

# **Toward Sustainable Municipal Wastewater Treatment System in Tbilisi, Georgia**

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## **Abstract**

The study is focused on the municipal wastewater treatment system for Tbilisi, Georgia. The study was carried out to analyse domestic strategies and strategies proposed by international aid organisations for water and wastewater (W&WW) infrastructure rehabilitation in Tbilisi, with the objective of recommending sustainable solutions.

In Georgia, the challenging issue is to find a balance between environmental, social, economic and political considerations in addressing W&WW sustainability. The main reasons for inefficient and inadequate wastewater management in Georgia are: lack of political commitment and financial resources; poor policy, institutional and regulatory frameworks; low prestige and recognition of the wastewater sector in comparison to the water supply; neglected stakeholder interests and preferences, as well as inefficient use of water.

The study concludes that the current condition of the W&WW sector corresponds to the social and economic conditions in the country and that most of the principles for W&WW sustainability are poorly addressed in Georgia. The country's strategy is focused on step by step approaches in order to avert further deterioration of the sector with limited financial resources. Hence users' ability and affordability to pay for the service provided are taken into account. The strategies proposed by international organisations are mostly low investment oriented and are focused on water efficiency measures.

The study recommends setting priority goals and short term objectives for W&WW sector rehabilitation and further development, taking into consideration the interests of all stakeholders, the country's development potential and the needs of future generations. The study also recommends that sustainability be addressed through low investment approaches, paying more attention to water efficiency measures through economic mechanisms.



## Executive Summary

Access to water supply and sanitation (WSS) are universal needs and, indeed, are basic human rights. However, the present situation of WSS is extremely inadequate in most of the developing countries. Georgia, the former USSR republic, declared its independence in April 1991. Following this, a series of civil and ethnic conflicts occurred and the country experienced sharp economic decline. Political and economic events in Georgia resulted in the degradation of many sectors, including the municipal W&WW sector. The challenge in Georgia is to identify and implement feasible, effective and sustainable strategies W&WW sector rehabilitation using socially acceptable methods.

The aim of the thesis is to analyse proposed strategies to rehabilitate the W&WW treatment system in Tbilisi with a view to recommending sustainable solutions.

The objectives of the thesis are to:

1. define W&WW sector sustainability criteria
2. draw the general picture of the W&WW sector in Tbilisi
3. identify the problems related to the sector
4. analyse proposed strategies by domestic and international aid organisations for W&WW sector rehabilitation and compare these with the W&WW sector sustainability criteria
5. define the strategies for W&WW sector rehabilitation in Tbilisi to reaching sustainability.

Various international organizations have elaborated different strategies for sustainable management of a W&WW treatment sector. However, all these proposed approaches are quite similar to each other. The principles which are most often repeated are the following:

*Table 1-1 Identified W&WW Sector Sustainability Criteria*

Identified Principles	Explanation (Definition)
Secure political commitment	Central government should be the facilitator and initiator of a sustainable wastewater management system. This means always keeping three essential principles for sustainable sanitation systems in mind: equity, health promotion and protection of the environment.
Create an enabling environment for sustainable solutions	Central government should create the policy, legal, regulatory, institutional and financial frameworks to support the delivery of services at the municipal level in a transparent, participatory and decentralized manner.
Involvement of stakeholders from the very beginning	Early, continuous, targeted and transparent communication between parties involved, their committed co-operation and consequent establishment of firm partnerships, will help to ensure a high level of participation and the foundation for successful management.
Apply demand-driven approaches	In selecting appropriate technology and management

Identified Principles	Explanation (Definition)
	options, attention must be given to users' preferences and their ability and willingness to pay.
Pollution prevention at source and efficient use of water	Wastewater management need not always involve high initial investments. A very careful search for low-cost, and thus more sustainable, technologies and approaches will result in a reduction in the quantity of wastewater and in investments savings related to construction, operation and maintenance of sewerage systems and treatment facilities.
Application of 'the user pays' and 'the polluter pays' principles	The employment of these principles will ensure financial stability and sustainability.
Step-by-step approach	Minimizing current and future environmental and human health damage as much as possible within existing budgetary limits to reach long-term management objectives.
Integrate the municipal wastewater sector with other economic sectors	Linking wastewater management with other sectors will ensure better opportunities for faster cost-recovery, risk-reduction, financial stability and sustainability of the actions applied.
Public-private and public-public partnerships	Public-private partnerships, and also public-public are important tools to assist local governments in initial financing and operating the infrastructure for wastewater management.

The W&WW sector in Georgia is in a poor condition and is in need of rehabilitation. Since the 1990s' no significant reconstruction works have been conducted within the W&WW infrastructure. In Tbilisi, major sections of the potable and wastewater networks are beyond their service lives, resulting in considerable leaks from pipes. Gardabani regional WWTP cannot provide sewage treatment with high efficiency. Low water charges and poor payment discipline do not allow the W&WW utilities to cover operational costs and the system depends on governmental subsidies.

The reasons for inefficient and inadequate wastewater management in Georgia are: lack of political commitment and financial resources; poor policy, institutional and regulatory frameworks; low prestige and recognition of the wastewater sector in comparison to the water supply; neglected stakeholder interests and preferences, as well as inefficient use of water. There is no incentive for water efficiency, not only among households but also within industry.

Eight projects financed by international organisations have been addressed the W&WW sector rehabilitation issue in Georgia. The World Bank (WB) is the financing agency for five of the projects; two projects were realised with the financial support of Technical Aid to the Commonwealth of Independent States (TACIS) and one with the financial support of The Danish Environmental Protection Agency (Danish EPA). Not all sustainability principles are addressed separately by each project, but most of the principles are covered by the projects as a whole. The strategies proposed by international organizations are mostly low investment oriented and are focused on water efficiency measures.

Generally, most of the principles for W&WW sustainability are addressed poorly in Georgia. The country's strategy is focused on step by step approaches in order to avert further deterioration of the sector with limited financial resources; hence users' willingness and affordability to pay for the service provided are taken into account.

**To secure political commitment** – W&WW sector rehabilitation is not among the priorities of the country's economic and social policy. This is reflected in a low level of budget financed capital investments. Overall, there is low political commitment to address W&WW sector rehabilitation, which is mostly caused due to lack of financial affordability.

**Create an enabling environment for sustainable solutions** – The overall institutional structure, according to the sustainability criteria, is in place in Georgia. However, poorly defined responsibility among local and national authorities, inadequate management, and poor financial and regulatory frameworks prevent adequate W&WW service provision.

**Stakeholders' involvement from the very beginning** – Not all stakeholder interests are taken into account by the Georgian government in W&WW sector management.

**Application of demand-driven approaches** – the W&WW service in Georgia is set at a level in accordance with users' willingness and affordability to pay.

**Pollution prevention at source, water conservation and efficient use of water** - There are no economic instruments (pollution taxes) in place to create incentives in industry for eco-efficiency. Fines as well as fees are not structured in a way that would provide the right incentives to encourage pollution control or investments in eco-efficiency. A serious problem in the municipal sector is the inefficiency of water resources management. Poor quality of the distribution network results in water losses at a high rate. No metering practice and low charges on water create low incentives for water efficiency in households; hence cultural issues and low awareness are among the reasons for water inefficiency.

**Application of 'the user pays' and 'the polluter pays' principles** – Georgia does not have the right environment to ensure the financial sustainability of the W&WW sector. W&WW service provision is not financially profitable for the utility. User charges are lower than the real price of W&WW service; there is not pollution taxes employed in Georgia.

**Step-by-step approach** – to avert further deterioration of the service and improve health and environmental prospects within existing budgetary limits, investments allocated from projects financed by international organizations as well as from local budgets were used for short term projects - mostly on water supply and wastewater distribution network repair reconstruction activities - rather than on large, longer term projects.

**Integration of the municipal wastewater sector into other economic sectors** – Integration of the wastewater infrastructure with the waste supply sector is already in place in Georgia; it was considered in the beginning of the planning process of Gardabani WWTP. However, the potential to integrate wastewater with other sectors is not exploited.

**Public-private partnerships, and also public-public partnerships** – The current situation in Georgia, firstly the "political instability" and secondly the unprofitability of the W&WW service in Tbilisi, creates low incentives in foreign private firms to make investments in the W&WW sector. Hence, there is no law which will support public involvement in local resource management and planning processes.

According to the identified problems and taking into account the financial ability of country to invest in wastewater sector rehabilitation, the following immediate measures are recommended:

- The wastewater treatment sector should be prioritized;

- Clear targets should be set for the level the system should be restored/rehabilitated to; immediate actions should be defined and further amended for continuing improvement of the W&WW sector;
- The low investment approaches and actions to create incentives (introduction of economic instruments and payment according to actual level of water consumed) for water efficiency should be implemented;
- Household charges on water should be raised, supplemented by awareness raising activities to encourage willingness to pay;
- Foreign private companies' involvement in the W&WW sector should be facilitated by the national government of Georgia, supplemented with the improvement of regulatory settings.

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# 1 Introduction

## 1.1 Background Information and Statement of the Problem

It is universally accepted that access to a clean source of water and good sanitation constitute basic human rights. However, in most developing countries water supply and sanitation are extremely poor. Statistics indicate that over one billion people worldwide lack access to safe water, and nearly two billion lack safe sanitation. It is also reported that every year more than three million people die from water-related diseases (Indian Institute of Technology, n. d.).

The provision of WSS in the areas of deprivation is probably one of the greatest challenges for urban planners, engineers, and managers. In developing countries the major problem is to select the appropriate technology and find sustainable solutions. Considerations are multi-faceted and include technical feasibility, affordability, customs and practices, and institutional support available (Indian Institute of Technology, n. d.). The challenge is not to present a single and absolute solution, but to offer various options, and to encourage the communities to adopt the one best suited to their needs in a sustainable manner (Indian Institute of Technology, n. d.).

Georgia, the former USSR republic, declared its independence in April 1991. After the collapse of the Soviet Union and the declaration of independence, a series of civil and ethnic conflicts occurred and the country experienced a sharp economic decline. Political and economic events in Georgia resulted in the devaluation of many sectors including the municipal W&WW sector. After the “Rose Revolution” in 2003, the economic situation in the country began to stabilize (Figure 1-1). Nevertheless, the W&WW sector still faces problems.

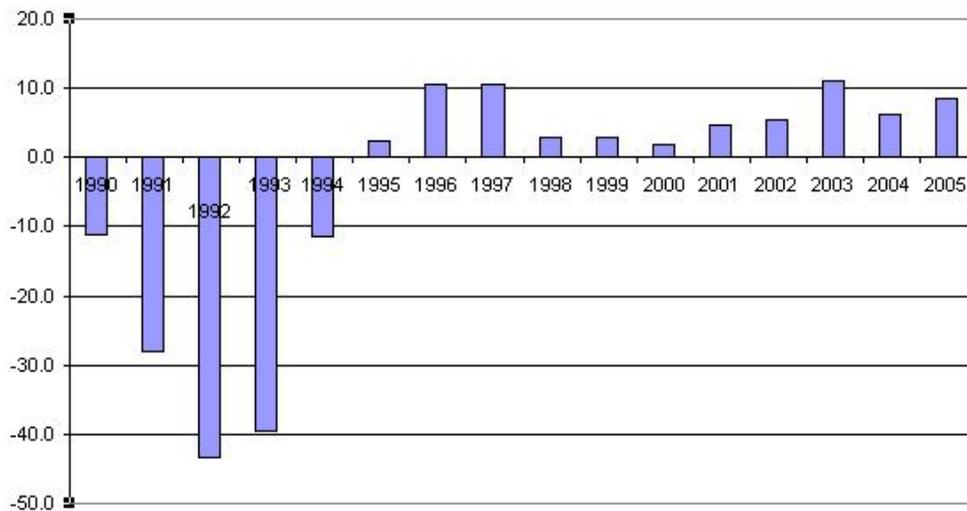


Figure 1-1 Annual Gross Domestic Product (GDP) Growth (%)

Source: World Bank, 2006

Water production and consumption in Georgia is high relative to western European countries. Tbilisi is the primary economic center in the country – it is home to 20% of the population and the main industrial units. Tbilisi requires more water than other cities in Georgia. Water consumption in Tbilisi constitutes 0.5-0.9 m<sup>3</sup> per person daily due to the inefficiency of measures taken by both individual households and the water supply service providers (Organisation for Economic Co-operation and Development (OECD), n. d. a). Another problem is water loss. Major parts of potable and wastewater networks are beyond their service lives, resulting in considerable leaks from pipes (OECD, n. d. a). Non operational losses exceed the permissible levels by international standards. Most of the wastewater treatment plants (WWTP) are out of operation, and cannot provide sewage treatment with high efficiency<sup>1</sup>. Wastewater flow from Tbilisi in Gardabani WWTP is treated only mechanically. Hence, the majority of the wastewater is discharged into the open water bodies without any treatment and ultimately causes contamination of rivers and basins. Low water charges do not allow the W&WW utilities to cover operational costs. Poor payment discipline is another factor that aggravates their financial situation. Therefore the system depends on governmental subsidies (OECD, n. d. a). Severe financial shortfalls preclude proper operation and maintenance of the system and do not allow for necessary asset rehabilitation and replacement (WB, 2001b).

The challenge in Georgia is to identify and implement feasible, effective and sustainable strategies W&WW sector rehabilitation using socially acceptable methods.

## 1.2 Aim and Objectives of the Research

The aim of the thesis is to analyse proposed strategies to rehabilitate the W&WW treatment system in Tbilisi with a view to recommending sustainable solutions.

The objectives of the thesis are to:

1. define W&WW sector sustainability criteria
2. draw the general picture of the W&WW sector in Tbilisi
3. identify the problems related to the sector
4. analyse proposed strategies by domestic and international aid organisations for W&WW sector rehabilitation and compare these with the W&WW sector sustainability criteria
5. define the strategies for W&WW sector rehabilitation in Tbilisi to reaching sustainability.

## 1.3 Researchers' Questions

In the thesis “Toward Sustainable Municipal Wastewater Treatment System in Tbilisi, Georgia” researchers' questions addressed the following:

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<sup>1</sup> Bregadze, M. (2006, July 17). Personal Interview.

- I. what are the sustainability criteria for the W&WW treatment system
- II. what are the main problems related to the W&WW treatment system in Tbilisi
- III. what are proposed strategies by international aid and domestic organizations for W&WW treatment system rehabilitation in Tbilisi
- IV. what are the ways for W&WW treatment system rehabilitation in Tbilisi in a sustainable manner.

## **1.4 Framework and Limitations**

The study is focussed on the municipal wastewater treatment system for Tbilisi city. Municipal wastewater is defined as a “mixture of domestic wastewater, effluents from commercial and industrial establishments, and urban runoff” (United Nations Environment Programme (UNEP), 2004). In Tbilisi the urban runoffs are collected separately through a storm water overflow system and discharged directly to the surface waters without any treatment. Therefore the scope of the study includes domestic, commercial and industrial discharges.

The choice of country for study wastewater treatment system was conditioned by the personal interest of the author, since she is originally from Georgia. The study was limited to Tbilisi city. Due to the timeframe it was not possible to cover the whole Georgian wastewater infrastructure, nor to extend the research to other cities. Tbilisi is the capital city and the largest city in Georgia. Therefore, the main problems relating to the wastewater treatment system can be clearly demonstrated by taking this city as an example. In addition, the recommendations and conclusions designed for Tbilisi city can be applied to other big cities of Georgia, since they have a similar environment in the W&WW sector.

The study was limited to eight projects, proposed by international institutions. Since the W&WW sector is not a priority sphere in Georgia, not many projects, investments nor domestic strategic plans are in operation for Tbilisi wastewater treatment infrastructure development. In addition, most of the projects, proposals and completed activities in the W&WW sector cover mainly water supply sector improvements. Therefore the study also focussed on municipal water supply. It should, however, be noted that it is not possible to plan wastewater infrastructure without considering the waste supply sector, since wastewater management is not an isolated problem and integrates with other sectors including water supply. However, information about the results and implementation procedures was limited for certain project proposals.

Information about the W&WW sector in Georgia available from on-line sources was quite limited. Information presented in printed literature was contradictory with regard to quantitative data. Therefore, for reliability of data and in order to get more information, the author interviewed professionals working in this sector. However, it was not possible to get all the information from interviews, especially with regard to the Tbilisi Water Supply and Sanitation project; The administration of Tbilisi Water Utility (TWU) has changed and the author was not able to get in contact with the ex-executive director, Iuza Tsartsidze, who might have been able to provide information with regard to projects. The WB representative who had been in charge

of Tbilisi Water Supply and Sanitation project implementation is no longer a WB employee and his successor was not able to provide information.

## 1.5 Methodology and Structure of Thesis

The study was initiated with the aim to analyse proposed strategies to rehabilitate the W&WW treatment system in Tbilisi with a view to recommending sustainable solutions.

The research outline is drawn in Figure 1-2. The paper has four research questions (section 1.3), five objectives (section 1.2) and the work is divided into 6 main chapters.

**Objective 1** – to define W&WW sector sustainability criteria is addressed in the **Chapter 2**. For this purpose the author has examined the various articles and reports published by the different international organizations. In **Chapter 2: Principles of Sustainable W&WW Systems Development**, the author outlines the strategies for sustainable management of the W&WW treatment sector, proposed by international organizations such as the Water Supply and Sanitation Collaborative Council (WSSCC), the World Bank, the United Nations Development Programme (UNDP), the World Bank Water and Sanitation Programme, the World Health Organization (WHO), United Nations Environment Programme Global Programme Action (UNEP/GPA). Ten key principles for sustainable wastewater management for policy and decision makers which was developed by UNEP/GPA, in co-operation with WHO, United Nations Human Settlements Programme (HABITAT) and WSSCC, are also outlined. The author makes a comparison of proposed strategies and sustainability principles and chooses the most “repeated” ones as a framework for making an analysis and to address research **objective 4** – to analyse proposed strategies by domestic and international aid organisations for W&WW sector rehabilitation and compare these with the W&WW sector sustainability criteria, presented in **Chapter 5**. Chapter 5 is a pathway to draw conclusions about whether the implemented and proposed strategies are in accordance with sustainability measures or not, which is presented in **Chapter 6**; as well as to address the research **objective 5** - to define the strategies for W&WW sector rehabilitation in Tbilisi to reaching sustainability, presented as recommendations in **Chapter 6**.

While addressing research objective 4, Chapters 3 and 4 were developed for identification of domestic and international aid organisations’ proposals for W&WW system rehabilitation.

Research **objectives 2 and 3** draw the general picture of the W&WW sector in Tbilisi and to identify the problems related to the sector are addressed in **Chapter 3**. In general, to study wastewater treatment systems the author started examination of materials in April 2006, which was related to a course called ‘Applied Research in Preventative Environmental Approaches’ as well as a study visit in Iceland and practical work aiming to plan a WWTP for small communities, which was one of the helpful tools to get a basic understanding of wastewater management. In Chapter 3 - W&WW sector in Tbilisi, Georgia – the author presents the general picture of the W&WW sector in Tbilisi, its technical, financial and institutional sides, and Georgian government policy for W&WW infrastructure development. For this purpose the author examined the different reports and project proposals. In order to reflect the real existing situation based on reliable sources, author made a two-month long study visit in Tbilisi. Information was mainly obtained through interviews. The interviewees were chosen according to

their relation to the W&WW infrastructure. All made interviews were the personal ones. In total 13 interviews were conducted that cover the majority of the stakeholders involved, including Ministry of Environment Protection and Natural Resources of Georgia (MoE), Local Municipality, TWU, Gardabani WWTP administration, NGOs, etc. In the selection of interviewees, the author has taken into consideration their knowledge and competence in wastewater management issues. The interviews aimed not only to get the “dry” information regarding wastewater infrastructure, but also to understand what the domestic institutions see as a solution to the problems and what are their attitudes and personal views toward this issue.

In addition to the interviews the author visited the Gardabani regional WWTP. Observation was carried out to see how wastewater treatment is conducted in order to compare the real picture with the information provided in literature and from interviewees.

**Research question III** - what are proposed strategies by international aid and domestic organizations for W&WW treatment system rehabilitation in Tbilisi – is addressed in Chapter 4. The author has contacted the different international organisations, foundations and embassies who are providing the financial support for Georgia, as well as Tbil-vodocanal and Gruz-vodocanal in order to collect information about all relevant projects for W&WW sector rehabilitation in Tbilisi. In total, information from about eight projects has been collected and a short summary of project proposals is provided in Chapter 4.

