EMERGING ECONOMIES TRANSITION

Environmental Finance

Financing Strategies for Water and Environmental Infrastructure

OECD

DANCEE
Danish Cooperation for Environment in Eastern Europe
Ministry of the Environment

Environmental Finance

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OECD
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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Foreword

An important obstacle to achieving environmental goals in many countries throughout the world has been the failure to adequately address the associated financial issues: the costs of achieving environmental goals; how those costs could be minimised; and the challenge of matching costs with available resources. This volume presents an approach for addressing these issues, particularly for investment-heavy environmental infrastructure, and shows how its application can improve decision-making and ensure a better use of scarce resources. The main ideas underlying this approach are realism, affordability and cost-effective use of resources.

The need for a fresh approach to this issue became evident as central and eastern European countries endeavoured to come to terms with mobilising substantial financial resources to comply with challenging EU environmental requirements, and as the countries of Eastern Europe, Caucasus and Central Asia (EECCA) struggled to maintain even low levels environmental infrastructure, such as water supply and sanitation. The Danish government and the OECD agreed to work together to address the issue. A series of detailed in-country studies were conducted, mostly in EECCA countries, but also in EU accession countries and in China. As a result, a computer-based decision support tool – FEASIBLE – has been developed that we hope will now find wider application. However, we believe that the application of this and related methodologies is not just a technical exercise: by engaging all the major ministries and other stakeholders involved in financing environmentally related infrastructure, it helps build a consensus that facilitates effective programme implementation and the achievement of environmental goals.

The work on which this volume is based was carried out within the framework of the EAP Task Force, an inter-governmental body established in 1993 within the "Environment for Europe" process to promote environmental policy and institutional reform in central and eastern Europe. The secretariat for the EAP Task Force is located within OECD's Non-Member Countries Division of the Environment Directorate, and forms part of the Organisation's Centre for Co-operation with Non-Members. The book is issued under the responsibility of OECD's Secretary-General; it does not necessarily reflect the views of the Organisation or its Member countries.

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Introductory Statement

by Mr. Hans Christian Schmidt,
Minister of the Environment, Denmark

During the 1990's National Environmental Action Plans (NEAPs) and strategies were developed in most Eastern European countries to address the challenges of reforming the environmental sector along with the transition from planned to market economies. While providing good overviews of the environmental problems and needs in the region, the first generation NEAPs did not reflect the limitations of scarce resources and the need for structural reforms of the environmental sectors. As a response to the limitations of the NEAPs, Denmark and other donor countries have during the last four years supported work in the OECD to develop Environmental Financing Strategies (EFSs), to help countries plan better for environmental improvements and secure long term sustainability of the planned infrastructure investments. The environmental financing strategy is a methodology used to organise information and to balance environmental policies and targets with available resources.

It is well documented today that the municipal infrastructure sector, not least in the water sector, is in a very critical state. This is especially true in countries of the former Soviet Union, the EECCA countries (Eastern Europe Caucasus and Central Asia), where accession to and support from the EU have so far not been driving forces. The current status of public infrastructure in the EECCA region is one of severe under-investment, huge losses of water and energy and a high accident rate. Preventive maintenance has given way to accident management and damage repair, costing several times more than that of regular maintenance. The needs by far exceed the available financial resources, and therefore, governments and service providers must prioritise and seek ways of increasing the financial flow to the sector as well as reducing the costs of providing the services.

The environmental financing strategy is, thus, a methodology to organise information and to balance environmental policies and targets with available resources. Up to now, Denmark has financed the development of a computerised decision support tool, the so-called FEASIBLE model, which facilitates the balancing of needs with available financing. The tool has been tested on a number of country and regional studies in the water sector (Georgia, Moldova, Kazakhstan, Ukraine and three regions in Russia, viz. Novgorod, Pskov and Kaliningrad), and lately it has been extended to include the waste sector. The waste model has been tested in Novgorod and in Latvia. The first reports (Georgia,

Moldova and Novgorod) were submitted to the Almaty Conference in the year 2000. In response to the "Guiding Principles for Reform of the Urban Water Supply and Sanitation Sector in the NIS" adopted by Ministers in Almaty, additional studies have now been completed, and the FEASIBLE model has been reprogrammed in a more user-friendly second version. This model is available for free to subscribers.

I am pleased to learn that recently other donors, such as the EU TACIS and Germany, have used the methodology and model developed to support EFSs in other regions in Russia and in Armenia. Furthermore, the methodology has been applied without the use of the FEASIBLE model but as a project based prioritisation tool that is particularly relevant in smaller countries and as a next step when overall policies and targets are set.

This report presents an overview of the EFS methodology and, in particular, the FEASIBLE model, and it provides a synthesis of the results achieved so far by applying the methodology. I will not give a summary of the report here but just point to a few key conclusions:

- The studies show that in the EECCA region the financial resources available today are hardly sufficient to cover operating costs of the existing deteriorating water infrastructure.

- User charges have reached affordability levels in some countries like Kazakhstan and Moldova. There is, however, still room for increasing tariffs in other regions, such as Russia and the Ukraine.

- There is scope for reducing operating costs through energy and water saving measures that should also be taken into account when dimensioning and designing new infrastructure or upgrading existing facilities.

- There is no doubt that public budgets as well as international financial support and partnerships will still have to play a substantial role in the future financing of strongly needed capital investments in improved environmental infrastructure. And this support must be linked with continued institutional and economic reforms.

The FEASIBLE model has proven its applicability, not only in EECCA countries but also in accession countries, and I believe that the cost-effectiveness of

Danish environmental investments could also be improved by applying the methodology more actively in Denmark. Lately, the OECD has demonstrated the applicability of the FEASIBLE model in developing countries by developing a financing strategy for the wastewater sector in the Chinese province of Sichuan.

We see the EFS methodology and the FEASIBLE model as important building blocks for the Strategic Partnership on Water for Sustainable Development, which was launched at the World Summit on Sustainable Development in Johannesburg in September 2002. It is my hope that this publication and the EFS methodology including the FEASIBLE model will be of interest to many new user groups (municipal investment planners, regional and national administrations, international financing institutions, consultants, etc.). I wish to thank those institutions, regions and countries, which have actively participated in developing the EFS methodology and the FEASIBLE tool and made valuable information available for the environmental financing strategies in general and for this publication in particular.

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Most of the financial resources for this work has been provided by the Danish government. Other countries/institutions that have provided support for studies include: Australia, EC/TACIS, Germany, UK, Japan

List of Abbreviations and Acronyms

C&D	Construction and demolition
CIS	Commonwealth of Independent States (of the former Soviet Union)
DANCEE	Danish Cooperation for Environment in Eastern Europe
DEPA	Danish Environmental Protection Agency
EAP	Environmental Action Programme
EECCA	Eastern Europe, Caucasus and Central Asia, comprises countries of the former Soviet Union except the EU accession countries (Estonia, Latvia and Lithuania)
EFS	Environmental financing strategy
EU	European Union
EUR	Euro
FDI	Foreign Direct Investments
FEASIBLE	Financing for Environmental, Affordable and Strategic Investments that Bring on Large-scale Expenditure
GDP	Gross domestic product
GEL	Georgian lari
HH	Household
HHW	Hazardous household waste
IFI	International financing institution

ISPA	Instruments for Structural Policy Adjustment
LCD	Litre per capita per day
MRF	Materials recycling facility
MSW	Municipal solid waste
NEAP	National environmental action programme
NIS	Newly Independent States (of the former Soviet Union)
O&M	Operation and maintenance
OECD	Organisation for Economic Co-operation and Development
SMART	Specific, measurable, agreed, realistic and time-bound (targets)
USD	United States dollar
WEEE	Waste electrical and electronic equipment
WS	Water supply
WW	Wastewater
WWT	Wastewater treatment

Executive Summary

An important obstacle to achieving environmental goals in many countries has been the failure to adequately address the associated financial issues: the costs of achieving environmental goals; how those costs could be minimised; and the challenge of matching costs with available resources. This volume presents an approach for addressing these issues, particularly for investment-heavy environmental infrastructure, such as urban water supply, wastewater collection and treatment and municipal solid waste. Its main message is that a systematic modelling approach to investment and financial management can improve decision-making and ensure a better use of scarce resources. The main ideas underlying this approach are the importance of realism, affordability and cost-effective use of resources in achieving environmental goals.

A computerised decision support tool – FEASIBLE – was developed by OECD and Denmark to help develop financing strategies, mostly in the countries of Eastern Europe, Caucasus and Central Asia (EECCA), but also in EU accession countries and China. It currently may be applied in the water supply, waste water and solid waste management sectors, and the goal is to extend it to energy-related infrastructure. FEASIBLE is freely available and can be obtained through the web pages of OECD, the Danish Environmental Protection Agency and COWI, the Danish consulting firm that developed the model.

The basic approach underlying FEASIBLE is to take public policy targets in areas like water supply and sanitation, determine the costs and timetables of achieving them, and to compare the schedule of these expenditure needs with available sources of finance. This analysis generally reveals “finance gaps” during planned implementation. FEASIBLE can then develop various scenarios to determine how these gaps could be closed. This could be by: identifying policy reforms that could help achieve the targets at lower cost; identifying ways of mobilising additional finance; adjusting the ambition level of the targets; or extending the time period for achieving the targets.

An important feature of FEASIBLE is the emphasis on realism and affordability. The model can assess the levels of finance (public, private, domestic, foreign) that might be available under different macro-economic conditions. In this way it provides a check on what public budgets might realistically be expected to contribute. It can also help to assess the potential social implications of increasing tariffs by determining the impacts of such price increases on household income. By focussing on these issues, the application of FEASIBLE is more than a tech-

nical exercise: it also supports a process of dialogue and consensus building among the key stakeholders involved in financing environmentally-related infrastructure. In this way it can build a bridge between policy development and implementation.

The analyses prepared to date for EECCA countries have shown that the percentage of the urban population with access to water supply, wastewater treatment and solid waste management services is higher than in countries at a similar income level, but that these services are inefficiently designed and very costly to operate and maintain. At the same time, the existing arrangements for providing these services are financially unsustainable. Thus, in most EECCA countries there is a chronic shortage of funds for proper operation and maintenance of infrastructure, such as small repairs, replacement of worn-out parts, small capital repairs and essential rehabilitation. This has resulted in the rapid loss of the economic and technical value of assets. If corrective action is not taken, it may eventually lead to the physical collapse of the infrastructure, with severe consequences for human health, the environment and economic activity.

The grave situation in EECCA calls for a fundamental reform in the approach to financing environmentally-related infrastructure and the associated policy and institutional arrangements. Overly ambitious plans to extend the coverage and level of infrastructure services need to be replaced by more realistic, modest capital improvement programmes, tailored at providing essential repairs and rehabilitation of critical elements of infrastructure in order to maximise efficiency gains (mainly reduction of energy costs) within the limits of what households and public budgets can afford.

Even achieving these more modest objectives represents a major challenge for EECCA countries. *User charges* will be the most important long-term source of finance for operation and maintenance expenditure, though the low income in many EECCA countries represents an important affordability constraint. *Public budgets* will have an essential role in the short and medium term in financing rehabilitation and capital investments, in providing social protection and in facilitating access to credit. However, infrastructure programmes have to compete with other pressing social priorities. Thus, scarce *public funds and donor grants* need to be strategically prioritised; they will need to be increased in many

EECCA if the Millennium Development Goals are to be achieved[1]. The importance of *domestic financial and capital markets* will grow over time. *International financial institutions (IFI)* will continue to have an important role in capital investments and promoting financial and management discipline. The role of the *private sector* will for many years be more important in providing managerial know-how than finance.

Even though the development of environmental financing strategies (EFS) has only been undertaken in the last few years, it has already triggered some significant policy changes in EECCA countries. *In Novgorod Oblast (Russia)*, the EFS for the water sector was officially adopted by Regional Government and used to identify a portfolio of projects co-financed by the Oblast and international donors. The municipal waste EFS for *the Novgorod and Yaroslavl Oblasts* led to a revision of the waste management plans that involved the identification of more cost-effective regional solutions. *In Moldova*, the EFS was adopted as an official policy document and supported a draft government resolution relaxing unrealistically stringent wastewater effluent standards. *In Kaliningrad (Russia)*, the EFS was used to identify a portfolio of projects co-financed by the Oblast and international donors. *In Ukraine*, the EFS was used to support a comprehensive water sector strategy. *In Pskov (Russia)*, the EFS stimulated a policy debate about infrastructure development targets that were revealed as being financially unsustainable and unrealistic. *In Georgia and Kazakhstan*, the EFS has provided a revealing "reality check" on possible co-financing arrangements with IFIs and donors.

The experience accumulated to date suggests that the environmental financing strategy methodology can be useful tool for governments in developing realistic plans to achieve nationally or internationally agreed targets. The underlying assumption is that governments should not finance all or most expenditure, or sponsor all or most projects. Relying on the public budget to finance operational and maintenance costs of collective infrastructure, for example, is not a sustainable solution. The main role of government in relation to finance is to establish the policy, regulatory and institutional framework within which resources from users, financial markets, capital markets, local budgets and enterprises can be

[1] As one of the Millennium Development Goals, by 2015 all United Nations Member States have pledged to reduce by half the proportion of people without sustainable access to safe drinking water. At the Johannesburg Earth Summit it was further agreed, by 2015 to reduce by half the proportion of people without access to basic sanitation

mobilised in a complementary way, and applied as cost-effectively as possible to achieve agreed goals. Hence, the financing strategies can be useful not only to help plan the government budget, but also in suggesting how policy instruments that affect the capacities and decisions of other public and private financial agents might be reformed.

1 Introduction

In the post-Soviet period, the financing of environmental expenditure needs in the EECCA countries, particularly water and sanitation services, has been characterised by: heavy reliance on shrinking public budgets; user charges significantly below cost-recovery levels; non-transparent and inefficient subsidy schemes; few disbursements of donor grants and IFI loans; no commercial financing (with the exception of arrangements involving the operation of municipal infrastructure by large enterprises). Such practices are financially unsustainable. The result is that basic infrastructure maintenance work is not carried out, and the assets deteriorate, eventually ceasing to function.

To address the situation, most EECCA governments have developed target-specific programmes, which have attempted to evaluate the situation and compile ad-hoc long lists of relevant projects with attached estimates of their expenditure investment needs, as well as identification of desired financing sources. However, the inclusion of these projects into the budget process has proven to be difficult, and most of the target-specific programmes remained significantly under-funded.

Sectoral planning tools, such as national environmental action programmes (NEAPs) have been developed. These programmes were valuable in identifying priority environmental problems. They have often identified lists of the most urgent measures required, including investments to address emergency environmental issues in the near term. However, the NEAPs lacked concrete estimates of costs and expenditure requirements and did not provide realistic bridges between the identified measures and the financial resources available. It was generally assumed that finance would be available for all capital investments needed to meet the targets, even if the cost of the action plan was unaffordable for the economy. Thus, while NEAPs can be considered as important first steps towards sound strategic planning, they needed to be complemented by more realistic implementation strategies, including viable, long-term, investment and financing strategies.

In October 2000, a Conference of Economic, Finance and Environment Ministers on the water sector in EECCA countries in Almaty acknowledged the need to better integrate economic and environmental decision making as part of the broader reform of decision making by governments. Ministers called for the development of realistic, targeted, and affordable sector financing strategies.

Within the framework of the EAP Task Force and with strong support of Denmark, a methodology for conducting environmental financing strategies, and in particular, the FEASIBLE methodology, was developed.

This volume provides an overview of the environmental financing strategy methodology and the related computerised decision support tool, FEASIBLE, as well as the experience to date with their application in the water, wastewater and municipal solid waste sectors.

Most of the financing strategies implemented to date have been developed using the modelling-based FEASIBLE methodology, which therefore features prominently in the present publication. This is, however, only one of several approaches to preparing financing strategies, and a case using a more project based approach is also presented.

Chapter 2, Environmental Financing Strategies introduces the concept of environmental financing strategies and gives an introduction to the application of the methodology so far.

Chapter 3, The FEASIBLE Model provides an introduction to the computerised decision support tool FEASIBLE which is available to support the development of national or regional environmental financing strategies using a modelling based methodology.

Chapter 4, Development and Implementation of Environmental Financing Strategies describes the iterative process of developing an environmental financing strategy, the data requirements and the political/administrative issues related to ownership of the analysis and outcomes.

Chapter 5, Main Results of EFS Development in EECCA provides an overview of the main results of the application of FEASIBLE in Eastern Europe, Caucasus and Central Asia (EECCA) in relation to water supply, wastewater treatment and solid waste management.

Finally, **Chapter 6, Applicability in Other Regions and Sectors** describes the applicability of the methodology in EU accession countries (with a case example from Latvia and Lithuania), and the extent to which the environmental financing strategy concept is applicable in developing countries. Furthermore, a case example of the specific challenges encountered in applying the environmental fi-

nancing strategy concept in China is provided. Finally, the possibilities for, and challenges in connection with, the introduction of the environmental financing strategy concept in the energy/air pollution sectors are briefly discussed.

2 Environmental Financing Strategies

2.1 The Concept

The environmental financing strategy methodology was developed in response to the limitations of national environmental strategies and action plans to adequately address associated financial issues. Environmental financing strategies aim to organise information in a form that facilitates decision making, whether in setting policies and targets, creating or strengthening institutions, or mobilising sources of financing. The key (and this was the major limitation of NEAPs) is to impart realism, and promote the concepts of affordability and cost-effectiveness in the implementation of environmental programmes.

An environmental financing strategy is a methodological framework for medium- to long-term strategic balancing of environmental and infrastructure service targets with available financing. It is applicable in the environmental sectors that require investment-heavy environmental infrastructure.[2]

The basic idea behind the environmental financing strategy concept is quite simple. There should always be a balance between the money needed to meet the target and the money available to do so. Applying this concept yields a number of benefits, which can most easily be explained through a stylised example as included in the Box 2-1 below.

[2] The methodology as implemented in the FEASIBLE model was developed by the OECD EAP Task Force. The model itself was developed by the Danish consulting company COWI in close co-operation with the OECD with financial support by DANCEE.

Box 2-1 Financing strategies - an illustrative stylised example

Assume that the target in a country is to have mechanical and biological treatment of all municipal wastewater. Developing a financial strategy for the water and wastewater sectors would imply a need to estimate the costs of this target and establish a coherent strategy for its financing. The costs include not only the investment in new treatment plants in the towns which do not currently have such plants, but also, and equally important, the operation and maintenance costs of the existing and new facilities.

Assessing all these costs and subsequently comparing them with the available supply of finance may reveal that significant additional financial resources will be required to achieve the target. A financing strategy aims to close the gap between the financial requirements and the supply of finance currently available. That can happen through a combination of three types of measures:

- Cost reduction related to efficiency improvement.
- Increased supply of finance.
- Reduction of the target service level.

Through the analytical process, it may become clear that cost reduction through reinvestments aiming at energy savings combined with the maximum affordable user charges will not be sufficient to close the financing gap. In that case, the conclusion may be that the target cannot be achieved or the time schedule for implementing the target has to be extended. In our example, it might be necessary to postpone the deadline for achieving wastewater treatment in the small and medium-sized towns.

Having this kind of formalised financial strategy will be very useful for stakeholders. For the authority that distributes investment resources, the result of the financing strategy gives an important input to the overall prioritisation of the investment funds. If no formalised financing strategy exists, there is a risk of ad hoc prioritisation and resulting non-optimal distribution of the investment funds. In such case investment in infrastructure may end up being wasted if there is, subsequently, no money for proper operation and maintenance.

In this way, the financing strategy can be used by many stakeholders to identify what they need to contribute in order to achieve a given service level. In our example, the municipalities may have to contribute through subsidies and/or by allowing user charges to increase to full cost recovery level or to the highest affordable level.

The process of preparing the financing strategy is as important as the technical calculation. By engaging all relevant authorities responsible for finance, economy, construction, environment – it promotes dialogue and eventually consensus on the specific actions that each should take. Thus the process of developing government programmes of action, if well organised, builds a bridge to effective implementation.

2.2 Application

The development of an environmental financing strategy aims to verify the realism and affordability of the general long-term objectives of sector policies and programmes. The strategy provides a long-term predictable framework for preparing mid-term investment programmes and for project pipelines in the public sector at different levels of government. It helps streamline the annual budget process and the preparation of individual capital investment projects.

Historically, environmental action plans have often been prepared without proper regard to how the identified activities should be financed and whether people could afford them. These issues have been particularly difficult to analyse realistically for large-scale environmental programmes that require heavy capital investments in public infrastructure and have a long time span. As a result, the subsequent implementation has often been impeded by resource constraints and characterised by interruptions, delays, cost overruns, conflicts over resource allocation, and ad hoc spending decisions. An environmental financing strategy assists in determining realistic and affordable service levels and in demonstrating the roles that different sources can play in financing the required expenditure. Thus, a well prepared environmental financing strategy increases the chances of successful implementation.

In most countries, if there is not enough money to reach policy objectives, policy makers try either to mobilise more money or to revise the objectives. In the EU candidate countries and EU member states, the targets of environmental and infrastructure development programmes are, to a large extent, externally determined by the EU laws. Under these circumstances, the purpose of the environmental financing strategy is to identify, in quantitative terms, the measures that would ensure an adequate supply of finance in the right places and times. This can help EU accession countries to design feasible implementation programmes for complying with EU directives.

An environmental financing strategy provides a framework for systematic costing of environmental targets in line with the best international standards and for assessing the implications of aggregated costs on liquidity and household affordability. It develops scenarios that show where the bottlenecks lie, and what kind of funding and other intervention may be needed. It offers a commonly understood language of communication among all relevant stakeholders involved

in the development of the environmental and municipal infrastructure sectors, especially among environmental, technical and financial stakeholders.

The financing strategy methodology presented here is a strategic planning tool designed for governments operating in market economies, i.e. governments that are policy makers and regulators of economic activity, rather than the central planners and owners of all assets and projects. Developing financing strategies by the government does not imply that the government should finance all or most expenditure, or own all projects. In fact, relying on the public budget to finance e.g. operational and maintenance costs of collective infrastructure is not a sustainable solution. Users, financial markets, capital markets and local budgets all need to complement each other in effective financial packages. Governments, however, create the legal and regulatory framework in which private financial institutions operate. Governments have several instruments to stimulate or hinder their willingness to provide finance for public environmental infrastructure. Hence, the financing strategy framework is not only needed to plan the government budget, but also to plan and reform those government policy instruments that affect the capacities and decisions of other public and private financial agents.

