than what is currently being provided.

Figure 6.5 Financing gap in the EU scenario



The rest of the gap is driven by the rehabilitation programme and new investment expenditure needs. It equals EUR 7.6 billion in total or an average of EUR 950 million annually in the period 2004-2012. This represents about 2% of the annual GDP for the same period or 4.7% of the average forecasted annual government expenditure. This would indeed be an extremely ambitious and challenging investment programme if it were to be implemented. Funding such expenditure out of the budget is very unlikely given the current very modest level of public investment in the water sector. Alternatively, it could be financed through loans from international financial institutions and donor organisations. However, the amount of future surplus generated by the sector to potentially finance such loans is insufficient even with significantly increased user tariffs. Therefore, if the "EU scenario" is to be implemented, it can only be sustained by a very considerable package of significant user charge increases, substantial growth in the funds publicly available and external borrowings, and maybe potentially, the introduction of new organisational and financial models in the sector.

6.5 Operating safety scenario

The previous scenario demonstrates that a significant financing gap will remain even with a substantial increase in user charges and funds publicly available for investment. The gap is foremost driven by the rehabilitation programme (intended replace assets classified as "urgent") and a new investment program (intended to add new users to the system and bring the water sector services to EU quality and standards level).

In the current "operating safety scenario", the new investment programme is dropped and the main target is to ensure that the infrastructure is brought to a level where operations, in the current scope, can be run as originally intended.

6.5.1 Expenditure needs

The components of expenditure needs for the operating safety scenario are presented in Table 6.7 below. Total expenditure has decreased by the amount of new investment. In comparison with the EU scenario, maintenance costs have slightly been reduced. This is obviously an outcome of dropping the new investment programme and of a consequent reduction in maintenance needed, in the same respect. Similarly, the operating cost of running the utilities has been reduced.

Table 6.7 Operating safety scenario expenditure need, EUR million

	2003	2004	2005	2006	2007	2008	2009	2010	2023
Water supply									
New investments	0	0	0	0	0	0	0	0	0
Renovation	0	230	235	242	250	255	261	267	0
Maintenance	219	227	230	234	239	241	244	247	297
Operation	359	372	366	363	359	351	343	335	371
Wastewater									
New investments	0	0	0	0	0	0	0	0	0
Renovation	0	307	314	324	334	341	349	357	0
Maintenance	227	235	241	248	256	261	267	273	335
Operation	158	163	162	162	161	159	156	154	175
Water sector total									
New investments	0	0	0	0	0	0	0	0	0
Renovation	0	537	550	567	583	596	609	624	0
Maintenance	446	462	470	483	494	503	511	521	633
Operation	517	536	528	524	519	509	499	489	546
Total	0	0	0	0	0	0	0	0	0

Source: FEASIBLE

6.5.2 Supply of finance

The supply of finance for this scenario is close to the profile of the EU scenario. Household user charges remain fixed at the 4% affordability level. However, due to the elimination of the new extensions programme, the household user base has been slightly reduced, which again causes the drop in the total amount of user charges collected in comparison with the EU scenario.

Similarly, the non-household charges are fixed at the level of full operation and maintenance cost recovery and, therefore, vary only slightly in this scenario compared to the EU scenario. Public funds and funds from external credits are

fixed. This set of assumptions yields a total supply of finance profile as shown in Table 6.8 below.