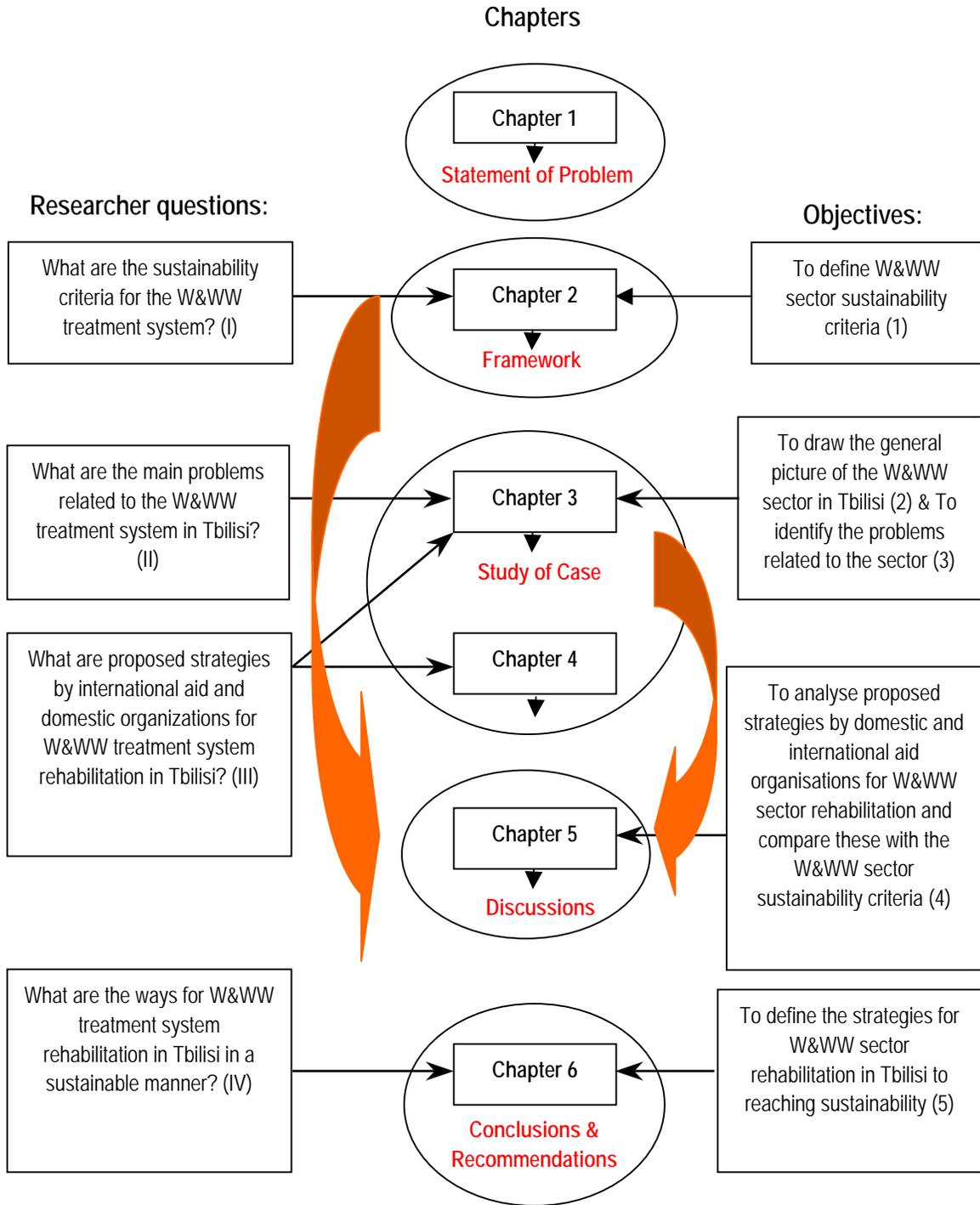


Figure 1-2 Research Path

## 2 Principles of Sustainable W&WW Systems Development

### 2.1 Introduction

The purpose of this chapter is to address the research objective 1 – to define W&WW sector sustainability criteria. The chapter was prepared in order to achieve the objective - to analyse proposed strategies by domestic and international aid organisations for W&WW system rehabilitation and compare them with the W&WW system sustainability criteria. It starts with a general definition of sustainable development and explains the necessity of sustainable water resource management. Then follows an outline of the general criteria for sustainable, sound W&WW treatment system development proposed and elaborated by various international organizations such as: the World Health Organisation (WHO), the WSSCC, the World Bank, UNDP, WB - Water and Sanitation Programme, and the UNEP Global Programme of Action. It ends with 10 key principles which were proposed by the UNEP/GPA, in co-operation with the WHO, HABITAT, and the WSSCC.

### 2.2 General Consideration of Sustainable Development

*“The Gods come near the places which have water  
and gardens in them, either natural or artificial.”*

*(Varahamihir, the mathematician and philosopher of the Gupta Age)*

Sustainability is one of the most important issues facing the world today. Sustainable development has been defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations (UN), 2006). The question of how to create and maintain a sustainable lifestyle is a complicated one.

Sustainable water resources management is one of the important issues, because it is directly linked to poverty reduction, health, agricultural productivity, industrial and energy development and sustainable growth in downstream communities.

Sustainable development and management of water resources is a critical and complex issue for both rich and poor countries. It is technically challenging and often entails trade-offs between environmental, social, economic, and political considerations. Finding a balance between these dimensions is an important aspect of sustainable development (Figure 2-1) (WB, 2003a, p. 5).

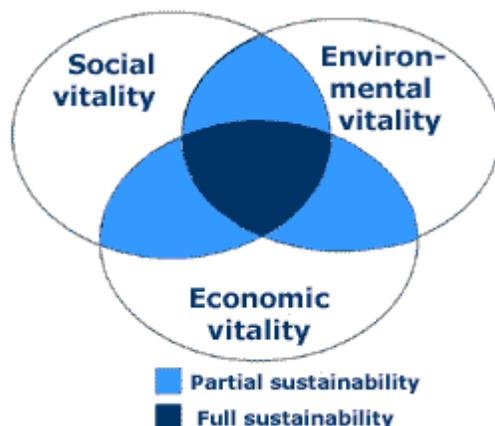


Figure 2-1 Sustainability Calls for Balance

Source: Daigger, Glen T., et al., 2001

Water supply, wastewater management and pollution controls are among the elements of water resources management. Access to WSS are universal needs and indeed are basic human rights. The production and delivery of drinking water and the conduction and treatment of wastewater are vital functions in any society. The benefits of proper WSS services are well known. These benefits emerge primarily as environmental and health improvements and economic gain (WHO, 2000).

To make the initial capital investment in the WSS sector is the easiest part of the job; it is relatively easy to find the resources (money, labour, materials and organization) for one big push to build something. However, it is much more difficult to build and maintain a truly sustainable system (WHO, 2000).

Generally, three principles are fundamental to the creation of socially, economically and environmentally sustainable water service systems:

- **Equity:** All segments of society have access to safe, appropriate systems adapted to their needs and means.
- **Health promotion and protection from disease:** Systems should prevent users and other people from contracting excreta-related diseases and should interrupt the cycle of disease transmission.
- **Protection of the environment:** Systems should neither pollute ecosystems nor deplete scarce resources (WHO, 2000).

### 2.3 What is the Truly Sustainable W&WW Treatment System?

The importance of sustainable use and provision of water and sanitation services was endorsed by Agenda 21 in Rio, 1991. Such concerns have helped push the international community to ensure that the targets of the 2000 Millennium Development Goals (MDGs) and the 2002 World

Summit on Sustainable Development (WSSD) address improved access to safe drinking water and adequate sanitation (UNEP/GPA, 2004).

The WSSD agreed target on water and sanitation: “To halve, by the year 2015, the proportion of people who are unable to reach or to afford safe drinking water and the proportion of people who do not have access to basic sanitation” (UN, 2002).

### 2.3.1 Sustaining Operation and Maintenance through Good Resource Management

At the beginning of the 1990s, following an extensive consultation process, the Operation and Maintenance Working Group of the WSSCC established crucial principles that were aimed at improving the sustainability of WSS services. They are presenting the economic pillar of sector sustainable management. They are:

- The provision of safe water is a service and requires a *service-orientated attitude* on the part of the agencies involved. ***Water should be managed as a commodity***: its use should be financially sound, but subject to legal and regulatory controls to ensure its conservation, protection and well-balanced use.
- Water and sanitation services should normally be set ***at a level that users are willing to finance***, operate and maintain.
- Water supply and sanitation systems should be managed and operated in accordance with the principles of ***good business practice***. The form of management will vary according to the local situation. The agency should adopt an open policy and be fully accountable to its customers.

In addition governments should have a legitimate concern to satisfy the basic needs of disadvantaged segments of their population, and may require agencies to provide services through special financial arrangements, possibly on a temporary basis, to promote public health and economic development (WHO, 2000).

### 2.3.2 Demand Oriented Approach

Studies conducted by the WB in the 1980s revealed that the sustainable provision of water and sanitation service depended on the extent to which ***consumers preferences and willingness to pay*** were incorporated in the investment planning and implementation process. The demand oriented approach should include the needs of all those affected by sanitation services. (World Bank, 2003b, p. 13).

A demand-based approach requires implementing agencies to find out what potential users want and what resources they have to finance and manage installed systems; and to design systems, financing mechanisms, and support structures that are best suited to their needs (Water and Sanitation Programme, 1997, p. 8).

The demand-oriented approach allows community members to take responsibility for their sanitation and wastewater treatment needs. Wastewater professionals provide technical assistance, but community members decide on the level of treatment to be constructed (within a budget) and may participate in construction, operation, and maintenance (World Bank, 2003b, p. 14).

### **2.3.3 Strategic Sanitation Approach**

The UNDP, World Bank Water and Sanitation Programme developed the Strategic Sanitation Approach. The strategic sanitation approach draws upon lessons from experience, WB urban development work, and from others working in the water and sanitation sector worldwide.

This approach sets out a number of key concepts:

- A commitment to sound finances,
- A concern with cities as a whole rather than with discrete projects,
- A wide view of sanitation, encompassing storm water drainage, sludge disposal, the disposal of human wastes, and solid waste management,
- The use of different sanitation options in different areas within a city, depending on local conditions,
- The division and devolution of responsibilities for the management of sanitation services - in other words, recognizing that one organization does not have to be responsible for all aspects of sanitation provision
- The use of a small-step approach, which portrays sanitation provision as a process rather than a series of large projects. (UNEP/GPA, 2001).

The goal of the strategic sanitation approach is to provide reliable and environmentally sound WSS services, to foster investment and operational efficiency, and to develop sustainable services even where urban poverty is growing. Through this approach, municipalities and communities should base their plans and actions on:

- Choices on technologies and service levels;
- Step-by-step actions which unbundled services both vertically and horizontally;
- Economic replicability;
- Responsive institutional arrangements (WSP, 1998).

### **2.3.4 Factors Determining Sustainability of Water Supply and Sanitation Projects**

A series of meetings across Africa led to the conclusion that important factors determining the sustainability of water supply and sanitation projects included:

- Community participation in all stages of project planning, design, implementation, management and operation, with consideration of gender issues.
- Political commitment.
- Intersectoral co-ordination and collaboration.
- Adequate institutional frameworks.
- Human resources development in all its forms and at all levels.
- Self-improvement of communities.
- Better hygiene and sanitation.
- Improved information management.
- Improved environmental sanitation in communities.
- Use of appropriate, environmentally sound technologies.
- Involvement of the private sector through sound regulatory and controlling mechanisms (UNEP/GPA, 2001).

## **2.4 Key Principles for Municipal Wastewater Management**

At the basic level, adequate sanitation should ensure safe disposal of human waste and provide adequate water for ablution, to prevent food contamination and health hazards. Also, an integral part of any sanitation programme should include health education and hygiene promotion (Indian Institute of Technology, n. d.).

Inadequate handling of wastewater has serious consequences for human health, the environment and economic development. Poor sanitation leads to diseases and often death, especially in the low-income high-density settlements, and in economic terms, it makes the whole community impoverished. It contaminates the water supply, increasing the risk of infectious diseases and deteriorating groundwater and other local ecosystems (UNEP/WHO/HABITAT/WSSCC, 2004).

**The basic criteria for a satisfactory excreta disposal system** that will be socially acceptable and effective in use are as under:

- There should be no contact by humans with waste materials within the system.
- There should be no access to the waste for insects and animals.
- It should not generate foul odour or insect nuisance.
- It should not contaminate ground water that may pollute wells and springs.
- It should not contaminate surface water.
- It should not contaminate surface soil.
- The system should be simple to construct and easy to maintain.

In many developing countries, installations often fall short of these objectives. Resource constraint is one major reason for this, but equally important is a general lack of understanding of health hazards by the community in question (Indian Institute of Technology, n. d.).

### **2.4.1 Effective Sanitation Programmes**

According to the WHO the implementation of effective sanitation programmes should:

- Help to prevent environmental pollution and degradation.
- Provide impetus for the development of a range of systems that are applicable to different cultural and environmental conditions.
- Treat sanitation as a major field of endeavor in its own right, with sufficient investment to revitalize training programmes and professional standing.
- Create a demand for systems that move increasingly towards safe reuse and recycling of wastewater.
- Encourage governments, nongovernmental organizations, the private sector and donors to review their sanitation policies.
- Involve in the design process people for whom the systems are being built.

Barriers to progress in sanitation include:

- Lack of political will.
- Low prestige and recognition.
- Poor policy at all levels.

- Weak institutional framework.
- Inadequate and poorly used resources.
- Inappropriate approaches.
- Failure to recognize defects of current excreta management systems.
- Neglect of consumer preferences.
- Ineffective promotion and low public awareness.
- Women and children last (WHO, 2000)

### 2.4.2 Optimal Wastewater Management

According to the WB optimal wastewater management should be based on three elements:

- a decision on what must be achieved-what the society demands or wants in terms of water quality and the related uses or benefits to ***consider water as an economic good***,
- what the ***society can afford, what it is willing to pay for***, and what is feasible for it to undertake and operate, which is in the end related to the costs that society as a whole has to bear to make solutions sustainable;
- the ***institutional and regulatory framework*** to implement the process and provide the coordination mechanisms necessary for involving interested stakeholders in the two decisions mentioned above, so that an accepted and ***adequate combination of technical solutions, incentives, and control mechanisms*** can be agreed-on and applied (World Bank, 1999, p. 4).

### 2.4.3 UNEP Global Programme Action Approach

To assist governments in implementing concrete actions at local and national levels, a *Strategic Action Plan on Municipal Wastewater* was developed by UNEP Global Programme of Action (UNEP/GPA) on of the Marine Environment from Land-based Activities which identified the following reasons for inefficient and inadequate wastewater management:

- low prestige and recognition (compared to, for example, water treatment),
- weak policies and institutional frameworks,
- neglect of stakeholder interests,
- lack of adequate funding and political will,

- inappropriate technologies,
- low public awareness and lack of solidarity.

To improve the existing situation with respect to wastewater management, UNEP/GPA proposed to initiate actions that focus on promoting the use of alternative solutions including:

- low-cost and environmentally sound sanitation and wastewater treatment technologies
- innovative financial mechanisms
- appropriate partnerships, and
- the creation of an enabling environment for action.

#### **2.4.4 10 KEYS for Sustainable Municipal Wastewater Management**

In line with this, UNEP/GPA, in co-operation with the WHO, HABITAT and the WSSCC, has developed the *‘Guidelines on Municipal Wastewater Management’*, including 10 key principles for Policy and Decision Makers (at the national and local level, especially in developing countries), focusing on policy issues, financing mechanisms, technologies and management approaches (UNEP/GPA, 2004).

##### **1. Secure political commitment and domestic financial resources as absolute prerequisites for appropriate wastewater management.**

“Political will and financial affordability are prerequisites for adequate wastewater management”. “First, political will is fundamental for assigning a high priority to wastewater management among other pressing public investment needs. Second, the chosen wastewater management approach must be financially affordable” (WB, 2003b).

“A political climate has to be created in which a high priority is assigned to all aspects of sustainable municipal wastewater management”. “This is a necessary condition for the development of various initiatives, including mitigation measures and programmes that require financially viable investments to safeguard ecosystems and public health from the threats of untreated municipal wastewater discharges” (UNEP, 2002).

##### **2. Create an enabling environment for sustainable solutions at both national and local levels.**

“All branches of government have a responsibility for creating solutions”. Both national and local governments should undertake responsibilities as facilitators and initiators of appropriate urban wastewater management (UNEP, 2002).

“Governments have a leading role in ensuring sustainable governance and developing mechanisms that create adequate conditions for correct actions”. “National authorities should create the policy, legal, regulatory, institutional and financial frameworks to support the delivery

of services at the municipal level in a transparent, participatory and decentralized manner”, even when primary governance of wastewater management issues is at the local government level (UNEP/WHO/HABITAT/WSSCC, 2004).

### **3. Apply demand-driven approaches.**

“In selecting appropriate technology and management options, attention must be given to users’ preferences and their ability and willingness to pay”. “These approaches, however, require comprehensive analysis of both the present and future societal demands”. With such analyses realistic choices can be made from a wide range of technological, financial and management options (UNEP/WHO/HABITAT/WSSCC, 2004).

### **4. Prevent pollution at the source; use and re-use water efficiently; and apply appropriate, low cost technologies for wastewater treatment.**

“Wastewater management need not always involve high initial investments. A very careful search for low-cost - and thus more sustainable - technologies, and approaches that target waste prevention, pre-treatment, water conservation, efficient use of water, and natural systems for wastewater treatment, is essential” (WB, 2003b).

“Sound wastewater management relies upon efficient utilization and preservation of water resources”. This should result in a reduction in wastewater quantity and in investments savings related to construction, operation and maintenance of sewerage systems and treatment facilities. “Prevention of pollution at its source is another key action that ensures quality wastewater management and minimizes the impact on the environment. The correct selection of technology and application of appropriate, cost-effective solutions for sewage purification make a basis for successful wastewater management” (UNEP/WHO/HABITAT/WSSCC, 2004).

### **5. Make water users and polluters pay for services based on social equity and solidarity to reach cost-recovery.**

“The employment of principles like ‘the water user pays’ and ‘the polluter pays’ is required to achieve stable and sustainable wastewater management with efficient cost-recovery systems. These principles should be applied in a socially acceptable way, considering solidarity and equitable sharing of costs by all citizens (rich and poor) and facilities” (UNEP/WHO/HABITAT/WSSCC, 2004).

### **6. Use time-bound targets and indicators for environmental integrity as well as for public health and economic welfare, to make actions successful.**

Environmental degradation and pollution, the incidence of waterborne diseases in humans (human health), and poverty (economic aspects) are all important indicators for action and driving forces for adequate urban wastewater management. “Timely actions with well-defined schedules and deadlines for execution and completion are prerequisites for their accomplishment. Time-bound targets are additional instruments for priority setting, resource allocation and adequate progress reporting “(UNEP, 2002).

**7. Implement measures step-by-step while exploring alternatives to reach long-term management goals.**

“The high costs of wastewater systems necessitate a long-term, step-by-step approach, minimizing current and future environmental and human health damage as much as possible within existing budgetary limits”. “A step-by-step approach allows for the implementation of feasible, tailor-made and cost-effective measures that will help to reach long-term management objectives”. Such an approach also allows for development in close co-operation with other sectors (UNEP/WHO/HABITAT/WSSCC, 2004).

**8. Involve all stakeholders through partnership from the very beginning to secure their commitment as well as to ensure transparency in management and decision-making processes.**

“Municipal wastewater management is a rather complex set of organized efforts and actions on domestic sewage issues that must involve proactive participation and contribution of various governmental and non-governmental stakeholders dedicated to achieve given goals” (UNEP, 2002). Actors stem from local, regional, national and even international levels, and possibly the private sector (The private sector can act as a partner in building and improving infrastructure, in operating and maintaining facilities, or in providing administrative services). “Early, continuous, targeted and transparent communication between the parties involved, their committed co-operation and consequent establishment of firm partnerships, will help ensure a high level of participation, the foundation for successful management” (UNEP/WHO/HABITAT/WSSCC, 2004).

**9. Link the municipal wastewater sector to other economic sectors to ensure financial stability and sustainability.**

“Sustainable wastewater management may involve high initial investments and long-term contracts to cover financial risks and to recover costs. As profits - or “net benefits” - are likely to be higher in other sectors, linking these to wastewater management can reduce the risks involved and enhance the feasibility of new partnerships” (WB, 2003b). Developments in other (socio-) economic sectors, for instance water supply or tourism, may create opportunities to address sanitation at the same time. “Linking wastewater management with these ensures better opportunities for faster cost-recovery, risk-reduction, financial stability and sustainability of the actions applied” (UNEP/WHO/HABITAT/WSSCC, 2004).

**10. Introduce innovative financial mechanisms, including private sector involvement and public-public partnerships.**

“Traditionally, sanitation services have been provided by public authorities. Costs for investments, operation and maintenance, however, often outstrip their capacities, as do present and future requirements for serving the un-served”. Therefore, innovative, more flexible and effective financial management mechanisms have to be considered, e.g. micro-financing, revolving funds, risk-sharing alternatives or municipal bonds. “Public-private partnerships, and also public-public partnerships, are important tools to assist local governments in initial financing and operating the infrastructure for wastewater management” (UNEP, 2002). “New

partnerships are important options and potentially useful tools, if the governing regulatory system is strong enough or can be strengthened enough to avoid the negative consequences that can result from private participation in management of public goods” (WB, 2003b).

#### **2.4.4.1 Additional Consideration**

This day in many parts of the world governments is the W&WW service provider. Generally, a country’s central government plays a significant role as facilitator and initiator of sustainable wastewater management (WB, 2003b). Governments should create an enabling policy environment through which wastewater management will ensure equity, promote health, protect from disease and protect the environment (UNEP/WHO/HABITAT/WSSCC, 2004).

While central authorities remain responsible for strategic planning, policy, and regulatory aspects of sector development, to ensure institutional sustainability in wastewater management the responsibility for services should be delegated to the local level. However, clearly defined and consistent responsibilities, a legal structure reflecting these responsibilities, an effective regulatory body, appropriate regulations, codes, and standards are essential elements for enabling such an environment (UNEP/WHO/HABITAT/WSSCC, 2004).

Public and private institutions that remain responsible for the actual provision of services should have a high degree of autonomy. Included in this is that they have to be permitted to raise funds from sources most suitable to their needs, develop their own cost-recovery policies and procedures, have autonomy in human resource development matters, etc (UNEP/WHO/HABITAT/WSSCC, 2004).

All stakeholders, ranging from the household level to regional, national and even international levels, as well as the private sector, should be involved in policy-making, in planning and implementation of sustainable solutions (UNEP/WHO/HABITAT/WSSCC, 2004). When the community is not a party in the decision-making and implementation process, the systems break down (Indian Institute of Technology, n. d.).

Important strategic aspects to be considered in the planning process are: prevention of pollution at the source, cost-effective technologies, integration policy with other sectors (water supply, land use planning), the consideration of temporal (stepwise) and spatial differentiation, awareness-raising and solidarity among communities in order to create ‘catchment solidarity’ (UNEP/WHO/HABITAT/WSSCC, 2004).

Each wastewater management should be flexible, tailor-made set-up, in which necessary steps can be taken at different points in time, depending on available resources and capabilities. Therefore, the application of a well-defined, logical framework that incorporates a comprehensive set of carefully prescribed, logically related tasks is advisable (UNEP/WHO/HABITAT/WSSCC, 2004).

Formulating environmental standards and objectives is a crucial part of wastewater management planning. The formulation of objectives and related standards requires an analysis of the technical, economic, and social feasibility of different options. Without enforcement, standards

are simply ignored. Environmental regulation should be realistic and allow local flexibility in implementation (UNEP/WHO/HABITAT/WSSCC, 2004).

Enforcing existing rules and regulations is one of the most difficult aspects of governance, both in developed and developing countries. Enforcing wastewater policy also entails monitoring water quality, issuing discharge licences, and collecting discharge fees or penalties. The implementing agencies<sup>2</sup> need to be provided with management tools in the form of regulatory instruments and economic or market based instruments (subsidies, taxes, covenants, etc). Such instruments should be supported by legislation and other types of authorization (UNEP/WHO/HABITAT/WSSCC, 2004).