Environmental financing strategies can be used by transition and developing countries as well as western market economies:

- To assess total investment needs of alternative policy targets.
- To bring about practical implementation programmes taking into considerations what the economy and households can afford.
- To identify investment projects and build short- to medium-term project pipelines.
- To identify the policies and measures which are necessary to ensure effective financing of the project pipelines.
- To support claims of environment and other ministries responsible for municipal services on the public budget.
- To support transition country requests for donor and IFI financing.

- To measure and report on the progress in the implementation of programmes and policies.

Environmental financing strategies are also used by donor countries and IFIs:

- To check if local co-financing commitments are realistic.
- To co-ordinate different donor and IFI programmes.
- To identify country pipelines of supported investment projects.
- To provide an additional dimension (bigger picture) for appraisal of the financial viability of individual investment projects.

An illustrative example of several of these points is provided in Box 2-2 below, which summarises the role of the environmental financing strategy for Georgia in linking feasibility studies and macro-level planning.

Box 2-2 Environmental financing strategies - linking feasibility studies and macro-level planning

Environmental financing strategies can help link feasibility studies at the project level with macro-economic and budget planning, a linkage that is often not examined. Although both municipalities and IFIs analyse the affordability and liquidity related to individual investment projects, environmental financing strategies provide a framework for systematic aggregation of these and other projects at regional and national levels in order to assess their joint implications for domestic policies and budgets.

This value added was clearly demonstrated in Georgia, where the World Bank was developing a project for rehabilitation of the water and sanitation system in Tbilisi, while the European Commission was encouraging rehabilitation of the wastewater treatment plants along the Black Sea coast. Each party was making independent assumptions about the availability of co-financing from the central budget of Georgia, without full information of the aggregated claims on the consolidated budget. Merging these two ambitious investment programmes, as well as other programmes related to water services in other parts of Georgia, into the framework of an environmental financing strategy helped identify, in quantitative terms, the difficult trade-offs that the Georgian budget planners would face if they wanted to fulfil all these commitments.

2.3 The FEASIBLE Model

A computerised decision support tool has been developed to support the practical implementation of the methodological framework. The tool, called FEASIBLE, facilitates an iterative process of matching the expenditures required to meet given targets with available finance.

Most of the financing strategies described in the present publication have been developed using FEASIBLE. However, other approaches using the same or a similar methodological framework can also be used to elaborate financing strategies.

The key feature of FEASIBLE is the use of generic cost functions, which allow easy estimation of the costs of alternative service and environmental targets with a limited data collection effort. Further information on the FEASIBLE model is provided in Chapter 3.

2.4 Implementation to Date

To date, about a dozen environmental financing strategies have been developed in EECCA countries and regions covering water supply, wastewater treatment and municipal solid waste. An overview of these strategies is provided in Table 2-1.

Table 2-1 Overview of environmental financing strategies in CEE and EECCA countries

Country	Region	Sectors covered	Finalised
EECCA			
Georgia	National	WS & WW	2001
Moldova	National	WS & WW	2000
Russia	Kaliningrad	WS & WW	2002
	Novgorod	WS & WW	2000
		MSW	2002
	Pskov	WS & WW	2001
	Rostov on Don	WS & WW	2003
	Rostov on Don	MSW	2003
	Yaroslavl	MSW	2003
Kazakhstan	National	WS & WW	2001
	Eastern Kazakhstan Oblast	WS & WW	2003
Ukraine	National	WS & WW	2003
Armenia	National	WW	2003
CEE			
Lithuania	National	WS, WW & MSW	2001
Latvia	Riga	MSW	2002
Other Transition and Developing Countries			
China	Sichuan Province	WW	2003

Note: WS (Water supply), WW (Wastewater treatment), MSW (Municipal Solid Waste).

Applied methodology

Most of the financing strategies have been developed using the modelling-based FEASIBLE methodology. However, the financing strategies for Kaliningrad and Lithuania have been developed without the use of FEASIBLE using a more project based approach.

While the project based approach can achieve a higher degree of accuracy, its need for project level data limits its applicability to smaller countries/regions and centrally-planned, sectors and makes it more difficult to do the "what-if" scenario analysis, which has proved to be useful for policy development and implementation when applying FEASIBLE.

Donor financing
For the financing strategies developed to date, the following countries/institutions have provided financial support:

- For Rostov on Don and Yaroslavl: EU TACIS, Denmark, OECD.
- For Armenia: Germany.
- For Sichuan: the OECD, Australia, Japan.
- For the remaining financing strategies: Denmark.

The environmental financing strategies have been used by ministries of housing (responsible for urban infrastructure) and ministries of environment in reframing their policies and in their negotiations with ministries of finance and economy on the public investment programmes. For further discussion of policy impacts, please refer to Chapter 5.

Further reading
Readers who are interested in more detailed background material on environmental financing strategies and their practical application or on the computerised decision support tool FEASIBLE should refer, in particular, to the following publications:

- The FEASIBLE Model, Version 2, User Manual and Documentation, 2003.

- Financing Strategies for the Urban Water Sector in the NIS: Overview, Fifth Meeting of the NIS Environmental Finance Network, 21-23 May, 2001, OECD EAP Task Force.

A comprehensive list of relevant publications is provided at the end of this publication under literature.

3 The FEASIBLE Model

A major challenge when developing environmental financing strategies in EECCA is the lack of available data on investment and rehabilitation needs at the individual facility level. In order to overcome this challenge and enable successive iterations of alternative policy combinations in an environment where detailed and credible data is scarce, a software tool was created to enable realistic estimation of total financing needs by aggregation of individual needs.

FEASIBLE is a software tool developed to support the preparation of environmental financing strategies for water, wastewater and municipal solid waste services. The first version of FEASIBLE, a spreadsheet based version for water and wastewater, was released in 2001. FEASIBLE Version 2 is a stand alone application based on a database. It is released concurrently with this publication.[3]

The present chapter provides a brief description of FEASIBLE, its main functions, what it can and cannot do. A detailed description of the model is available in "The FEASIBLE Model, Version 2, User Manual & Documentation, 2003".

3.1 Using FEASIBLE

FEASIBLE can be used to facilitate the iterative process of balancing the required finance with the available finance. It provides a systematic, consistent and quantitative framework for analysing feasibility of financing environmental targets. A computerised model, FEASIBLE may be used to analyse "what if" scenarios that simulate what would happen if some present policies were changed. FEASIBLE presents the financial impacts of these changes in a systematic and transparent manner.

FEASIBLE requires specific, technical city-by-city data on the present size and state of infrastructure. It also requires that policy makers specify their objectives in terms of specific, measurable and time-bound targets. FEASIBLE calculates the investment, maintenance and operational expenditure that would be required to reach specific targets determined by local policy makers. Targets and objectives are not entered directly, but expressed in terms of selected technical measures. The translation from objectives and targets to technical measures is done as

[3] The FEASIBLE model is freeware and can be obtained through the web pages of the OECD, DEPA and COWI.

a pre-modelling exercise by the user. FEASIBLE calculates expenditure needs under different assumptions concerning input data and parameters related to:

- Objectives and targets.
- Technical measures.
- Macro-economic projection.
- Technical and price correction coefficients.

The expenditure requirements are subsequently compared with forecasted levels and sources of finance. All sources of finance (public, private, domestic, foreign, etc.) and all financial products can be simulated.

FEASIBLE compares the expenditure needs with the supply of finance on a year-by-year basis and computes cash flow forecast, i.e. financing deficits or surpluses, both annual and accumulated. Not only the magnitude of total cash flow deficits/surpluses is presented. The structure of the financing gaps is also shown, e.g. coverage of capital investment expenditure by various funding sources that can be used to finance fixed assets, operation and maintenance costs, etc. These results help policy makers understand where the main bottle-necks are, as well as where, when and what additional policy interventions are needed to facilitate effective financing of infrastructure development pro-grammes.

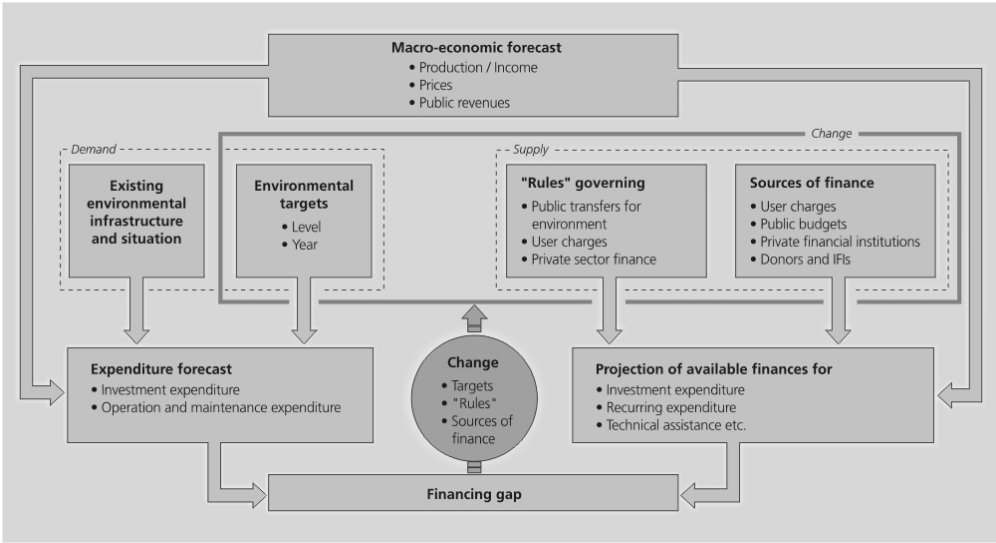
An environmental financing strategy can be developed through series of iterative runs of FEASIBLE with different assumptions describing targets and measures to mobilise additional finance or to re-allocate available funds. This process en-gages many policy makers and local experts who should reach a consensus, first on targets and then on the most realistic package of specific measures that can mobilise sufficient financial resources to meet the desired targets. The use of FEASIBLE introduces an additional layer of realism into this multi-stakeholders dialogue. In FEASIBLE, any increase in supply of finance is compared with what the national economy, public budgets[4] and households[5] could potentially

[4] Additional public expenditure are assessed on the basis of detailed analysis and forecast of macroeconomic developments, examination of historical budget execution records, review of relevant expenditure patterns and trends in comparable countries, as well as extensive discus-sions of the medium and long-term budgeting and investment planning with national, re-gional, and local authorities.

afford. This comparison serves as a test of whether suggested policy options are realistic. If affordable measures to mobilise additional finance cannot be found, FEASIBLE allows environmental or service level targets to be changed in order to simulate the effect of decreasing the demand for financing.

The chart below provides a schematic overview of the iterative process of the FEASIBLE methodology.

Figure 3-1: Overview of the FEASIBLE environmental financing strategy methodology



This iterative process informs decision makers how to use the limited funds of the public sector to achieve the biggest effect, and what needs to be done to mobilise sufficient financing from private and foreign sources. In several countries, it has proven to be a useful tool in the dialogue between the authorities responsible for infrastructure and environment, on the one hand, and authorities responsible for finance and economy, on the other. It has also been used to support ne-

[5] Households' capacities to sustain increased user charges are assessed against internationally adopted benchmarks for countries of similar income levels. In most of the environmental financing strategies covered by this review, the benchmark level for household water bill is established at 4% of average household income, under different assumptions on rates of future income growth.

gotiations on priority investment projects financed by IFI loans or through bilateral co-operation programmes.

Box 3-1 FEASIBLE - data need

The FEASIBLE model requires the user to collect and enter basic city-by-city and global data on the present infrastructure in the sectors covered by the financing strategy, including:

- Basic demographic data (population, income, local price levels).
- Existing service level (coverage, quality, capacity, technologies).
- Existing supply of finance (user charges, public budgets, international sources of finance).
- Environmental and service targets.

Although the model is able to run with a limited input and will propose default levels for some parameters, the value of the output increases with the accuracy of the data input.

The FEASIBLE methodology is quite specialised, and thus cannot serve all purposes. For example, it cannot optimise the selection of technical measures in terms of cost-benefit ratio or cost effectiveness. Box 3-2 below highlights the limitations of FEASIBLE.

Box 3-2 FEASIBLE - what the model cannot do

The FEASIBLE model cannot:

- Substitute for feasibility studies.
- Substitute for cost-effectiveness optimisation.
- Substitute for priority setting and cost-benefit analysis.
- Substitute for good policy making and effective implementation.
- Substitute for willingness-to-pay analysis.

It should, furthermore, be noted that proper use of FEASIBLE and interpretation of model results require extensive knowledge of the technical and financial aspects of the sectors analysed, as well as familiarity with computers. Hence, in some countries, local consultants and staff of beneficiary ministries will need to be trained in the use of FEASIBLE in order to be able to apply it appropriately.

3.2 Structure and Main Functions of FEASIBLE

FEASIBLE Version 2 enables analysis of the following sectors:

- Water supply and treatment.
- Wastewater collection and treatment.
- Municipal solid waste management.

Each module can be run independently of the others.

FEASIBLE is structured into four main components:

- **General information,** which contains the definition of the geographic area covered, subdivided into regions, municipalities and groups of municipalities, local cost correction coefficients, and the basic macro-economic and financial data underlying all model scenarios.

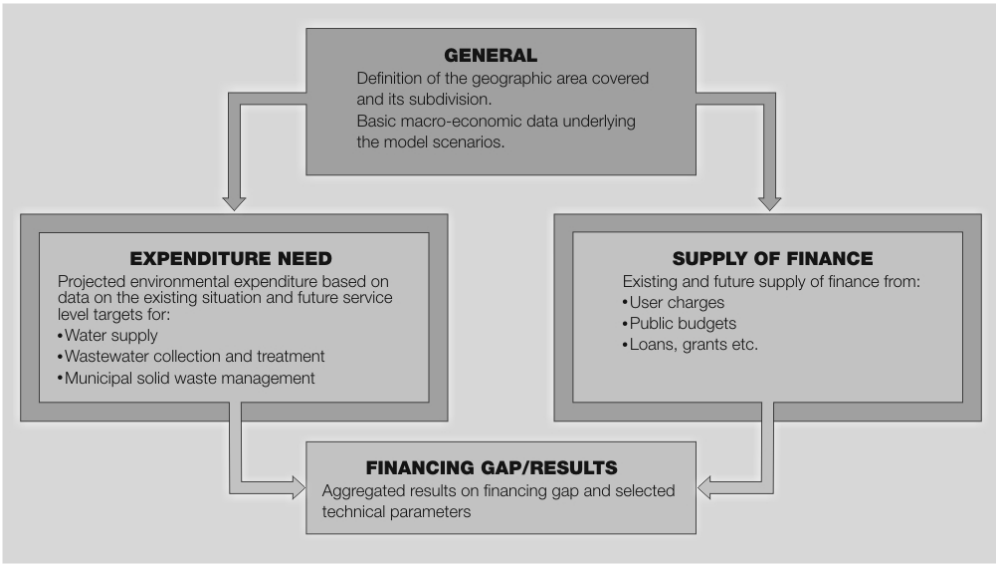
- **Expenditure need**, which calculates the projected environmental expenditure (for operation and maintenance, re-investment, renovation and new investments in environmental infrastructure), based on data on the existing situation, service level targets entered by the user and cost correction coefficients.

- **Supply of finance and affordability**, which describes the existing and future supply of finance from various sources and in various forms, for example, user charges, public budgets, loans, grants, etc. It also allows the user to define an affordability limit to which the potential increase in the corresponding source, for example user charges, will be constrained.

- **Financing gap/results**, in which aggregated results on financing gap and selected technical parameters are calculated and displayed in tabular and graphical format.

These components are composed as illustrated in Figure 3-2 below.

Figure 3-2 Structure of FEASIBLE



Water supply

The key parameters available to describe the service level and set targets for the water supply system are:

- Type of water intake and treatment technology.
- Volume of water production.
- Coverage of water supply (percentage of the population covered by central or local water supply).
- Renovation of intake, treatment and transmission system, as well as distribution network and service connections.

The water supply technologies available in the model are:

Urban	Rural
• Groundwater intake, no treatment. • Groundwater intake with normal treatment (chlorination, coagulation, sedimentation and filtration). • Surface water intake with normal treatment (chlorination, coagulation, sedimentation and filtration). • Surface water intake with advanced treatment (normal treatment + ozonation and filtration in a granular activated carbon filter).	• Hand pumps, groundwater. • Electrical pumps, no treatment, groundwater. • Electrical pumps, treatment, groundwater.

Wastewater treatment

The key parameters available to describe the service level and set targets for the wastewater treatment system include:

- Type of wastewater treatment technology.
- Wastewater collection rate (percentage of the population connected to sewer system).
- The share of the population connected to a wastewater treatment plant.
- Renovation and upgrading of pumping stations (increasing energy efficiency).

The wastewater treatment technologies available in FEASIBLE are:

Urban	Rural
• Mechanical. • Chemical (phosphorous removal). • Biological. • Nitrification. • Denitrification. • Nitrogen removal.	• Septic tanks. • Reed bed. • Biological sand filters. • Stabilisation ponds.

Municipal solid waste

The key parameters available to describe the service level and set targets for the collection municipal solid waste are:

- Coverage of collection system (% of population).
- Type of collection system implemented.

For treatment/recovery, FEASIBLE offers different types of treatment or recovery facilities, and the user is required to distribute collected waste to these facilities.

The municipal solid waste collection and treatment/recovery technologies available in FEASIBLE are:

Waste collection	Treatment/recovery
For households: • Kerbside, ordinary collection. • Kerbside, dual collection. • Drop-off, recycling station. • Drop-off, take back. • Drop-off, decentral. bring banks. • Kerbside, recyclables collection. For commerce, industry and C&D: • Container ordinary collection. • Container recyclables collection.	• MRF - Mixed waste. • MRF - Recyclables. - Mixed recyclables. - Source separated recyclables. • MRF - WEEE. • Composting plant. - Windrow (garden waste). - In-vessel composting (food waste). • Bio gasification plant. • Landfill. - EU. - Controlled landfill. - Dump. • Incineration plant. - New - heat/electricity. - New - heat. - Old. • HHW treatment facility. • C&D recycling facility.

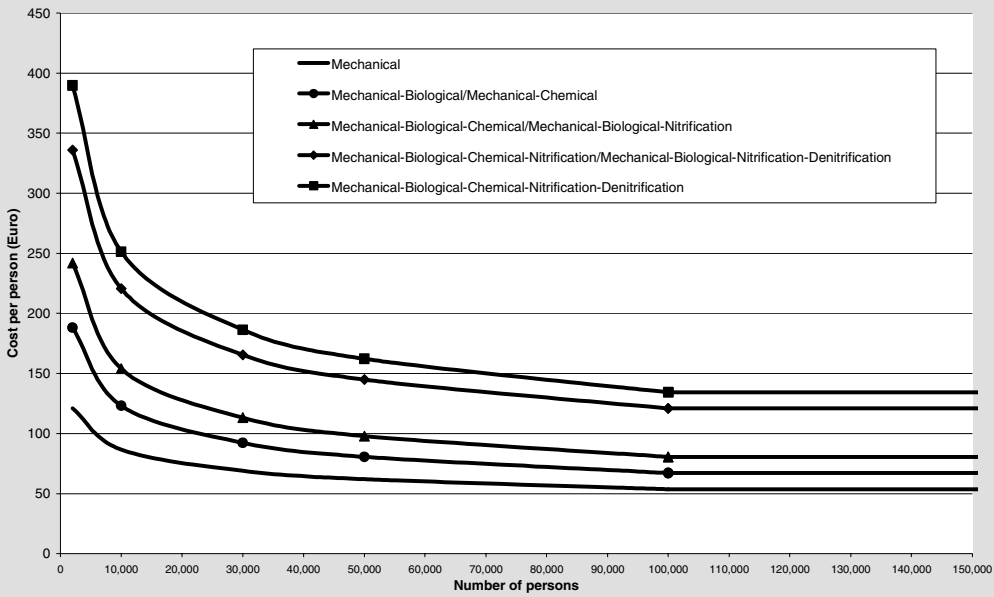
Generic expenditure functions

The calculation of the expenditure need is based on a number of generic expenditure functions that are incorporated into FEASIBLE. These expenditure functions allow easy estimation of the costs of alternative service and environmental targets with a limited data collection effort. They cover a number of technical measures within each sector.

Box 3-3 FEASIBLE - generic cost functions and local cost correction

FEASIBLE calculates the cost of specific technologies based on generic cost functions and local cost correction.

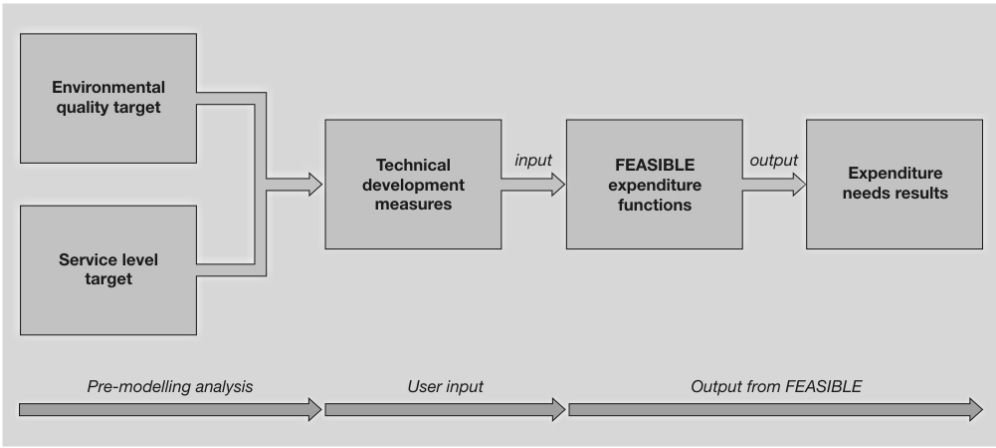
The generic cost functions estimate unit cost as a function of the type and the capacity of a facility. These functional relationships were derived from a number of stylised feasibility studies and are expressed at the international price level. The graph below shows just one example of such cost functions where the unit investment expenditure for alternative wastewater treatment technologies are shown as a function of the number of persons connected to the treatment facility. These expenditure functions are expressed in international prices and reflect the typical distribution on main cost components (equipment, materials, design, labour, energy, land, etc.) in European utilities. Each cost component has its own cost correction coefficient which can be used to adjust the international cost levels to local cost levels.



This means that the existing situation and the target situation are mimicked in the model through the selection of specific technical measures which would lead to the fulfilment of a given target.

A very important pre-modelling exercise therefore consists in translating environmental quality or service level targets to technical measures as illustrated in Figure 3-3 below.