Table 6.8 Operating safety scenario supply of finance, EUR million

	2003	2004	2005	2006	2007	2008	2009	2010	2023
Total household user charges available	143	212	286	414	516	571	600	630	1,018
Total non-household user charges available	173	208	242	277	312	314	323	325	313
Water and sanitation public funds	65	68	70	74	97	102	107	112	218
Environmental water and sanitation funds	10	11	11	12	12	13	14	14	24
IFIs and donor funds		109							
Total scenario financing	392	608	610	777	937	1,000	1,044	1,082	1,573

Source: FEASIBLE

6.5.3 Policy conclusions and gap analysis

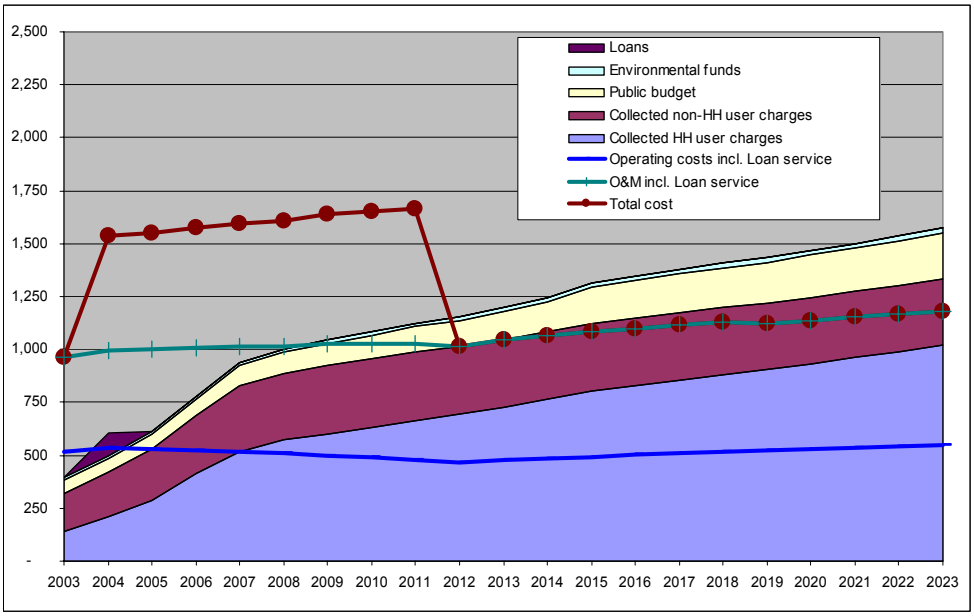
The balance of scenario costs and supply of finance is presented in Table 6.9 and Figure 6.6 below.

Table 6.9 Operating safety scenario expenditure needs, supply of finance, gaps and backlogs, EUR million

	2003	2004	2005	2006	2007	2008	2009	2010	2023
Total operating expenditure and loan service*	517	536	528	524	519	509	499	489	546
Total maintenance expenditure	446	462	470	483	494	503	511	521	633
Total rehabilitation costs	0	537	550	567	583	596	609	624	0
New investments	0	0	0	0	0	0	0	0	0
Total expenditure need	963	1,535	1,548	1,574	1,597	1,608	1,620	1,634	1,179
Total supply of finance	392	608	610	777	937	1,000	1,044	1,082	1,573
Financing gap	571	928	939	796	660	608	576	552	-394
Maintenance backlog	422	750	1,139	1,368	1,445	1,456	1,422	1,350	-2,123
Non-HH fraction of O&M expenditure	297	305	307	310	312	314	323	325	313