Depending on the local environmental, economic, and cultural situation, different wastewater discharge and treatment systems will have to be applied. The selection of a treatment technology is an essential step in any wastewater management strategy. The most appropriate technology for a given situation is the one that ensures an acceptable quality of the receiving water. Target levels for water quality and wastewater management determine the required investment. The investment level, with its operational and maintenance costs, determines the costs that need to be recovered through a combination of tariffs or taxes. Cost recovery in turn determines the service level that can be provided and the associated water quality objectives that can be realized (UNEP/WHO/HABITAT/WSSCC, 2004).

Various cost recovery instruments are being applied worldwide to cover at least operational costs of wastewater treatment, and possibly some of the capital investment. These include direct charges to users or pollution fees, such as effluent charges and discharge permits. To ensure that revenues are indeed allocated to the appropriate service provider, a fund should be accountable and provide transparency about its fund management (UNEP/WHO/HABITAT/WSSCC, 2004).

No service is sustainable in the long run if its costs cannot be recovered. To the extent that recurrent costs are subsidized directly by the state, the system's users are hostage to political whim. On the other hand, this does not mean that all users must necessarily pay the same share of the cost, or even that the cost of each user's services must be recovered from that individual user. In practice, some degree of cross-subsidy is inevitable due to the complexity of calculating the costs of an individual household service. More importantly, some degree of cross-subsidy from wealthier to poorer users is desirable to ensure access for all, and thus minimize disease and maximize public health benefits (WHO, 2000).

It is important to recognize that public understanding and attitudes regarding wastewater management differ significantly from every other form of infrastructure service. People do not want to recognize their individual contributions to waste generation. Besides, it is very difficult to sanction non-payment or non-compliant use of the system. Success of wastewater management programmes depends on effective advocacy and public awareness through

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<sup>2</sup> Examples of implementing agencies are: national ministerial departments, state or municipal technical departments, departments of environmental management, public works, public health, water utilities, and river basin agencies. At local levels, they can include community-based organizations such as NGOs and women's associations and private sector companies.

information, education and communication. Communication can help to make policy-makers, the private sector, and communities committed to programmes and to prevent expensive mistakes. People must be informed and convinced, or they do not feel part of a process and may not be motivated to change their behaviour (UNEP/WHO/HABITAT/WSSCC, 2004).

Partnerships between the public and private sector are most commonly cited in concessions and management contracts. Water supply and sanitation projects can benefit from typical private company characteristics such as their professional managerial capacity, the fact that they are technically better qualified and equipped, and operate at high efficiency levels. However, transfer of responsibilities to private sector can lead to environmental pollution unless there are adequate regulatory controls and the political and financial backing to enforce them. Clearly, strong governments are needed to actively promote schemes among potential partners, to ensure that necessary tools are in place and that companies comply with their obligations (UNEP/WHO/HABITAT/WSSCC, 2004).

## **2.5 Summary**

The sustainable development and management of water resources, which includes the water supply, wastewater management and pollution controls, is one of the most critical and complex issues for both rich and poor countries. It entails trade-offs among environmental, social, economic, and political considerations and necessitates finding a balance between these dimensions in order to address sustainability.

The present situation of WSS is extremely poor in most of the developing countries; access to WSS are universal needs and indeed are basic human rights. However, over one billion people lack access to safe water, and nearly two billion lack safe sanitation. It is also reported that more than three million people die every year from water-related diseases (Indian Institute of Technology, n. d.).

Sustainable water resources management is directly linked to poverty reduction, health, agricultural productivity, industrial and energy development and sustainable growth in downstream communities.

The importance of sustainable use and provision of water and sanitation services was endorsed by Agenda 21 in Rio, 1991 as well as at the 2002 World Summit on Sustainable Development, where the issue of improved access to safe drinking water and adequate sanitation was addressed.

However it is one of the greatest challenges to provide sustainable WSS in low-income areas. In developing countries the major problem is to select an appropriate technology and approach, considering multi-faceted issues including technical feasibility, affordability, customs and practices, and the institutional support available.

As summarised in Table 2-1 below, barriers to progress in sanitation identified by WHO and UNEP/GPA are quite similar to each other.

Table 2-1 Barriers in Wastewater Management

UNEP/GPA	WHO
Lack of adequate funding and political will.	Lack of political will.
Weak policies and institutional frameworks.	Poor policy at all levels. /Weak institutional framework.
Neglect of stakeholder interests.	Neglect of consumer preferences.
Low prestige and recognition (compared to, for example, water treatment).	Low prestige and recognition.
Inappropriate technologies.	Inappropriate approaches / Inadequate and poorly used resources.
Low public awareness and lack of solidarity.	Ineffective promotion and low public awareness.
	Failure to recognize defects of current excreta management systems.

The main reasons for inefficient and inadequate wastewater management are: lack of political willingness and financial resources, poor policy and institutional frameworks at all levels, neglected stakeholder interests and consumer preferences, low prestige and recognition of wastewater sector as well as low public awareness and therefore lack of public solidarity, and in addition, the inadequacy of chosen technologies and approaches for sufficient management of resources.

The various international organizations have elaborated the different strategies for sustainable management of the W&WW treatment sector. These include:

- principles for improving the sustainability of water supply and sanitation services, established by the Operation and Maintenance Working Group of the WSSCC
- the Demand Oriented Approach proposed by the World Bank
- the Strategic Sanitation Approach developed by the UNDP, World Bank Water and Sanitation Programme
- factors determining Sustainability of Water Supply and Sanitation Projects proposed by the WHO
- the basic principles for implementation of effective sanitation programmes proposed by the WHO
- actions that focus on promoting the use of alternative solutions, to improve the existing situation with respect to wastewater management proposed by UNEP/GPA

- 10 key principles for sustainable wastewater management for policy and decision makers (at the national and local level) developed by UNEP/GPA, in co-operation with the WHO, HABITAT and the WSSCC.

The summary table of sustainable principles for W&WW sector development is provided in Appendix I. It is clear that one of the most comprehensive approaches was proposed by UNEP/WHO/HABITAT/WSSCC, which covers all aspects (policy issues, financing mechanisms, technologies and management approaches) that should be taken into consideration by policy and decision makers (especially for developing countries) in the planning and implementation processes of W&WW projects. However, all these proposed approaches are quite similar to each other. The many “repeated” principles are the following:

- To secure political commitment
- Create an enabling environment for sustainable solutions
- Stakeholders’ involvement from the very beginning
- Application of demand-driven approaches
- Pollution prevention at source, water conservation and efficient use of water
- Application of ‘the user pays’ and ‘the polluter pays’ principles
- Step-by-step approach
- Integration of the municipal wastewater sector into other economic sectors
- Public-private partnerships, and also public-public partnerships.

**To secure political commitment**, central government should be facilitator and initiator of sustainable wastewater management systems. This means always keeping three essential principles for sustainable sanitation systems in mind: equity, health promotion and protection of the environment. The government should **create an enabling environment for sustainable solutions**, which means that central government should create the policy, legal, regulatory, institutional and financial frameworks to support the delivery of services at the municipal level in a transparent, participatory and decentralized manner. When the community is not a party in the decision-making and implementation process, the systems break down; therefore **all stakeholders should be involved from the very beginning** in policy-making, in planning and implementation of sustainable solutions. **Application of demand-driven approaches:** depending on the local environmental, economic, and cultural situation, different wastewater discharge and treatment systems will have to be applied, where, in selecting appropriate technology and management options, attention must be given to users’ preferences and their ability and willingness to pay. Sound wastewater management relies on efficient utilization and preservation of water resources. The correct selection of technology and application of appropriate, cost-effective solutions that target **pollution prevention at source, water conservation and efficient use of water**, make a basis for successful wastewater management.

No service is sustainable in the long run if its costs cannot be recovered, therefore **the employment of principles like ‘the user pays’ and ‘the polluter pays’** is required to achieve stable and sustainable wastewater management with efficient cost-recovery systems. The high costs of wastewater systems necessitates a **step-by-step approach**, minimizing current and future environmental and human health damage as much as possible within existing budgetary limits to reach long-term management objectives. Such an approach also allows for the development, in close co-operation with other (socio-) economic sectors; for instance, water supply or tourism may create opportunities to address sanitation at the same time. **Integration of the municipal wastewater sector into other economic sectors** will ensure financial stability and sustainability. Traditionally, sanitation services have been provided by public authorities. Costs for investments, operation and maintenance, however, often outstrip their capacities. **Public-private partnerships and public-public partnerships** are important tools to assist local governments in initial financing and operation of the infrastructure for wastewater management.

The principles outlined above will be used as guiding tools for making an analysis of proposed strategies by domestic and international aid organisations for W&WW system rehabilitation in Tbilisi.

## **3 The W&WW Sector in Tbilisi, Georgia**

### **3.1 Introduction**

The purpose of this chapter is to draw the general picture of the W&WW sector in Tbilisi, Georgia, identify the problems related to the sector and introduce the reader to the domestic strategies toward W&WW system rehabilitation.

The chapter starts with a description of the country's profile, its water resources and River Mtkvari. The purpose of describing the quality and conditions of the Mtkvari river is directly linked to the W&WW sector. All wastewater flows from Tbilisi are supposed to be collected by sewage collectors and conveyed to Gardabani regional WWTP. Key links in the system have never been constructed. Collection sewers in Tbilisi along each bank of the Mtkvari river convey only part of the city's sewage. Untreated industrial and municipal wastewater discharges, which come largely from within the territory of Tbilisi city, influence the river quality and cause an impact on downstream communities.

The chapter describes the organisational structure of the W&WW sector, institutional bodies who are responsible for safe service provision on both the national and local level, as well as financial, regulatory and legislative mechanisms for sector development and management. Hence, the technical condition of the country's municipal water supply and sewage system as well as of Gardabani regional WWTP and Tbilisi water supply sector, the tariff system for W&WW service provision for household and other consumer categories and gaps in the system.

Also presented are the environmental financing and expenditure and the strategies that were designed for sector rehabilitation as well as proposals for future actions.

The chapter gives an overview of the technical, financial and institutional sides of the sector and Georgian government policy for W&WW infrastructure development.

### **3.2 Georgia its Water Recourses and River Mtkvari**

Georgia is located in the Caucasus region in the southeast of Europe. Total area of country is 69,700 km<sup>2</sup>. It is bordered by the Russian Federation in the north, Azerbaijan in the southeast, Armenia and Turkey in the south, and the Black Sea in the west (Figure 3-1). For administrative purposes, the country is divided into 11 regions<sup>3</sup>, comprising some 67 districts. The total population of Georgia is less than 5 million, 58% of which live in urban areas (Food and Agriculture Organization of The United Nations, n. d.).

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<sup>3</sup> Including two autonomous republics Abkhazia, and Ajaria.



Figure 3-1 Map of Georgia

Source: *State of the Environment Georgia, 1996*

Tbilisi is the capital city of Georgia, with the population of over 1.0 million and total area of 200 km<sup>2</sup>. Tbilisi is located at eastern part of Georgia (State of the Environment in Tbilisi, 2000).

Georgia is the richest country in the South Caucasus in terms of available ground and surface water resources. 10.94% of the territory of the republic is covered by water (OECD, n. d. b). There is four times or more water available per capita in Georgia than in Armenia and Azerbaijan (United Nations Economic Commission for Europe, n. d. a). The country has two primary drainage basins. The eastern basin drains into the Caspian Sea, the western into the Black Sea (International Waters Learning Exchange and Recourse Network (IWLEARN), 2006).

There are more than 860 lakes and reservoirs in Georgia with a total surface area of about 170 km<sup>2</sup> and more than 26 thousand rivers with total length of 59,000 km. Ground water resources include numerous fresh, mineral springs and thermal waters. The major rivers in Georgia are: Alazani, Mtkvari, Chorokhi, Enguri, Rioni (State of the Environment Georgia, 1996).

The river **Mtkvari** is one of the biggest rivers in the country as well as in South Caucasus. River Mtkvari originates in the Kizil-Giadik mountain range in Ardahan province in Northeast Turkey, and flows through Georgia, Armenia, and Azerbaijan to the Caspian Sea. The total length of the river is about 1,515 km, of which 390 km is on the territory of Georgia (United Nations Development Programme Global Environment Facility (UNDP/GEF), 2004). Length of Mtkvari River within the Tbilisi is 33 km. The Mtkvari River represents the main hydrological unit of Tbilisi city, as indeed it is of the whole of Georgia (WB, 2001a). Mtkvari River is essential for Georgian economy. Georgia depends on the Mtkvari river for industry, agriculture, fishing, energy production and recreation (UNDP/GEF, 2004).

River Mtkvari is one of the most polluted rivers in Georgia<sup>4</sup> (State of the Environment Georgia, 1996). The river is relatively unpolluted when it enters Georgia, it is polluted downstream; pollution comes mainly from the big cities such as: Borjomi, Gori, Tbilisi and Rustavi (United Nations Economic Commission for Europe (UNECE), n. d. a). By the time the water leaves Georgia for Azerbaijan it is seriously degraded (IWLEARN, 2006). A range of factors, including pollution from industry, municipal wastewater discharges, domestic solid waste, agricultural pesticides, large scale irrigation, hydropower schemes and watershed degradation have all contributed to a reduction in water quality (UNDP/GEF, 2004).

Based on multiyear monitoring conducted recent years in Georgia, by the center of monitoring and forecasting within the NATO Science for Peace - “South Caucasus River Monitoring” Programme framework, it was determined that basin of Mtkvari is generally polluted by the wastewater from agriculture and communal activities; materials that cause pollution mainly are: biogenic compounds, organic and mechanical substances<sup>5</sup>.

The reason of Mtkvari river pollution in Tbilisi always were and still remain the household waters as well as the sewage waters from the number of industrial units<sup>6</sup>. It should be noted that half of the industrial facilities of Georgia are concentrated in the Mtkvari river basin – in the city of Tbilisi and Kvemo-Kartli Region. There are up to 12,000 registered industrial units in Tbilisi<sup>7</sup>. All of these units are to a certain degree the polluters of the water resources (UNDP/SIDA, 2005).

Even though that industrial activity has declined in recent years in Georgia due to economic crisis, industrial wastewater discharges coming largely from the Tbilisi region, with inefficient or no treatment, are having serious impact on surface water quality (State of the Environment in Tbilisi, 2000). The MoE estimates that more than 80% to 90% of industrial waste water is not treated before being discharged to sewers and municipal waste-water treatment plants (where there is a network), or directly to surface waters (where there is no network) (UNECE, n. d. a). The acting industrial units either have no Wastewater Treatment Facilities (WWTF) or these constructions do not operate, just some of them are satisfied with partial mechanical treatment<sup>8</sup>.

The situation is even more aggravated due to the fact that about 40-50% of wastewater produced within the territory of Tbilisi (both municipal and industrial) is discharged in to the Mtkvari river without any treatment. All flows from Tbilisi are supposed to be collected by sewage collector and conveyed to Gardabani regional WWTP. Collection sewers in Tbilisi along each bank of the Mtkvari river convey only part of the city’s sewage. The remaining wastewater flow discharge untreated directly into the Mtkvari river, because key links in the system have never been constructed (WB, 2001a).

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4 The most polluted rivers in Georgia are the Mtkvari, Rioni, Kvirila, Galidzga, Tkibuli, Enguri and Gubistskali.

5 Kordzakhia, G. (2006, Jun 27). Personal Interview

6 Azarashvili, M. (2006, Jun 27). Personal Interview

7 Kelbakiani, G. (2006, Jun 23). Personal Interview.

8 Akhvlediani, D. (2006, July 12). Personal Interview.

### 3.3 Organizational Structure of the W&WW Sector, Regulatory and Policy Issues

#### 3.3.1 Organizational Structure of the W&WW Sector

W&WW services (water supply, wastewater collection and treatment) for households and other consumers<sup>9</sup> categories are provided by municipal W&WW utilities. W&WW utilities of Georgia are mainly societies with limited liability. They all are in public ownership. After sector reform<sup>10</sup> in Georgia (1997) and restructuring of Georgian Government all W&WW utilities were transferred to the local authorities; local authorities are supervising operational and administrative activities of the utilities. W&WW utilities in Georgia are established by the Ministry of Economic Development through the Public and W&WW utilities Management Agency upon the agreement with local municipal and district authorities<sup>11</sup> (Figure 3-2) (European Union Water Initiative (EUWI), n. d.).

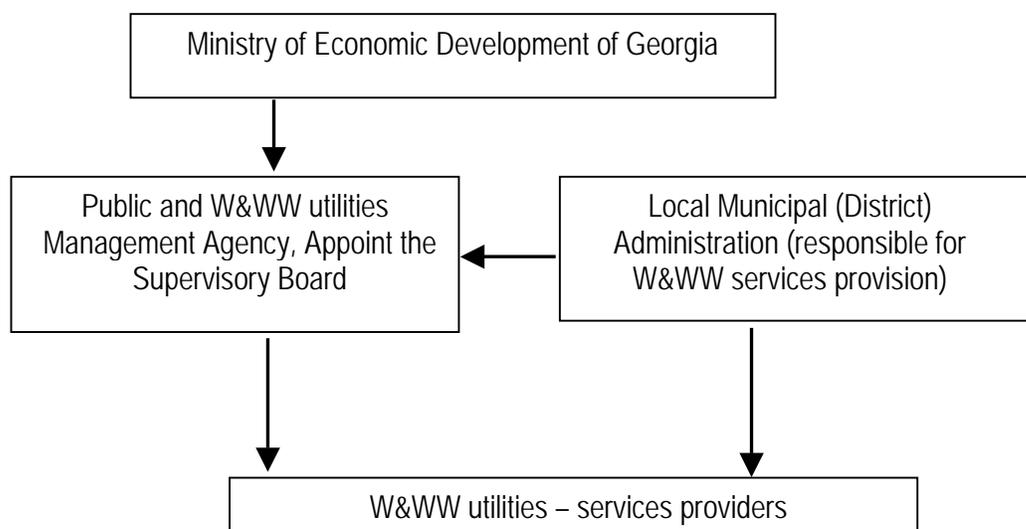


Figure 3-2 Interrelations of the Key Legal Actors in W&WW Sector

Source: EUWI, n. d.

<sup>9</sup> W&WW services consumers in Georgia are households, public institutions, industrial enterprises, housing utilities and the private sector.

<sup>10</sup> Government has undertaken a broad sector reform effort aimed at attaining greater decentralization as defined by the principle of subsidiarity - the principle which states that matters ought to be handled by the smallest (or, the lowest) competent authority (World Bank, 1997).

<sup>11</sup> According to the Law of Georgia “On Business Undertakings”, the limited liability societies are managed by a supervisory board, members of which are appointed by the Public and W&WW utilities Management Agency and local authorities, for the exception of Tbilisi, where the Supervisory Board of Tbil-vodocanal LLC is formed by the City Mayor after consultations and agreement with the legislative body of Tbilisi.

In Tbilisi the W&WW service provision is under responsibility of Tbilisi Water Utility – Tbilvodocanal (Tbilisi Water Channel) Limited Liability Company (LLC), the founder of which is City Administration (EUWI, n. d.).

Jun 2006 SAI Global Limited has certified the TWU to the international quality standard ISO 9001:2000. TWU was inspected by expert auditors over a number of months and was found to have successfully implemented the internationally recognized quality management system. It is the first state owned company to achieve significant benchmark in such a short period of time (within eight months) and has demonstrated its ability to consistently deliver its services and focus on continuous improvement (SAI Global, 2006).

Gruz-vodocanal (Georgian Water Channel) LLC operates regional WWTF located in Gardabani, with 1.0 million m<sup>3</sup>/day capacity, and main sewer from Tbilisi to Gardabani of 26 km length (EUWI, n. d.).

Gruz-vodocanal LLC has been functioning since 1998. It was founded by the Public and W&WW utilities Management Agency under the Ministry of Economic Development of Georgia. The regional treatment plant and sewer from Tbilisi to Gardabani operated by Gruz-vodocanal LLC are in the state ownership (EUWI, n. d.).

### **3.3.2 Key Actors in W&WW Sector**

**The Ministry of Economic Development of Georgia** provides methodological and functional management, coordination and sectoral control for water infrastructure development (UNDP/SIDA, 2005).

**Ministry of Finance** acts as the founder of water and sewerage utilities, Ministry makes funds available from the central Government for water investment (albeit now quite limited with decentralization). Now primarily acts as the counterpart for disbursing and managing funds from the limited programmes of the WB (UNECE, n. d. a)

Control and enforcement of any regulation related to drinking water intake, treatment, quality and distribution is under responsibility of **Ministry of Labor, Health protection and Social Affairs of Georgia**<sup>12</sup> (UNDP/GEF, 2003).

Ministry of Labour, Health and Social Affairs develops and approves sanitary-hygienic rules and norms to guarantee safe environment for population; in particular, Ministry set standards for

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<sup>12</sup> Particularly, State Sanitary Supervision Service (which constitutes the environmental health branch of the Ministry of Labour, Health and Social Affairs) was responsible for state sanitary supervision on drinking water quality. But this service stopped the functioning as a result of institutional reforming in the Ministry. There is no information when it starts functioning again.

drinking water<sup>13</sup> and recreational use<sup>14</sup>, as well as wastewater used for land irrigation<sup>15</sup>. Most of the standards are adopted from those in place during the Soviet era, albeit with some regard to international norms (such as those of the WHO) (UNDP/GEF, 2003).

The control over the protection of water resources, issuing licenses on special water use and approval of discharge limits of contaminating substances in surface water bodies is done by the **Ministry of Environment Protection and Natural Resources of Georgia** (UNDP/SIDA, 2005).

**Local Municipality** - Main volume of work for functioning and development of the sector is given to the local organs of management and self-governance (UNDP/SIDA, 2005).

The municipalities have authority over the natural resources in their area (UNECE, n. d. a). The Municipalities are responsible to consumers for ensuring and securing an uninterrupted water supply and a high quality of drinking water (UNDP/GEF, 2003). The Municipalities are facilitating investments in the drinking water and sewage operations, so that rehabilitation and upgrading needs are met, through decisions on tariffs. Municipalities are legally obliged to compensate for any shortfall in the revenue of the utilities due to insufficient tariffs (UNDP/GEF, 2003).

At the moment, the municipalities are financially dependent on State budget allocations, which barely cover salaries and related expenditures (UNECE, n. d. a). Additional sources of revenue under the control of municipalities are property taxes, communal fees and income from municipal services (EUWI, n. d.)