Figure 3-3 Phases in the use of FEASIBLE



Hence, when modelling the existing situation in FEASIBLE, the user should select technical measures that are as close as possible to those actually applied in the relevant areas (regions, municipalities or groups of municipalities). Likewise, when modelling a target, the user should select technical measures that would lead to the achievement of the target according to the pre-model analysis.

The expenditure needs are calculated in international prices by the model, and a set of price correction coefficients is used by FEASIBLE to convert results from international prices to local prices. The user is, therefore, required to enter data concerning the local cost of key cost components, such as land, power, fuel, labour, equipment, building materials, etc.

In the supply of finance component, the user is required to specify data on the existing financing situation, as well as the future supply of finance. The forecast of the future supply of finance is done by the user as a pre-model exercise. The supply of finance is specified on a year-by-year cash-flow basis.

FEASIBLE distinguishes between the following sources and instruments of financing:

- User charges (from households, industry or other consumers).
- Public budget.
- Grants (from several sources).
- Loans (from IFIs or commercial banks).
- Other.

The financing gap/results component provides aggregated results on the financing gap, expenditure needs, supply of finance and selected technical parameters. The user may choose to see the gap for specific expenditure types and sources of supply of finance. Box 3-4 below shows some examples of types of financing gaps that may be analysed.

Box 3-4 FEASIBLE results - Examples of types of financing gaps

Total financing deficit/surplus

- Comparing the total expenditure need with the total supply of financing reflects the balance (or lack of balance) between the service level ambitions and the available financing.

Cost recovery deficit/surplus

- Comparing the O&M expenditure need with the supply of finance from user charges reflects the extent to which tariff payments by direct users are sufficient to cover the necessary operation and maintenance of the infrastructure.
- Comparing the O&M and re-investment expenditure need with the supply of finance from user charges reflects the extent to which tariff payments provide a contribution to operation and renewal of fixed assets in the infrastructure.

Re-investment deficit/surplus

- Comparing the O&M and re-investment expenditure need with the total supply of finance reflects the extent to which the total available financing is sufficient to cover the necessary operation, maintenance and re-investment. If an accumulated gap (backlog) appears, the implication is that the infrastructure will deteriorate compared to the base year.

Investment expenditure deficit/surplus

- Comparing the expenditure need for renovation, upgrading and extension of the service level with the supply of finance targeted at capital expenditure reflects the balance between needed investments and financing available to finance such investments.

Due care should, however, be taken when interpreting the aggregated financing gap in a country or large region with numerous independent utilities in the environmental sector covered by the financing strategy, as user charges typically are not transferable across administrative jurisdictions. Hence, an aggregated balance may well reflect local imbalances. For this purpose, FEASIBLE allows analysis of financial surpluses/deficits at more disaggregated levels (groups of municipalities or individual cities).

4 Development and Implementation of Environmental Financing Strategies

This chapter provides an overview of the generic process and tasks of developing and implementing an environmental financing strategy (EFS). The actual implementation of the EFS methodology in a given country or region may, of course, deviate from this general description depending on the specific context and local circumstances. Chapter 5 contains a case description, which gives an impression of the way in which the practical implementation has been handled and the results generated. Furthermore, it should be noted that important follow-up activities such as policy implementation studies, feasibility studies and detailed design, which are outside the scope of the environmental financing strategies themselves, need to be implemented for the benefits to materialise.

4.1 Stakeholders and the Process

Effective dialogue is needed

An intense process of analysis, consensus building and communication across various groups of stakeholders is an integral part of the preparation of an environment financing strategy. This multi-stakeholder dialogue will usually comprise the following types of stakeholders:

- Authorities responsible for municipal infrastructure and/or the environment in the country in question. These authorities will, generally, have some overall sector planning responsibilities and should, therefore, be involved in discussions concerning target setting and sector priorities.

- Authorities responsible for public budget planning (fiscal policy and economic planning) in the country in question. Ministries of economy and finance will, generally, be the key actors in relation to the public budget, which may be an important source of finance for municipal environmental infrastructure. These authorities should, therefore, be involved in considerations with regard to alternative policy packages for supply of finance.

- The local authorities and/or utilities who are responsible for providing the environmental services to the end-users, and who will be the owners of individual investment or rehabilitation projects. In addition, the tariff policy is most often decided at the local level. These stakeholders have the detailed data on the current situation that is required in order to make a projection of

the expenditure needs. At the same time, participation of implementing agencies in discussions concerning targets and policies is imperative.

- International financing institutions or donors who may act as sponsors of consultancy inputs to EFS development, and who may wish to use the financing strategy as a tool to support negotiations with authorities and municipalities in the relevant country.

- Private domestic and foreign partners and investors who could, potentially, be interested to participate in and provide funds for utility rehabilitation and modernisation programmes. Such interests will, most likely, be low at the early stages of sector restructuring. In some specific cases, however, as, for example, large utilities in country capitals or other major cities, private investor funds could be a realistic source of financing.

- Consultants (international and/or local) will often be hired to assist in the development of an environmental financing strategy. The consultants can facilitate the process by being responsible for the calculation of expenditure needs and supply of finance for various scenarios based on the data and decisions supplied by the other stakeholders. For this purpose, the consultants may use FEASIBLE.

Obviously, local ownership of the process and the results is paramount to facilitate the practical use of an environmental financing strategy, as key issues addressed, such as the adequacy of present user charges and the realism of stated service level targets, by nature, will be politically sensitive.

The suggested structure of this dialogue is outlined below.

Phases in development and implementation

Developing and implementing an environmental financing strategy will take place as a process stretching over a considerable span of time[6]. In general, the process can be expected to consist of the following phases:

1 Preparation (1-3 calendar months).

[6] Experience has shown that the preparation of an environmental financing strategy needs to be supported by local and international consultancy assistance. This will typically be in the order of 15 man-months local consultancy and 5 man-months international consultancy.

2 EFS baseline analysis (5-7 calendar months).

3 EFS scenario analysis (3-4 calendar months).

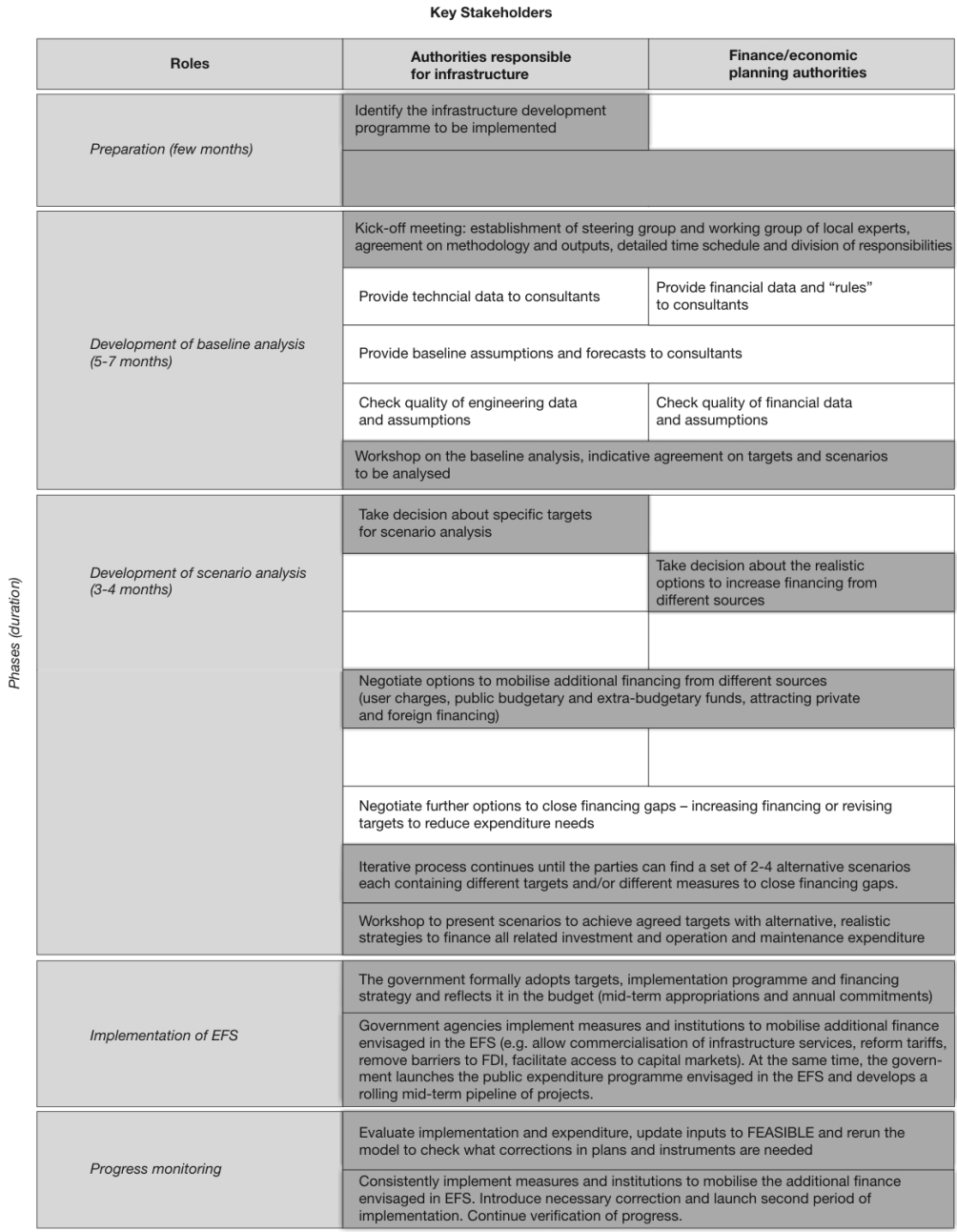
4 Preparation of implementation programme/strategy (duration depending on local political process).

5 Implementation, including progress monitoring and updating (continuous).

The general content of each of these phases and the roles of the various stakeholders involved are depicted in the flow diagram in Figure 4-1 below. The flow diagram illustrates how international co-operation can be used to facilitate the process of using FEASIBLE to develop a financing strategy. The process in any particular country or region may follow a different path. The dark fields show essential actions – the "drivers" – of the process at each stage. The lighter fields illustrate supporting actions.

Although only the first three phases are a part of the environmental financing strategies themselves, the last two phases are nevertheless necessary preconditions for the benefits to materialise.

Figure 4-1 The process of developing and implementing financing strategies and the roles of key stakeholders



Key Stakeholders

Foreign and local consultants and experts	Project owners (e.g. municipalities and utilities)	International cooperation partners
		Develop terms of reference; identify funding. Choose international consultants
		Participate, agree, execute contracts
Collect data on the present state of infrastructure and available finance (2-3 field missions)	Provide technical and financial data to consultants	
Calibrate FEASIBLE, load data, develop baseline scenario and baseline financing gap assessment	Provide baseline assumptions and forecasts to consultants	
Write intermediate report on baseline scenario; characterise baseline financing gaps		Check quality of methodology
Fomulate targets in the quantitative language of FEASIBLE		
Fomulate realistic options to increase financing in the quantitative language of FEASIBLE	Take decision about the realistic options to increase financing from different sources	
Carry out simulations for scenario analysis; identify financing gaps for each target; provide this information to authorities		
Provide technical support for negotiations	Provide commitments on local co-financing and tariffs	
Simulate if proposals agreed by authorites can close financing gaps. Feed back.		
Provide technical support for negotiations, conduct “what-if” simulations	Provide inputs to negotiations on targets or increased local co-financing including tariffs	
Provide consulting services to municipalities in project development and preparation and to the government in pipeline management	Municipalities reflect government decisions in their mid-term investment plans, prepare project proposals and submit them to the government expenditure programme	IFIs and donor countries take the approved EFS into account in their programming
Provide consulting services to municipalities and the government	Implement periodical review of their investment plans and implement projects	

4.2 Importance of the Baseline Analysis

The establishment of a sound baseline scenario is crucial to any medium- or long-term analysis of sector policies and programmes. This alternative describes the future as it is likely to look if historical trends and present policies[7] continue unchanged. This is not a trivial exercise, as expected changes external to the sector under consideration need to be taken into account in defining the baseline, for example technological progress, growth of income, changes in population and consumption patterns, macro-economic conditions, international trade, etc. However, a good "no-change-in-policy" alternative is essential to understand the need, if any, for modification of present policies and for altering the trends.

In terms of an environment financing strategy, the baseline scenario includes a projection of the future needs for expenditure that will result from maintaining the present level and quality of service, with the same facilities under operation, the same pollution control equipment, emission standards, etc. Completion of already ongoing or firmly committed projects can also be included in the baseline. The baseline scenario also includes a projection of the supply of finance that will result from continuation of present policies on user charges, public budget allocations, private sector financing for the environment sector, etc. For grants and loans, normally, only firmly committed finance is included in the baseline.

4.3 Scenario Analysis and the Policy Dialogue

The environmental finance strategy, *sensu strictu* [8], is established by running the model several times with different targets and different parameters representing various available packages of policies affecting the demand and supply of financing until one or more scenario is found where all targets are met and all financing gaps are closed.

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[7] Note that "policy" is defined broadly to encompass the entire spectrum of policy pronouncement, enactment of laws and regulations, enforcement hereof and all practices and habits that can be said to be policy related. In some countries, enhanced enforcement of policy may constitute a significant "change in policy".

[8] A combined set of environmental targets and financing proposals is said to constitute an environmental financing strategy s*ensu strictu* if it closes the financing gaps (i.e. no deficits in any year).

The need for environmental expenditure is a function of the level of ambition of the targets, both in terms of how soon and how much (e.g. water produced, population served, pollution abatement) is to be achieved.

The supply of finance is influenced by a large number of policies, including, but not confined to, policies on user charges, public budget allocations and the access to capital and financial markets capable of offering long-term debt finance. Government policies may also enhance sovereign and municipal credit worthiness, create more favourable conditions for private sector participation or better leveraging of foreign funds.

A set of environmental targets and policies that influence the supply of finance form a scenario. The scenario is feasible if all targets are met and all financing gaps can be closed during the entire implementation period.

The scenario analysis forms the basis for policy dialogue on whether the policies that determine the available supply of finance and the environmental objectives need to be revised and how.

This interactive process of multiple model runs and policy assessment is needed to define realistic strategies. Realistic strategies are those for which feasible policy packages ensure that the planned service level is provided at affordable user charges and fiscal burdens. The financing gap can be bridged by a combination of increasing the supply of finance and decreasing the demand for financing (e.g. through cost savings or revised targets). The affordability constraint, determined on the basis of international benchmark data for comparable income level countries, can be met only by a combination of income growth, income support and decreasing the financing needs.

The key value in applying the EFS methodology lies in its contribution to systematising the difficult discussions on targets, instruments and money. Local leadership in the process and ownership of results is the necessary condition to facilitate the practical use in development and implementation of infrastructure development programmes.

5 Main Results of EFS Development in EECCA

5.1 The Municipal Water Services Sector in EECCA

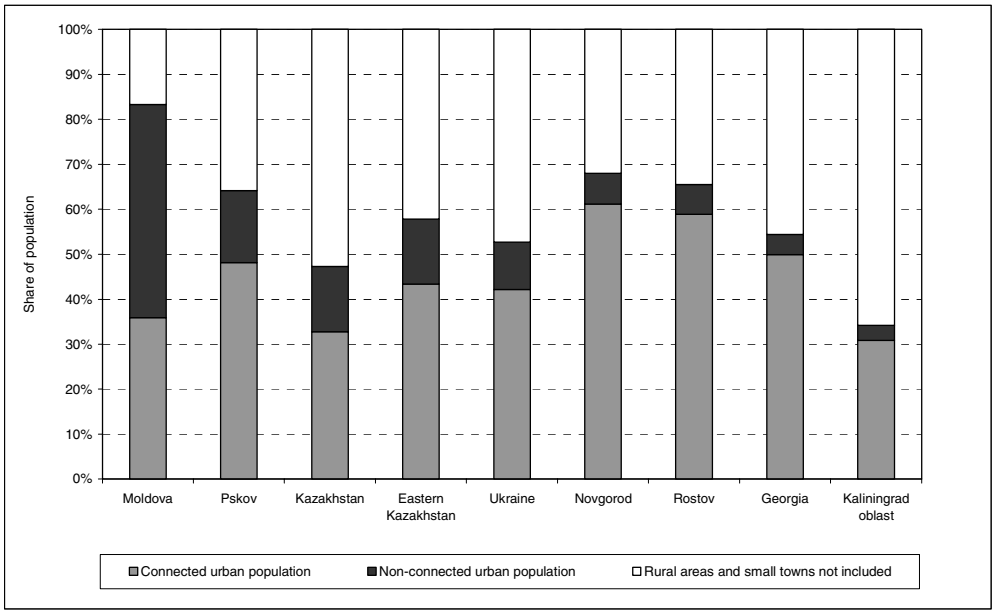
Country-specific analyses conducted in the years 2000-2002 using the EFS methodology and FEASIBLE have revealed and quantified several financial challenges that EECCA countries face in their efforts to keep up and improve the level of urban water and wastewater services. But at the same time these exercises have also helped the governments identify realistic and concrete steps to improve infrastructure services even under very tight budget constraints.

Existing service level

The EFS country studies included only the urban population[9]. The rates of urban population connected to centralised water supply and wastewater collection systems (75-95%) are often comparable with those in OECD countries. However, there are significant differences between and within the countries, as shown in Figure 5-1 below. Although the share of the rural population supplied by central systems has not been estimated, it is not expected to be high. Generally, the share of the total population connected to central water supply is between 30 and 60%.

[9] In Novgorod, Pskov, Moldova and Georgia, this includes the population in towns with more than 1,500 inhabitants. In Kazakhstan, only the urban population in towns above 20,000 inhabitants is included, while in the Ukraine study, the limit is 10,000 inhabitants.

Figure 5-1 Share of population included in EFS studies and the connection rates to central water supply

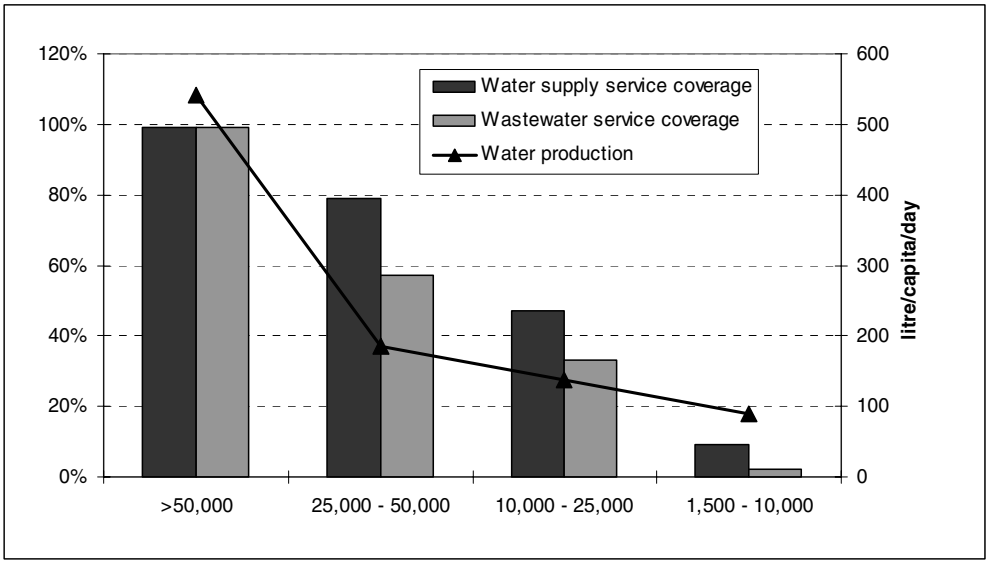


Source: Data collected within country and regional environmental financing strategies (EFS)

As regards wastewater collection, the connection rate is 10-20% lower than for water supply. Most of the large cities have biological wastewater treatment plants, sometimes with significant excess capacity.

The above figures for connected population are, however, average figures for the country and regions. Significant variation exists within the countries/regions depending on the size of the settlement. Figure 5-2, for example, demonstrates the distribution of the connected inhabitants to the centralised water and sewerage system in Moldova. The bars scaled against the left axis indicate that the coverage of both water supply and wastewater collection is 100% in the largest cities and significantly less in small towns. The line marked with triangles and scaled against the right axis shows the production of water per capita per day. It clearly illustrates excessive water production and losses in large cities. These two variables are shown on one diagram for convenience only. It should not imply that there is a correlation between them.

Figure 5-2 Coverage by centralised water and sewerage systems and consumption of water in Moldova



Source: Data collected for Moldova EFS

Typically, the infrastructure was usually inefficiently designed and, hence, it is very costly to operate and maintain. Especially, energy costs are excessive, accounting for up to 60% of the total operating costs (compared to 10-15% typically in OECD countries).

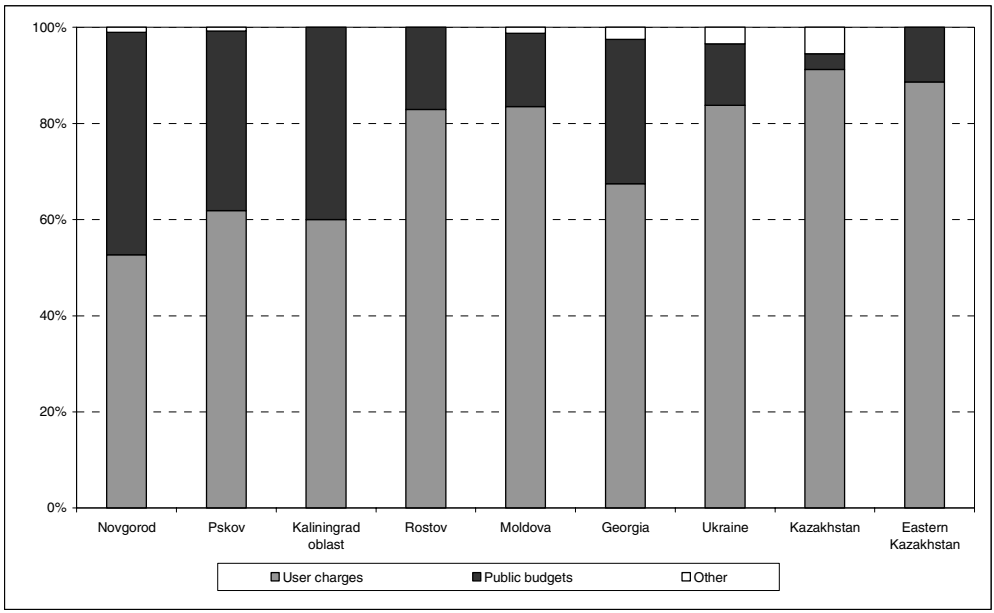
High water production contributes to excessive operating costs. There are high losses in the distribution system as a result of badly maintained supply systems, and over-consumption by end-consumers is also common. Tariffs are charged on the basis of norms and not on the basis of actual consumption, which implies that there is little incentive for the user to reduce consumption.