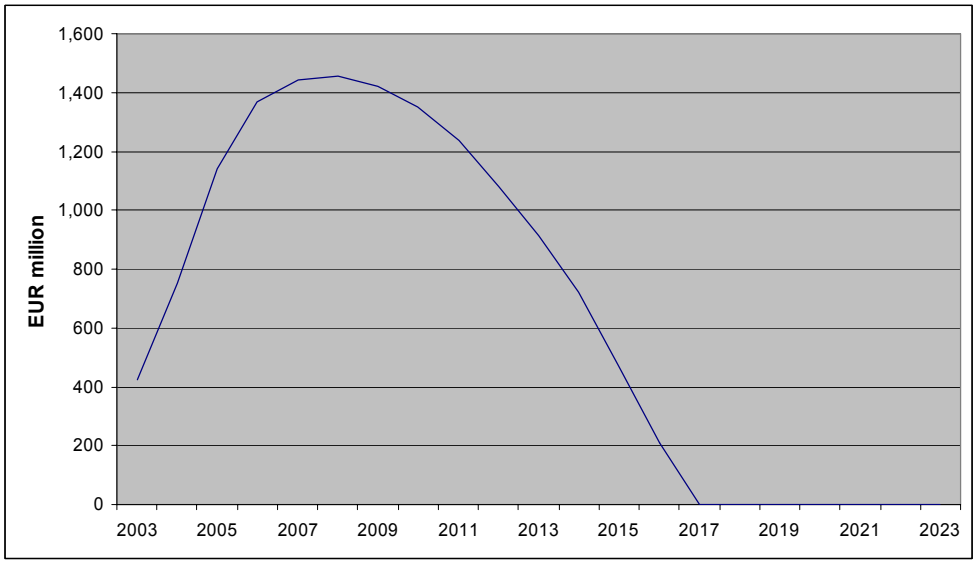
Source: FEASIBLE
NOTE: loan terms assumed: maturity - 15 years, grace - 5years, 5% - real interest rate.

Figure 6.6 Operating safety scenario expenditure and supply of finance, EUR million



The funding available from all the sources fully covers the operation and maintenance costs by the year 2009 as compared to 2008 in the EU scenario. This one year shift is basically explained by a decrease in the household user charges (lowered income base as the new extensions programme is not implemented in this scenario) as well as a lower than adequate decrease in total O&M expenditure need. The accumulation of financial resources to close the maintenance gap is, therefore, also slightly reduced, and, accordingly ,the maintenance backlog is fully closed only by 2017 (see Figure 6.7).

Figure 6.7 Current maintenance backlog in operating safety scenario



Once again, however, a substantial gap remains in terms of the total cost of implementing the scenario. In absolute cumulative terms, the additional financing need amounts to EUR 6.2 billion until 2012 or an average of EUR 690 million annually for the same period. It makes up approximately 1.2% of the average annual forecasted GDP or 3.4% of the average annual consolidated public budget expenditure. The main components of the gap are:

- Uncovered operation and maintenance costs in the period 2003-2009, with an absolute cumulative value of EUR 1.67 billion or EUR 277 million annually.

- Expenditure needs of the rehabilitation programme in the period 2004-2012 with an absolute cumulative value of EUR 4.55 billion.

6.6 Urgent rehabilitation and financing action plan scenario

From the discussion of two previous scenarios it appears that even a substantial increase in the supply of finance does not provide necessary funding for restructuring the water and sanitation sectors in the Ukraine. The extent of the maintenance backlog of the past is the main reason for the remaining gap (see section 5.8). Furthermore, most of these assets are in a "near-to-collapse" state and are classified as urgent. Further postponing their rehabilitation will, in practice, lead to severe disruptions of the services. What would a workable and realistic scenario look like under these conditions?

There is no doubt that the assumptions as to the financial sources available in the two previous scenarios have been stretched to their utmost limit. As previously argued, the 4% threshold for consumer affordability is not "sacred", inasmuch as the economic value of reliable water and wastewater services is, in many cases, likely to be higher than a level that corresponds to 4% of the average income. However, there is most likely great regional and local variance in the economic value of these services, and the 4% threshold is, therefore, probably as valid an average estimate as would 4.5% or 5% be, without conducting more detailed affordability analyses. Also, the budget financing assumed in the two previous scenarios will imply extremely ambitious investment programmes already, and increasing this component does not seem a workable solution. Other sources play only a marginal role.

It is difficult, if not directly impossible, to see how the large financing gap of the early years of the strategy period can possible be closed, due to the vast amounts of financing needed. We find that the most likely conduct will simply be to accept that financial resources will be scarce, in any case. The gap will. for logical reasons, then have to be closed by adjusting the annual expenditure needs to match the existing finance profile. This is, to a certain extent, what we have done so far in the scenario formulation. The demands for achievable service levels have been relaxed gradually (what service level reductions are acceptable), and the implications have been analysed. This normative approach to scenario formulation - though appealing in theory - is, however, most likely

scenario formulation - though appealing in theory - is, however, most likely not workable in practice.