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13 Hygienic Requirements to Drinking Water Quality of the Centralized Water Supply Systems, adopted by the Ministry of Health of Georgia, order N297/n, 16.08.01; Hygienic Requirements to Drinking Water Quality of the Non-centralized Water Supply Systems, adopted by the Ministry of Health of Georgia, order N297/n, 16.08.01

14 Sanitary Rules and Norms on Protection of Surface Waters Against Pollution, adopted by the Ministry of Health of Georgia, order N297/n, 16.08.01

15 “Hygienic Requirements to Wastewater and Sewage Sludge Use for Land Irrigation and Fertilization”, adopted by the Ministry of Health of Georgia, order N297/n, 16.08.01

Decentralization of the responsibilities and such distribution of rights and obligations gave two alternative results. From one side - transfer of the decision making on the local level, from the other side - such decentralization significantly complicated the normal W&WW service provision (UNDP/SIDA, 2005). Currently there is no united W&WW utilities coordination centre in Georgia which could provide practical assistance to the utilities, and will be responsible for its management and development (EUWI, n. d). No overall co-ordination of this sector in Georgia and important water management and services functions are not undertaken as nobody is responsible or because, those that are responsible, lack the capacities and/or resources to do it (UNDP/GEF, 2003). All representing water and sewerage utilities throughout the country agreed that disjointed and uncoordinated utility operations are the main cause of the current difficulties in supplying communities with potable water and sewerage and wastewater treatment services (OECD, n. d. a).

### 3.3.3 Regulatory Issues

#### 3.3.3.1 Drinking Water Quality Control

Water quality standards for drinking water are issued administratively by the Ministry of Labor, Health and Social Affairs. There is no State Georgian standard elaborated yet; Water quality standards for drinking water are adapted from old Soviet norms and albeit with some regard to international norms<sup>16</sup>.

The control and monitoring of drinking water quality is not conducted on state level anymore (*as a State Sanitary Supervision Service (Ministry of Labour, Health and Social Affairs) has stopped functioning due to the institutional reforming in the Ministry*). Currently local municipalities are responsible about provision this issue. In addition that TWU conducts regular laboratory analysis on water quality, there are 330 stationery points in Tbilisi where up to 15-20 samples are taken and analysed every day by the Sanitary Environmental Protection and Ecological Monitoring Canter<sup>17</sup> (Local Municipality).

Nevertheless lack of finances, biological and epidemiological monitoring on the quality of drinking water was regularly conducted in Tbilisi. But laboratory is in poor conditions and none of reconstruction works have been performed in recent years<sup>18</sup>.

#### 3.3.3.2 Wastewater Discharge Quality Control

All municipal, industrial or other facilities that have direct discharge of wastewater into the rivers, lakes, reservoirs and other surface waters require the license on wastewater discharge.

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16 Shvangiradze, D. (2006, July 19). Personal Interview.

17 Avaliani, D. (2006, July 19). Personal Interview.

18 Avaliani, D. (2006, July 19). Personal Interview.

Licensing is based on the calculation of Maximum Allowable Discharges (MAD) (UNDP/GEF, 2003). Setting and control of the wastewater emission standards are based on the “Methodology of the calculation of the wastewater Maximum Allowable Discharge (MAD) limits” and is the responsibility of the MoE (UNDP/GEF, 2003). The industrial discharges that goes to the municipal treatment plant is not subject to licensing by the MoE. Instead the quality and quantity of discharge are set by negotiation and contract between the industry and the wastewater utility (UNECE, n. d. a).

The industrial discharges that go directly to the surfaces water are subject of regulation of MoE, **Department of Product Safety, Veterinary & Plant Protection (Ministry of Agriculture)** is also responsible for monitoring and control of wastewater discharges form food industries (Avaliani, D., 2006) and Local Municipality.

Despite the fact that three institutional bodies are responsible about this issue none of them is providing the responsibilities as it should to be done.

The Department of Product Safety, Veterinary & Plant Protection of the Ministry of Agriculture is a new division created in March 2006 and was not provided with adequate resources (both human and material) therefore yet the time of writing of thesis, has not started implementation of delegated responsibilities<sup>19</sup>.

MoE due to the lack of human as well as financial recourses also basic equipment and tool for monitoring compliance by industry with emission limits can't perform monitoring works<sup>20</sup>.

Sanitary Environmental Protection and Ecological Monitoring Center stopped monitoring activities of food processing industries since creation of Product Safety, Veterinary & Plant protection Department, due to the fact that responsibility has been delivered to the Ministry of Agriculture. Even though monitoring activities of other type of industries and food industries before the March 2006 do not have the regular character due to lack of financial resources<sup>21</sup>.

Industry is free from pollution taxes, but they have to pay fee for discharge of wastewater and fines in case if no compliance with emission limits will be detected<sup>22</sup>. The core of the system is self-reporting by users to national authorities. Fines and fee structures do not appear to provide the right incentives to encourage pollution control or investments for efficiency (UNECE, n. d. a).

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<sup>19</sup> Shvangiradze, D. (2006, July 19). Personal Interview.

<sup>20</sup> Jinoria, I. (2006, Jul 19). Personal Interview

<sup>21</sup> Shvangiradze, D. (2006, July 19). Personal Interview.

<sup>22</sup> Jinoria, I. (2006, Jul 19). Personal Interview.

The economic instruments for water management in Georgia included water effluent taxes and non-compliance fees. Since the new government came in force new tax code was adopted (2005), where “polluter pays principle” is not considered and environmental pollution taxes have not been unified (Makarova, M., 2006). The strategy of the new government is focused on country economical development therefore the new taxation policy is “loyal” toward industry sector. Main argument of the cancellation of environmental taxes was their not compliance to the functions which was clearly stated in legislation (Appendix II);

### 3.3.3.3 Surface Water Quality Control

Surface water quality standards are issued administratively by the MoE (Regulation on the protection of Georgian surface waters from pollution, adopted by the MoE, order N147, 17.09.96 (Annex 1). Entity of public law of the MoE - *Centre of monitoring and forecasting* is technically responsible for monitoring, collection, storage and analysis of environmental data on surface water quality. The water quality monitoring system covers all important rivers, streams and reservoirs (UNDP/GEF, 2003); but as a result of inadequate finances could not conduct the regular monitoring activities. However it should be noted that important laboratory works have been conducted within the framework of NATO Science for Peace - “South Caucasus River Monitoring” Programme and improvements in equipment and methodologies have been achieved as well.

### 3.3.4 Legal and Policy Frameworks

#### 3.3.4.1 Legislative documents regulating functions, rights, obligations and relations of key legal actors

Relations, obligations, rights, functions of W&WW utilities and other legal actors in Georgia are regulated through the agreements between W&WW utilities and consumers. These agreements are the basis for relations between the key actors of W&WW sector, they stipulate their mutual rights and obligations based on the following regulations: Water Law<sup>23</sup> of Georgia, Rules for the Use of Public Water and Sewerage Systems<sup>24</sup>, Specifications for the Quality of Wastewater

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23 Law on Water has been in force since 1997 and was further amended in June 2000. In 2003 the final version of the Law on Water was passed.

24 Rules of use of communal water and wastewater systems (Order of the Ministry of Urbanization and Construction of Georgia No. 81 of 21 October 1998)

Discharged by Industrial Enterprises into Municipal Sewage Networks<sup>25</sup>, and Rules of Operation of Water Supply and Sewerage Systems in Inhabited Localities<sup>26</sup> (EUWI, n. d.)

### 3.3.4.2 Other Legal and Policy Frameworks

#### Policy Framework

There is no separate policy document that directly spells out Georgian policy for protecting and managing water availability and quality. The Law on Water and a number of relevant laws does outline key principles that comprise a policy framework:

- Create an enabling environment for sustainable solutions at both national and local levels
- Develop integrated and demand-driven management systems combining the collection and treatment of wastewater with drinking water supply and the provision of sanitation services
- Prevent pollution at the source, use water efficiently and apply appropriate low cost technologies for wastewater treatment
- Use time-bound targets and indicators for environmental integrity
- Implement measures step-by-step to reach long-term management goals
- Introduce innovative financial mechanisms (UNDP/GEF, 2003).

#### Legal Frameworks

Today, Georgia recognizes the need of and is willing to treat environmental (incl. water resources use and protection) issues as an integral part of the overall strategy for economic and social development. Georgian constitution, adopted by the Parliament in 1995, states that:

- ***Everyone has the right to live in a healthy environment and to use its national and cultural resources.*** Everyone has the duty to protect the natural and cultural environment.
- ***The State undertakes to protect the natural environment and to guarantee its rational use, in order to maintain a healthy environment that meets the ecological and economic needs of society,*** and preserves the interests of current and future generations (UNDP/GEF, 2003).

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<sup>25</sup> Technical conditions of wastewater discharge to sewerage by industrial enterprises (Order of the Ministry of Urbanization and Construction of Georgia No. 05 of 9 February 1998)

<sup>26</sup> Rules of technical operation of water and wastewater systems in settlements of Georgia, valid since 1 April 2001 (Order of the Ministry of Urbanization and Construction of Georgia No. 70 of 25 December 2001 agreed with the Chief Sanitary Doctor of Georgia, Ministry of Environment and registered by the Ministry of Justice of Georgia).

One of the most comprehensive legal framework - **Law on Water** sets the overall objective of the water resources management activities in Georgia and provides guiding principles and instruments that will be applied to achieve that goal in the long term. Law cover a very wide and comprehensive set of issues such as pollution control policies, protection of drinking water sources, licensing of water use and discharge, categorization and protection of resources and many others. According to the Law on Water, all water resources are the public property and protected by the state. Population of Georgia is obliged to use water in a saving manner and not to contaminate water resources (UNEP/GEF, 2003).

**The Law on Health Protection** was adopted by Parliament in 1997. The Law outlines measures to be taken *to guarantee safe environment for health of population*, the influence of dangerous factors on health and preventive measures to be taken (UNEP/GEF, 2003).

**The Sanitary Code** adopted by Parliament in 2003 defines sanitary-hygiene norms to be complied with; it also describes the responsibilities of different authorities in case of problems, and it defines the measures to be implemented in order to solve the problems (UNEP/GEF, 2003).

In Georgia, the general public's right to participate in decision-making is secured by the Constitution of Georgia, **Law on Environmental Protection**, and **Aarhus Convention** (OECD, 2005c);

Currently, the Parliament is reviewing a law on public involvement in the local self-governance authorities, the adoption of which would enhance the influence of the general public on environmental protection issues (OECD, 2005c).

## 3.4 Georgian Government Policy for W&WW Sector Development

### 3.4.1 Environmental Financing and Expenditure

Strategies, objectives and major directions for Georgia's socio-economic development are defined in the *Indicative Plan for Social and Economic Development*. It is the basis for drafting state budget. The indicative plan is based on programmes and project proposals from different ministries, agencies and other executive bodies. The project proposals are submitted to the Ministry of Economical Development. When the priority projects are approved, they are included in the draft indicative plan for the upcoming year to be subsequently considered in the draft state budget (ENECE, n. d. a).

The State budgets that were adopted according to the indicative plans over the past years show a decline in the expenditures on environmental protection. The projections of expenditure by sector show that continuing priority is given to public order and safety. Health and education have received substantial increases in spending in recent years (ENECE, n. d. a). Most environment-related programmes and plans were developed with the assistance of various international financial institutions. Plans usually include activities that are solely designed to attract future funding from international organizations. Most ongoing and planned measures receive financial support from donor countries and international financial institutions (ENECE, n. d. a).

### 3.4.2 W&WW Sector Financing

Target development programmes and plans of capital investment in W&WW infrastructure are designed by the Ministry of Economic Development. The programmes are coordinated with the Ministry of Finance and implemented if funds are available in the budget (EUWI, n. d.). W&WW sector rehabilitation is not among the priorities of country economic and social policy, this is reflected in a low level of budget financed capital investments (OECD, n. d.)

In present, rehabilitation, development and capital construction of W&WW infrastructure are performed by the Municipal Development Fund (MDF) (Appendix III) and the Fund of Social Investment of Georgia (only for rural W&WW utilities), as well as through transfer of national budgetary funds to all municipal facilities, with exception of Tbilisi city (for Tbilisi the funds for development and rehabilitation of the water supply and sewage sector are allocated from the municipal budget) (EUWI, n. d.).

Social Investments Fund of Georgia finances the program to abate poverty, in the frameworks of which rural W&WW utilities were rehabilitated in 2002-2003. Rehabilitation of 14 infrastructure facilities cost 2.4 million GEL (EUWI, n. d.).

In 2001-2004 in the frameworks of MDF 10.6 million GEL was allocated for construction and commissioning of facilities in W&WW infrastructure.

Apart from MDF and Social Investments Fund, finances for W&WW systems rehabilitation in 2002-2003 were allocated through transfers from the national budget to the territorial budgets. In 2002 26 municipalities spent 1.2 million GEL of the total amount of transfers received for W&WW systems rehabilitation, and in 2003 21 municipality allocated 0.33 million GEL (EUWI, n. d.).

For the period of 2001-2004 6.5 million GEL<sup>27</sup> was allocated for reconstruction of W&WW sector in Tbilisi through MDF. Hence, Tbilisi local budget provided 3.6 million GEL in 2002, 4.9 million GEL in 2003, 3.1 million GEL in 2004 (EUWI, n. d.), 10.0 million GEL in 2005 and 28.0 million GEL in 2006<sup>28</sup> (Kelbakiani, G., 2006) (Figure 3-3).

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<sup>27</sup> The average annual exchange rate in 2005 was: 1 USD= 2.16 GEL

<sup>28</sup> From local municipality in 2005 25.8 million GEL and in 2006 40.6 million GEL was allocated in W&WW sector.

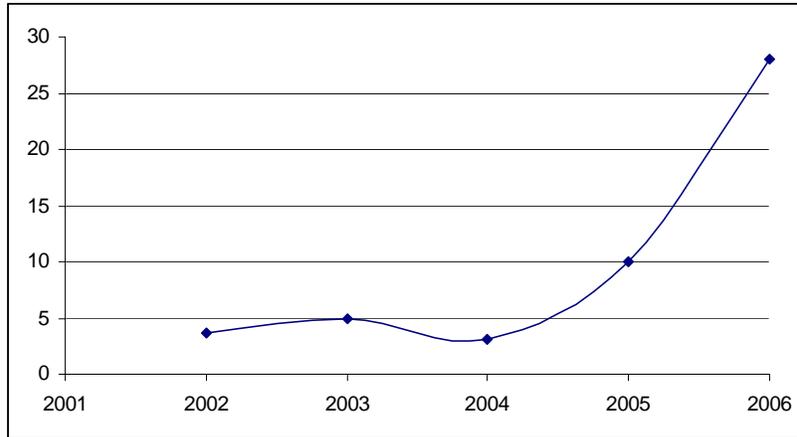


Figure 3-3 Capital Investments from Local Municipality in W&WW sector in Tbilisi (2002-2006)

### 3.4.3 Housing and Communal Sector Reforming

In the frameworks of the concept of housing and communal sector reforming in Georgia, adopted by the President of Georgia No. 543 of 23 September 1998, the programme of “Sanitary and Technical Improvement of W&WW Systems in Cities and Districts of Georgia for 1999-2001” was prepared.

An approximate cost of the programme was 85.0 million GEL, including 48.8 million GEL for rehabilitation of water supply systems, and 36.2 million GEL for rehabilitation of wastewater system. However, due to a lack of financing and low household incomes level, only minor part of the programme has been implemented (EUWI, n. d.)

### 3.4.4 National Environmental Action Plan

The main environmental policy document in Georgia is the National Environmental Action Plan (NEAP), with the 5-year span. In Georgia development of the NEAP began in 1996, with financial support of the WB<sup>29</sup> (United Nations convention to Combat Desertification, (UNCCD), 2002).

It identifies priority environmental problems in the country and proposes short and medium term institutional and regulatory changes and investment actions to address the problems. The first NEAP, was approved through the Decree of the President of Georgia in May 2000 (UNCCD, 2002)

The following priority issues were identified in the field of water resources management:

- Municipal wastewater treatment

<sup>29</sup> Development of the second NEAP is under implementation in Georgia with financial support of UNDP.

- Industrial wastewater treatment
- Medical wastewater treatment
- Diffuse water pollution sources
- Municipal drinking water supply
- Rural drinking water supply
- Irrigation water supply
- Water Resources Management
- Monitoring

Priorities were identified through consultations conducted under the auspices of the MoE and included all interested parties (all parliamentary committees and political groups, the Ministries, numerous governmental institutions and NGOs) (UNPD/GEF, 2003).

In the field of water resources protection and management the major short-term priority actions set up in NEAP were follows:

- Improve water supply and WWTPs in major cities. Specific investment actions included:
  - rebuilding the Jinali-Tbilisi sewage collector in order to improve the water supply to Tbilisi,
  - rehabilitating the WWTP at Gardabani,
- Installing WWTF for hospitals and clinics dealing with infectious diseases,
- Introducing industrial and domestic water meters.

The NEAP identified a range of environmental problems, but did not take into account the cost and fundability of the actions necessary and identified actions have not implemented (UNPD/GEF, 2003).

## 3.5 Sewage and Wastewater Treatment System

### 3.5.1 Sewage and Wastewater Treatment System in Georgia

Centralized sewerage systems cover 45 cities and districts of Georgia, 33 of which have WWTP of total design capacity equal to 1.6 million m<sup>3</sup> a day. The total length of wastewater networks and sewers is 4.0 thousand km. Totally, up to 80% of population is connected to sewerage system; thus indicating high network penetration by international standards (OECD, 2000).

However, the systems are in a poor condition; today most of them do not work or work with low capacity (EUWI, n. d.).

These treatment facilities were put into operation in 1972-1986. The plants are typically 20-35 years old; the design technology is now outdated and doesn't comply with modern requirements especially with regard to sludge treatment. All WWTF were designed and constructed as mechanical-biological treatment plants. At this moment, no treatment plant can provide any biological purification of municipal sewage since the technical facilities are out of order. In the settlements where WWTF exist and operate, only mechanical treatment is applied at best. In the rest settlements wastewater is discharged directly to the receiving waters either through emergency outlets or a part of the technological chain without treatment and disinfection (EUWI, n. d.).

### **3.5.2 Gardabani Wastewater Treatment Plant**

Wastewater flows from Tbilisi are conveyed through 26 km lengths of sewers to Gardabani WWTP. Gardabani regional WWTP with capacity 1.0 million m<sup>3</sup> water a day was built in 1984. The WWTF is located in Gardabani region, about 30 km south-east of Tbilisi, near Azerbaijani border.

The complex is foreseen for complete biological purification of industrial and domestic sewage<sup>30</sup> of the next cities: Tbilisi, Rustavi, Gardabani, Dusheti, Mtskheta, Marneuli and Bolnisi. Complex is not working with full load; currently the complex treats mechanically only wastewater from Tbilisi (partially<sup>31</sup>), Rustavi and a number of smaller towns in volume of 0.6-0.7 million m<sup>3</sup>/day. Mechanically treated water is discharged to river Mtkvari which is used as a source of water supply for some down stream located settlements (UNDP/GEF, 2003).

From Tbilisi water for treatment was supplied up to 0.3 – 0.32 million m<sup>3</sup>/per day<sup>32</sup>, after conducting some rehabilitation works, wastewater volume have increased up to 0.33-0.4 million m<sup>3</sup>/per day<sup>33</sup>.

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30 Sewage do not includes the rainwater, it is collected separately through storm water overflow system and discharged directly to the river Mtkvari without any treatment.

31 Only 50-60% of the total volume of wastewater both industrial and municipal of Tbilisi city is treated, the rest wastewater is discharged into the Mtkvari river and its tributaries (Vere, Gldanula, Digmula) on the territory of Tbilisi without any treatment. There are more than 70 points of discharging the wastewater into the Mtkvari in the city (ENDP/SIDA, 2005). Only 43% out of 100% connections to the sewer collection were actually installed in Tbilisi (UNECE, n. d. a).

32 Kandelaki, M. (2006, July 05). Personal Interview.

33 The increase in wastewater volume was detected in summer period when the city is “empty” and most of residents are on holidays; it is expected that form autumn this data will be considerably higher (Bregadze, M., 2006).

Some parts of wastewater pipelines were replaced by financial support of Tbilisi Municipality and MDF during last three years in Tbilisi. Still there is going some reconstruction activities in Tbilisi which will result the increase of wastewater loads by 0.13-0.15 million m<sup>3</sup>/per day, as it is expected (Kelbakiani, G., 2006). 1,220 km sewage system network of the city is worn out and should be replaced (EUWI, n. d.); but it is difficult to say when it will be fully replaced.

The next stages of primary treatment are operational in Gardabani WWTP (in Appendix IV is available information about wastewater treatment stages):

### **Removal of Large Objects**

In this mechanical treatment stage, influent of sewage water is strained to remove all large objects that are deposited in the sewer system. This is done using automated mechanically raked screen (Figure 3-4).



*Figure 3-4 Grid*

### **Sand Removal**

In sand catcher (Figure 3-5), in special channel the velocity of the incoming wastewater is carefully controlled to allow sand, grit and stones to settle but still maintain the majority of the organic material within the flow.



*Figure 3-5 Sand Traps*

### **Sedimentation**

Sewage is passed through large circular sedimentation tanks (Figure 3-6). The tanks are large enough that solids can settle and floating material such as grease and plastics can rise to the surface and be skimmed off. Tanks are equipped with mechanically driven scrapers that continually drive the collected sludge towards a hopper in the base of the tank from where it is pumped; there is no further sludge treatment stage in place.



*Figure 3-6 Primary Sedimentation Tank*

The main purpose of the primary (mechanical) treatment stage is to produce a generally homogeneous liquid capable of being treated biologically and a sludge that can be separately

treated or processed. But there is neither biological nor sludge treatment stages in place in Gardabani WWTP.

During operation of the processing line (including biological treatment) the substantial amount of excess sludge was accumulated on sludge beds which are located on territory of the WWTP. So, presently the total area filled with well stabilized sludge is around 20 ha and 1-1.5 meter high. This sludge could be used as fertilizer in agriculture. Number of tests performed by the sanitary inspectorate confirmed that the mentioned sludge did not contain heavy metals and could be utilized as a fertilizer in agriculture (EUWI, n. d.)

The biological stage of the regional WWTF does not work since 1991. Energy crisis and further significant growth of electricity tariffs at a lack of financing have negatively influenced on Gardabani WWTP. The technological process was interrupted, the micro-organisms used for biological treatment were lost, pipes and conduits were clogged up (EUWI, n. d.). When biological treatment was in place the sewage was treated with 95% efficiency, nowadays with only mechanical treatment stage the wastewater treatment efficiency consist less than 50%<sup>34</sup>.