Existing financing situation

User charges account for a varying share of the supply of finance: from about 50% in Novgorod, Russia, to more than 90% in Kazakhstan. The remaining funds for the water utilities come mostly from public budgets. The share of other resources such as bank credits, bonds, environmental funds, foreign grants and loans is marginal compared to user charges and public funds.

This situation reflects the degree of reforms in the water and wastewater sector - in particular, the extent to which cost recovery policies have been implemented. It also shows poor access to debt financing of water and wastewater infrastructure.

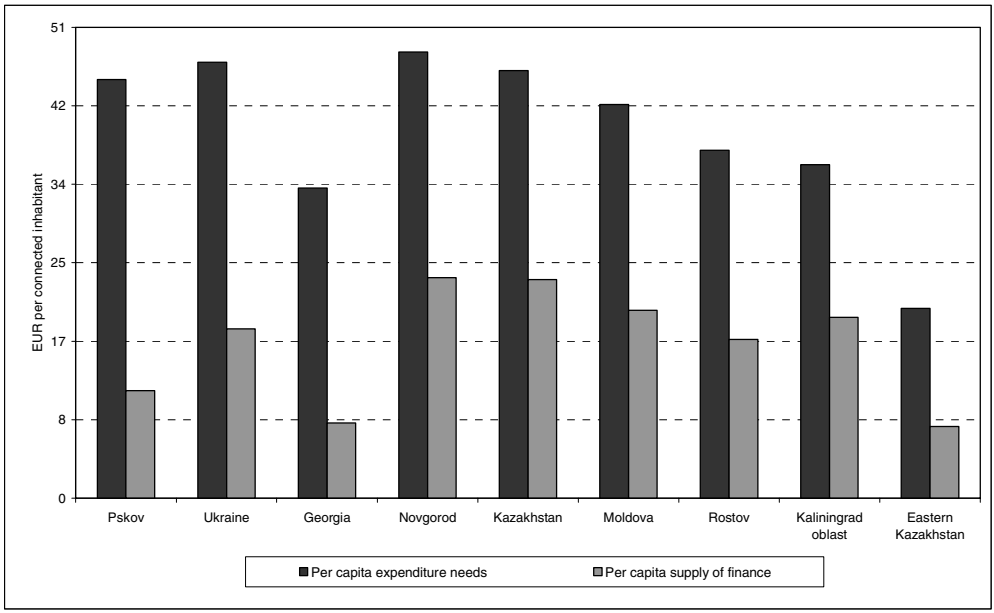
Figure 5-3 Existing sources of financing water and wastewater utilities



Source: Data collected within country and regional environmental financing strategies (EFS)

The key output of the EFS is the calculation of the cash-flow balances. That is, the difference between the estimated expenditure need and the baseline supply of finance. In Figure 5-4 below, the expenditure and supply of finance are compared. The expenditure need was estimated as the expenditure needed to operate, maintain and re-invest so as to keep the value of the existing assets constant.

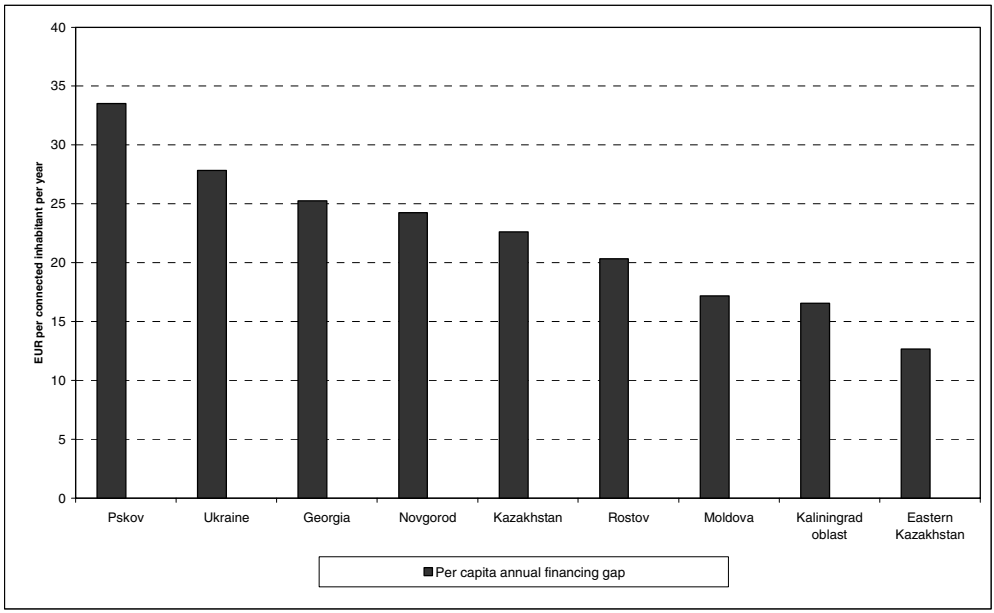
Figure 5-4 Expenditure need and supply of finance in EUR per connected inhabitant in the first year of the baseline scenario



Source: FEASIBLE, except Kaliningrad oblast for which individual model calculations are presented

In all countries, a significant financing gap was estimated even for the baseline scenarios, which did not include extensions of presently functioning infrastructure. Only around half of the necessary funds are being provided. In per capita terms the estimated annual additional funding requirements varies among countries and regions, from EUR 34 in Pskov to around EUR 15 in Eastern Kazakhstan (see Figure 5-5). It is also noticeable that there is significant variation within the countries. This is demonstrated by the comparison of the individual regions in Russia and by comparing the overall estimations for Kazakhstan with the assessment for the Eastern Kazakhstan region.

Figure 5-5 Financing gap per connected inhabitant on an annual basis (EUR), in the first year of implementation programme



Source: FEASIBLE, except Kaliningrad oblast for which individual model calculations are presented

Increasing the supply of finance to bridge the deficits could involve significant burdens on some countries in EECCA. In order to fully cover the operation and maintenance costs of the currently operating urban water infrastructure alone, Moldova would, for example, need to spend 3.2% of the current GDP, Georgia, 3.0%, and Kazakhstan, 1.2% per year. In all cases, this would imply doubling or tripling the current level of expenditure on the water sector. The cost burden on the economy appears heavy when compared with the estimates for the EU candidate countries in CEE. For example, it was estimated that Lithuania would have to spend from 1.0% of the GDP in 2005 to 2.6% of the forecasted GDP in 2020 to implement the entire body of environmental directives of the European Union (DANCEE/Anderson and Semeniene, 2001). These figures include annualised investment and O&M costs for all environmental directives including the drinking water and urban wastewater directives. A similar relative cost burden has been calculated for other accession countries, such as the Czech Republic (2.5% to 3.7% of GDP) and Poland (1.3% to 3.7% of GDP).

The additional payments for operations and basic maintenance would have to come from those financing sources that are available for such expenditures, i.e. practically only users and taxpayers (budgets). The users' charges in particular (as shown in Figure 5.3) have no realistic alternative as a source of covering regular operation and maintenance costs. The only alternative is a decrease of the level of service (Box 5-1).

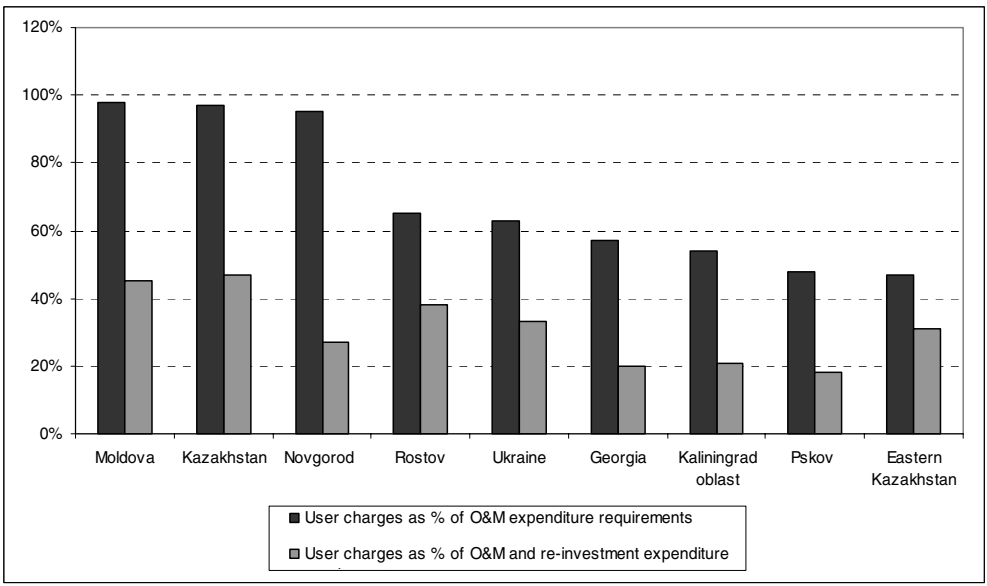
Box 5-1 Decreased level of service as an alternative to increase of users charges

Cities in EECCA countries react to high operating costs by not operating the infrastructure or operating it unevenly. Water and wastewater services are often unreliable with frequent interruptions and low quality. In many cities, water is supplied only a few hours a day, and it is insufficiently treated. Most wastewater treatment plants are bypassed or provide only basic mechanical treatment, if any at all.

The most serious consequences are caused by the chronic shortage of funds for proper maintenance of infrastructure, such as small repairs, replacement of worn-out parts, small capital repairs and essential rehabilitation. This has initially implied a focus on breakdown maintenance (vs. preventive maintenance), and it has subsequently meant that the assets rapidly lose their economic value, physically fall apart and, finally, they get abandoned. In several cases, the infrastructure is so run down that there is a serious threat of complete collapse of the entire system if funds for maintenance and rehabilitation are not provided.

In the Soviet times, the excessive costs were subsidised in many ways – directly from the budgets and indirectly, e.g. by providing energy below cost price. Over the last decade, the user charges have not caught up with the rapid liberalisation of input prices (e.g. of electricity and chemicals), and they have not made up for budget expenditure cuts. In many cities, user charges do not even cover the cost of operating the remaining, partly functioning infrastructure. Among the countries and regions studied, only Moldova and Novgorod, on average, charge users almost full operating costs, but collected user charges nowhere cover more than half the costs of both operating and maintaining existing assets (please refer to Figure 5-6 below). Some variation within countries is also present. While the average for Kazakhstan demonstrates that user charges cover close to all operating costs, in Eastern Kazakhstan, they are only able to provide financing for half of the total operating and basic maintenance expenditure need.

Figure 5-6 Collected user charges as % of expenditure needed in the first year of the baseline scenario to properly operate infrastructure (only what was in use) and maintain the present service level



Source: FEASIBLE, except Kaliningrad Oblast for which individual model calculations are presented

Capital investments have been rare and mainly in emergencies reflecting the focus on breakdown maintenance. Furthermore, they have not always been allocated strategically to improve the efficiency and sustainability of services. A few large cities have, however, embarked on more strategic capital improvement programmes, usually with foreign financing.

Policy options to close the financing gap

Given this situation, just maintaining the present, very low level of water and wastewater services, although this may not look ambitious as a policy objective, would impose significant cost burdens on the countries studied.

The EFS studies examined many alternative policy options before making a recommendation as to which financing strategies can be implemented. The alternative options analysed can be bundled into three main groups:

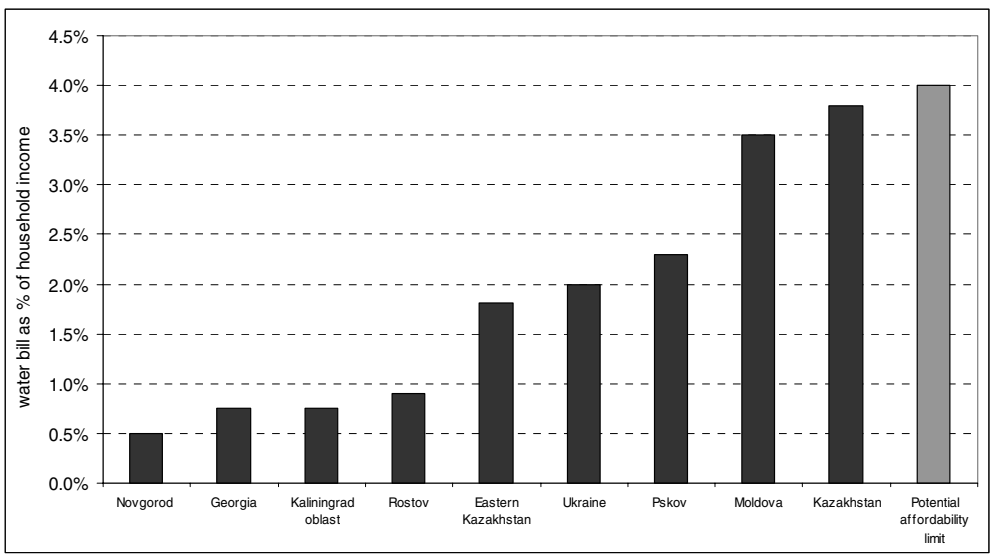
- Cost savings through efficiency improvements.
- Increased supply of finance.

- Decreased service level ambitions.

The current high energy consumption implies room for substantial *cost savings*. Thus, targeting the scarce maintenance and re-investment funds to achieve such cost savings was identified as one of the most important measures.

Simulations of various *options to increase the supply of finance* to cover the operation and maintenance gap have shown that user charges are the only realistic long-term source of finance for these expenditure categories. Most households seem to be able to pay more than they actually do. In several countries studied, the average charges paid for water and wastewater as a proportion of average household income (0.5-2.5%) are well below international benchmarks for countries of similar income levels (typically 3-5%). On the other hand, Kazakhstan (on the country level) and Moldova are recovering a much higher share of costs from households, with charges approaching the limits of what the households can probably afford (Figure 5-7 below).

Figure 5-7 Water bill as percentage of average household income

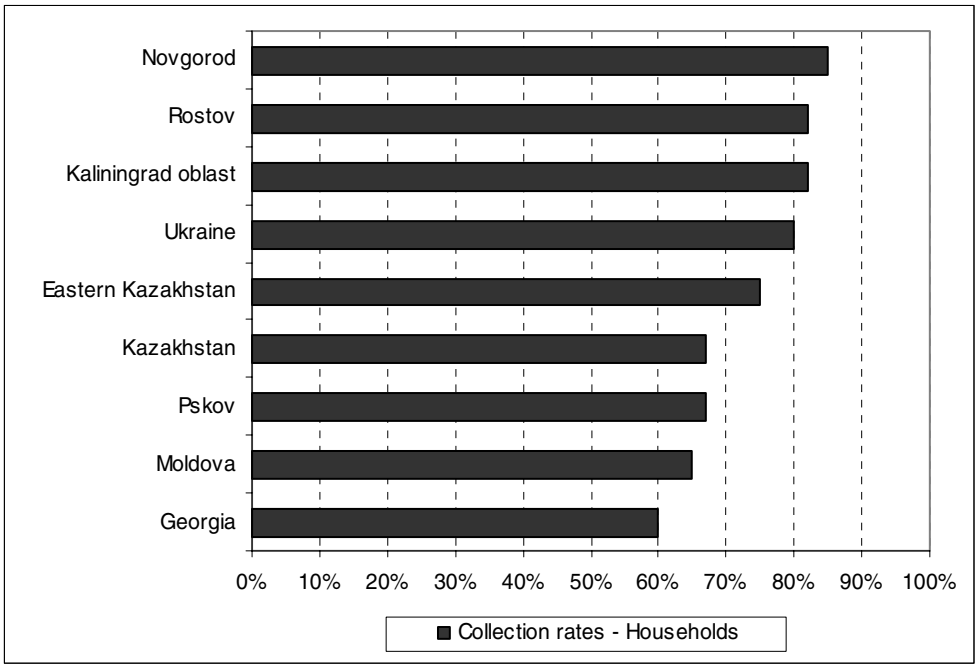


Even in the countries and regions that impose relatively moderate charges on users, affordability is a serious problem for a relatively small share of the population (10-20%). These most affected social groups are also often well defined,

e.g. pensioners, disabled, deprived suburbs. Thus, there seems to be significant room for reform of the existing all-inclusive subsidy schemes. Replacing them with more targeted support for specified social groups also seems to carry a potential for overall savings in public budgets[10].

Another reform, which has been considered as part of an environmental financing strategies analysis was related to restrictive tariff setting policies and poor financial management and collection procedures of water utilities. In several countries average collection rates are as low as 60-70% of billed amounts. Strengthening of the payment discipline has been shown to generate substantial additional funding in itself (see Figure 5-8 and Figure 5-9).

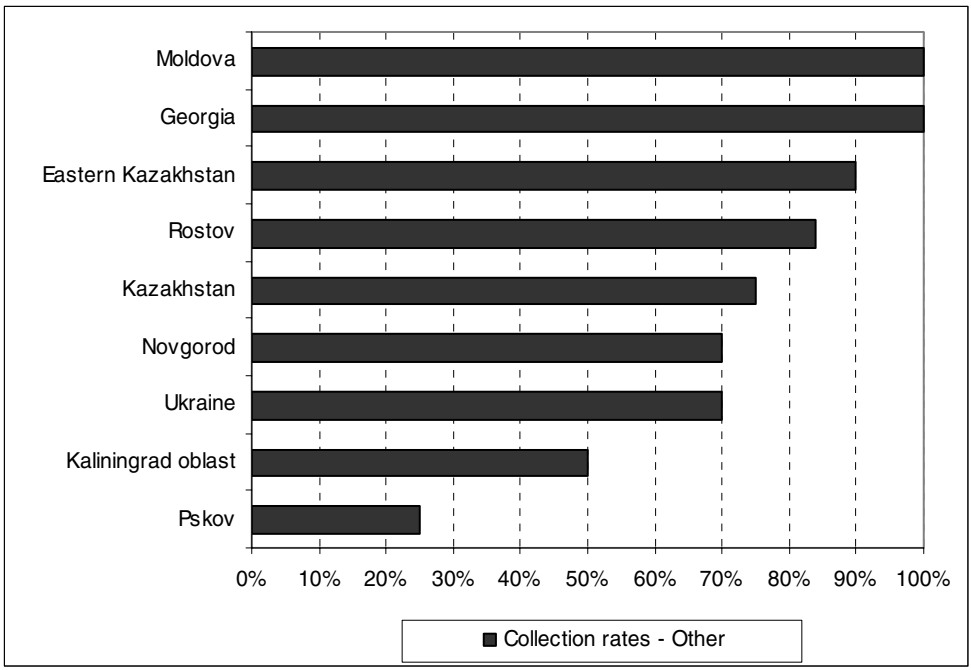
Figure 5-8 Collection of user charges from households



Source: Data collected within country and regional environmental financing strategies (EFS)

[10] See "Affordability, social protection and public participation in urban water sector reforms in EECCA: Key issues and Recommendations" OECD/EAP Task Force, 2003

Figure 5-9: Collection of user charges from other customers



Source: Data collected within country and regional environmental financing strategies (EFS)

Public sources of financing, albeit scarce, will have to play an essential role in leveraging financing for capital investments for rehabilitation and major development of the infrastructure. There are no substitutes for public funds to provide social protection of poor and vulnerable groups and to facilitate access to debt financing. However, in order to play these roles effectively, budgetary funds and donor grants need to be strategically concentrated on fewer priority programmes. These programmes no longer need to include immense investments, but rather modest rehabilitation of strategic parts of the system that bring about operational efficiency and cost savings. In some countries, for example in Kazakhstan, public expenditure on water and wastewater infrastructure has been particularly dramatically constrained, partly due to the government policy to encourage full cost recovery at the local level. The study has shown that such an ambitious policy, while having several merits, will be difficult to sustain in the medium and long run if infrastructure development targets are to be achieved.

International financial institutions (IFI) will continue to have an important role in relation to capital investments. For many years to come, they will be a major source of long-term financing in EECCA. Furthermore, they provide an important demonstration and catalytic function, and introduce engineering, financial and management discipline into project management, paving the way for greater reliance on debt financing for capital improvements.

In EECCA, the private sector will most likely only play a limited role in the foreseeable future in financing water infrastructure (depending on a country risk profile). Domestic and foreign direct investments in the sector will remain constrained by the low incomes and high risks caused by several institutional and policy obstacles. For several years, the main value added by the private sector will, therefore, be improved management practices and efficiency of operations (e.g. billing, customer relations), rather than financing.

The *option of decreasing the service level* was considered only in few cases. As the service level is already low, this alternative is politically undesirable. This alternative may also be financially self-destructive. It would be difficult to mobilise public support for tariff increase and for major reforms announcing that the service level would be even lower. People are willing to pay more for infrastructure only if they see that the level or quality of services improves. However, without a concentrated effort both to improve efficiency and to increase the supply of finance in selected places, a de facto deterioration of the service level will be the result across most cities.

5.2 Policy Impacts of EFS Development in EECCA

Environmental financing strategies are inputs to the strategic planning process. Therefore, the main impact is long term. However, the financing strategies prepared so far have already achieved significant short term policy impacts:

- The EFS has been adopted as a basic policy document in almost all the case countries.
- The EFS has changed the investment priority programmes in several cases.
- The EFS has promoted policy change regarding tariff setting and water demand policies and reforms of unrealistic standards.

- The EFS has been used by donors in the reformulation of water sector programmes.

First of all, the financing strategies have been adopted as one of the key policy documents in the water and wastewater sector with findings and recommendations being used when new policy in the sector is developed.

In the countries and regions where the beneficiary organisation is responsible for investment planning, the results of the EFS have been incorporated in the public investment programmes. In those cases where the responsibility for investment planning is divided between various levels, the impact has been less significant.

For other types of policy such as tariff setting where the responsibility is, usually, at the local level, the EFSs have had an indirect effect in highlighting the importance of tariff reforms for the stakeholders.

A significant short-term impact has been that the EFS has been used by donors as an instrument to change the focus of their water sector programmes. For example, DANCEE now supports only projects that are line with the strategy, which has meant a change of focus from service extension projects to efficiency improvement projects, such as energy efficiency.

However, it must be kept in mind that the impacts seen so far are mostly of a visible, short-term nature given the relatively short span of time in which the EFS methodology has been applied. Changes in policies, procedures, institutional and organisational structures are long term by nature. Likewise, the more indirect impacts, such as changed perceptions of government officials stemming from training and working with EFS methodologies, are difficult to capture and are only likely to have a visible impact in the longer term.