The approach to scenario formulation in this third and final scenario is descriptive rather than normative in terms of service levels achieved. Basically, funds are being spent in the sector as they become available from the various sources. There are two obvious flaws in this approach:

- It will be very hard, if not impossible, to anticipate what service levels will actually be achieved, in the short and medium term. It depends on the funds available. This may be politically unsatisfactory for obvious reasons. One should realise, however, that this may exactly end up being the case, even if one the two previous scenarios is adopted as the official policy.

- It will be necessary to keep and maintain pressure at the political level on actually raising the maximum amount of financing (corresponding to the levels assumed in the two first scenarios). The need for financing is not eased just because short- and medium-term service level targets cannot be described in details.

The scarce financial resources will have to be prioritised from year to year. One suggested order of such priority could be as follows:

- Throughout the entire period, user charges are used to cover operating costs first;

- Any further surplus remaining from user charges is used to address the rehabilitation programme, rather than the current asset maintenance;

- Current asset maintenance is accumulated as a backlog of maintenance and postponed to subsequent years until the rehabilitation programme is complete;

- After that, the total available funds are used in the order of priority, to cover operation costs, then the maintenance backlog from the early years of strategy implementation and lastly, normal maintenance of the current year.

Such a strategy will inevitably lead to a total expenditure increase, as postponing current maintenance will result in further deterioration of the assets and increase the total maintenance/rehabilitation cost of same assets in the future. More specifically:

- Maintenance/capital reinvestment for the period 2004-2012 when postponed for 10 years will increase the total cost by 25%, on average, due to irreversible asset deterioration and real price increase of production inputs;

- As operating costs fall in constant and increase in real prices, however, the actual operating cost savings are lower than in the operational safety scenario, due to postponed current maintenance/capital reinvestment.

- The achievable service levels will be higher than in the baseline, but lower than in the operational safety scenario.

Table 6.10 and Figure 6.8 below demonstrate such a scenario in numbers and graphically.

Table 6.10 Urgent rehabilitation and financing action plan scenario, EUR million

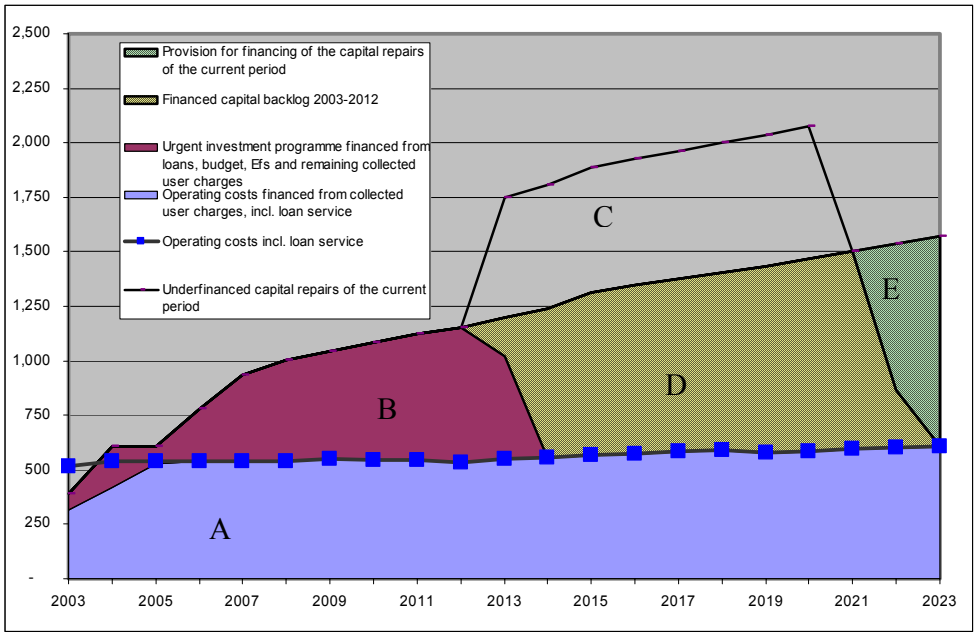
	2003	2004	2005	2006	2007	2008	2009	2010	2023
Operating costs incl. loan service*	517	541	538	540	541	537	550	546	607
Operating costs financed from collected user charges, incl. loan service	316	420	528	540	541	537	550	546	607
Urgent investment programme financed from loans, budget, environmental funds and remaining collected user charges	76	188	82	238	397	464	494	536	0
Annual normal capital repairs needs of the current year	446	462	470	483	494	503	511	521	633
Increased capital repairs needs (backlog 2003-2012)	0	0	0	0	0	0	0	0	692
Financed capital backlog 2003-2012	0	0	0	0	0	0	0	0	0
Provision for financing of the capital repairs of the current period	0	0	0	0	0	0	0	0	966
Underfinanced maintenance/capital repairs of the current period	0	0	0	0	0	0	0	0	0
Underfinanced capital repairs of the current period	393	608	610	778	937	1,001	1,044	1,083	1,574