The emergency outlet, gas holder and methane tank are not yet built. The complex is in a need of reconstruction and substitution for depreciated equipments (Appendix V) (EUWI, n. d.); After independence no significant repair reconstruction activities have been conducted in Gardabani WWTP, only 4 pumps have been changed through USAID grant programme (120 000 USD)<sup>35</sup>; as it is estimated 20 million USD is needed for total rehabilitation of the complex<sup>36</sup>.

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34 Bregadze, M. (2006, July 17). Personal Interview.

35 Bregadze, M. (2006, July 17). Personal Interview.

36 Kandelaki, M. (2006, July 05). Personal Interview.

Administration of Gruz-vodocanas LLC is working actively to attract foreign private companies, for making investment in W&WW infrastructure development; based on the information provided by WWTP administration generally, there is little interest from foreign private sector to be involved in the provision of W&WW services in Georgia (the interest was low before as well as after revolution).

The administration of Gruz-vodocanas LLC as a solution of the problem considers giving the wastewater treatment plant to foreign investor on base of long term (15-20 years) lease contract. Foreign Investment Company should be selected and the lease contract should be signed after the tender will be announced and the certain conditions will be committed.

Primary condition includes, Investment Company has to have the strong background and financial resources in order to be able to restore and rehabilitate sewage collectors and Gardabani WWTP including to introduce organic fertilizer production, biological treatment stage and modern technologies, decrease of Gardabani WWTP dependence on external power suppliers through construction of low-capacity hydroelectric power station; This entire works should be supervised by the Gruz- vodocanal administration.

Currently there is going negotiations and consultation works about this issue with the Ministry of Economic Development of Georgia (Kandelaki, M. 2006).

## 3.6 Municipal Water Supply

### 3.6.1 Municipal Water Supply in Georgia

85 cities and districts of Georgia are provided with centralized water supply systems. There are up to 1,600 separate systems of water supply, providing supply of 1.7 million m<sup>3</sup> of drinking water per day to all consumer categories (UNDP/SIDA, 2005). About 95% of urban and 35% of the rural population in Georgia is supplied by centralized water service. This indicates high network coverage by international Standards (OECD, 2000).

Drinking water is mainly withdrawn from the ground sources. The underground water is making almost 80% of the total volume of water supplied by the centralized system of water supply. No special treatment of water is taking place before providing it to the consumers. The water is only chlorinated in most cases with liquid chlorine or chloride of lime. In the case of the use of surface water it is treated (coagulation, filtration, chlorinating<sup>37</sup>) (UNDP/SIDA, 2005).

The total length of water distribution networks in Georgia is 9.5 thousand km. From the total water supply network about 5.0 thousand km is completely amortized and requires replacement. Since 1987 no significant maintenance and repair works have been conducted of water pipelines.

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<sup>37</sup> Chlorine is not produced in Georgia; its import is connected with considerable expenses, which are not always available in the country. The problems are significant in the sphere of disinfection of drinking water. Thus, chlorination of water is systematically carried out only in big cities while in peripheral places situation is very poor (UNDP/SIDA, 2005).

Poor quality of the distribution network results in a water loss rate of 25%-50% of the total volumes of water delivered to the network (expert evaluation of Gruz-vodocanal LLC)<sup>38</sup> (UNDP/SIDA, 2005). According to standards, technical water losses should not exceed 10%; however, in practice this figure is much higher in Georgia (EUWI, n. d.).

All urban households are supplied with water according to the fixed schedule including in Tbilisi<sup>39</sup>; water is receiving much less than 24 hours a day, in some cities as little as 8-10 hours a day (OECD, 2001). This affects mainly people occupying higher floors of buildings, because of low pressure in the system (EUWI, n. d.).

### 3.6.2 Water Supply in Tbilisi

Water supply in Tbilisi is carried out by Tbil-vodocanal LLC; which is also responsible for water supply and wastewater distribution network in the city. Water main from Tbilisi delivers drinking water not only to the people in the Tbilisi city, but also to the suburban resorts (34 settlements in total); thus, Tbil-vodocanal LLC serves around 24% of population in the country (EUWI, n. d.).

Tbilisi has the oldest water supply system and it is mainly sourced from the river Aragvi<sup>40</sup>, a major tributary of the river Mtkvari; totally water is withdrawn from 6 underground water intakes and 2 surface water intakes (EUWI, n. d.). Water is supplied by gravity to the lower city, along the Mtkvari river, while pumping is required to service higher areas; elevations vary from 350 m to 1,400 m. (WB, 2001a)

The centralized water supply system in Tbilisi dates back to 1887 (WB, 2001a). The greatest share of the water transportation infrastructure requires replacement and capital reconstruction (EUWI, n. d.). During Last three year some parts of water-supply pipelines have been replaced, rehabilitation works are still in place, but it is difficult to foreseen when does the whole water supply distribution network will be repaired<sup>41</sup>. Due to the poor conditions of the distribution network, according to the expert estimates, the percentage of losses in main and distribution pipelines in Tbilisi may be as high as 45-50% of the total water delivered to the network, but no exact data is available about the percentage of the water losses (EUWI, n. d.).

The microbiological and chemical analysis of drinking water shows that water in most cases is supplied with low chlorination. Otherwise it does conform to the applicable state standards and sanitary and hygienic requirements<sup>42</sup>.

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38 No exact information exists due to the absence of water meters.

39 The regularity of water supply in Tbilisi varies between districts. Some districts are supplied 24 hours a day (central districts, Big Digomi, part of Isani, part of Nadzaladevi, part of Navtlugi), other districts are supplied 12 hours a day, 6 hours in the morning and 6 hours in the evening (Nutsubidze Plato, part of Nadzaladevi, Svanetisubani, Nakhlovka). Furthermore, in some districts (Verketili – Slope) the water is supplied for 4–6 hours, that is 2-3 hours in the morning and 2-3 hours in the evening.

40 Shvangiradze, D. (2006, July 19). Personal Interview.

41 Kelbakiani, G. (2006, Jun 23). Personal Interview.

42 Shvangiradze, D. (2006, July 19). Personal Interview.

Drinking water quality problems mostly have the local character and are related to leaking pipes and cross contamination from the sewage system<sup>43</sup>. In Tbilisi where leaky water supply pipes are located next to leaky sewage collectors, cross contamination can occur due to power failure, when the water supply is interrupted<sup>44</sup> and negative pressures are allowed to develop in the pipes (WB, 2001 a). Pollution of drinking water by sewage has resulted in spread of infectious diseases; outbreaks of amebiasis have occurred in Tbilisi each year since 1997, with total 2423 cases up until 2001 (UNECE, n. d. a); but non of such cases have been recorded during last years in Tbilisi<sup>45</sup>.

### 3.7 Water Consumption in Tbilisi

In Tbilisi main consumer category is households (Figure 3-7), 91.8% of the total volume of water consumed comes on the domestic sector and the rest - up to 8.2% on industries and other facilities (EUWI, n. d.).

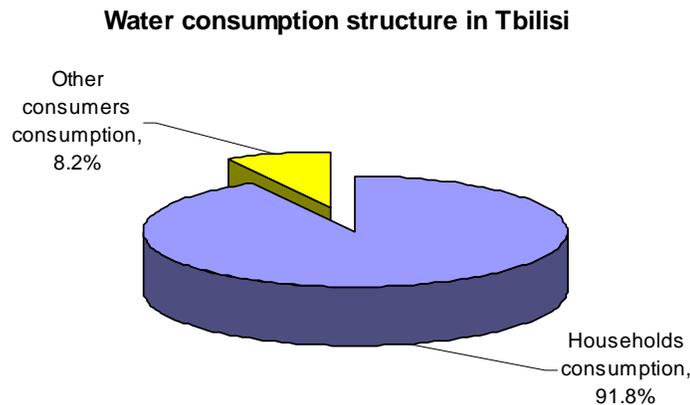


Figure 3-7 Water Consumption in Tbilisi

Source: EUWI, n. d.

Water production and consumption in Tbilisi remained stable and relatively high<sup>46</sup>. For example water production in Tbilisi in 2001 was 1.6 m<sup>3</sup> per person daily. Actual volume of water

43 Avaliani, D. (2006, July 19). Personal Interview.

44 As I already mentioned the water in most cases is supplied with severe violation of the schedule; less than 24 hour a day.

45 Avaliani, D. (2006, July 19). Personal Interview.

46 Water consumption in the municipal sector unlike the industrial and agricultural sectors has not experienced any dramatic changes (UNDP/SIDA, 2005). Presently, the number of population in Georgia is approximately the same as it was during the Soviet Union, 15 ears ago. Thus can explain that water consumption in households remained fairly stable (Mariam Ubilava and et al., n. d.).

consumption per person varies within a wide range 0.5-0.9 m<sup>3</sup> a day (no exact data is available) (OECD, n. d. a).

If it is accepted that the maximum 'real' demand for water is no more than 0.25 m<sup>3</sup> per person per day, as it is typical for other cities in Europe, then clearly much of the water used is lost through leakage, wastage, or otherwise unaccounted for (WB, 2001a). This hypothesis might be true; but it is really difficult if not impossible to define what real water consumption in Tbilisi per person is daily, since there are no meters installed in household.

The introduction of water meter is connected with finances, which is limited now for utility and for local budget; in addition, public is not yet ready to accept the metered practices, as it is expected this issue will cause protest in society (Kelbakiani, G., 2006)

Also some household and enterprises are illegal consumers of potable water. Practice showed that after conducting the rehabilitation works and after replacement water supply networks in certain districts of Tbilisi the water consumption has decreased considerably (by 10%<sup>47</sup>). This means that this index is overrated due to the high rate of water losses caused by poor technical condition of the water supply network<sup>48</sup>. Although the data is overrated, the actual level of water consumption in Tbilisi is nevertheless high – such “culture” of water consumption was formed in the soviet times and is supported by the present water supply system of the city (UNDP/SIDA, 2005).

### 3.7.1 Cultural Issues and Water Efficiency in Households

The majority of population thinks that water should be supplied free of charge no matter at what cost to the country as a whole. There is a cultural dimension in that water had always been supplied by the government “free of charge” during Soviet Union period, this “spoiled” the population. Some people are not able to come to terms with the transition to the market economy which the country has embraced, and they still feel that water should be supplied free to them (WB, 2001a).

In addition, as Georgia is rich in term of available water resources, which is public good, the population attitude toward this issue is - society should benefit free from it; but society does not accounts and/or do not want to consider the fact that the water need proper treatment before it will be distributed to the final user which cost the government money.

There is also this cultural preference for drinking running water, as against stagnant water coming out on opening a tap. As a result, the community water fountains in Tbilisi are never equipped with a tap (Figure 3-8), and are allowed to flow continuously, resulting in the waste of water as well as energy (WB, 2001a).

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47 Tarashvili U. (2006, July 14). Personal Interview.

48 Physical water losses in Georgia are a multiple of losses by Western companies.



Figure 3-8 Fountain

No awareness raising activities about sustainable consumption of water have been realized for Tbilisi inhabitants; there are several NGOs working about this issue but their major targets are regions (Magradze, G. 2006).

### 3.7.2 Water Consumption and Efficiency in Industry

In addition to the household which is the major water consumers in Tbilisi the industry is another sector which shares less than 8% of water consumed<sup>49</sup>. Nowadays, the share of water consumed by industry sector is not high with comparison to households, but during the Soviet Union period the industry sector was one of the major user of water resources in Georgia, (Tbilisi), (see Appendix VI).

The reason of decreasing level of water consumption by industry is that industrial activities have declined after independence and not technological development of this sector and/or introduction of eco-technologies (Mariam Ubilava and et al., n. d.).

## 3.8 Financial Issues

### 3.8.1 Water and Wastewater Tariff

The municipal user charges in Georgia include charges for water supply and waste water collection and treatment (UNECE, n. d. b). Tariffs on W&WW service in Georgia vary widely

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<sup>49</sup> in this 8% is also accounted the budget financing organizations and different kind of enterprises such as restaurants, cafes hairdresser etc. (private sector); there is no data available about actual water use by industry

between different cities and districts of Georgia and depend on the geographical location of the area served by W&WW utilities<sup>50</sup>.

Tariffs are elaborated and established separately by W&WW utilities, coordinated with and approved by local authorities and registered with the Ministry of Justice of Georgia (EUWI, n. d.).

Presently, the households pay for the drinking water supply services based on the established norms. Water consumption norm for Tbilisi households is 0.8 m<sup>3</sup> per capita per day. Monthly payments for W&WW services based on norms amounts 1.2 GEL per person. In Tbilisi tariff for households equals to 0.04 GEL per m<sup>3</sup> of water and 0.01 GEL per m<sup>3</sup> of wastewater, 0.05 GEL in total including VAT. The tariffs for other consumer categories in Tbilisi is 1.6 GEL per m<sup>3</sup> of water and 0.6 GEL per m<sup>3</sup> of collected and treated wastewater respectively, 2.2 GEL in total<sup>51</sup>.

The household tariff on W&WW service is low and consist 1/4 of real price for potable water production and delivery to the end users and 1/2 of real price for wastewater collection and treatment.

TWU several times has raised the issue to increase the tariff for W&WW service provision at the level that it was possible to cover the utilities operational costs; but condition was not approved by city administration (Kelbakiani, G., 2006).

### 3.8.2 Payment Collection Rates

The W&WW payment collection rates remain low for all W&WW utilities in Georgia (Table 3-1). This has created major financial difficulties for utilities (EUWI, n. d.).

Table 3-1 Water and Wastewater Payment Collection Rate for all Consumers Categories in Georgia in 2003

	Households	Industry	Public and other Institutions
Water	34%	82%	59%
Wastewater	30%	89%	48%

Source: EUWI, n. d.

The payment collection rate from the households is the lowest. The payment collection rate for all consumer categories was a little higher in Tbilisi and it was especially low in places where household incomes are notably lower e.g. Rustavi, Samtredia, Zugdidi (Table 3-2).

<sup>50</sup> If a settlement is situated on the plane, it has gravity water networks, and the cost of services provided is less than in the settlements where water is pumped, and where energy costs are therefore higher. Thus, the costs of services and the tariff rate are higher for such towns.

<sup>51</sup> Tarashvili, U. (2006, July 14). Personal Interview.

Table 3-2 W&WW Payment Collection Rate in Georgian Cities in 2003-2004

	Households		Industries		Public Institutions	
	2003	2004	2003	2004	2003	2004
Tbilisi	40%	54%	91%	83%	57%	81%
Zugdidi	6%	5%	73%	84%	-	-
Rustavcanal	1%	1%	35%	74%	5%	6%
Samtredia canal	3%	1%	102%	69%	104%	148%

Source: EUWI, n. d.

Payment collection rate increased for all consumer categories in Tbilisi in 2004 as compared to 2003. It was due to Tbil-vodocanal LLC initiative. Unified format of the bill for households was developed together with the Tbilisi Energy Company “Telasi”. “Telasi” prints and sends out the bills. Households are to pay for consumed electric energy and water through “Telasi” cash payment centers. Then payment for water is transferred to the Tbil-vodocanal LLC account. This resulted in a considerable increase of household payments (EUWI, n. d.).

*Note: In Tbilisi the relations between TWU and its customers (of all categories) are regulated by "Directives for Users of Tbilisi Water Supply and Sanitation Services"<sup>52</sup>. According to this directive, in cases of non-payment TWU has full right to terminate service to all categories of customers. TWU uses this right for industrial, budgetary, and rarely for domestic metered customers (individual houses), but not for residential customers living in apartment buildings (OECD, n. d. a).*

### 3.8.3 Coverage from the Household Tariffs

The level of cost coverage from household tariffs in all settlements of Georgia is very low. The approved household tariff in Tbilisi covers only of 29% of W&WW service costs (EUWI, n. d.). The rest is compensated from municipal budget and by other sources of revenue<sup>53</sup> of Tbil-vodocanal LLC (Figure 3-9).

Cross-subsidizing is the major social security tool used to preserve low residential charges in Tbilisi and other large towns (OECD, n. d. a). There is a certain trend towards reduced cross-subsidizing<sup>54</sup>; however it still remains extensive in Tbilisi<sup>55</sup>.

52 Adopted by the city council on March 2, 2000; Resolution No. 3-13.

53 Revenues from other W&WW service consumers

54 Mayor reason of reduced cross-subsidizing was identification of large number of illegal consumers of potable water, the illegal consumption constituted up to 0.017 million m3 water per day, thus has improved the financial conditions of TWU and need in governmental subsidies has reduced by 50% (Kelbakiani, G., 2006).

55 Kelbakiani, G. (2006, Jun 23). Personal Interview.

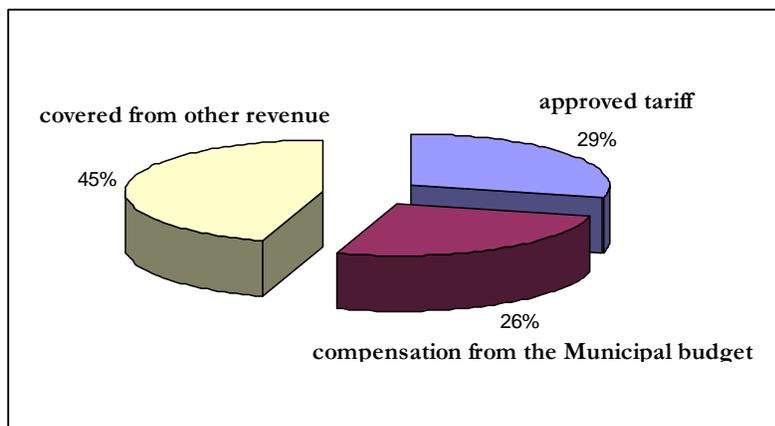


Figure 3-9 Coverage of Costs of the Water Services for Households in Tbilisi

Source EUWI, n. d.

The reasons that revenues from charges on W&WW do not cover utility costs are various:

- There is no adequate regulative framework for tariff policy which could ensure a sufficient level of income for W&WW utilities,
- Low collection rate, which can be explained by:
  - Poor social conditions: majority of population due to the low income could not afford payment of charges
  - Cultural issue: some people do not consider payment for W&WW service obligatory
  - Poor service quality: in some districts of Tbilisi frequent interruption of water supply creates unwillingness of many consumers to pay for the services

Due to the fact that Georgian utilities are not authorized to disconnect non-payers, and fines for non payment are often ruled unlawful complicates situation even more.

### 3.9 Summary

In Georgia W&WW services for households and other consumers categories are provided by municipal W&WW utilities. Since sector reform and the restructuring of the Georgian Government 1997, the main volume of work for the functioning and development of the sector is given to the local authorities for management and self-governance. In Tbilisi W&WW service provision is under the responsibility of Tbilisi Water Utility. Gruz-vodocanal LLC operates the regional WWTF located in Gardabani as well as the main sewer from Tbilisi to Gardabani.

Although the bulk of responsibility for the regular operation and development of utilities lies with local authorities and self-governing bodies, the Ministry of Economic Development is responsible for guidance on water infrastructure development. The Ministry of Health Care, Labor and Social Welfare is responsible for the development of water sanitary/hygienic standards, as well as for state sanitary supervision on drinking water quality. The MoE authorizes water use, defines discharge limits and monitors the environmental impact. The Ministry of Finance makes funds available from central government for water investments.

The government should **create an enabling environment for sustainable solutions** – which means that central government should create a policy, legal, regulatory, institutional and financial framework in which all branches of government should have a responsibility towards creating solutions. There appears to be in place an overall structure that adheres to the sustainability criteria; even though concerns over effectiveness remain. All branches of government have certain responsibilities for service provision at the municipal level. However, unclear segregation of water sector responsibilities among the national and local authorities and bodies of self-governance causes problems. Decentralization of responsibilities and distribution of rights and obligations have created two alternative results. From one side - transfer of the decision making to the local level, and from the other side - such decentralization significantly complicated the normal W&WW service provision. This is caused by inadequate management and a complex regulatory system, in addition to a lack of finances and human resources, which hampers an adequate provision of a W&WW service.

W&WW sector rehabilitation is not among the priorities of the country's economic and social policy. This is reflected in a low level of capital investments financed through the central budget. Despite the fact that the principal environmental policy document, the NEAP, set specific investment actions such as the rebuilding of the Jinali-Tbilisi sewage collector and the rehabilitation of the WWTP at Gardabani, the identified actions have not been implemented due to the lack of funding. For the same reason (lack of financing) only minor parts of the programme of "sanitary and technical improvement of W&WW systems in cities and districts of Georgia", adopted by the President of Georgia in September 1998, in the framework of housing and communal sector reform, have been implemented.

The overall benefit of reconstruction of the W&WW sector is clear and is linked to health and environmental improvements and economic gain. However, with limited financial resources the capital rehabilitation of the wastewater infrastructure is not affordable for Georgia. The continuing priority is public order and safety. Health and education have received substantial increases in spending in recent years. According to the sustainability criteria, central government should be the facilitator and initiator of a sustainable wastewater management system; **political will** is fundamental for assigning a high priority to wastewater management among other pressing public investment needs. It is thus a really challenging and complicated issue. How can the government, with limited financial resources, assign a high priority to W&WW sector development in a sustainable manner, while the social condition in Georgia is really poor? Environmental issues are always compromised for social and economic development.

From the total water supply network about 60% is completely amortized and requires replacement and capital reconstruction. Since 1987 no significant maintenance and repair works have been carried out on water pipelines. Poor quality of the distribution network results in a

high rate of water losses. According to expert estimates, the percentage of losses in the main and distribution pipelines in Tbilisi may be as high as 45-50% of the total water delivered to the network, but no exact data is available (EUWI, n. d.).

Although capital rehabilitation of the wastewater infrastructure is not placed at the top of the agenda, there have been certain attempts by the government to make improvement in the wastewater sector **step by step**, in order to avert current and future environmental and human health damage as much as possible. Within existing budgetary limits some parts of the W&WW distribution network have been replaced and rehabilitated; there is a certain trend in raising capital investments for W&WW infrastructure (Figure 3-3). Some reconstruction work is still ongoing in Tbilisi city, but it is difficult to foresee when the whole water supply distribution network will be repaired. During the last three years rehabilitation activities in the W&WW sector in Tbilisi have resulted in water supply service improvement in comparison with previous years, and significant water sieving measures have been achieved in certain districts of Tbilisi city.