Based on the EFSs developed so far, three factors have been particularly important to achieving a wider impact of the EFS:

- Ability to mobilise the key stakeholders and to ensure their leadership and ownership of the process of developing the EFS.

- Timing and co-ordination with other sector planning initiatives and budgeting procedures in the relevant country/region. Clearly, the potential impact of a financing strategy can be much greater in a country where a reform

process is already underway, and where the stakeholders know what to do with it.

- Co-ordination between governments at different levels (national, regional, local). This is important as in many EECCA countries local governments have full responsibility for providing municipal services and developing the municipal infrastructure, including capital investments planning.

Box 5-2 Overview of policy impact

The environmental financing strategies for water supply/wastewater treatment have resulted in a number of policy impacts:

- In Moldova, the authorities wanted to verify how feasible it would be to implement very stringent wastewater effluent standards stipulated by national post-soviet legislation. The analysis demonstrated that compliance with these standards is so expensive that it would be impossible to finance over the next 20 years, even under the most optimistic assumptions about growth of user fees, income, public sector revenues and financial markets. This triggered the Ministry of Environmental and Natural Resources to prepare a draft government resolution relaxing municipal effluent standards to the levels of the EU urban wastewater treatment directive.
- In Novgorod Oblast, at the initiative of the Regional Committee for Environment Protection (Goscomecologiya), the WS/WW strategy was adopted as the major policy document of the Regional Administration. Priority investment projects identified through FEASIBLE analysis that provide major contributions to strategic targets were included in the regional "Action Plan on Environmental Protection and Effective Nature Use for 2001-2004".
- In Pskov Oblast, the first round of policy dialogue between different departments of the Oblast Administration, supported by FEASIBLE simulations, has not generated any feasible scenarios. Financial authorities and experts could not agree on the radical measures that would be needed to increase supply financing of water and wastewater infrastructure to the levels covering costs of ambitious extension of services proposed by the environmental authorities. But simulations revealed very low levels of user fees compared to other Russian regions. This has prompted the regional administration to issue recommendations on procedures for calculation and approval of municipal services tariffs and improvement of many existing weaknesses of the tariff policies applied in the cities. Furthermore, they have insisted more firmly that local administrations follow the schedule for achieving full cost recovery through household tariffs for municipal services.
- In Kaliningrad Oblast, the environmental financing strategy is being used to develop a

medium-term development plan for the oblast with the overall aim to promote better use of public resources.

- In the Ukraine, the national financing strategy was used to support the financial analysis of the wider water sector strategy of the government, thus becoming an essential part of the government's sector planning.

Furthermore, the recent environmental financing strategies for municipal solid waste have also had impacts:

- In Novgorod Oblast, the financing strategy has facilitated a substantial revision of regional waste management plans and revealed many options for consolidation of the planned landfills and waste processing facilities to reduce costs by achieving economy of scale. The analysis has also identified a package of policies that can reduce the demand for landfills and identified three priority capital investment projects, all involving inter-municipal co-operation.
- In Yaroslavl Oblast, the financing strategy was used to identify waste management development options, and it has triggered a debate on restructuring the waste management company. The financing strategy analysis found that the waste management systems in the large cities of the Yaroslavl region already generate a financial surplus even at current, affordable levels of tariffs, and could, thus, potentially support private sector participation
- In Rostov Oblast, the regional environmental committee is trying to use the financing strategy to strengthen its negotiating position in the bargaining with the regional finance administration over the annual budget and to argue for co-operation between local governments in developing cheaper regional solutions.

5.3 Urban Water Supply and Sanitation - Ukraine Case Study

Introduction

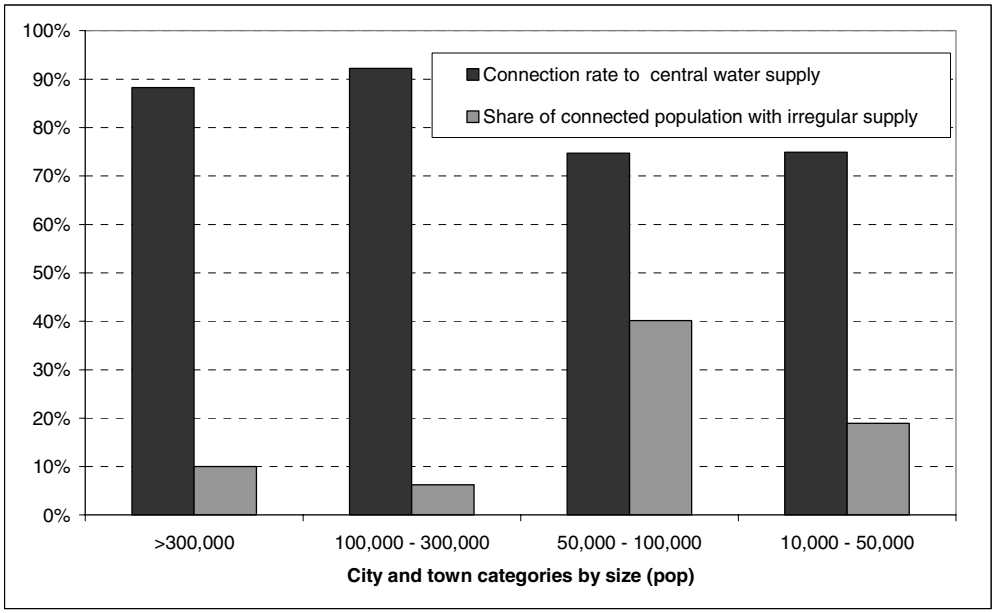
The current state of the water and wastewater sectors in Ukraine is critical. Existing infrastructure assets continue to deteriorate without proper maintenance; service levels are poor in terms of quality, safety and reliability; operational practices are highly cost-inefficient; management systems and resource allocation are inadequate and mostly directed to day-to-day operation/emergency liquidation activities rather than strategic development and planning. Based on the survey data from water utilities, it was assessed that about 50% of all the assets are already worn-out and need to be replaced. Unless a properly structured and realistically planned urgent restructuring programme is designed and implemented, the entire system of service delivery is likely to collapse with a corresponding negative effect on public health and overall poverty reduction efforts.

The environmental financing strategy methodology has been developed to address all of these problems through detailed review/quantification of existing problems and analysis of alternative scenarios of development. The important feature of Ukraine's EFS is that it has been going on in parallel with the National Water Sector Strategy and Action Plan project financed by DANCEE. Thus, the EFS has been used as a tool in the financial analysis of the sector and development of alternative scenarios.

Existing situation in water and wastewater services

The connection rate to a centralised water supply network is rather high and ranges from 92% in large cities to 75% in smaller towns (10,000 - 50,000 inhabitants). About 19% of households are affected by scheduled water supply (see Figure 5-10). As far as water losses are concerned, they are significant and average about 30% of all water supplied through the distribution network. The actual figure could be even higher, since additional loss may be hidden in the excessively high consumption norms. About 50-70% of cities and towns receive water of acceptable quality by European standards. In 30-50% of cities and towns, the quality may be improved by implementation of an asset rehabilitation programme. In about 10-15% of cities and towns, major infrastructure redesign and renovation are required to achieve acceptable standards.

Figure 5-10: Water supply coverage and regularity



Source: Data collected for the Ukraine EFS

The share of urban population connected to a centralised wastewater system ranges from 45% in small towns to 85% in large cities. The overall system components, including pipes, collector, and treatment plants, are 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 of about 25 years) and most are currently in operation. The method of wastewater treatment is also subject to variation depending on the size of the town. Based on the collected data it was estimated that, in cities with a population above 100,000, the mechanical-biological method is actually used to treat about 80% of wastewater. In the smaller towns, the average is about 45%.

Available finance

The structure of the finance available to the water sector in the Ukraine (see Figure 5-11) does not significantly differ from that in other countries and regions considered within the EFS programme. User charges from households, industrial/commercial entities and budget organisations represent, by far, the largest share of total funds available to water utilities. In 2003, the billed user charges from the customers covered by centralised systems were estimated at EUR 426

million. With an average collection rate for households at 80% and a similar rate for non-households at 70%, the cash proceeds from all users is estimated at EUR 316 million. Households account for approximately 46% of this amount. Depending on the range of estimated per capita income expenditure levels, the total household charges effectively translates into the monthly water bill accounting for approximately 1.6-1.9% of the monthly household income[11].

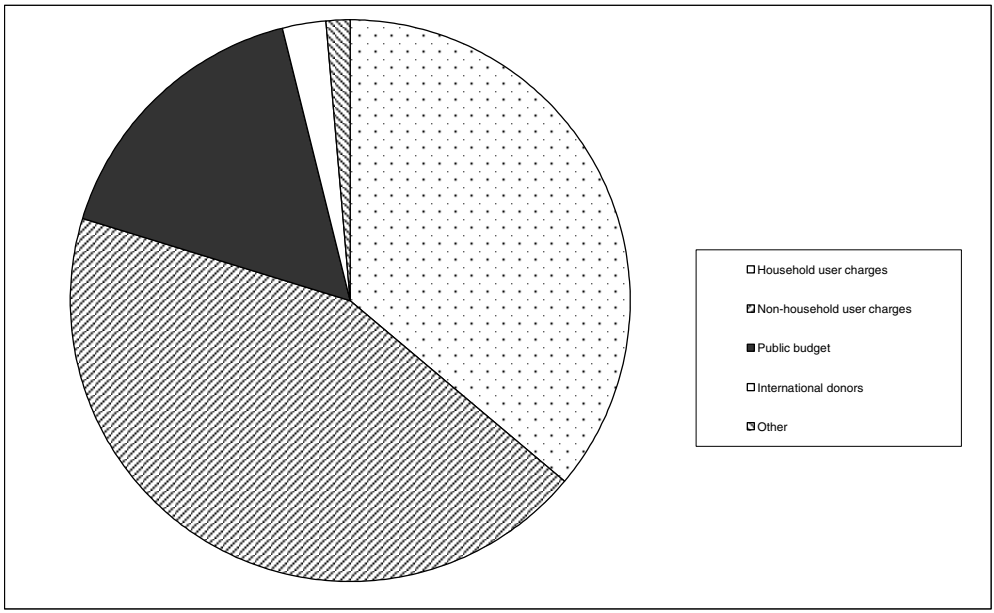
A total of EUR 48 million was available for water utilities from public budgets in the year 2000. It accounts for approximately 0.4% of the average consolidated public expenditure, or 0.15% of the GDP. This amount includes operational subsidies from national and local budgets in compensation for affordability constraints and discounts for privileged groups. A small share of the funds is used for maintenance and rehabilitation investment programmes.

With regard to environmental funds, 56% of their expenditure is directed to water-related projects. The absolute amount of such funds is, however, small, making their overall contribution to capital investment in the water sector only of marginal nature. In 2003, the total financing for water projects from the environmental funds system was estimated at EUR 10.4 million.

The aggregate data on sector financing by international financial institutions and donors were not readily available. It is evaluated, however, that the total amount of IFI and donor loans/grants does not exceed 0.1% of the overall expenditure needs. The cumulative amount of water project funding committed from foreign sources was estimated to be in the range of EUR 100-109 million. While committed, not all of these funds have been disbursed yet. In addition, annual disbursement levels are very difficult to assess. Therefore, Figure 5-11 below shows only an indicative estimate of the international financial institutions and donor support to the water sector in 2003.

[11] Household expenditure data have been used as a proxy for income levels

Figure 5-11 Sources of financing for water and wastewater utilities operation and investment in Ukraine (2003)



Source: Estimates on the basis of historical data collected for the Ukraine EFS

Baseline scenario results

Table 5-1 provides a summary of the baseline expenditure needs, available supply of finance, share of the needed funds provided by diverse financing sources, and remaining financial gap and maintenance backlog. It is important to note that the profile of expenditure needs in the baseline scenario includes a rehabilitation programme designed to address a large backlog of maintenance from the past during the period 2004-2011. The rationale is that most of the assets under this programme are in the "near-to-collapse" state, and renovation needs were classified as "urgent". Further postponing their rehabilitation will lead to increased disruptions of the quality and quantity of services, further deterioration of assets and eventual collapse of the entire system.

Table 5-1 Baseline scenario of annual expenditure needs, supply of finance, financial gap and accumulated maintenance backlog, EUR million

	2003	2004	2005	2006	2007	2010	2015	2023
Total expenditure need	963	1,565	1,590	1,629	1,666	1,766	1,229	1,336
Total supply of finance	392	522	423	438	452	491	562	642
Baseline Financing Gap	572	1,043	1,167	1,191	1,214	1,274	667	694
Supply of available finance as % of expenditure need	*41%*	*33%*	*27%*	*27%*	*27%*	*28%*	*46%*	*48%*
User charges as % of operating expenditure	*61%*	*61%*	*62%*	*63%*	*64%*	*66%*	*69%*	*71%*
User charges as % of operating and maintenance expenditure	*33%*	*33%*	*33%*	*33%*	*34%*	*34%*	*35%*	*35%*
Maintenance backlog accumulated since the base year (2003)	*383*	*679*	*1,093*	*1,518*	*1,953*	*3,305*	*5,711*	*9,820*

Source: Draft report, Environmental Financing Strategy for the Municipal Water and Wastewater Sectors in the Ukraine, Background analysis

Model calculations for the baseline scenario demonstrate a significant shortage of funds. The total annual supply of finance, not to mention user charges alone, is insufficient 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 operating and maintenance (O&M) costs. The cumulative maintenance gap reaches over EUR 9 billion by the end of the period. This is clearly not sustainable and indicates that further significant depletion of network infrastructure and assets can be expected if no changes in policies are made.

Operating safety scenario

The scenario of full EU compliance by 2010 has been analysed to understand the extent of the costs involved and the financing/investments required. It suffices to say that for only a rehabilitation programme and new investment, excluding operating costs, additional funds in the amount of 2% of the annual GDP will be required (average of EUR 1 billion in additional funds for the period from 2003

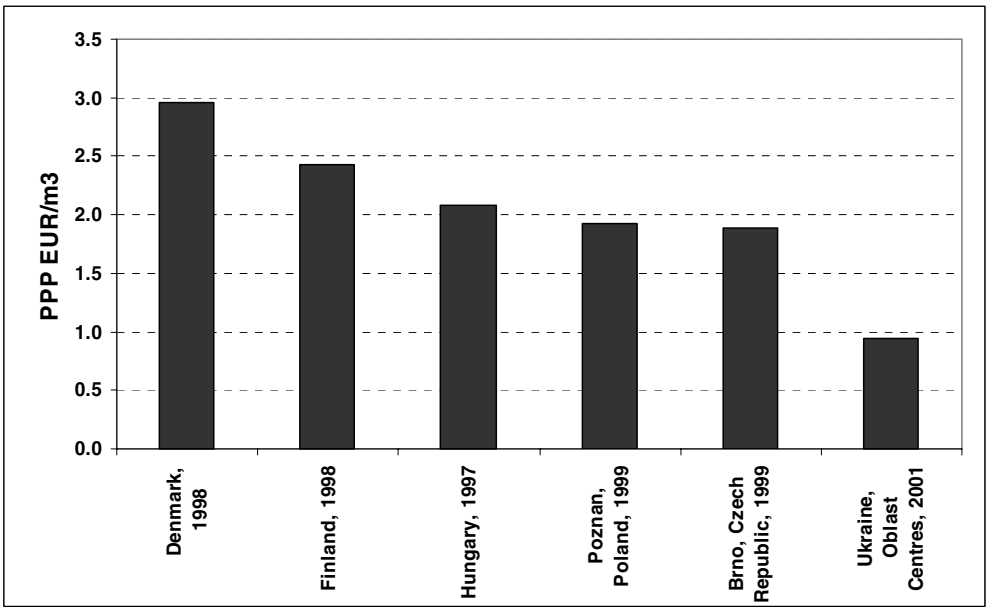
to 2012). It is difficult to envisage the availability of such funds during the next decade. As a result, an alternative scenario has been analysed that ensures that the water supply system is brought to a level where operations can be run smoothly and safely. This is achieved through the implementation of a rehabilitation programme that is similar to the one of the baseline scenario. However, in the baseline scenario such a programme could not have been carried out due to limitations on finance available. In the operating safety scenario, additional funding generated through modelled policy changes makes partial implementation of the rehabilitation programme possible. As a result, water loss savings, demand reduction and reduction of infiltration, as well as investment in more energy efficient equipment, result in reduced operation costs and some reduction in capital repairs in the longer term.

Among alternative policy instruments, revision of the existing tariff setting and regulation policy to achieve full cost recovery together with improvements in payment discipline (increased collection rates) appears to be most effective. Figure 5-12 presents current levels of the average PPP[12] water tariff in Ukraine in comparison with other countries. This tariff rate translates into a monthly water bill that makes up about 1.6-1.9%[13] of the average household's personal monthly expenditure. A gradual increase in the average household water bill to the level of 4% affordability by the year 2007 and further retaining them at that level will provide a growing profile of user revenues to the sector. Assuming that subsidies are provided to low income families through a direct cash assistance programme, such tariff increases are assessed to be feasible.

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

[13] In calculating these figures actual, observed tariff levels rather than PPP corrected tariffs have been used.

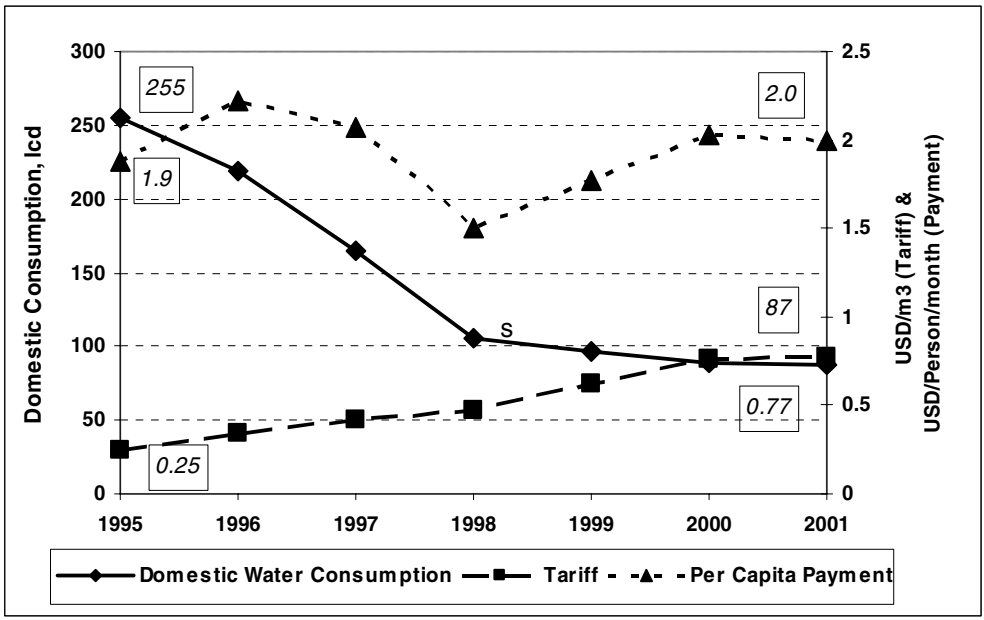
Figure 5-12 Tariff levels in selected countries / cities (PPP EUR/m^3)



Source: COWI analysis of diverse country reports and datasets

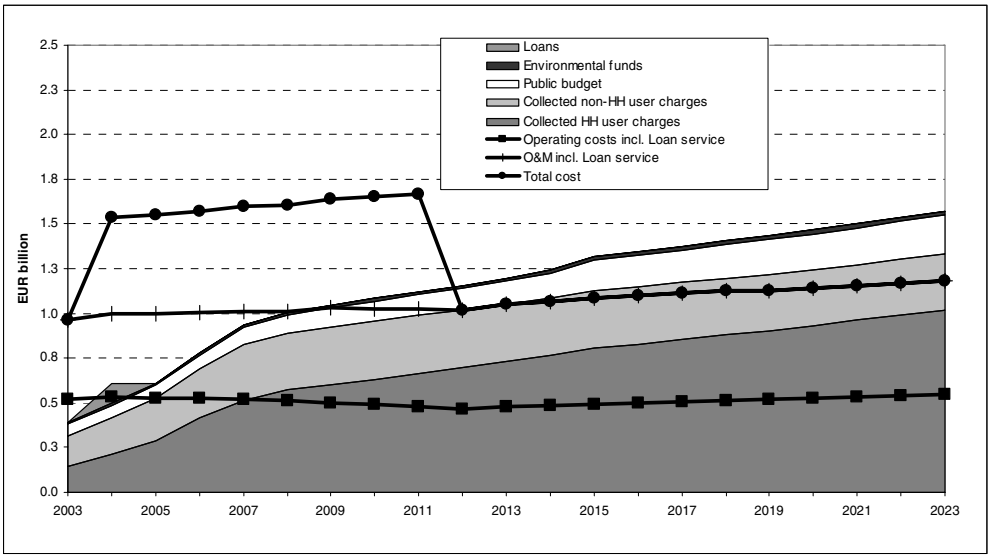
Furthermore, experience from earlier environmental financing strategies, as well as analysis of tariff increases in comparable countries, demonstrate that a significant reduction in water consumption typically follows increases in tariffs. As a result, the variations in the final bill to households are not significant (see Figure 5-13, for the example, from Klaipeda, Lithuania).

Figure 5-13 Tariff, water conservation and resulting cost to consumer, Klaipeda 1995 -2001



For non-household customers, tariff rates have been presumed to fully cover the corresponding share of O&M costs by 2007 and stay at that level thereafter. A moderate increase in budget funds for the sector - from the current level of 0.4% of public expenditure to 0.5% in the medium and 0.6% in the long-term perspective - have also been assumed in these scenario calculations. In addition, the share of public expenditure in GDP is assumed to be fixed; thus, the absolute levels of public expenditure will grow with the rate of annual GDP growth. All of these modelled policy measures result in additional funds available to the sector. It helps to substantially reduce the financing gap; however, a large financial deficit, especially in short-to-medium term, remains (see Figure 5-14).