Source: Off-model calculations based on FEASIBLE data
NOTE: loan terms assumed: maturity - 15 years, grace - 5years, 5% - real interest rate.

As it appears, user charges are used in each period to cover the operating cost needs (even then, a small fraction of operating cost in 2003-2005 remain underfinanced). All the remaining sources are then directed to the rehabilitation programme (red area in the figure). The rehabilitation programme will be completed only by 2014. Starting from 2012, it will be possible to gradually allocate resources to close the maintenance backlog of the early years of restructuring (area D). While such backlog continues to be closed in the following years, another backlog of maintenance for the years 2012-2023 accumulates (area C).

It can be addressed starting in 2021 only. The iterative process will continue until all the past maintenance backlogs are fully closed and normal maintenance of the current year will become possible.

Figure 6.8 Urgent rehabilitation and financing action plan scenario



7 A note on regional challenges

The financing strategy analysis has been made on a national scale. Naturally, there is great variation from city to city and from utility to utility. In principle, the picture described may cover both cities where revenues can quickly be increased to a level which is sufficient to both rehabilitate and maintain current assets and cities where such an increase in revenues will be next to impossible, even over a twenty year period under the assumptions made.

We have analysed the underlying data and present some observations related to regional variations in this chapter. As we have collected data from more than 400 cities - in particular, related to the quality of the infrastructure, it is possible to present observations rooted in actual data collected. However, the collection of data related to variations in the supply of finance among cities, and the process of date verification reflects the fact that the financing strategy was intended to be a national level strategy and that the volume of resources available has been similar to the volume of resource for other, much smaller countries (such as Georgia and Moldova). Therefore, we have chosen not to quantify any of the observations in this chapter. In order to have appropriate quantification, it would be necessary to prepare a strategy similar to this for the region in question.

The data collected indicates that the renovation needs seem to decrease relatively with the size of the city (in terms of population). The smaller the city, the greater the renovation needs, relatively speaking. This is true for both water supply and wastewater. The table below demonstrates the estimated renovation need of water supply networks in the large towns (>300,000 inhab.), medium-size towns (50,000 to 300,000 inhab.) and small towns (less than 50,000 inhab.). If the renovation need of the water supply network[28] in the largest towns in the sample the renovation need for was estimated at 38%, on average, the state of disrepair of the smallest towns is nearly 15% higher.