The actual volume of water consumption per person varies within a wide range, 0.5-0.9 m<sup>3</sup> a day. The reason for this public attitude toward water consumption can be explained by a lack of awareness in the society about efficiency of use. This mindset is deeply ingrained and needs to be overcome through a process of education and persuasion if the investments in water supply are to be made sustainable (WB, 2001a). Heavy consumption also implies that there are poor metering practices and low charges on water; in most households water consumption is not metered, which does not encourage users to save water (OECD, n. d. a). The government does not plan to introduce economic measures such as water meters and/or to raise the charges on water in order to create incentives for **water efficiency**. The reason they give for this decision is to avoid creating discontent among the population.

Current municipal users' charges do not create any incentives in the industry sector for the introduction of eco-technologies. Even though the tariff remains low, for some industries it is difficult to pay charges of actual water consumed, as they can't afford to pay; instead they are artificially decreasing the real data on actual water consumed and/or and they are becoming illegal consumers. This issue creates additional financial difficulties for the utility provider. It should be noted that not all enterprises, public institutions and households are connected to the sewage collector. Enterprises, whose industrial water is discharged directly to the surface water, are not obliged to pay for a waste water treatment service; this is an additional disincentive for efficiency.

There is no efficient cost recovery system and the W&WW service is financially unsustainable. The municipal **user charges** in Georgia include charges for water supply and waste water collection and treatment. The tariff on the W&WW service is lower than the real price of potable water production and delivery to the end users and wastewater collection and treatment. The level of cost coverage from household tariffs in all settlements of Georgia is very low. The approved household tariff in Tbilisi covers only 29% of W&WW service costs. The rest is compensated for from the municipal budget and by other sources of revenue from Tbilvodocanal LLC. Cross-subsidizing is the major social security tool used to preserve low residential charges in Tbilisi and other large towns. There is a certain trend towards reduced cross-subsidizing; however it still remains extensive in Tbilisi. TWU several times has raised the issue of increasing the tariff for W&WW service provision to a level where it would be possible

to cover the utility's operational costs; but the conditions were not approved by the city's administration. Hence, currently industry is exempt from pollution taxes. The economic instruments for water management in Georgia used to include water effluence taxes and non-compliance fees. Since the new government came into force a new tax code was adopted, where the '**polluter pays principle**' is not used and therefore environmental pollution taxes have not been implemented.

Although industry is exempt from pollution taxes, they do have to pay fees for wastewater discharge and fines if lacks of compliance with emission limits are detected. Fines and fee structures do not appear to provide the right incentives to encourage **pollution control or investments for efficiency** (UNECE, n. d. a). Hence, the pollution control of industrial wastewater discharges is not at an adequate level due to the poor institutional and regulative frameworks in Georgia. Central to the operation of the system is self-reporting by users to national authorities. Since only a small minority of industrial users carry out accurate monitoring of their discharge, the system is not believed to be an effective means of discouraging pollution (UNECE, n. d. a). The MoE estimates that between 80% and 90% of industrial wastewater is not treated before being discharged to sewers and municipal WWTPs (where there is a network), or directly to surface waters (where there is no network) (UNECE, n. d. a).

A high initial investment cost is necessary to create a more appropriate wastewater treatment system, which will also result in a considerable increase in user charges. Because the population's affordability limit to pay for service provision is even below the level necessary to conduct the mechanical treatment stage properly, and government subsidies are necessary to cover utility operational and maintenance costs, it seems the introduction of even the biological treatment stage is a long term perspective, especially if no special investments are allocated to this sector nor other mechanisms introduced. The full package of wastewater treatment levels cannot be considered by the Georgian government. Based on **users' preferences and their ability and willingness to pay**, only the mechanical wastewater treatment stage is financially affordable for Georgia.

By international standards, there is high sewage network penetration in Georgia; however the system is in a poor condition. There is no treatment plant that can provide any biological purification of municipal sewage since the technical facilities are, at time of writing, out of order. The subsequent stages of primary treatment are operational in Gardabani WWTP: removal of large objects, sand removal and sedimentation. When the biological treatment stage was in place the sewage was treated with 95% efficiency, but nowadays, with only the mechanical treatment stage, the wastewater treatment efficiency is less than 50%. Since Georgia gained independence, no significant repair or reconstruction activities have been conducted in Gardabani WWTP; only 4 pumps have been changed through a USAID grant programme. It is estimated that 20 million USD is needed for total rehabilitation of the complex.

As a possible solution to the problem, the administration of Gruz-vodocanal LLC is considering giving the WWTP to a foreign investor on the basis of a long term (15-20 years) lease contract. Negotiations and consultation about this issue are ongoing with Georgia's Ministry of Economic Development. However, the current situation in Georgia – firstly the "political instability" and secondly the unprofitability of the W&WW service in Tbilisi – creates a low incentive in **private firms** to make investments in W&WW sector.

It can be concluded that not all the principles for sustainability of W&WW sector development are applicable in Georgia. There is low political commitment to support and initiate wastewater investments needed, due to lack of financial affordability. The responsibility for W&WW service provision was delegated to the lowest level of self governance - the institutional structure in Georgia allows for all branches of government create and enable environments for sustainable solutions. However, due to the poor regulatory and financial frameworks, the overall structure is unsustainable. There are no economic instruments in place to encourage households and industry to be more water efficient and/or prevent pollution at source. Poor regulation is also among the factors that prevent implementation of eco-efficiency measures in industry. Hence the inadequate tariff policy does not allow for the creation of sustainable wastewater management with efficient cost-recovery systems. In addition, lack of profitability of the service creates low incentives for foreign private firm participation. However, such a tariff policy can be explained by poor social conditions of the population; the service is set at a level which almost every user can afford. While choosing the wastewater treatment system, all stakeholders' interests should be taken into consideration, including those in downstream communities. In Georgia this is not taken into account; therefore, inefficiently treated wastewater has an impact on communities in Azerbaijan which are using river Mtkvari resources as potable water. However, with limited financial resources, the central government in Georgia tries to avert further deterioration of the W&WW sector by making investments in short term projects.

## 4 Projects for W&WW Sector Rehabilitation in Georgia

### 4.1 Introduction

The purpose of this chapter is to introduce the reader to strategies proposed by international organizations for W&WW treatment system rehabilitation in Tbilisi. The chapter outlines projects developed with the financial support of the World Bank, TACIS and Danish EPA. The chapter describes the main aims and objectives of implemented projects and/or project proposals, as well as the results of finished projects and recommendations proposed within project implementations. In total eight projects are discussed; three have been implemented through a WB loan, two projects were realised with the financial support of TACIS and one with the financial support of Danish EPA. The chapter presents information about Tbilisi Water Supply and Sanitation Project, which should have been implemented with the financial support of the World Bank. The implementation of the project has failed for certain reasons. So too has the project Modernization of Water Supply System, about which information is quite limited. General information about the projects is outlined in Table 4-1 below.

Table 4-1 Projects for W&WW Sector Rehabilitation Financed by International Aid Organisations

Financing Agency	Project Title	Total Amount of Financing	Year of Implementation	Implementing Agency	Status of the Project
World Bank	Municipal Infrastructure Rehabilitation Project	18 Million USD	1994-2000	Independent Agency for Development of Municipal Services	Finished
	Municipal Development and Decentralisation Project	20.9 Million USD	1997-2002	MDF	Finished
	Municipal Development and Decentralisation Project II	19.41 million USD	2002-2007	MDF	Active
	Tbilisi Water Supply and Sanitation Project	25 Million USD	2001	General Deso	Dropped

Financing Agency	Project Title	Total Amount of Financing	Year of Implementation	Implementing Agency	Status of the Project
	Modernization of Water Supply System	25 Million USD	1996	Not Applicable	Not Applicable
TACIS	Volume I - Feasibility Analysis	Not Applicable	2004	COWI A/S (Denmark) and the Moscow Representative Office of COWI Consult Int. Ltd	Finished
	Volume II - Affordability Analysis				
Danish EPA	Municipal Water and Wastewater Sector in Georgia - Financing Strategy	Not Applicable	1999	Performing organisation(s) is COWI Hungary in association with COWI AS	Finished

## 4.2 The World Bank Projects

### 4.2.1 Municipal Infrastructure Rehabilitation Project

Georgian Municipal Infrastructure Rehabilitation Project (MIRP) is one of the WB projects approved by the Board<sup>56</sup> on July 30, 1994 (closed date June 30, 2000) (WB, 1997).

The project had three main short-term objectives:

- arresting further deterioration of critical municipal infrastructure services vital to public welfare;
- improving overall management and delivery of municipal services in a sustainable, environmentally beneficial manner;
- reinforcing credibility of local governments through visible interventions in key services in order to help reinstate public confidence and ensure social stability (WB, 1994).

Two main components of the project were:

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<sup>56</sup> the International Development Association (IDA) Board of Directors approved the USD18 million credit.

- an infrastructure rehabilitation investment component and
- an institutional development component: (WB, 1994).

Infrastructure rehabilitation investment component aimed at protecting essential infrastructure<sup>57</sup> from further decay and renovating some urgently needed economic and social services including water supply and wastewater (WB, 1994).

**Water Supply** short-term investment programme (USD 1.32 million) - would enable the purchase and replacement of essential spares, materials and equipment (i.e., pumps, motors, switchgear, cabling, chlorination, laboratory and short-wave communication radio), replace the distribution pipe work, and repair service reservoirs.

The short-term investment project intended reduce the rate at which the system is deteriorating, reduce wastage of water, to maintain water quality, and improve utilization of the system.

Expected results of the project were:

- improve environmental quality and reduce exposure to water-related disease;
- maintain or improve the quality of drinking water;
- maintain existing access to water supply services.

**Wastewater** (USD 0.61 million) project would finance:

- Provision of plant and equipment for the maintenance of sewers.
- Renovation works to sewers and water treatment plants (WB, 1994).

The short term investments would include the renovation of sufficient primary tanks and associated systems, to permit a total of seven tanks in service.

Wastewater Treatment in Tbilisi would:

- reduce the serious hazard to the public and help alleviate environmental degradation;
- increase access to sewerage services;
- increase operational efficiency by reducing electricity requirements for pumping stations and reducing somewhat the overall manpower requirements.

An institutional development component included:

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<sup>57</sup> heating and energy-saving measures for schools and hospitals, urban transport, solid waste collection and disposal;

- Provision of equipment and assistance to the Agency<sup>58</sup> to strengthen its project management capacity, including procurement planning, project accounting, technical assessments and analysis of environmental and social impact.
- Assistance for:
  - special environmental public awareness and education activities in Tbilisi and other cities of Georgia;
  - institutional capacity building at the municipal level for improved environmental assessment, monitoring and management;
  - water supply & waste water treatment development in Tbilisi and other cities of Georgia (WB, 1994);

*Note: No document is available about the results of the project on the WB database.*

#### **4.2.2 Modernization of Water Supply System**

In 1996 the experts of the WB with participation of Tbil-vodocanal LLC has developed the project of modernization of water supply system.

The aim of which was:

- suspension of the process of worsening of water-supply and water allocation system;
- optimal growth of the efficiency of the work of the system;
- decrease of the leakage of water and establishing control over the loss of water;
- improvement of the quality of W&WW treatment.

Implementation of the project was connected with relevant investments (UNDP/SIDA, 2005); which was equal to 25 million USD. Project “Modernisation of the Water Supply System” should start to be realized in the 1998.

*Note: The information about the follow up of the project is not available in the WB database.*

#### **4.2.3 Tbilisi Water Supply and Sanitation Project**

President of Georgia of 22 July 2001 and on behalf of the Prime Minister of Georgia, Georgian Government and the WB made a decision on joint elaboration and implementation of the

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<sup>58</sup> In order to ensure efficient implementation of the project , prior to negotiations Government has established a non-governmental, non-profit private company, the Independent Agency for Development of Municipal Services.

project aimed at rehabilitation of water supply system in Tbilisi (EUWI, n. d.). Tbilisi WSS Project, was expected to reach the WB Board of Directors in spring 2003 (UNECE, n. d. a).

Besides physical rehabilitation (to improve drinking water and associated sanitation conditions), the project envisioned institutional reforming (to improve legislative conditions and utility management), as well as private sector involvement in operation of maintenance of the engineering infrastructure of Tbil-vodocanal LLC (EUWI, n. d.).

The main objective of the proposed project was to help the Tbilisi Municipality in improving Urban WSS System through increasing its managerial, operational, technical and economic efficiency.

Specifically, the project would assist TWU in improving the quality and reliability of water supply through:

- reducing technical water losses by rehabilitating deteriorated network sections as well as improving network design and operations;
- conceiving and implementing a programme of effective demand management to reduce excessive water consumption and wastage;
- repairing and/or replacing energy-inefficient and broken down pumping systems;
- increasing the quality of water by rehabilitating key elements (e.g., filter beds) of the existing water treatment installations (WB, 2001 b);

In parallel to these technical measures, the project will contribute in increasing economic and operational efficiency of Tbilisi WSS Sector with a view to:

- introduce information and other management systems;
- implement advanced operational methods and achieve cost effectiveness;
- increase revenues through tariff adjustments, improve bill collection, and reduce arrears (WB, 2001 b);

WB disbursed 25.0 million USD at the same time it recommended that only a private foreign firm should carry out the rehabilitation operations (OECD, 2005b). The project was tendered with participation of foreign companies. The contract was awarded to French Company Jeberaul Desi (General Deso).

*Note: The project is now suspended (OECD, 2005c).*

The project was tendered and the contracted was awarded to French Company Jeberaul Desi (General Deso). As it turned out later that French company “General Deso” was interested in managing the country’s fresh water resources rather than in rehabilitation the city’s WSS

systems,<sup>59</sup> company focused on reducing the water supply and supplying environmentally unsafe surface water to the capital city instead of high-quality underground water (OECD, 2005c).

The company's proposals relied on constant increase of consumer tariffs in the long run, As a result, access to a vital resource – drinking water – could have become limited for the bulk of the population of Tbilisi, because they could not afford the increased charges (OECD, 2005c).

This was revealed by help of Researchers of the Department of Water Supply and Use of Water Resources of Georgian Technical University; they have studied the project of the French company.

Based on this findings up to eighty NGOs and researchers institutions, signed a petition to the President and Prime Minister of Georgia and the Mayor of Tbilisi. At the same time, meetings with the public, press-conferences, and public discussions at the Georgian Technical University at the Parliament of Georgia, local Tbilisi department, and ombudsman office were organized<sup>60</sup>.

The strong protest of third sector, against the lease of Tbil-vodocanal LLC to “General Deso” under the proposed contract, made the government of Georgia to reconsider the lease of Tbil-vodocanal LLC to a foreign company. With effort of third sector the project implementation has failed.

#### **4.2.4 Municipal Development and Decentralisation Project**

The Municipal Development and Decentralization Project (MDDP) (USD 20.9 million)<sup>61</sup> was a combined outcome of the MIRP, and Economic Sector Work (ESW) on local government issues carried out in 1996.

The project's main objectives were:

- assisting the decentralization process at the central and local government level;
- promoting an improvement of financial and administrative management as well as municipal investment programme;
- supporting urgent local investments;
- generating employment opportunities.

Project had two main components:

Component I: Institutional Development and

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<sup>59</sup> Jishkariani, G. (2006, July 17). Personal Interview

<sup>60</sup> Jishkariani, G. (2006, July 17). Personal Interview

<sup>61</sup> Approved date - 15-JUL-1997; closing date 31-DEC-2002

## Component II: Physical Investments

The physical investments component included, but was not limited to, construction rehabilitation and maintenance of public infrastructure (primary and secondary) facilities, and services under the responsibilities of local government, including: water supply, sanitation.

The MDDP financed a total of 89 investment projects and implemented by MDF in eleven municipalities, however two thirds of the project's investment resources were absorbed by Tbilisi municipality (WB, 2003c).

About 64% of investment funding was used for urban road rehabilitation projects, 11% for water supply projects, 10% for projects in the education sector, 4% for public transport projects, 2% for health sector projects, and about 9% for other miscellaneous projects (WB, 2003c).

Water supply projects included rehabilitation of water catchments, distribution networks, installing meters and pumping installations in Gori, Poti, Rustavi, and Telavi and water main and sewerage network repair works in Tbilisi (WB, 2003c) (see results of MDDP in Appendix VII).

The MDDP focused on highly relevant institutional development issues the main objective of the project was: "support the initial stage of the decentralization process aimed at shifting responsibility and accountability in terms of delivery and maintenance of urban services to municipalities". "Making the access to investment financing conditional on the efforts made by participating local governments to improve their administrative and financial management performance was a new and innovative approach in the context of a former Soviet Union country... the MDDP fell in the end short of its original institutional development targets ... decentralization and local government development, especially in a country with no previous tradition in this area, is necessarily a lengthy and complex process ... Primarily for this reason, the Bank agreed to have the MDDP followed by a second operation, the Georgia Municipal Development and Decentralization Project II - MDDP II ... The objective of the MDDP II is to continue, and expand on, the work initiated under the MDDP and help local governments increase the effectiveness of their management of local infrastructure and delivery of utility services"

### **4.2.5 Municipal Development and Decentralisation Project II**

The Second Municipal Development and Decentralization Project (MDDP II) which is still active<sup>62</sup>, seek to increasing "the effectiveness of participating Local Government Units (LGUs) in their identification, planning, delivery, and cost recovery of local infrastructure, and utility services" (WB, 2002).

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<sup>62</sup> Approved date 01-AUG-2002; Closing date 30-JUN-2007

The MDF is implementation agency of MDDP II activities in nine municipalities: Tbilisi, Kutaisi, Batumi, Poti, Rustavi, Samtredia, Zestafoni, Ozurgeti, Gori; 23 Projects have already been completed and 17 Projects are under implementation. The distribution of investments among cities and sectoral diversification of projects are represented in the Figures 4-1 & 4-2 below (Municipal Development Fund of Georgia (MDF), 2005).

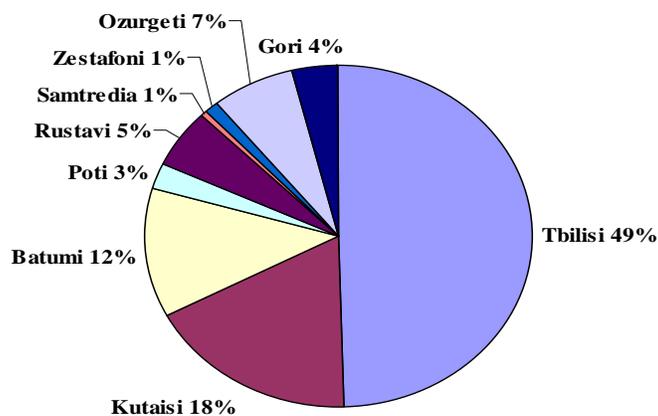


Figure 4-1 Distribution of Investments among Cities

Source: MDF of Georgia, 2005

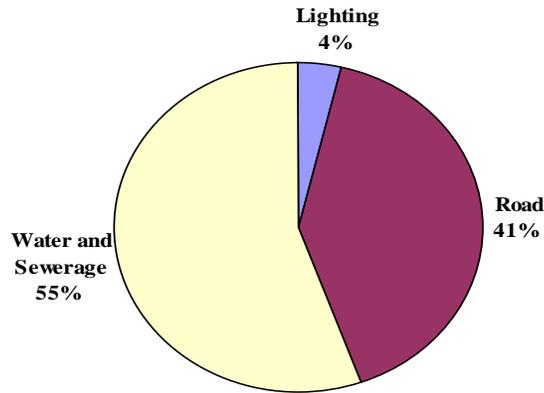


Figure 4-2 Sectoral Diversification of Investment Projects

Source: MDF of Georgia, 2005

The following water supply and sanitation projects have been implemented in Tbilisi (Table 4-2), see results of implemented project of the MDDPII in Appendix VIII:

Table 4-2 Implemented Projects in Water Supply and Sewerage Sector in Tbilisi

N	Title	Estimated Cost (in GEL)
1.	Rehabilitation of Water and Sewerage Systems for Lotkini Settlement on Tseronisi, Akhtala and Zakaraia Streets	1,385,477
2.	Rehabilitation of Water and Sewerage Systems for Svaneti Settlement on Graneli, Lami and Davitasvili Streets	1,409,198
3.	Rehabilitation of Road Pavement and Water Supply System on Panaskerteli-Tsitsishvili Street	361,016
4.	Rehabilitation of Tbilisi Water Supply Facilities in Aragvi Gorge <ul style="list-style-type: none"> <li>➤ Rehabilitation Works for D=1100mm Water Pipe at the Junction of the Rivers Tedzami and Aragvi</li> <li>➤ Rehabilitation Works for Dusheti Gorge Channel and Standby Headworks in Zhinvali</li> </ul>	16,848,853

N	Title	Estimated Cost (in GEL)
	<ul style="list-style-type: none"> <li>➤ Emergency Rehabilitation Works for Zhinvali Hydro Power Station Discharge Channel, Cleaning the Dusheti Gorge Channel and Temporary Rehabilitation of the Damaged Site</li> <li>➤ Rehabilitation of the d=700mm duct feeding the Bulachauri water supply infiltration grounds on the right bank of the River Aragvi</li> <li>➤ Rehabilitation of the d=900mm damaged duct for Choporti and Misaktsieli settlers in the active bed of the River Aragvi</li> <li>➤ Cleaning Works for Zhinvali Hydro Power Station Discharge Channel, Dusheti Gorge Channel, Buffer Pond and Standby Headwork Dam's Head and Tail Races, Installation of Temporary Channel and Water-intake Crater</li> <li>➤ Rehabilitation of the Misaktsieli check dam</li> <li>➤ Rehabilitation of Choporti reservoir water intake and check dam</li> <li>➤ Rehabilitation of Abanoskhevi check dam</li> <li>➤ Rehabilitation of Saguramo reservoir check dam</li> <li>➤ Cleaning Choporti reservoir</li> </ul> <p>Installation of the By-pass Raw Water Pipeline and Rehabilitation of the existing #1, 2, 3 and 4 Settlers, Infiltration Grounds and Drain Pipes of Natakhtari Water Supply System.</p>	

Source: MDF of Georgia, 2005.

Note: since the MDDP II is still active, some projects are under implementation not complete completion and result report is available.