Figure 5-14 Operating safety scenario expenditure and supply of finance, EUR million



Source: Draft report, Environmental Financing Strategy for the Municipal Water and Wastewater Sectors in the Ukraine, Background analysis

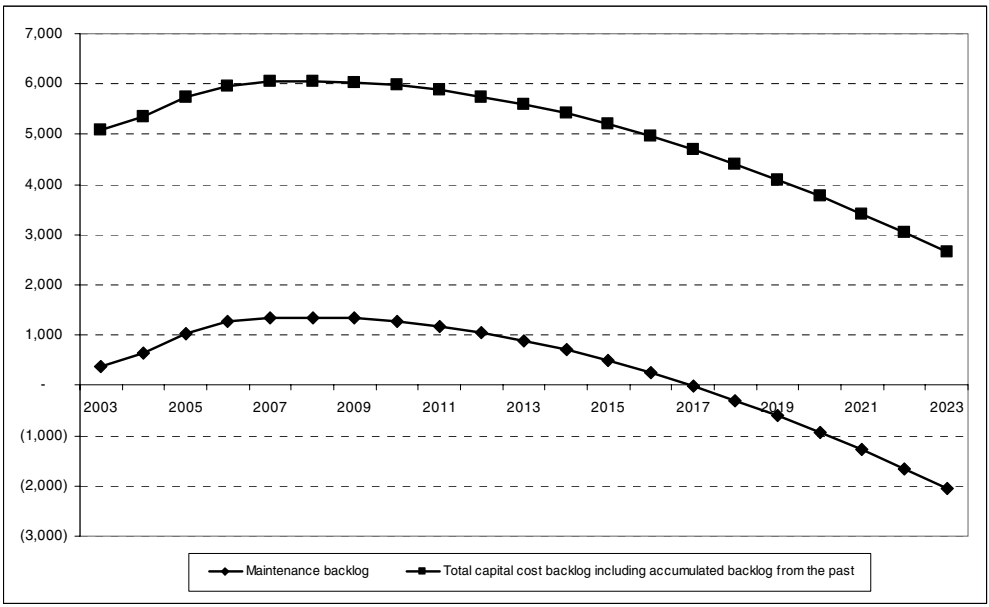
On current bases (in the same year) the total collected user charges fully cover the operating expenditure already in 2005. The total current finances available fully cover current operation and maintenance costs by the year 2009. Moreover, the area above the O&M curve after 2009 represents surplus of financing available and is growing over time[14]. It could, potentially, be used to close the maintenance backlog accumulated from the base year (2003).

However, a substantial gap in terms of total expenditure needs remains. The maintenance gap accumulated since the year 2003 can be closed within this scenario only in 2018 (see Figure 5-15, lower line). However, capital investment needed to address the urgent infrastructure, and asset rehabilitation (basically the accumulated backlog from the past) could not be financed in forecasted future under assumptions of supply of finance used in this scenario (see 5-15, higher

[14] 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 backlog of maintenance, short- and medium term borrowings and potential private investments.

line). The policy changes envisaged in the Operating Safety scenario are not sufficient to close the total capital cost backlog, which includes keeping up with neglected maintenance needs and new capital investments in rehabilitation.

Figure 5-15 Maintenance backlog accumulated since 2003 and total capital cost backlog (including the backlog from the past), EUR million



Source: Draft report, Environmental Financing Strategy for the Municipal Water and Wastewater Sectors in the Ukraine, Background analysis

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 GDP forecasted, or 3.4% of the average annual consolidated public budget expenditure. Increases of budget financing to such levels will most likely be difficult, if not un-feasible. Alternatively, foreign loans could be used to provide the needed expenditure. However, while it could help to reduce the gap partially, the financing surplus of future years indicates that it will be difficult to generate enough funds to service the foreign borrowing required to close the entire rehabilitation and extension programme needs.

Supply of finance profile scenario

The policy changes which resulted in substantial increases in the supply of finance did not provide the necessary funding to meet all expenditure needs envisaged by the operating safety scenario. The main reason for the remaining funding gap is the investment requirements for the rehabilitation programme designed to address previously un-maintained assets (backlog of maintenance from the past). As mentioned earlier, most of those assets are in the "near-to-collapse" state and are classified as "urgent". Further postponing their rehabilitation will lead to increased disruptions of the services.

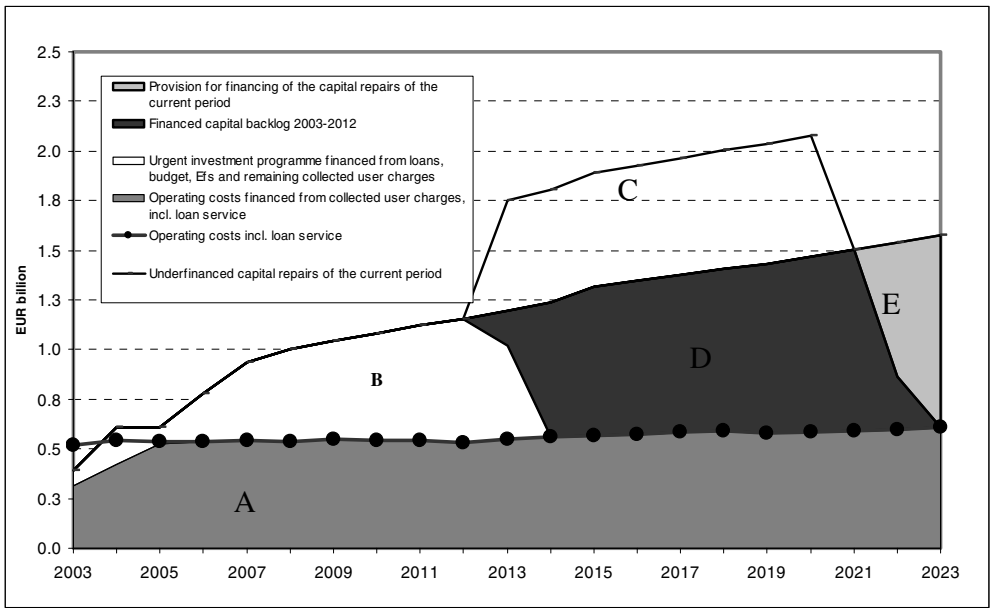
In these circumstances, the possible option could be to accept the supply of finance profile and design an investment programme that prioritises annual expenditure needs to fit the funding profile constraint. In other words, such a scenario would address real practice situations when, facing a significant shortage of funds, utility management will, most likely, direct available funds to rehabilitation of the urgent parts of the network, rather than allocate them to planned routine current maintenance work. A possible structure of such prioritisation plan could be as follows:

- Throughout the whole period, user charges could initially be used to cover operating costs.
- Any remaining surplus from user charges could then be directed to address rehabilitation programme needs, rather than immediate current asset maintenance.
- In these circumstances, however, current asset maintenance is accumulated as a backlog of maintenance and postponed to later years until the rehabilitation programme has been completed.
- Once the rehabilitation programme has been completed, the available funds could be 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.

It is important to note, that implementation of such a strategy will inevitably lead to total expenditure increase. This is due to postponing current maintenance, which will inevitably result in further deterioration of the assets and will increase their total maintenance/rehabilitation cost in the future. Model calculations for Ukraine suggest that such expenditure needs for the period 2004-2012, when postponed by 10 years, will increase in total by 25%. However, when substantial

shortage of funds persists even after accounting for all realistic measures to increase supply of finance, such prioritisation option could be the only realistic scenario allowing necessary funds for urgent rehabilitation programmes. The implementation of such a programme is depicted graphically in Figure 5-16.

Figure 5-16 Supply of finance profile scenario



Source: Draft report, Environmental Financing Strategy for the Municipal Water and Wastewater Sectors in the Ukraine, Background analysis

In this scenario option, user charges are used first to close the operating cost needs. All the remaining sources are then directed to the rehabilitation programme (the B area on the figure), which is completed by 2014. Starting from 2012, resources are gradually allocated to closing the maintenance backlog of early years of restructuring (area D). While the backlog continues to be closed in subsequent years, another backlog of maintenance for the years 2012-2023 accumulates (area C) which it is then only possible to address 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.

Conclusions
The Ukraine water and wastewater sector faces significant shortage of funds. Analysis of existing problems and review of recent developments allowed identification of policy measures that could help to remedy the situation. Among others, such measures include:

- Necessary increases in the current user tariffs towards full service cost recovery levels alongside with the targeted cash assistance schemes to make services affordable for low-income groups.
- Improvements in the payment discipline (collection ratio) among all customer groups.
- Increased budget funds and their re-direction from providing operating subsidies towards more specifically targeted infrastructure rehabilitation programmes.

However, the extent of accumulated urgent rehabilitation needs is so large, that even a substantial supply of finance increase due to modelled policy changes, did not close the financing gap. Significant shortage of finance, especially in the short to medium-term period, remains. As a result, a scenario of expenditure prioritisation is proposed where allocation of current funds is targeted towards implementation of a rehabilitation programme. It, inevitably, results in long-term additional costs, as the current maintenance is postponed. Unless, however, a substantially higher amount of budget funds and foreign assistance resources becomes available, such a prioritisation option could appear to be the only realistic option for Ukraine's water sector development.

5.4 Municipal Solid Waste Management - Novgorod and Yaroslavl Case Studies

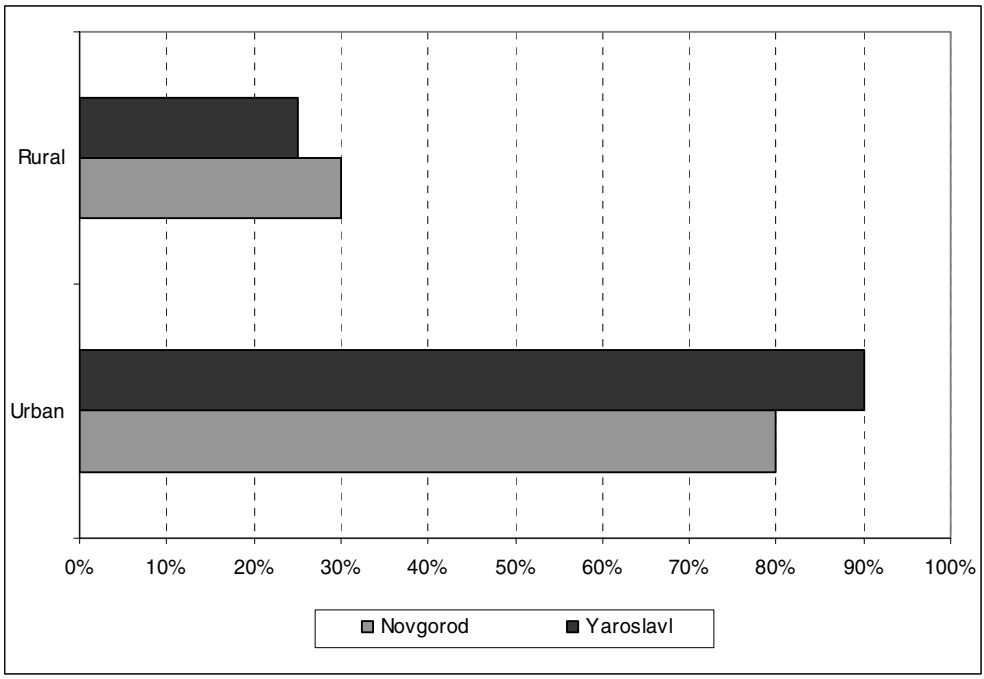
At the time of preparing this publication, the experience concerning the development and implementation of financing strategies for the municipal solid waste sector was still limited. Three case studies have, so far, been carried out using a pilot version of the MSW component of FEASIBLE version 2 - two in the Russian Federation regions of Novgorod and Yaroslavl and one in Latvia. In this chapter, the results of the EFS studies in the Russian regions are presented. An account of the Latvia study is provided in Chapter 6.1.

Existing Situation in Novgorod and Yaroslavl regions

The management of solid waste, particularly municipal solid waste, presents a major challenge across all regions of the Russian Federation. In most cities and towns, waste management practices are outdated in terms of both collection and disposal methods. There are urgent needs for upgrades and improvements with regard to waste collection coverage, levels of recycling and disposal facilities.

There is significant variation in population coverage by waste collection services. In large cities and towns, it is typically around 80-90%, while in the rural areas, the average coverage is in the range of 20-30% (see Figure 5-17). In addition, even in the urban areas, many of the private single-family housing regions are poorly covered or not covered at all by organised waste collection systems.

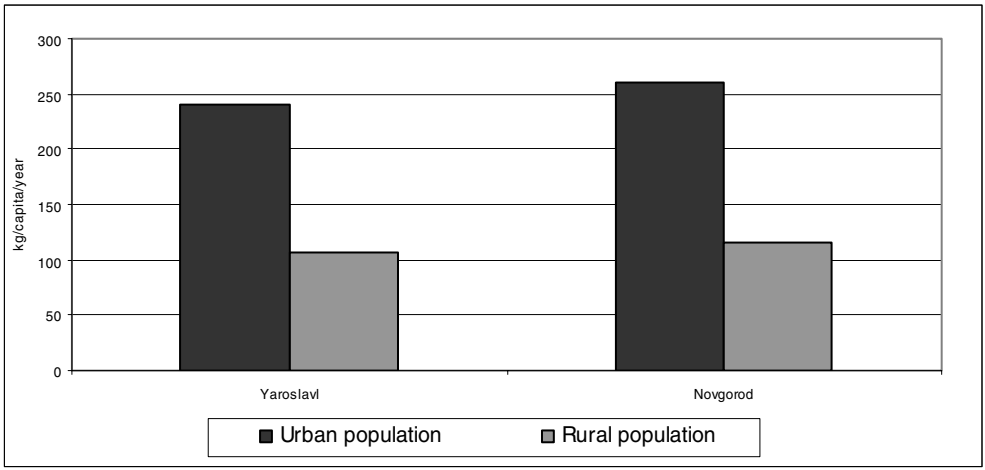
Figure 5-17 Averaged population coverage by MSW collection system in urban and rural areas



Similar variation exists with regard to waste generation. It is assessed that, on average, per capita municipal waste production in urban areas is more than twice the corresponding figure for rural regions (Figure 5-18). These figures should,

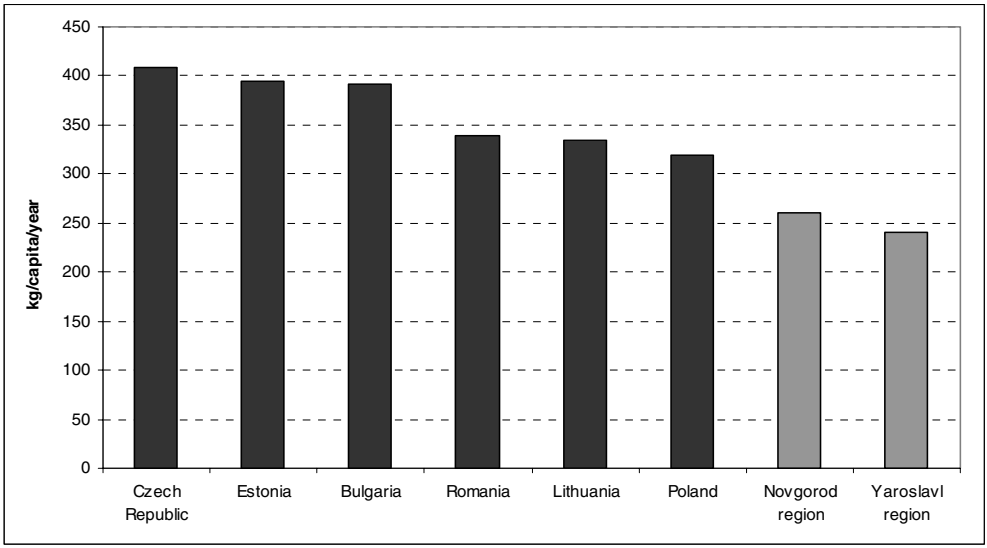
however, be treated with caution, since the lower level of waste generation in rural areas could be the result of unregistered waste dumping due to low coverage by centralised waste collection systems.

Figure 5-18 Per capita municipal waste generation in urban and rural areas (2001)



In comparison to the average levels of waste generation in other countries, the above figures seem low. This could, however, be explained by the significant average income level differentiation in the two regions of the Russian Federation and the CEE countries to which they are compared, as well as possible unaccounted for waste streams in Novgorod and Yaroslavl due to illegal waste dumping practices.

Figure 5-19 Waste generation in Novgorod and Yaroslavl regions in comparison with selected CEE country averages



Source: Data collected within waste management project in CEE countries conducted by DHV CR for the Secretariat of Sofia Initiatives on Economic Instruments (SIEI) at the Regional Environmental Centre for Central and Eastern Europe (REC), data collected for Novgorod and Yaroslavl EFS

Landfill disposal is the primary method of municipal waste handling. Typically, multiple landfills and dump sites serving individual cities and towns or groups of them exist, most of which do not comply with national, not to mention international, environmental standards. While most likely not entirely representative of all parts the Russian Federation, the cases of Novgorod and Yaroslavl have, nevertheless, helped to identify the most common problems and issues of waste disposal sites that any investment modernisation programme will have to take into account. Among others, these problems and issues include:

- Lack of synthetic liners at all dump sites and lack of even natural clay lining at most sites.
- No leachate control, collection or treatment.
- Frequent disposal of MSW together with industrial, medical and other types of waste.
- Lack of systematic practice of waste coverage by soil.
- Absence of methane collection system.

- Over-utilisation of many landfills and dump sites beyond their capacity.
- Poor site access control resulting in illegal and uncontrolled waste disposal activities.

Recycling is on the rise, but still at very early stages of development. Several companies in both Yaroslavl and Novgorod oblasts collect recyclables, but their activities are primarily directed towards industrial and commercial waste generators with very little or almost no household involvement. The situation is mainly explained by the lack of demand for recyclables with a resulting lower secondary market price than in other comparable countries (see Table 5-2).

Table 5-2 Secondary market price of selected recyclables (EUR/tonne)

	Novgorod	Belgrade
Paper, cardboard	32 - 52	67 - 75
Plastic	97	330
Scrap aluminium	800	790

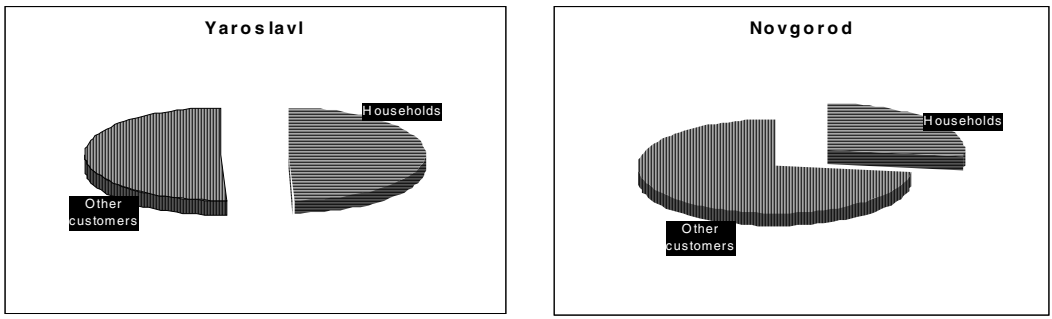
Source: Belgrade waste management company, data collected for Novgorod EFS

Financing Sources for MSW Operations and Investment

The fact that only two studies have been carried out so far within the Russian Federation does not allow conclusions about general trends in financing sources for MSW services. For example, estimates of public expenditure on the solid waste sector differ significantly between the two regions. In Novgorod, it has been estimated to be in the range of RUR 80 million in 2000, or RUR 112 in per capita terms (for the entire oblast population). In Yaroslavl, however, the total public expenses stand at RUR 25 million/year or RUR 20 per person in 2000.

Different proportions of the total user charges paid by households are also observed. As Figure 5-20 demonstrates, the presence of significant cross-subsidisation is apparent in Novgorod oblast, where households account for only 27% of the total revenues of MSW utilities from customers.

Figure 5-20 Share of total user charges paid by households (2001)



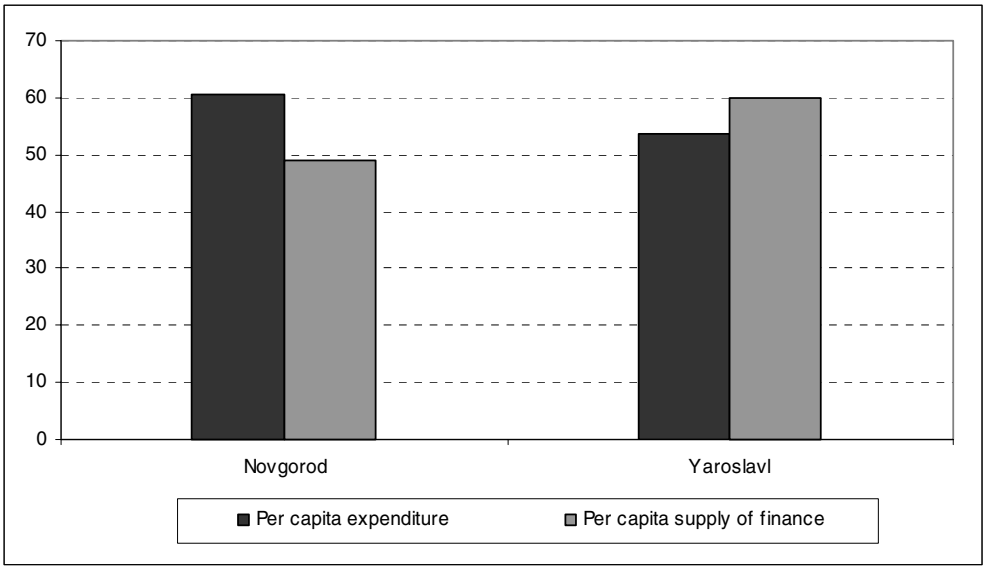
This is also demonstrated by the low levels of the household tariffs. By the end of 2001, it was estimated that the average household expenditure on solid waste services accounted for only 0.5% of the average household income. At the same time, in Yaroslavl, this figure was even less and is standing at 0.3% of the income, on average.

Preliminary Results of Novgorod and Yaroslavl Oblast Solid Waste Management Sector Analysis

The analysis of the existing situation and estimation of the available financing to the sector allowed preliminary conclusions about feasible options for sector service quality and quantity improvements. However, the degree of potential restructuring and improvement measures depend significantly on the regional specificities and capacity to sustain changes financially. Obviously, larger cities are in a better position in this respect than small towns and especially rural areas. As a result, in each study, the region has been broken down into sub-regions according to the current levels of MSW services, future ambitions with regard to reforms, demographic characteristics and the potential for inter-rayon co-operation. For each group, the baseline scenario has been simulated to assess the financing gap of maintaining the existing solid waste management system.