[28] The state of disrepair of water supply networks is a good indicator of the general state of disrepair of the whole water infrastructure

Table 7.1 Water infrastructure renovation need in towns and urban settlements of different size

Item	Share of population in the total sample	Connection rate to central water supply	Estimated renovation need for network
Size of municipality	% of the sample's total population	% of total population	% of total replacement value
>300,000	61%	88%	38%
100,000 - 300,000	19%	92%	42%
50,000 - 100,000	8%	75%	46%
10,000 - 50,000	13%	75%	52%

Source: questionnaires to vodokanals

The result is not surprising, given that small towns usually have fewer resources for development of municipal infrastructure than larger towns, simply due to the lower average income level and more limited possibilities of developing economies of scale.

Also in the future, it would be reasonable to expect that small towns will continue to have more problems with availability of financing for the development of municipal infrastructure. Since the prognosis of the available financial resources for the Ukrainian water supply and sanitation sectors was based on Ukrainian average household income, the proposed increase in monthly household user charge may lead to financial surpluses in large vodokanals and yet not fully cover the financial deficit in smaller vodokanals.

As estimated from official publications of the Ukrainian National Statistical Office, the average urban household expenditure in 2000 and 2001 was at about UAH 625 (EUR 120) per month. The table below demonstrates the income differences in urban households by comparing the average urban household expenditure in 2001 for small and large towns of the Ukraine, as well as for the average urban household.

Table 7.2 Expenditure differences for urban households in the Ukraine

Indicator	2000*	2001**	% of urban HH expenditure
Average household expenditure	541.3	618.1	99%
Average urban household expenditure	**547.3**	**625.0**	**100%**
Average household expenditure in large towns	556.3	635.3	102%
Average household expenditure in small towns	536.1	612.2	96%

*Source: * Ukrainian National Statistical Office; ** estimate based on year 2000*

Various options exist to deal with these imbalances. The Donetsk region is in the process of establishing a regionwide water utility. This would enable funds to be transferred from richer agglomerations to poorer ones and to address the most urgent rehabilitation needs, even when these occur in small cities with very limited revenue and limited or no access to foreign funding. In the medium to long term, such large regional water utilities may also become attractive financing objects for private investors and thus further contribute to alleviating the funding gap. Another option would be to target the cheapest source of investment finance (budgetary sources, environmental funds) toward the smallest towns and let the owners of the vodokanals of richer, larger towns seek financing at the market or improve cost recovery mechanisms via tariffs.

Meanwhile, it would be recommendable to lower the level of aggregation of similar analysis in the future. Ideally, along with development of long-term financing plans for vodokanals and their owners-municipalities, it would be a good idea to make financing strategies for the water supply and sanitation sector at the oblast level.

Annex 1 Project steering group

- Y. Ruban, Chairman (Ministry of Environment and Natural Resource, Ukraine). The position as chairman of the project steering group was taken over by Mr S. Lizun at the meeting held in Copenhagen on March 12, 2002.
- M. Pillipchuk (Ministry of Environment and Natural Resource, Ukraine)
- O. Dobrokhatska (Ministry of Finance, Ukraine)
- O. Lototskiy (Ministry of Economy, Ukraine)
- O. Milner (Derzhzhytlokomungosp, State Committee on Housing-municipal Economy of Ukraine, former Derzhbud, instituted from March 2002)
- G. Peszko (OECD Environmental Directorate)
- B. Pulawski (Danish Environmental Protection Agency, DANCEE)
- M. Jacobsen (COWI)

Annex 2 Literature

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Environmental Financing Strategy for the Municipal Water and Wastewater Sectors in the Ukraine. Background Analysis

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Abstract:
The purpose of the municipal water and wastewater financing strategy for the Ukraine is to determine a realistic, agreed and affordable service and to demonstrate how environmental expenditure can be financed. The water and wastewater financing strategy has been developed in an iterative process in a dialogue with the finance, environmental and other relevant authorities. This report presents the final background analyses by the consultant.

Terms:
Ukraine, NIS, water utilities, water, wastewater, wastewater treatment, infrastructure investment, national environmental action plan (NEAP), environmental financing, environmental policy analysis, water tariffs, international finance

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