### 4.3 TACIS Project - Support to the Georgian Government in Developing and Implementing a Financial Strategy for Urban Water Supply and Sanitation in Georgia - Carrying out the Feasibility Analysis

In December 2004 the consortium of COWI A/S (Denmark) and the Moscow Representative Office of COWI consult Int. Ltd. won the tender for consultancy services held by the OECD EAP Task Force Secretariat for implementation of the TACIS financed project " Support to the Georgian Government in Developing and Implementing a Financial Strategy for Urban Water Supply and Sanitation in Georgia - Carrying out the Feasibility Analysis" (EUWI, n. d.).

The project included two components:

- To deal with elaboration of the financing strategy for the urban W&WW sector in Georgia

- To focus on the assessment of affordability of W&WW services for the population in Georgia.

This project was carried out under the general guidance of the steering committee consisting of representatives from the Ministry of Finance, the Ministry of Economic Development, MoE, Gruz-vodocanal LLC and other W&WW utilities with the participation of local experts (EUWI, n. d.).

The main aims of the project included:

- To assess the financial implications of achieving the MDGs (see Appendix IX);
- To help the Government of Georgia to set realistic targets for the rehabilitation and development of urban WSS infrastructure and services;
- To identify options to bridge the financial gap between the expenditure needed for achieving policy objectives and the financing available (EUWI, n. d.).

#### **4.3.1 Volume I: Financing Strategy for W&WW Sector in Georgia**

Development of this Financing Strategy is intended to assist the Government of Georgia with setting feasible objectives for rehabilitation and development of the WSS infrastructure (Georgian Water Utility, 2005a).

Four scenarios have been prepared and studied: **Baseline Scenario and three Development Scenarios.**

**Baseline scenario** envisages just proper maintenance of existing infrastructure and maintaining the level of WSS services, preventing their further deterioration. However, implementation of the package of the following policies would allow for a gradual elimination of the indicated annual financing gap:

- Improving collection efficiency of water bill for business firms, budget organizations and for households;
- Raise the annual water bill for households to the highest affordable level, followed by annual increases at the same rate as nominal growth of the GDP<sup>63</sup>. Simultaneously adopt payment based on actual consumption, by introducing water meters (including in apartments), and implement measures for reduction of physical and commercial water losses;

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<sup>63</sup> As the annual water price for households in Tbilisi is already at the maximum affordability level, it is suggested to leave it unchanged in 2006.

For business firms and budget organizations further increases of tariffs would probably induce them to opt out of the network system and find alternative sources; water prices for these organizations would therefore remain at the current levels

- Increase budgetary resources (be they domestic, or from donors or international creditors) allocated to investment in the water and sanitation sectors (Georgian Water Utility (GWU), 2005a).

#### Achieving the MDGs on WSS in urban areas of Georgia – Development Scenarios

1. “Scenario 1 “all in-house tap connection”: This would involve rehabilitation of the existing water mains and sewerage in the 20 cities and towns; construction of new infrastructure (water intake, distribution and treatment facilities) to provide sustainable access to safe water via in-house water taps to all urban consumers, including those who do not have such access at the moment; reducing losses and unaccounted for water in Tbilisi” (GWU, 2005a).
2. “Scenario 2 “in-house tap connections plus stand-pipes” shares the objectives of scenario 1, albeit using another technology: safe water to be delivered by standpipes located within 200 metres of households that do not currently have sustainable access to water. This would involve approximately 5% of the urban population in Georgia receiving water through stand-pipes” (GWU, 2005a).
3. “Scenario 3 “all in-house tap connection plus wastewater treatment in coastal zones” is a variant of scenario 1, which also entails the rehabilitation of mechanical treatment of wastewater in the Black Sea coastal area. This would be a first step towards a complete rehabilitation of the treatment of wastewater in Georgia, and towards abating pollution in a region which hosts an important part of the Georgian tourism industry – a potential driver of economic growth in the country” (GWU, 2005a).

#### Conclusion

“Achieving the water related MDGs in urban Georgia is possible, but will be financially painful for households and public budgets. They will require great efforts from Georgia, full mobilization of internal resources and significant international support (grants and concessionary loans)” (GWU, 2005a).

The proposed tariff scenario in all three scenarios assumes that monthly charges in Tbilisi will amount to approximately 4.50 GEL per household per month, respectively, which is in line with the affordability threshold, but most likely well above the present willingness to pay (GWU, 2005a).

Thus, implementation of the tariff scenario requires (a) a well-designed information and public awareness campaign to improve the willingness to pay; and (b) that appropriate measures to protect the poor sections of the population are put in place (GWU, 2005a).

Despite the considerable financial effort involved in all three scenarios, the calculation in the report shows that it will be impossible to eliminate the accumulated financial gap (maintenance backlog) before 2013 (GWU, 2005a).

#### Recommendations

The report recommends the following set of policy measures:

- To set (and to implement) priorities for the WSS sector, at national level – politicians should seriously consider introducing an appropriate combination of in-house tap and stand-pipe technologies to achieve water-related MDGs
- To allocate more public money to the WSS sector, and to monitor its use in accordance with set priorities; the outcome of the financial strategy should be integrated into medium-term expenditure programmes and annual public budgets, at both national and local levels
- To increase the collection rate, and to review the tariff policy, taking affordability constraints in the population into account; experience from Armenia has shown that this is feasible and can yield significant and rapid improvements; a well-planned public awareness campaign should accompany these measures
- To mitigate the leaks in the network and to decrease the unaccounted for water; incentives should be designed to reward leak detection, disruption of illegal connections, the introduction of water meters and to promote a more rational use of water resources (UNDP, 2006).

This package can only be implemented if:

- The sector's governance structure is reformed;
- Human and institutional capacities are significantly strengthened in municipalities and water utilities; incentives and performance based rewards are designed and built into the contracts between municipalities and utilities
- An effective social protection mechanism is implemented, in order to mitigate the social consequences of greater cost recovery through increased user charges (UNDP, 2006).

Also within this project “Support to Georgian Government in Developing and implementing Financial Strategy for Urban WSS in Georgia and Carrying Out the Feasibility Analysis” was identified the following priority project ideas:

“Rehabilitation of water mains and distribution networks in Tbilisi city” with overall objective, to reduce of losses and unaccounted for water and with potential benefits: to improve quality of water; prevent secondary pollution of drinking water and infectious diseases. As a result significant water savings, reduction of load on the water intakes will be achieved. As it is calculated it will cost approximately 12 million USD (EUWI, n. d.).

“Rehabilitation of regional Gardabani WWTP“ with Overall objective to recommence of biological treatment the potential benefits of the project are significant reduction of pollution load caused by insufficiently treated waste water which is discharged directly to river Mtkvari what would result in improvement of ecological safety of water supply systems of down stream located settlements. After implemented of this project, preliminary cost of which is 10-12 million

USD, significant improvement of ecological condition of river Mtkvari and the Caspian Sea will be achieved (EUWI, n. d.).

“Rehabilitation of sewerage collector Zhinvali-Tbilisi” objective of the project is to provide Tbilisi city and other towns and settlements with safe drinking water. Project cost will be about 6 million USD as a result improvement of sanitary and epidemiological situation of water-supply system of Tbilisi city and other towns and settlements as well as reduction of pollution of river Aragvi, which is a water-supply source for a number of cities and towns will be ensured (EUWI, n. d.).

“Introduction of organic fertilizer production at the Gardabani WWTP” in order to establishing of an organic fertilizer production at the Gardabani WWTP; the total cost of the projects is not calculated but as a social and natural benefits of the project consequently sludge utilization for agricultural purposes and accumulated sludge removal will be expected (EUWI, n. d.).

“Decrease of Gardabani WWTP dependence on external power suppliers through construction of low-capacity hydroelectric power station” the objective of the project is to Decrease of Gardabani WWTP dependence on external power suppliers. Social and environmental benefits of the project includes: decrease of load on national electricity network and increase of sustainability of waste water mechanical treatment. The Project cost is not calculated (EUWI, n. d.).

### **4.3.2 Volume II: Affordability Analysis and Willingness to Pay**

This report represents the second volume of the report on the project Support to the Georgian Government in Developing and Implementing a Financial Strategy for Urban Water Supply and Sanitation in Georgia - Carrying out the Feasibility Analysis.

The price variants presented in this chapter were developed taking into account the results of the affordability assessment, as well as the need to bridge the financing gap identified in Volume I (Financing Strategy).

The report considers two price variants:

- Variant 1: Affordability Limit
- Variant 2: Closing the Financing Gap

The aim of the analysis is to find the maximum affordable price as is assumed that the affordability price level is lower than the price that ensures full cost recovery. For making final conclusions the Affordability (or Ability to Pay - ATP) and Willingness to Pay (WTP) analysis were considered (GWU, 2005b).

In Variant 1 the affordability analysis is taken as starting point and the water price is determined such that most households are able to pay.

In Variant 2, the price increases are assumed as an example that ensures that the financial gap is closed. Hence whereas the price increases follow strictly from the assumptions made in the affordability analysis in Variant 1, Variant 2 is just one out of many ways of bridging the financing gap that could have been analyzed (GWU, 2005b).

### **Variant 1 - Affordability Limit**

Variant 1 considers an option of the maximum acceptable price from the point of view of affordability for households. In this variant it is assumed that the limit of an affordable water price is such that only 5% of the households spend more than 2.5% of their total household budget on WSS. A separate subsidy scheme is considered to be necessary for these 5% of the households (GWU, 2005b).

The assumption on 5% of households paying more than 2.5% of the total budget could be changed according to the percentage assessed affordable and the preferred extent of the subsidy system. Price increase suggested in Variant 1 follows strictly from the assumptions made in the affordability analysis. In Tbilisi, the present price is at an appropriate level and there is no room for increases in the price. In the years up to 2015, the nominal prices are proposed to increase by 10-11% yearly so that the price for WSS follows the increase in nominal GDP (as some economic development is assumed in Tbilisi) (GWU, 2005b).

### **Variant 2 - Closing the Financing Gap**

Variant 2 is an example of how such a price structure could be formed, that there would be no financing cash flow gap during the period considered (2005-2015). This means that neither the affordability analysis nor the willingness to pay analysis has been used as input for this variant (GWU, 2005b).

In Variant 2, in order to close financial gap the tariffs in Tbilisi are to increase by 135% in 2006 and 105% in 2007 and 5% in the remaining years;

The affordability analysis indicates that under Variant 2 a large part of the households in Tbilisi would be likely to have difficulties in paying for the water and sanitation services. This is especially the case in 2007, where 18% of the households are spending more than 2.5% of their total household expenditures on WSS. Hence following the affordability and willingness to pay analysis, Variant 2 cannot be suggested as a reasonable price variant (GWU, 2005b).

## **4.4 Danish EPA Project - Municipal Water and Wastewater Sector in Georgia - Background Analysis for Financing Strategy**

The Danish Environmental Protection Agency has decided to fund a number of projects in order to provide assistance to the OECD Environmental Action Plan Task Force (EAP TF) Secretariat and directly to selected Ministries of Environment in the NIS. The projects commenced in August 1999. "Municipal Water and Wastewater Sector in Georgia - Financing Strategy" is one of a series of documents coming from the project (OECD, 2001). Performing organisation(s) is COWI Hungary in association with COWI AS.

The purpose of the municipal W&WW financing strategy for the Republic of Georgia is “to determine a realistic, agreed and affordable service and to demonstrate how environmental expenditure can be financed”.

Due to the considerable uncertainties in predicting future economic development of country, for analysis are predicted two development frameworks:

- Low - GDP 4% growth rate with inflation rate 4%
- High - GDP 8% growth rate with 4% inflation rate.

And two alternative scenarios are analyzed:

- maintenance scenario
- Tbilisi rehabilitation scenario

**Baseline scenario:** it means to maintenance of existing situation as the baseline target and to stop deterioration in both the water supply and wastewater collection and treatment infrastructure.

The cost of meeting the baseline targets (including water supply and wastewater collection operational & maintenance cost in five Georgian plants) equals to 165 Million GEL. Comparison of baseline expenditure need and the supply that can cover the expenditure reveals a significant financing gap. “If the present trends in available finance continue there will not be enough money to maintain even the present, low level of water and sanitation services. Even worse, financing under this "business as usual" scenario will not even be sufficient to cover the costs of proper operation of existing systems until 2014 assuming high economic growth and after 2020 if the GDP growth is slower. Therefore, if no more finance is provided the existing, already deteriorated infrastructure will decay further and its operations will continue to be irregular and inappropriate” (OECD, 2001). The maintenance scenario therefore focuses on the options for increasing the supply of available finance. For solution of the problem was proposed:

- increasing user charge rates to 2% of overage household incomes and improving collection rates;
- earmarking a part of the environmental tax revenue (about 9 million GEL / year), or alternatively increasing the share of government budget spending on WSS;
- utilizing foreign (IDA) loans up to the level which can be supported by local contributions.

If these measures are implemented it will be possible to restore the 1999 service level and quality in a 20 years perspective (OECD, 2001).

### **Partial Rehabilitation Targets**

Maintains of the existing situation and in addition partial rehabilitation of Tbilisi water supply network through pump replacement and increased replacement of pipes; but it does not include the rehabilitation the regional WWTP in Gardabani (OECD, 2001).

Phasing such partial rehabilitation of essential parts of the WSS infrastructure in Tbilisi will increase the demand for financing. To make it feasible was recommended: to increase the user charges more steeply and faster in these areas up to 3% of average household income, to increase the budgetary finance and earmarked environmental taxes also include same preferential (IDA) loan financing; hence, to install meters which furthermore reduce the consumption rate and thus operational costs.

If this measures will be implemented closing the financing gaps, improvement in the level and quality of water service, will be possible earlier than in the maintenance scenario. The present service level could on average be restored earlier by 2015 (OECD, 2001).

## Conclusion

Georgia can only afford narrowly targeted priority rehabilitation investments in the next 20 years. Given the very small size of the central budget for many years to come, and the limited borrowing capacity of the country, the funds controlled at the national level can be spent for rehabilitation of the Tbilisi system or WSS infrastructure in big municipalities but not in all regions of Georgian at the same time (OECD, 2001).

## 4.5 Summary

**The Municipal Infrastructure Rehabilitation Project** was the first step by the Georgian government toward improving management and *delivery of municipal services in a sustainable and environmentally beneficial manner* (as states one of the objectives of the project). The project covered Tbilisi and other key municipalities and was initiated in 1994. At that time, the successful implementation of the project was connected to the certain risks due to the political instability. It was a period when the civil war had just ended and the government was in the process of consolidating its power and determining institutional responsibilities. With the 18 million USD loan they planned to improve both the infrastructure and develop *institutional arrangements* in Tbilisi and in other key municipalities. The infrastructure development element included not only water supply and wastewater sector improvement but also the energy and transport waste management sectors as well. The institutional development element was to address the special *environmental public awareness and institutional capacity building at the municipal level* for improved environmental assessment, monitoring and management. Thus, public-public participation sustainability principle is addressed through the institutional development element.

The implementation of project activities was to be conducted by a newly created, nongovernmental, non-profitmaking private company – the Independent Agency for Development of Municipal Services (the Agency). The establishment of Agency was initiated by the Georgian government in order to ensure efficient implementation of the proposed MIRP. *The establishment of the Agency was a new alternative to traditional procurement procedures in Georgia.*

The MIRP included the following short term investment programs for Tbilisi infrastructure rehabilitation program: Heating/Energy Saving, Urban Transport, **Water Supply** (USD 1.32 million), **Wastewater** (USD 0.61 million), and Landfill. The results of the projects and overall benefit were connected *to arresting further deterioration* of essential municipal services and *mitigating environmental and health hazards*. However, the implementation completion report of MIRP is not available on WB database and it is not possible to provide information about results of the project components. It is worth mentioning that the World Bank MDDP staff appraisal report states that, “The Municipal Infrastructure Rehabilitation Project is nearing the end of a successful implementation” (WB, 1997). The MIRP closed on June 30, 2000. The MIRP provided the basis for a broad program of Bank support to the local government sector in Georgia. Among the outcomes of the project are the MDDP and the Tbilisi Water Supply and Sanitation project.

In 1996, WB experts, with the participation of Tbil-vodocanal LLC, have developed a project of **modernization of the water supply system**. Implementation of the project was connected to relevant investments which equalled USD 25 million. Project implementation should have started in 1998. However, there is very limited information about the project, both in the WB database and other sources. There is no information available about the project proposal nor about its expected results. However, based on the project aims and objectives it can be concluded that the modernisation water supply project intended to address *water efficiency* measures through a decrease in leakages.

The main aim of the **Tbilisi Water Supply and Sanitation Project**, facilitated by the WB in 2001, was to help the Tbilisi Municipality to improve the Urban WSS System through increasing its *managerial, operational, technical and economic efficiency*. The project included two key elements: the establishment of a repair and rehabilitation fund to improve drinking water and sanitation conditions, and a technical assistance element to improve legislative conditions and utility management. During the implementation of the project it was planned to have *private sector involvement* in the operation and maintenance of the engineering infrastructure. 25 million USD investments would cover *water loss reduction, effective water demand management, repairing and replacing broken or energy inefficient pumps*, reduction in cross-connections with wastewater collection pipes, and rehabilitating treatment technologies. According to the project proposal, the following sustainability principles should be addressed in the implementation of the project: improvement of financial sustainability through tariff adjustments, improved bill collection and eco-efficiency approaches to be taken, and the involvement of the private sector. The project was tendered and the contract was awarded to a French company, Jeberaul Desi (General Deso).

It later turned out that the French company “General Deso” was interested in managing the country’s water resources rather than conducting a rehabilitation of the city’s WSS systems. The company focused on reducing the water supply and supplying environmentally unsafe surface water to the capital city instead of high-quality underground water. The strong protest by the third sector, against the lease of Tbil-vodocanal LLC to “General Deso” under the proposed contract, made the government reconsider the lease of Tbil-vodocanal LLC to a foreign company and cancel the contract. Because of the efforts of the third sector, the project implementation has failed. It is a clear example of how the public can exercise their rights and have the ability to influence decision-making in protection, use, and management of water resources. The involvement all interested stakeholders and the creation of transparency in

management and decision-making processes from the beginning is necessary for the success of the wastewater management system. Within this project this principle was strongly addressed, which ensured the prevention of “conditional sustainability” of the project.

Within the **Municipal Development and Decentralization Project** (1997-2002), 89 investment projects have been implemented by the Municipal Development Fund in eleven municipalities of Georgia. The financing of investment projects by the MDF is made with the following conditions: 20% is covered by a local self-government, 40% from the International Development Association and 40% from the credit of the Municipal Development Fund. The annual interest rate is 15%, the repayment period is 10 years, and there is a grace period of one year. Within such conditions, two thirds of the project’s investment resources were absorbed by Tbilisi municipality because the borrowing capacity of most municipalities was small in comparison with the amount of resources available. About 11% of the investment funding (20.9 million USD) was used for water supply projects. The rest was used for urban road rehabilitation projects, in the education sector, for public transport projects, for health sector projects, etc. In total, eight water supply investment projects have been realized in Tbilisi through which underground leakages of drainage and sewage water were reduced; hence the threat of water contamination was mitigated. Besides the *water efficiency measures* taken, which were considered in the physical investment program, the MDDP focused on highly relevant *institutional development issues*. The main objective of the project was to “support the initial stage of the *decentralization process aimed at shifting responsibility and accountability in terms of delivery and maintenance of urban services to municipalities*”. “Making the access to investment financing conditional on the efforts made by participating local governments to improve their administrative and financial management performance was a new and innovative approach in the context of a former Soviet Union country... the MDDP fell in the end short of its original institutional development targets ... decentralization and local government development, especially in a country with no previous tradition in this area, is necessarily a lengthy and complex process ... Primarily for this reason, the Bank agreed to have the MDDP followed by a second operation, the Georgia Municipal Development and Decentralization Project II - MDDP II ... The objective of the MDDP II is to continue, and expand on, the work initiated under the MDDP *and help local governments increase the effectiveness of their management of local infrastructure and delivery of utility services*” (WB, 2003c).

The implementation agency of **MDDP II** is MDF. The four water supply and sanitation projects have been already completed in Tbilisi Municipality through which Tbilisi Water Supply Facilities in Aragvi Gorge and Water and Sewerage Systems have been rehabilitated in different districts of Tbilisi. The objectives of the projects were *provision of reliable water supply* for Tbilisi City and *to prevent deterioration of the road paving*, improve provision of services to the population, and *eliminate the threat of disease outbreaks*. MDDP will be completed in June 2007. Some projects are already under implementation.

There are certain similarities between MDDP and MDDP II. The aims of both projects are to assist the government to create such institutional frameworks which will ensure delivery of services at the municipal level in a decentralized manner as well to address the water efficiency measures, through decreases in water leakages.

The project **Support to the Georgian Government in Developing and Implementing a Financial Strategy for Urban Water Supply and Sanitation in Georgia - Carrying out the Feasibility Analysis** was realised with the financial support of TACIS in 2004. The project had two elements: to elaborate on the **Financing Strategy** (Volume I) for the urban W&WW sector in Georgia and to focus on the assessment of **affordability** (Volume II) of W&WW services for the population in Georgia. Thus was done to assess the financial implications of achieving the MDGs and to help the government of Georgia to set realistic targets for the rehabilitation and development of urban WSS infrastructure and services as well as to identify options to bridge the financial gap between the expenditure needed for achieving policy objectives and the financing available.

In order to achieve the MDGs and to eliminate the accumulated financial gaps, it was recommended to raise monthly household charges. This should be supplemented by a well-designed information and public awareness campaign *to improve the willingness to pay*.

However, the second volume of the project **Affordability Analysis** concludes that the present price in Tbilisi is at an appropriate level and there is no room for increases in the price. Conclusions, analysis and calculations were arrived at and *the user willingness and affordability to pay for W&WW service* were accounted for. In addition, the project proposes general recommendations for W&WW sector improvement. The recommendations reflect the W&WW service sustainability principles, including: to *set priorities* for the WSS sector, at a national level; to allocate more public money to the WSS sector, and to monitor its use in accordance with set priorities; to increase the collection rate, and to review the *tariff policy, to reduce the leaks in the network and to decrease the unaccounted for water*, to design incentives to reward leak detection, the disruption of illegal connections, the *introduction of water meters* and *to promote a more rational use of water resources*. Also within this project was identified the following priority project ideas: Rehabilitation of water mains and distribution networks in Tbilisi city; Rehabilitation of regional Gardabani WWTP; Rehabilitation of sewerage collector Zhinvali-Tbilisi; Introduction of organic fertilizer production at the Gardabani WWTP; Decrease of Gardabani WWTP dependence on external power suppliers through construction of a low-capacity hydroelectric power station.