Figure 5-21 demonstrates the results of baseline scenario simulations for group 1 in each region which includes the oblast centre and surrounding rayons. Overall, even if the financing gap is present in Novgorod, it is relatively small, considering the fact that no substantial growth in tariffs has been assumed. In Yaroslavl, there is no financing gap at all, and the sector, as a whole, generates a profit which could be used for the development of more ambitious scenarios.

Figure 5-21 Per capita expenditure need and supply of finance for the baseline scenario



For the less urbanised and rural areas (groups 2 and 3), the baseline scenario projections were similarly optimistic and ran a small surplus over the total expenditure needs.

Furthermore, the more ambitious scenarios of development have been analysed for each group with respect to

- Increases in collection coverage.
- Introduction of recycling collection systems.
- Upgrades of the present disposal practices.

For each of the options, changes in the policy instruments have been assumed, such as a tariff increase, a larger share of public expenditure to the sector, and availability of national and international grants and loan financing.

The overall conclusions may be summarised as follows:

- There is considerable potential for increasing the collection coverage in the oblast, and this is shown to be financially feasible in all the groups of both Novgorod and Yaroslavl oblasts.

- Separate collection of recyclables through the establishment of recycling centres and bring banks would be expedient in major cities where one can expect a sufficient volume of sorted recyclables to warrant the required investments. In these regions, tariff increases within affordable limits would mostly compensate for the additional expenditure needed to introduce new collection practices.

- The target of closing existing dumps and constructing controlled landfills seems to be a financially feasible strategic target for large cities and areas with a high proportion of urban population. In the case of the economically depressed rayons, however, substantial co-financing from the oblast budget would be required to achieve the target.

- Construction of controlled landfills requires a relatively large investment, and the O&M costs are higher compared to the open dump sites.

- Inter-municipal co-operation is therefore necessary in order to ensure a cost-effective system. Fortunately, the discussions in the working group revealed that there is both good motives and potential for inter-municipal co-operation in the Novgorod Oblast.

- Construction of a waste incineration plant in either of the oblasts is not financially expedient.

Conclusion

The case studies in Novgorod and Yaroslavl Oblast have shown that FEASIBLE is a valuable tool in the preparation of environmental financing strategies, which in turn play an important role in charting the course for upgrades and developments of municipal solid waste management systems in regions such as Novgorod and Yaroslavl in Russia.

The main conclusions of the model runs could, at first glance, seem to contradict the common view that waste management companies in Russia are, generally, loss making. This, however, might be due to the fact that most of those companies provide a range of services, including street cleaning and other activities,

which they could be cross-subsidising from the waste management and, thus, overall running a negative balance. Using the model capabilities and scenario analysis, however, it was possible to show that, taken on its own, solid waste management could be a positive cash flow activity, and, if managed and targeted properly, might turn into a profitable business opportunity for municipal service providers.

6 Applicability to Other Regions and Sectors

6.1 Applicability to EU Accession Countries

In accession countries, the demand for environmental improvements is driven by the need to comply with the environmental requirements of the EU environmental legislation. Substantial financial resources are being made available domestically, supplemented by the pre-accession financial instruments (mainly ISPA). In addition, financial mechanisms in keeping with the Polluter-Pays Principle are emerging; increasingly enterprises and municipalities are financing their own environmental investments and raising funds on financial and capital markets.

Most accession countries are already allocating a greater share of their national income for environmental expenditures than EU member states and in some cases may be approaching affordability limits for public budgets and households. A rough assessment that was made by the OECD in the paper submitted to the Kyiv conference suggests that, with the exception of Poland and Hungary, the current levels of environmental investments in accession countries would not be sufficient to cover the official estimates of investment needs and according to the schedules contained in transitional agreements. In so far as this is the case, it would require those countries to revise their planned levels of environmental investments, review the realism of the transitional schedules and/or the cost-effectiveness of the approaches they are following to implement EU directives. Eventually additional investment expenditures will need to be mobilised from public and private sources to effectively match revised investment needs. Moreover, the World Bank studies have shown that the challenge of financing recurrent expenditures is an additional challenge that is almost as large as for annual capital expenditures.

In the 2001 communication on “The Challenge of Environmental Financing in the Candidate Countries”, the European Commission has identified 13 environmental directives, which will require heavy investments. Most of them involve large scale extensions of public infrastructure in water, wastewater, solid waste management and air quality control. To prepare for the challenge to implement and finance this infrastructure the Commission has requested the EU accession countries to review their financing opportunities, carefully consider affordability and prepare Directive Specific Implementation and Financing Plans. The FEASIBLE methodology may assist in preparing such implementation and fi-

nancing plans. In fact the FEASIBLE 2 model was specifically adjusted to also serve the needs of EU accession countries for developing strategies to comply with water and waste directives. The Latvia case study presented below shows a first step towards the full application of the FEASIBLE methodology to prepare realistic implementation and financing plans.

One lesson learned from the CEE experience with financing strategies shows that for cost effective implementation and sound financial management, there are benefits in developing implementation and financing plans for bundles of related Directives rather than for specific Directives. Moreover, investment and financing plans for large regions or countries should be strategic, rather than project-specific. This approach is based on the view that the Government can not and should not control the schedules of all individual projects (thousands for single Directives in some countries/regions), except the largest ones. The Government's main role is to establish and apply the policy and legal instruments that create incentives or disincentives to invest, including the provision of financing for priority infrastructure investments. The modelling tools, such as FEASIBLE may be used to periodically monitor the effectiveness of these policy instruments and provide the European Commission transparent integrated reports on progress towards full implementation of the Directives. Should the progress be unsatisfactory the model needs to be able to simulate the effects of modifications of policy instruments to accelerate implementation.

6.1.1 Municipal Solid Waste Management - Latvia Case Study

A case study was carried out in Latvia in association with the development of FEASIBLE Version 2. The Latvian case study focussed on establishing and costing a strategy to meet the requirements of both the EU Landfill Directive and the EU Packaging Waste Directive.

The existing situation in the municipal solid waste sector in Latvia is characterised by:

- Most household waste is collected as a mixed fraction, with only a few pilot schemes in place for the collection of sorted waste and recycling in large towns.

- Most of the waste is disposed of untreated in landfills.

- The closure and remediation of small municipal dump sites with inadequate environmental protection systems are critical environmental issues, as most of these sites did not comply with national environmental protection requirements and pose risks to environment and health.

The EU directives and regulations dealing with solid waste management and related Latvian regulations formed the objectives/targets that governed the waste modelling exercise for Latvia. The targets were, therefore, pre-determined, and the waste modelling exercise focused on alternative combinations of technical measures to achieve the given targets.

EU accession-related targets
The two EU directives that contain quantitative requirements for solid waste management are:

- The Directive on the Landfilling of Waste (Council Directive 99/31/EC), which includes reduction targets for the amount of biodegradable municipal waste going to landfills.

- The Packaging Directive (Council Directive 94/62/EC) and its amendment of 7 December 2001, which include general and material-specific recovery and recycling targets.

A baseline scenario was developed with the following key parameters:

- Increased MSW collection coverage from the present level of 50-90% to 75% in rural areas and 100% in all other areas by 2007.

- Establishment of recycling centres, bring banks, material recycling facilities and separate collection of recyclables from commerce, industry and C&D by 2007.

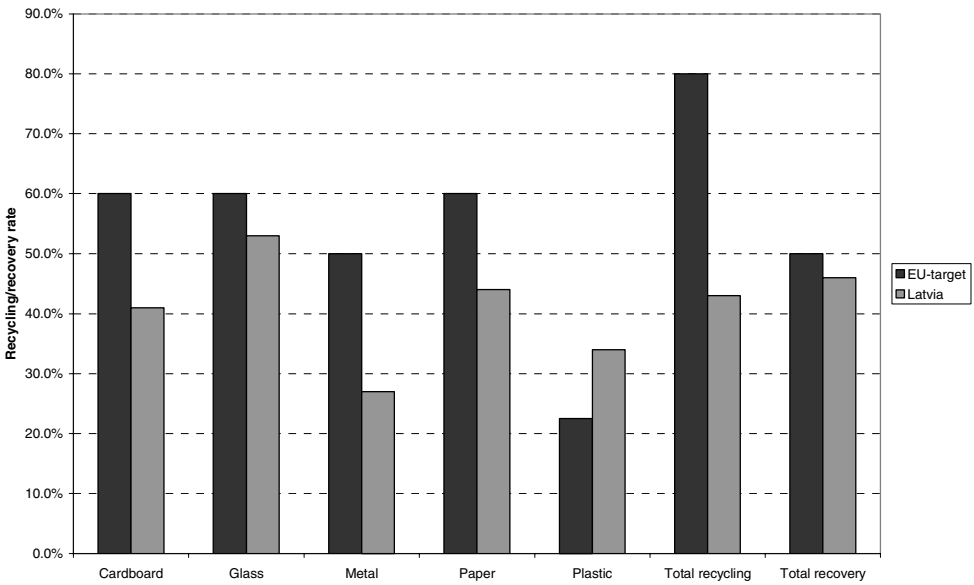
- The establishment of 10 regional landfills according to EU standards.

- Establishment of energy cells at one regional landfill (Riga) enabling 50% recovery of biodegradable waste.

Based on the FEASIBLE model run, the resulting recovery and recycling ratios were then compared to the EU requirements.

The model results on waste flow in the baseline scenario indicated that, with the given model assumptions on the efficiency of recycling centres and bring banks, implementing these collection methods is not sufficient in order to meet the EU directive requirements as to biodegradable waste recovery and packaging waste recycling and recovery (please refer to Figure 6-1 below).

Figure 6-1 Model results for Latvia vs. EU targets for recycling/recovery of packaging waste in 2015, baseline scenario



The baseline scenario hence called for an evaluation of other more ambitious options for the collection and recovery/recycling of biodegradable and packaging waste.

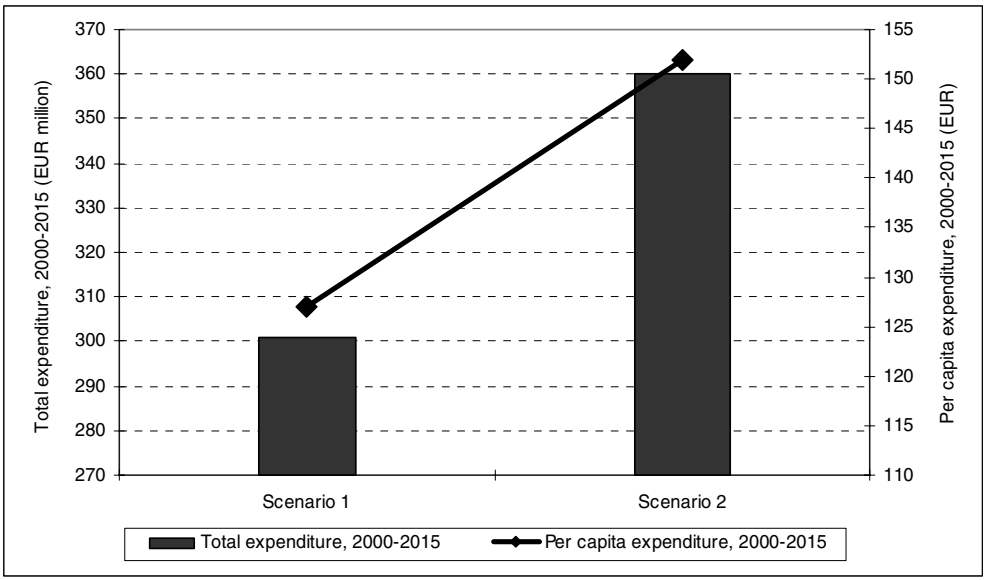
A second scenario was developed comprising the following development measures in addition to those introduced in the baseline scenario:

- Kerbside dual collection (except in Riga) and separate kerbside collection of recyclables and additional material recycling facilities from 2007.

- Establishment of five plants for composting of food waste collected separately (excluding Riga).

It is apparent that due to additional facilities established during the planning period, as well as more advanced collection systems, total expenditure needs for this scenario will be higher. Figure 6-2 demonstrates total and per capita expenditure requirements for both scenarios.

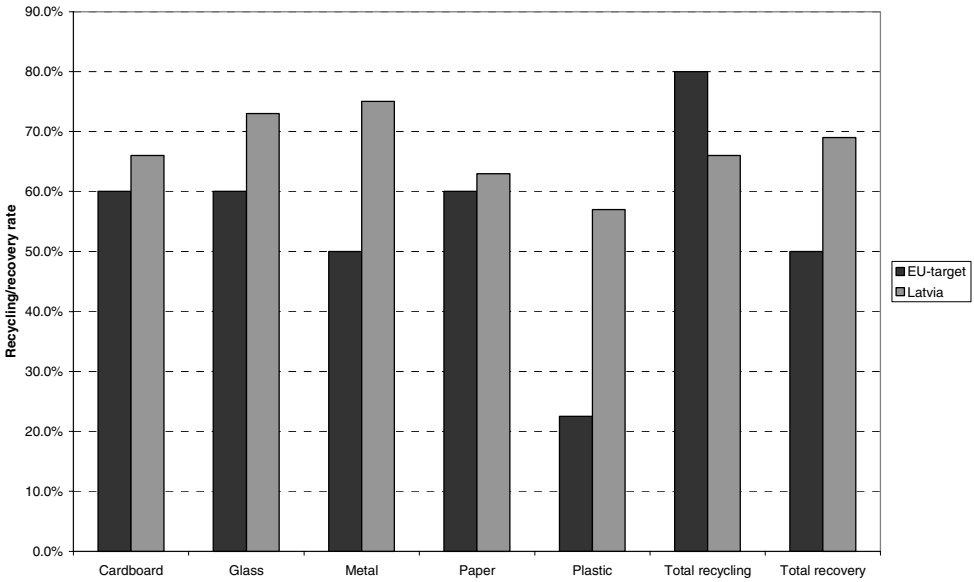
Figure 6-2 Total and per capita expenditure needs for the entire period 2000-2015 for Scenarios 1 and 2



The model results on waste flow now indicated that the development of the waste management system proposed in Scenario 2 brings the sector closer to meeting the EU requirements as to recovery of biodegradable municipal waste and packaging waste than Scenario 1, even though some requirements are still not fully met. However, when assessing these deficits, the many assumptions made in FEASIBLE as to the efficiency of waste collection and recycling systems, etc. and the related level of uncertainty must be considered.

Figure 6-3 shows that dual collection contributes to the recovery of packaging material, thanks to the diversion of the dry waste stream to a materials recycling facility for mixed waste. With regard to the total recycling of packaging waste, all material-specific targets are met in 2015 for the country as a whole, even though a small deficit is displayed for total recycling.

Figure 6-3 Recycling/recovery of packaging waste in 2015, Scenario 2



The case study showed that the modelling approach in FEASIBLE was suitable for the comparing of packages of technical measures that would achieve targets related to the EU directives on landfills and packaging.

6.1.2 Water and Wastewater Sector - Case Study: Lithuania

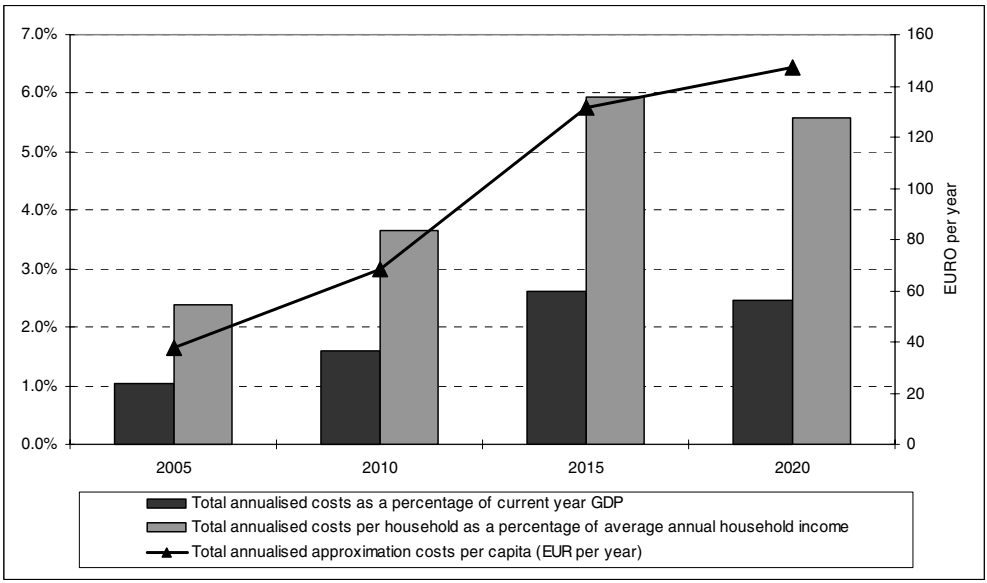
In 1999, an EFS[15] was prepared in Lithuania that was designed to analyse financing issues in the context of the full slate of EU environmental legislation. A major focus of this revised EFS was to develop an investment programme for the heavy-investment water and waste sectors that would enumerate and prioritise the investments needed to meet the requirements of the corresponding EU directives, indicate how they could be financed, and assess affordability issues. This case is an example of an EFS prepared without the use of FEASIBLE.

[15] The EFS, funded by DANCEE, was the outcome of collaboration between the Ministry of Environmental Protection, Milieu Environmental Law Consultancy, Ltd., and the Environmental Policy Centre in Vilnius.

The costs of approximation

According to the costing studies, cumulative investment costs to meet EU environmental requirements for the selected directives would reach EUR 1.7 billion by 2015. The table below presents the results of the national affordability analysis for selected indicators for an assumed 3.5% GDP growth rate (one of four rates used in the EFS). Despite the optimistic growth scenario, the burden of financing approximation costs increases considerably up to 2015. By 2015, the total annualised costs as a percentage of GDP would rise to 2.6%, approximately double the percentage that OECD countries spend on environment.[16]

Figure 6-4 National affordability indicators for the medium growth scenario



The municipal environmental investment programme

Cumulative investment costs for the four directives covering wastewater treatment, drinking water, landfills and packaging waste were expected to account for 65% of total environmental investment costs. As these sectors primarily entail public sector costs, the Ministry of Environmental Protection of Lithuania was interested in the project team carrying out a more detailed analysis of financing

[16] The OECD surveys report on expenditures, not annualised costs. In countries with sustainable environmental investment programs, expenditures should be similar to annualised costs.

issues for water and waste to determine if proposed compliance schedules were realistic, adequate sources of financing could be mobilised, and municipalities and households would be able to cover their share of financing costs.

To initiate the development of the investment programme, the project team compiled a list of specific projects for the major directives requiring investments by municipalities or municipally owned companies, and information was collected and summarised for each identified project. Table 6-1 and 6-2 present summaries of the projects in water/wastewater and waste management.

Table 6-1 Water and wastewater projects in investment programme

Priority	Types of Projects	No. of Projects	Investment Costs (EUR million)	Implementation Period
1st	Large urban WWT rehabilitation projects and urban WWT projects in towns without WWT	16	170	2001-2005
2nd	Other urban WWT projects grouped with sewerage or/and drinking water projects	8	60	2005-2007
3rd	Large drinking water projects and small urban WWT projects	9	50	2008-2011
4th	Regional projects covering drinking water component and sewerage component.	14	110	2011-2013

Table 6-2 Municipal waste projects in investment programme

Priority	Types of Projects	No. of Projects	Investment Costs (EUR million)	Implementation Period
1st	Construction of new regional landfills, closure of problematic landfills and introduction of collection and sorting lines.	12	90	2001-2005
2nd	Closure of old small and medium-sized landfills	11	30	2006-2007
3rd	Closure of the remaining landfills and construction of the first waste incineration and composting facilities.	7	160	2008-2010
4th	Remaining projects in waste sector, including composting systems in certain regions.	7	90	2011-2014

The second stage of the investment programme included initialisation of the investment capital component and gap analysis. For each project, the available domestic and external sources of financing were allocated to specific projects according to the co-financing rules agreed in discussions with the Ministry of the Environment. Three financing scenarios were analysed that differed in terms of the share of capital costs covered by external grants, IFI loans and domestic sources. The three scenarios are summarised in the table below.

Table 6-3 Investment needs for water and waste sector projects in Lithuania for the years 2001-2015 (EUR million)

	Scenario I	Scenario II	Scenario III
Foreign grant share	50%	40%	30%
Total amount needed	380	304	228
Sources needed on average per year	25	20	15
Available sources per year	~45	~35	~35
IFI Loan	30%	50%	60%
Total amount needed	228	380	457
Sources needed on average per year	15	25	33
Available sources per year	As much as needed	As much as needed	As much as needed
Lithuanian share	20%	10%	10%
Total amount needed	152	76	76
Sources needed on average per year	10	5	5
Available sources per year	~20	~10	~10

The analysis suggests that the major requirements arising from EU accession could be fulfilled by 2015, at least from an investment perspective. However, the results in the table do not account for constraints faced by municipalities in the form of borrowing limits and capacity for cost recovery. For municipalities, the amount of loans and annual costs of servicing the loans is related to municipal income to determine if the investment programme is feasible in terms of the legal restrictions on municipal borrowing. Also, the main sources of revenue for repayment of loans are water and waste tariffs. These fees must cover O&M and loan repayments. Thus, in order to assess cost recovery capabilities, assumptions must be made on credit terms and the level of O&M costs. Three scenarios (denoted A, B, and C) were developed to reflect different assumptions about credit terms on loans and O&M costs (4-year grace period specified for all scenarios):

Scenario A: 15 year repayment period, 6% interest rate, O&M costs = 7% of investment costs

Scenario B: 15 year repayment period, 6% interest rate, O&M costs = 5% of investment costs for water, 10% of investment costs for waste, 0% of investment costs for incineration and composting

Scenario C: 10 year repayment period, 10% interest rate, O&M costs = 7% of investment costs

For Scenario A-I with 30% of project costs financed by loans, 50 of 56 municipalities would exceed the 10% limit on borrowing for a single loan, while under Scenario C-III, all municipalities would exceed this limit. It is important to note that these results are only for the largest loan each municipality would take in the investment programme. In fact, each municipality would undertake 3 to 8 loan-financed projects under the investment programme. However, a waiver to exceed these limits can be obtained if the projects are included in the Public Investment Programme. Also, municipal budgets can be expected to increase with increasing GDP.

In terms of the other measure of municipal affordability (ratio of loan repayment amount to municipal budget), the 10% limit would not be exceeded for any municipalities under Scenario A-I, with percentages ranging up to 7.2%. For Scenario C-III, the 10% limit would be exceeded by fifteen municipalities. It should be noted that this assumes municipalities are not servicing other loans in the air sector or loans for non-environmental purposes.

For households, the costs of debt service and O&M are reflected in water and waste tariffs. "Population" affordability is analysed in terms of the percentage of household income that would be spent on these tariffs. The calculation of population affordability involves determination of the tariffs that would be required to cover loan repayments and O&M costs.[17] In addition, information on current household income and assumptions about rates of growth for household income is needed to assess affordability in the later years of the IP.

[17] The main report also examines population affordability in terms of tariffs to cover loan repayment only.

For Scenario A-I, the tariffs required in 2015 would be 1.5-1.8 % if incomes rise at 5% per year and 3.4 to 4.1% for zero growth in incomes. For Scenario C-III, the tariffs required in 2015 would be 1.97 to 2.34% if incomes rise at 5% per year and 4.35 to 5.24% for zero growth in incomes. As long as there is positive income growth, tariffs for water and waste would be below the 5% threshold that is commonly asserted as the maximum acceptable burden for both water and waste. However, these burdens could still be unacceptable to some rate payers in Lithuania.

National affordability to accept obligations related to the implementation of EU environmental requirements needs is analysed for both the water and waste sector costs included in the Municipal Environmental Investment Programme and for the share of annualised costs of covering all expenditures related to the environmental acquis (at least those directives covered in the Strategy). Data on the total sums needed and available for the investment programme have already been presented in the previous chapter. The state's share in the investment programme is assumed to be 20% according to Scenario I, and 10% according to Scenarios II and III. The table below indicates the total amount of State financing for the investment programme for the 20% share and relates these amounts to GDP under two alternative growth assumptions (0% and 3%). The share of state investment needs for the 10% share would be accordingly two times less.

Table 6-4 Share of annualised costs of the investment programme in GDP

Scenario	2003		2006		2009		2012		2015	
	0%*	3%**	0%	3%	0%	3%	0%	3%	0%	3%
A-I	0.12	0.11	0.29	0.24	0.42	0.32	0.54	0.37	0.64	0.40
C-III	0.13	0.12	0.44	0.36	0.67	0.5	0.87	0.6	1.05	0.66

* *GDP annual growth 0% from 1998 level*

** *GDP annual growth 3%** from 1999[18] level*

With at least moderate economic growth and expected financial schemes as well as favourable loan conditions, it has been concluded that the implementation of

[18] See above

water and waste sector projects should not be a significant burden for Lithuania, although the burden could vary by municipality.

Comparison of project and FEASIBLE-based approaches

The Lithuanian study was conducted before the FEASIBLE model was developed. The comparison of the Lithuanian financing strategy (project based) and the strategy developed for Ukraine (using a model such as FEASIBLE) shed some light on the general advantages and disadvantages of these two approaches for conducting expenditure needs estimates, supply of finance and financial gap analysis.

Table 6-5 Comparative characteristics of project and FEASIBLE-based strategy development approaches

	Project based approach	Modelling approach (e.g. FEASIBLE)
Input data requirements on expenditure needs	Extensive – through analysis of the results of individual (pre) feasibility studies or surveying local authorities and local project owners.	Moderate – uses available statistical technical data on present state of infrastructure verified and amended by experts or additional selective data collection. For small towns – aggregated data for groups of towns and expert estimates are sufficient. Exceptionally, for the largest cities or untypical large projects data may be entered project-by-project (option in FEASIBLE 2).
Verification of input data	Difficult – through random checks of the quality of individual feasibility studies and verification of subjective judgments of local authorities and project owners.	Easy – through cross checking objective technical data (e.g. population or existence and physical state of equipment – treatment plants, pumps and pipes).

	Project based approach	Modelling approach (e.g. FEASIBLE)
How expenditure needs are estimated	Expenditure needs estimated by project owners themselves and used as a direct input in analysis.	Expenditure needs estimated by consultants (on the basis of technical input data) using the generic cost functions, local cost correction coefficients and parameters of the model.
Accuracy of expenditure needs estimates	Difficult to asses - depends on the quality of individual (pre) feasibility studies and on the judgments made by local authorities and project owners (some may not know the expenditure needs, some may answer strategically – expecting subsidies and some may state wishes rather than realities).	For individual projects margin of error can be more than 50%. For large groups of cities and towns (over 30) the margin of error is usually in the range of 10-20%. Exceptionally for very large and untypical projects generic cost-functions can be bypassed and estimates entered directly to the model (option in FEASIBLE 2).
Verification of expenditure needs estimates	Difficult – as verification of input data.	Easy if the model is transparent and tested and not a "black box" – when cost functions and parameters are meaningfully exposed.
Supply of finance data	Are entered for individual projects or on aggregated level (for the whole sector).	Are entered by default on aggregated level (for the whole sector), but can also be entered on sub-regional/sub-sectoral level. Exceptionally – can be entered for individual projects.
Scenario analysis	Very difficult – requires recalculations for each project and ad hoc re-aggregations of results.	Easy – the model stores most information in a standardised data base. Selected parameters and input data can be modified, and results are recalculated automatically by the model.

	Project based approach	Modelling approach (e.g. FEASIBLE)
Relevance for analysis of policies	Limited to single test of very small number of policies and measures.	Open to many policies and measures, can compare effects of various policies and conduct tests for multiple assumptions.
Periodic monitoring of implementation of the strategy	Very difficult.	Easy.
Costs	Generally expensive, no economy of scale. Depends strongly on the scale of the programme and expected accuracy – very costly for large programmes and robust estimates. Periodical repetition (e.g. for progress monitoring purposes or if external conditions change) or analysing addition scenarios do not reduce costs significantly.	Development of the model is very costly (for water, wastewater and municipal solid waste already exists as public domain). Once the model is developed country studies are relatively cheap and there is strong economy of scale (costs do not increase proportionally to the number of cities/projects analysed). Accuracy is standard and does not affect costs. Costs of repetition, additional scenario analysis is very low.
Preferred applicability	Comparative advantage for small investment programmes and project pipelines (up to 30 projects) where robust feasibility studies are readily available.	Comparative advantage for large investment programmes (over 30 projects) where robust feasibility studies are not available, difficult to obtain or incomplete.
Sectoral applicability	Unlimited – can be applied to any sector, public and private.	Limited to the sectors for which the model was developed (e.g. FEASIBLE exists for municipal water, wastewater and solid waste sectors).

	Project based approach	Modelling approach (e.g. FEASIBLE)
Preferred owners	Comparative advantage for owners of specific project pipelines (e.g. financial institution or managers of specific expenditure programme).	Comparative advantage for public authorities responsible for supervision of implementation of large programmes of managing infrastructure and responsible for creating enabling conditions for owners of projects and owners of project pipelines.

6.2 Applicability to Developing Countries

Although the environmental financing strategy methodology was originally developed primarily in a CEE/EECCA context, the methodology is equally applicable in developing countries.

The same is true for the latest version of FEASIBLE, which includes a number of simple technologies for rural water supply (hand pumps) and wastewater treatment (septic tanks, reed bed, biological sand filters and stabilisation ponds).

Obviously, the difference in policy context implies that local sources of finance, local institutional capacity for analysis of model results and the range of affordable technology choices will be more limited in some - but not all - groups of developing countries.

Middle-income countries
The policy context and available technology choices in the middle-income countries in South East Asia and some of the more developed countries in Latin America are not significantly different from those of CEE/EECCA countries.

The situation in these countries is typically one where very rapid urbanisation has taken place with major cities increasing dramatically in size over a relatively short period of time. Very often, the development in the environmental infrastructure has not been able to keep pace. The result is that, in cities with centralised systems, the coverage of these systems is generally not very high. In other cities, local solutions that are not well suited for densely populated urban areas

are still used. Therefore, there is a huge need for investment in large-scale municipal environmental infrastructure in many of these countries. Environmental financing strategies could prove to be a very useful tool for the authorities responsible for the comprehensive investment programmes helping to ensure that public funds are spent in the best way and that policies for user charges are defined appropriately.

In particular, environmental infrastructure investments have, in the past, often not been accompanied by a strategy for sustainable long-term financing of the necessary operations and, in particular, maintenance costs.

In these countries, environmental financing strategies may provide the relevant authorities with important policy guidance and practical results on:

- The affordability and sustainability of the current infrastructure.
- The cost of achieving specified service level targets and possible needs for revision of regional/national/local targets, policies and service levels.
- Tariff-setting principles and the affordability of full cost recovery user charges.
- Investment planning and policies to close a financing gap.

Furthermore, environmental financing strategies may be used by ministries of environment and ministries responsible for municipal services in negotiations concerning scarce public budget funds and by national governments to support requests for IFI financing.

The analysis conducted by means of FEASIBLE in China and described below has demonstrated the applicability of the model for policy making in this region, as it precisely demonstrated when modification of present investment and financing plans will be needed, and what institutional reforms would facilitate successful implementation and realistic financing of the infrastructure development programme envisaged by the local authorities.

Low-income countries

In low-income countries, e.g. in Africa, most major environmental infrastructure investments are driven by donor financing. Furthermore, basic needs, such as

access to clean water, are often the overriding priority and affordability may significantly limit the potential technology choices and the room for user charges.

The ongoing shift in donor funding from individual donors funding individual projects to basket funding where multiple donors fund larger programmes has underpinned the need for analytical tools that can justify the long-term financial sustainability of the sector development and support the prioritisation of the limited financial and administrative resources available locally. In this context, environmental financing strategies can be an important basis for the dialogue between recipient countries and donors.

Securing basic needs requires limiting the contamination of scarce natural resources, which, in turn, is often caused by lack of wastewater treatment and inadequate management of municipal solid waste. Hence, fulfilling the basic needs objective will often not be possible without addressing priority environmental problems. Environmental financing strategies provide governments with quantifiable input on the costs of alternative investment strategies and the long-term financial sustainability of the infrastructure in these sectors, thereby highlighting the trade-offs between the sectors and facilitating informed prioritisation.

In the low-income countries, the most high-end technical solutions are often not affordable and even limited increases in general user charges may have a negative impact on already disenfranchised groups if they are not accompanied by targeted subsidies. Hence, if the environmental financing strategies developed presume increases in user charges, they should be complemented with more detailed willingness-to-pay and affordability analyses prior to their implementation.

Finally, it should be noted that environmental financing strategies can be an important tool for donor countries and IFIs to co-ordinate different donor and IFI programmes and to provide an additional dimension (regional/national and cross-sectoral) for appraisal of the financial viability of individual investment projects and programmes.

6.3 Experience from China

The Chinese study was conducted in the framework of co-operation between the OECD and China. The Chinese authorities decided to test the methodological

approach on a smaller scale, in a pilot region. The Sichuan Province was identified as a candidate for a pilot study. All together, 14 cities and counties (urban zones) were examined. All of them are located in the tributary of the Yangtze River upstream of the Three Gorges dam, which has already begun to be filled up**.** The analysis was limited to wastewater collection and treatment systems.

The existing situation for urban wastewater collection and treatment in the Sichuan province differs from that in EECCA countries in a few aspects. In short, the existing wastewater infrastructure is much less developed in Sichuan, but the level of investments in its expansion and government financial support are much higher.

In the cities studied, only 40-70% of population was connected to a centralised wastewater collection system. Moreover, most of these systems are old-fashioned open ditches along the streets. No wastewater treatment plants existed when the study was conducted. However, the large-scale investments in treatment capacity were ongoing in seven out of 14 cities, with substantial financial support from the central and provincial governments.

The utilities responsible for water supply are institutionally separated from wastewater utilities. This separation made it possible to conduct financing strategy analysis for wastewater collection and treatment systems, only.

The baseline scenario was based on the following assumptions:

- Rapid population growth (urbanisation).

- Seven municipalities will complete ongoing construction of wastewater treatment plants by 2004, all 14 municipalities will rehabilitate the existing sewerage system by 2010, and all 14 municipalities will extend the sewerage system by 2010 proportionally to the expected growth of population and urban zones.

- Municipal budget expenditure on wastewater infrastructure will grow in proportion to the growth of the local GDP, while remaining at the same ratio (3.2%) of total expenditure from local budgets and maintaining the same proportions between operational and investment subsidies (38% and 62%, respectively).

- Subsidies from the central and provincial governments allocated already to the municipalities and earmarked mainly for the construction wastewater treatment plants will be spent until 2004, when these plants will be completed.

- All committed loans will be disbursed and paid back according to known schedules.

- Wastewater fees (collected by water supply companies from all users connected to centralised water supply) and collection rates will remained unchanged. The volumes of user fees collected will grow pari passu with the growth in population and in the share of population connected to water supply.

- 90% of the urban population will be connected to centralised water supply by 2015 (and will pay charges).

- The average water consumption will increase to reach 60 m^3/capita/year in 2015 (government target).

- No additional finance that is not committed already will be provided.

All data and assumptions were introduced into FEASIBLE. By the time this book went to print only preliminary results for the baseline scenario were available. However, even these calculations gave very policy relevant results:

- The investment expenditure needs of the wastewater collection systems (sewerage) are several times higher than the investment needs of the wastewater treatment plants (Figure 6-5).

- If present trends continue, there will be enough funds available to complete the ongoing construction of 7 wastewater treatment plants, but the development of the necessary wastewater collection system will be significantly under-funded.

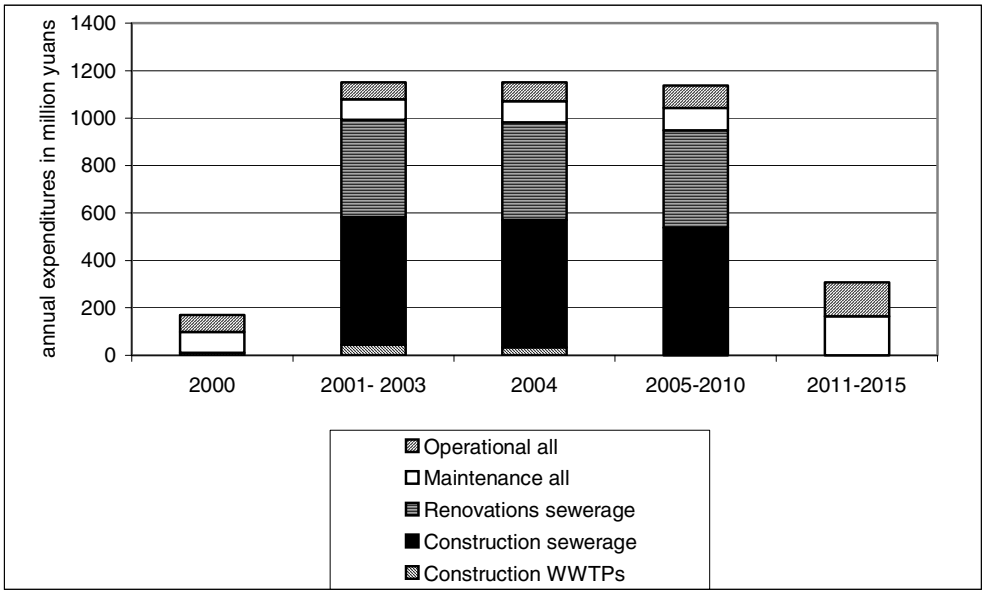
- If present trends continue, the development of the sewers systems will lag behind the construction of wastewater treatment plants, and in 2004, the new treatment plants will not have enough wastewater.

- The structure of the sources of financing relies very heavily on the public budgets as opposed to user fees.

- Wastewater fees cover only about 30% of the operational costs of the baseline infrastructure, and less than 20% of the costs of operation and necessary maintenance taken together.

- All domestic sources of finance (user fees and public budgets) would be enough to cover the costs of operation and necessary maintenance of the baseline infrastructure. However, if public budgets continue to subsidise O&M costs on such a scale, there will be not enough funds to finance investment expenditure.

Figure 6-5. Preliminary results of the baseline expenditure needs to complete the planned investment programme for the wastewater collection and treatment in 14 cities in Sichuan Province (in millions 2002 Yuans per year)



Although there seems to be some room for an increase of tariffs within the average affordability limits, mobilising additional finance to cover the expected expenditure needs will be a challenging task. Preliminary simulations show that a

combination of doubling central government transfers, attracting soft loans of a corresponding amount and phasing in a fivefold increase in user fees would fall short of covering all baseline financing needs. Hence, a more fundamental reform of the system of financing wastewater infrastructure would be required. Representatives of the various departments of the Sichuan Province Government have observed that the results of the study may be used to conduct some reforms of the institutional system of planning and financing wastewater infrastructure.

The state of urban wastewater collection and treatment infrastructure in the Sichuan province is different than in EECCA countries. Financing challenges also differ. In short, the existing wastewater infrastructure is much less developed in Sichuan, but the levels of investments and government financial support are much higher.

Nevertheless, the analysis conducted demonstrated the useful role that the FEASIBLE model can play in supporting policy making. It showed that the present investment and financing plans would need to be revised, and that institutional reforms would facilitate successful implementation and realistic financing of the infrastructure development programme envisaged by the Chinese authorities.

6.4 Introducing the Financing Strategy Concept in Other Environmental Sectors

The conceptual idea of establishing a financing strategy that balances long-term service level and environmental targets with the available supply of finance is generic and equally useful in other environmental sectors requiring intermediate or long-term public financial support.[19]

An obvious area for further development of the concept is the energy sector. This sector, in transition as well as developing countries, faces a major challenge in balancing the cost of technical measures (such as change in fuel mix, efficiency improvements, cleaner technologies, pollution control equipment) for key infrastructure (such as power and heat generation, transmission and distribution) needed to meet service requirements, while complying with stated pollution reduction targets of both regional (NOx, SOx) and global (CO2) nature, on the one

[19] The same is true for non-environmental sectors such as public transport and healthcare.

hand, with available funding (from traditional sources and flexible mechanisms under the Kyoto Protocol), on the other. The modelling-based approach with generic cost functions for standardised technology modules and iterative scenario building could greatly facilitate this process.

7 Prospective Applications of Environmental Financing Strategies

Relevance of the modelling approach
The structured modelling approach to financing strategies has proved to have a number of comparative advantages over traditional project based plans, in particular for large countries and regions and for large, long term investment programmes. Unlike long project-specific pipelines, the formal models:

- Aggregate large numbers of programmes and projects into a systematic, transparent framework.
- Enable quick and apparent "what-if" simulations with different assumptions.
- Reveal consequences of choices immediately and transparently.
- Support strategic allocation of public funds.
- Guide choices of policies and instruments needed to stimulate leverage of private and foreign financing.
- Facilitate the shift from an approach based on "needs" to one of "affordability".
- Make trade-offs between different commitments explicit and thereby forces discussions about real priorities and cost-effectiveness.

Accumulated experience has already revealed the most promising extensions of the application of the FEASIBLE approach to environmental financing strategies. Some of the areas where it could be most usefully applied include:

Integrated and realistic planning of environmentally related infrastructure
Experience with the environmental financing strategy concept to date has shown that it is a useful tool for realistic strategic planning in urban water supply, wastewater and solid waste sectors. But the major feature of the FEASIBLE approach to financing strategies has still to be demonstrated, i.e. integrated strategic financial planning for several municipal infrastructure sectors at the same time. In reality households must pay for all municipal services from one expenditure "basket". National and regional authorities also face trade-offs between

supporting various infrastructure services from consolidated budgets. The FEASIBLE model was originally designed with the intention to facilitate realistic management of such difficult trade-offs. But the practical applications have started in a bottom-up way, from analysis of individual sectors separately. In future it is expected that countries will build upon this experience and use FEASIBLE 2 for more integrated planning of all environmentally-related infrastructure.

Policy dialogue between environmental/technical and financial authorities
So far one of the key values of the country applications of the environmental financing methodology was that they provided sector managers with a tool to demonstrate to the ministries of finance that environmental infrastructure development programmes are not just the random lists of idealistic wishes, but that they can be prioritised and systematically incorporated into the public investments and budget process. Development of financing strategies facilitated the dialogue in a credible language of specific targets, concrete measures and realistic resource availability. Authorities responsible for environmental and infrastructure management in transition economies are expected to continue using the FEASIBLE approach to support analysis and presentation of their programmes in terms that are convincing to the authorities responsible for economic development and public finance.

Monitoring of implementation of infrastructure development programmes in transition countries
The countries that have conducted analysis for a specific sector can easily use its results and a computer tool for monitoring progress of infrastructure development in this sector and for identification of corrective measures that might be needed to achieve intended objectives. These countries already have a computer model with data bases from previous years and with simulations of alternative scenarios. Using FEASIBLE for checking whether the programme is implemented according to the schedule is relatively straightforward, cheap and requires much less data than the original analysis.

IFIs and donor countries
The availability of a transparent, approved financing strategy, based on solid analysis can facilitate an effective dialogue with IFIs and donor countries about programming and priorities. The modelling tool itself can serve all parties to support country assistance strategies, project identification and reduce the risks to project pipelines. Potential trade-offs and crowding out can be detected in ad-

vance and preventive measured agreed between domestic and foreign parties. Targets and investment priorities can be formalised and balanced against realistic local co-financing commitments from users and budgets.

EU accession countries
The environmental financing strategy concept and the FEASIBLE 2 model are well suited to assist in development of implementation and financing plans, which are needed during the transitional periods. For those EU accession countries, which face particularly large gaps between the present level of environmental expenditures and official cost estimates, the FEASIBLE model could be used to update and verify expenditure needs assessment and identify the crucial measures that can effectively bridge all possible financing deficits. FEASIBLE can be very useful to develop a programming framework for project pipelines for ISPA and later, for cohesion and structural funds.

Developing countries
Although the environmental financing strategy methodology and FEASIBLE were originally developed in a CEE/EECCA context, they are equally applicable in developing countries where their application could contribute greatly to structuring the policy dialogue and bring about financially sustainable down-to-earth implementation programmes that take into account what the economy and the households can afford. With developing countries needs in mind, the FEASIBLE 2 model was enhanced with the generic cost function for rural water supply and sanitation technologies commonly used in developing countries.

Other environmental sectors
Finally, there is scope for application of the EFS methodology in the energy sector which faces a major challenge in balancing the cost of the technical measures needed to meet service requirements (e.g. change in fuel sources, efficiency improvements, cleaner technologies) while complying with stated pollution reduction targets of both local and global nature, on the one hand, with the available funding (from traditional sources and revenues from the flexible mechanisms under the Kyoto Protocol), on the other. The model based approach with generic cost functions for standardised technology modules and iterative scenario building could greatly facilitate this process.

Limitations on applicability
It should, however, always be kept in mind that the EFS concept and the FEASIBLE model cannot substitute for:

- Feasibility studies.
- Willingness-to-pay and ability-to-pay analysis.
- Cost-effectiveness optimisation.
- Priority setting between sectors/programmes.
- Legal approximation plans.
- Good policy making and effective implementation.

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