**Municipal Water and Wastewater Sector in Georgia - Background Analysis for Financing Strategy** was realised with the financial support of The Danish Environmental Protection Agency in 1999 in order to determine a realistic, agreed and affordable service and to demonstrate how environmental expenditure can be financed. To close the financial gaps and stop further deterioration of W&WW infrastructure it was proposed *to increase user charge rates*, to earmark a proportion of the environmental tax revenue, or alternatively to increase the *share of government budget spending on WSS*, and to utilize foreign (IDA) loans up to the level which can be supported by local contributions; hence, *to install meters* which further *reduce the consumption rate and thus operational costs*. Taking into consideration the country's *social and economical capability to invest in W&WW* sector, it was concluded that Georgia can only afford narrowly targeted priority rehabilitation investments in the next 20 years.

There are certain similarities in the proposed recommendations elaborated within the project Support to the Georgian Government in Developing and Implementing a Financial Strategy for Urban Water Supply and Sanitation in Georgia - Carrying out the Feasibility Analysis and

Municipal Water and Wastewater Sector in Georgia - Background Analysis for Financing Strategy, since in both cases the implementation agency is COWI. Both projects are addressing the water efficiency approaches, however the former project recommends introduction demand oriented approaches, while the latter project recommends a step-by-step approach for W&WW sector rehabilitation.

Table 4-3 presents the sustainable principles for W&WW sector provision addressed in each of these projects proposed by international organisations for W&WW sector rehabilitation.

Table 4-3 Sustainability Principles Addressed in W&WW Projects

	MIRP (1)	Modernization Water Supply System (2)	Tbilisi Water Supply and Sanitation Project (3)	MDDP (4)	MDDP II (5)	TACIS Projects (6, 7 <sup>64</sup> )	Danish EPA (8)
To secure political commitment							
Create an enabling environment for sustainable solutions							
Stakeholder involvement from the very beginning							
Application of demand-driven approaches							
Pollution prevention at source, water conservation and efficient use of water							
Application of 'the user pays' and 'the polluter pays'							

<sup>64</sup> 6- volume I, 7 - volume II.

	MIRP (1)	Modernization Water Supply System (2)	Tbilisi Water Supply and Sanitation Project (3)	MDDP (4)	MDDP II (5)	TACIS Projects (6, 7 <sup>64</sup> )	Danish EPA (8)
principles							
Step-by-step approach							
Integration of the municipal wastewater sector to other economic sectors							
Public-private partnerships, and also public-public partnerships							

As can be seen in the table, not all sustainability principles are addressed by each project, but most of the principles are covered by the projects when taken as a whole. It is clear that water efficiency is the most crucial issue to be addressed in Georgia, since the objectives of almost all of projects included improvements to water efficiency. The two principles ‘integration of the municipal wastewater sector to other economic sectors’ and ‘to secure political commitment’, are not addressed by any of each projects. However, if there was no political support and commitment, the projects could not even be initiated, hence all projects are short term steps taken by the Georgian government to avert further deterioration of the sector and to improve environmental conditions and human health.

## 5 Discussions

The chapter addresses the research objective – to analyse proposed strategies by domestic and international aid organisations for W&WW system rehabilitation against the W&WW system sustainability criteria. The chapter introduces the principles as stated in literature. The author interprets and matches strategies proposed by international and domestic organisations in accordance with the principles.

### 5.1 To Secure Political Commitment

A political climate has to be created in which a high priority is assigned to all aspects of sustainable municipal wastewater management. This is a necessary condition for the development of various initiatives, including mitigation measures and programs that require financially viable investments to safeguard ecosystems and public health from the threats of untreated municipal wastewater discharges (UNEP, 2002).

Today, Georgia recognizes the need for, and is willing to treat, environmental issues as an integral part of the overall strategy for economic and social development. According to the Georgian constitution everyone has the right to live in a healthy environment and to use its national and cultural resources, and the state undertakes to protect the natural environment and to guarantee its rational use, in order to maintain a healthy environment that meets the ecological and economic needs of society, and preserve the interests of current and future generations. To be successful, national authorities need to secure political commitment and domestic financial resources, always keeping three essential principles for sustainable sanitation systems in mind: equity, health promotion and protection from diseases and the protection of the environment (UNEP/WHO/HABITAT/WSSCC, 2004). The three basic principles, equity (everyone has rights), health promotion (to live in a healthy environment) and the protection of the environment (the state undertakes to protect the natural environment), are outlined in the Georgian constitution. However, the challenging part is the implementation of law.

In Georgia W&WW network penetration is high according to international standards; however the system is in a poor condition and in need of rehabilitation and reconstruction. Wastewater discharges, coming largely from the Tbilisi region, with inefficient or no treatment, are having an impact on surface water quality and on downstream communities. Since 1990s' no significant reconstruction works have been conducted within the W&WW infrastructure. Georgia, after gaining independence, experienced sharp economic decline. During the transition period environmental protection never was the country's priority. The state budgets over the past years show a decline in the expenditures on environmental protection. The projections of expenditure by sector show that continuing priority is given to public order and safety.

W&WW sector rehabilitation is not among the priorities of the country's economic and social policy. This is reflected in a low level of budget financed capital investments. Such an attitude toward the W&WW sector can be explained by lack of financial resources. For example, the National Environmental Action Plan set specific investment actions such as the rebuilding of the Jinvali-Tbilisi sewage collector and rehabilitating the WWTP at Gardabani. The identified

actions have not implemented due to the lack of funding. Also due to a lack of financing, only a minor part of the programme of “Sanitary and Technical Improvement of W&WW Systems in Cities and Districts of Georgia”, adopted by the President of Georgia in September 1998 in the framework of the concept of housing and communal sector reforming, has been implemented.

Due to the fact that there was no fund available from the national budget to invest in the W&WW sector, the Georgian government took credit from WB and several projects, such as MIRP (USD 18.0 Million) and MDDP (USD 20.9 million) projects were realized. MDDP II (USD 19.41 million) is under implementation which will be finished in June 2007. However, not all the finances borrowed by the Georgian government for implementation of above mentioned project was invested in W&WW sector rehabilitation; only certain share from this loan was allocated in water supply and wastewater infrastructure rehabilitation works.

There are also certain trends in raising capital investments in W&WW infrastructure from local government (Figure 3-3), e.g. Tbilisi local budget provided 3.6 million GEL in 2002, 4.9 million GEL in 2003, 3.1 million GEL in 2004, 10.0 million GEL in 2005 and 28.0 million GEL in 2006. Explanations of this - raising capital investments in W&WW infrastructure – can be the GDP growth rate in the country (Figure 1-1), after the “Rose Revolution” (2003) the economy situation in Georgia started to stabilize and at the same time investments in the W&WW sector rose sharply in comparison to previous years.

Considering the country’s financial affordability to select sustainable W&WW sector solutions is most of the critical and challenging issues. Despite the fact that not much is done by the Georgian government for sustainable W&WW sector creation due to the lack of financial resources, according to the special activist taken from the Georgian government and investments allocated in the W&WW sector, there is certain political commitment to address sector rehabilitation.

## 5.2 Create an Enabling Environment for Sustainable Solutions

Governments have a leading role in ensuring sustainable governance and developing mechanisms that create adequate conditions for correct actions. National authorities should create the policy, legal, regulatory, institutional and financial frameworks to support the delivery of services at the municipal level in a transparent, participatory and decentralized manner (UNEP/WHO/HABITAT/WSSCC, 2004).

The government of Georgia undertook the important sector reform based on the Subsidiarity principle. Administrative and economic responsibility was delegated to the lowest level of government and nowadays local municipalities have the lead role in the provision of basic communal services in towns and villages. Even though the bulk of responsibility for the regular operation and development of utilities lies with local authorities and bodies of self-governance, the Ministry of Economic Development of Georgia is responsible for methodological guidance for water infrastructure development. The Ministry of Health Care, Labor and Social Welfare is responsible for the development of water sanitary/hygienic norms, as well as for state sanitary supervision on drinking water quality. The MoE authorizes water use, defines discharge limits

and monitors environmental impact and the Ministry of Finance has made funds available from central government for water investments, which is quite limited with decentralization (OECD, n. d. a).

Despite the fact that the overall structure, according to the sustainability criteria, appears to be in place in Georgia, concerns over effectiveness remain. Decentralization of the responsibilities gave two alternative results. First - transfer of the decision making on the local level, and second - such decentralization significantly complicated the normal W&WW service provision due to the unclear segregation of water sector responsibilities among the national and local authorities and bodies of self-governance. For instance, despite the fact that three institutional bodies, MoE, Ministry of Agriculture and Local Municipality are responsible for industrial wastewater discharges quality control, none of them is carrying out their responsibilities they should. Adequate provision of a W&WW service is hampered by inadequate management and the complexity of the regulatory system, which is caused by lack of finances as well as lack of human resources. The core of the system is self-reporting by users to national authorities.

Decentralization reform in Georgia was realized within the MDDP: "... the MDDP fell in the end short of its original institutional development targets ... **decentralization** and local government development, especially in a country with no previous tradition in this area, **is necessarily a lengthy and complex process** ... Primarily for this reason, the Bank agreed to have the MDDP followed by a second operation, the Georgia Municipal Development and Decentralization Project II - MDDP II ... The objective of the MDDP II is to continue, and expand on, the work initiated under the MDDP and help local governments increase the effectiveness of their management of local infrastructure and delivery of utility services" (WB, 2003c). MDDP II is still under implementation.

### 5.3 Stakeholders' Involvement from the very Beginning

Municipal wastewater management is a rather complex set of organised efforts and actions on domestic sewage issues that must involve proactive participation and contribution of various governmental and non-governmental stakeholders dedicated to achieve given goals (UNEP, 2002).

Only the Tbilisi Water Supply and Sanitation Project allows the possibility for a discussion on stakeholder involvement in decision making processes from the start. Stakeholder interest resulted in project suspension. The French company, "General Deso", was interested in managing the country's fresh water resources rather than in rehabilitation of the city's WSS systems. The company's proposals relied on a constant increase in consumer tariffs in the long run. As a result, access to a vital resource – drinking water – could have become limited for the bulk of the population of Tbilisi, because they could not afford the increased charges. Such a condition caused a protest in the society, and made the government of Georgia reconsider the lease contract. It is a clear example of how the general public can play a major role in addressing environmental issues in Georgia, exercise their rights and ability to influence decision-making process, as well as the governmental attitude toward stakeholder interests. According to the Law

on Environmental Protection and the Aarhus Convention, the general public's right to participate in decision-making is secured.

However, it is clear that not all interested stakeholder interests are accounted for by the Georgian government. For instance in downstream communities. Mtkvari river resources are used as potable water by the Azerbaijan community, and inefficiently treated wastewater which is discharged into the Mtkvari river causes an impact as well as discontentment in society.

## 5.4 Application of Demand-Driven Approaches

In selecting appropriate technology and management options attention must be given to users' preferences and their ability and willingness to pay. These approaches, however, require comprehensive analysis of both the present and future societal demands. With such analyses realistic choices can be made from a wide range of technological, financial and management options (UNEP/WHO/HABITAT/WSSCC, 2004).

In Georgia the present household tariff on W&WW service is much lower than the real price of water production and delivery to the end users and for wastewater collection and treatment. The approved household tariff in Tbilisi covers only of 29% of W&WW service costs. Despite the fact that the tariff on the W&WW service is low, not all consumers are able to pay; payment of municipal user charges is also difficult for some industrial enterprises and they are becoming illegal consumers of the service. Generally the W&WW payment collection rates remain low for all consumer categories in Georgia (Table 3-2). Cost recovery in turn determines the service level.

Even so the service level is low, no other appropriate wastewater treatment alternatives can be considered for Georgian community for long term depending on their affordability to pay for provided service. The high initial investment cost, necessary to create more appropriate wastewater treatment system would result the considerable increase of users' charges. The considerable increase of users' charges at these stages cannot be considered in Georgia; e.g. within the projects Support to the Georgian Government in Developing and Implementing a Financial Strategy for Urban Water Supply and Sanitation in Georgia - Carrying out the Feasibility Analysis (volume II – Affordability Analysis), to make the final recommendation, Affordability (or Ability to Pay - ATP) and Willingness to Pay (WTP) analyses were carried out (GWU, 2005b). Based on the analysis, since the present price in Georgia is at an appropriate level and there is no room for increases, no tariff increase policy was recommended till 2015 or earlier depending on GDP growth rate. TWU has several times raised this issue to increase the tariff on W&WW service, however the Georgian government is not planning to raise the household tariff considering the population social conditions and affordability to pay for provided service.

Based on economic conditions of Georgian society the present price on W&WW service is set at the level what is users' willingness and affordability to pay for provided service. Current economic and social environment in Georgia results the W&WW treatment level and technical

conditions. Thus based on community affordability level only mechanical treatment stage provision is applicable for Georgian community.

## 5.5 Efficient Use of Water, Water Conservation and Pollution Prevention at Source

Wastewater management need not always involve high initial investments. A very careful search for low-cost-and thus more sustainable-technologies and approaches that target waste prevention, pre-treatment, water conservation, efficient use of water, and natural systems for wastewater treatment is essential (WB, 2003b).

### Water Efficiency

In Tbilisi the water consumption rate is quite high and consists of between 0.5-0.9 m<sup>3</sup> per person daily. Although the data is overrated, due to the considerable leakages in the water supply distribution network, the actual level of water consumption in Tbilisi is nevertheless high. Inefficient water consumption in households can be explained by lack of awareness in society. This ingrained mindset needs to be overcome through a process of education and persuasion, if the investments in water supply are to be made sustainable (WB, 2001a). Heavy consumption also implies weak metering practices and low charges on water; in most households water consumption is not metered, which does not encourage users to save water (OECD, n. d. a). The introduction of economic mechanisms, e.g. water meters will result in the considerable decrease in water consumption (Appendix X).

There is no incentive for water efficiency, not only in households but also in industry. The share of water consumed by the industry sector is not high in comparison to households. The reason for such a low level of water consumption by industry is that industrial activities have declined after independence and there has not been much technological development of this sector and/or introduction of eco-technologies. Current municipal users' charges do not create any incentives in industry for the introduction of eco-technologies since the abatement cost are high. Hence, industrial units, which are not connected to the sewage collector, are not obliged to pay for the service, which is an additional motivation for inefficiency.

The introduction of water meters as well as an increase in the tariff on water will create incentives in both households and industry for water efficiency; thus this low investment approach will result in a reduction in wastewater quantity and in investment savings related to operation and maintenance of sewerage systems and treatment facilities. Both the projects, Support to the Georgian Government in Developing and Implementing a Financial Strategy for Urban Water Supply and Sanitation in Georgia - Carrying out the Feasibility Analysis (Volume I Financing Strategy) and Municipal Water and Wastewater Sector in Georgia - Background Analysis for Financing Strategy, recommend installation of water meters to promote a more rational use of water resources. However, the implementation of recommendations as well as changes to the tariff policy are not planned by the local municipality; one explanation was that it may give rise to discontentment in society.

## **Water Saving**

A serious problem in the municipal sector is the inefficiency of water resources management. The greatest share of the water transportation infrastructure requires replacement and capital reconstruction. Due to the poor condition of the distribution network, according to the expert estimates, the percentage of losses in main and distribution pipelines in Tbilisi may be as high as 45-50% of the total water delivered to the network. Non-operating losses drive up energy and chemical agent consumption.

As illustrated in Table 4-3, the majority of projects' interests financed by international institutions are focused on water efficiency and water saving measures. e. g.:

The main objective of the Modernization of Water Supply System project was to address water efficiency measures through a reduction in leakages.

Tbilisi Water Supply and Sanitation Project intended to increase operational, technical and economic efficiency of TWU through water efficiency measures. Part of the 25 million USD investment would be allocated to water loss reduction activities (as stated in the project proposal).

Within the Municipal Development and Decentralization Project, eight water supply investment projects have been realized in Tbilisi municipality, through which underground leakages of drainage and sewage waters were reduced.

Four water supply and sanitation projects have already been completed in Tbilisi Municipality. As a result, Water and Sewerage Systems have been rehabilitated. Some projects are under implementation within the project MDDP II.

Project Support to the Georgian Government in Developing and Implementing a Financial Strategy for Urban Water Supply and Sanitation in Georgia - Carrying out the Feasibility Analysis recommends mitigation of the leaks in the network and a reduction in the unaccounted-for water.

In addition that most of the project objectives financed by international institutions are addressing the water efficiency measures, the local municipality is also realise activates for improving the water efficiency. The money allocated to the W&WW sector from Tbilisi Municipality was primarily spent on water supply and wastewater distribution network repair reconstruction activities, in order to reduce water losses through leakages and to address water efficiency measures.

## **Prevention at Source**

Prevention of pollution at source is another key action that ensures quality wastewater management and minimizes the impact on the environment. However, the MoE estimates more than 80% to 90% of industrial wastewater is not treated before being discharged to sewers and municipal wastewater treatment plants (where there is a network), or directly to surface waters (where there is no network) (UNECE, n. d. a).

There are no pollution taxes in Georgia to motivate industry to prevent pollution. However, in the case of non compliance with emission limits, they have to pay fines. Fines and fee structures do not appear to provide the right incentives to encourage pollution control or investments in eco-efficiency (UNECE, n. d. a). Hence, pollution control of industrial wastewater discharges is not at an adequate level due to the poor institutional and regulative frameworks in Georgia. The core of the system is self-reporting by users to national authorities. Since only a small minority of industrial users carry out accurate monitoring of their discharges, the system is not believed to be an effective means for discouraging pollution (UNECE, n. d. a).

## 5.6 Application of ‘the User Pays’ and ‘the Polluter Pays’ Principles

The employment of principles like ‘the water user pays’ and ‘the polluter pays’ is required to achieve stable and sustainable wastewater management with efficient cost-recovery systems. These principles should be applied in a socially acceptable way, considering solidarity and equitable sharing of costs by all citizens (rich and poor) and facilities (UNEP/WHO/HABITAT/WSSCC, 2004).

There is no such condition in Georgia that ensures the financial sustainability of the system. Revenues from municipal users’ charges for water supply and wastewater collection and treatment do not cover utility costs. The approved household tariff in Tbilisi covers only 29% of W&WW service costs. The rest is compensated from the municipal budget and by other sources of revenue of Tbil-vodocanal LLC. However ‘the user pays’ principle in Georgia is applied in a socially acceptable way, considering the affordability of users to pay for the service provided; that is why the tariff on the W&WW service is lower than the real price for potable water production and delivery to the end users and wastewater collection and treatment. Despite the fact that “No service is sustainable in the long run if its costs cannot be recovered; it does not mean that all users must necessarily pay the same share of the cost...In practice, some degree of cross-subsidy is inevitable...” (WHO, 2000). In Georgia cross-subsidizing is the major social security tool used to preserve low residential charges in Tbilisi and other large towns, to ensure access for all, and thus minimize disease and maximize public health benefits.

Despite the fact that low tariffs on water is one of the reasons that the revenues from charges on W&WW do not cover utility costs and governmental subsidies are necessary to support the “poor” section of society, cultural issues are among the factors that result in low payment rates. Some people do not consider payment for W&WW service to be obligatory; this culture was formed during the Soviet Union period, since water had always been supplied by the government “free of charge”. In addition, as Georgia is rich in terms of available water resources, which is in the public interest, the population attitude toward this issue is that society should benefit free from it. Hence, in some districts of Tbilisi, frequent interruptions to the water supply creates an unwillingness among many consumers to pay for the services provided.

Awareness raising activities is one of the tools to make a basis for the households’ willingness to pay. Awareness raising activities ensure demonstration of win-win situations, and develop of commitment and catchment solidarity for success in wastewater management (UNEP/WHO/HABITAT/WSSCC, 2004). Success of wastewater management programs

depends on effective advocacy and public awareness through information, education, and communication. People must be informed and convinced. If they do not feel part of a process, they may not be motivated to change their behavior (UNEP/WHO/HABITAT/WSSCC, 2004).

Within the project Support to the Georgian Government in Developing and Implementing a Financial Strategy for Urban Water Supply and Sanitation in Georgia - Carrying out the Feasibility Analysis (Volume I Financing Strategy), one of the proposed recommendations was provision of an awareness campaign, which will be a precondition to increase the collection rate and to review the tariff policy. But awareness raising activities for demonstration and creation of catchment solidarity has not been realized in Tbilisi.

Currently, industry is free from pollution taxes. The economic instruments for water management in Georgia included water effluent taxes and non-compliance fees. In 2005 a new tax code was adopted, where environmental pollution taxes have not been unified.

The main argument for the cancellation of environmental taxes was their non compliance with the functions which was clearly stated in legislation (Appendix II). The employment of ‘the polluter pays’ principle first of all could create an incentive in industry for eco-efficiency and, furthermore, revenues from pollution taxes could be used for W&WW sector development, if an adequate tax code was to be created and regulation systems would ensure successful implementation of it. However, the country’s policy is “loyal” toward the industry sector and the employment of ‘the polluter pays’ principle, it seems, will not be considered in the near future in Georgia.

## 5.7 Step-by-Step Approach

The high costs of wastewater systems necessitate a long-term, step-by-step approach, minimizing current and future environmental and human health damage as much as possible within existing budgetary limits. A step-by-step approach allows for the implementation of feasible, tailor-made and cost-effective measures that will help to reach long-term management objectives. Such an approach also allows for the development, in close co-operation with other sectors (UNEP/WHO/HABITAT/WSSCC, 2004).

In wastewater management, necessary steps can be taken at different points in time, depending on available resources and capabilities, which means that sanitation provision is a process rather than a series of large projects. For instance, the project - Municipal Water and Wastewater Sector in Georgia - Background Analysis for Financing Strategy, recommends a step-by-step approach, implementation of narrowly targeted priority rehabilitation investments in the next 20 years, since there is non affordability by the Georgian government to make large investments in the W&WW sector.

It is a fact that, for the Georgian government, it is not financially affordable to make large investments and to conduct a capital reconstruction of W&WW infrastructure, even though the W&WW sector is in a poor condition. Investments allocated from projects financed by international organizations as well as from local budgets were used for short term projects

(mostly on water supply and wastewater distribution network repair reconstruction activities) rather than on large ones, since the investments were limited (Appendix VII, Table 4-2). This was done to avert further deterioration of the service and to improve health and the environment within existing budgetary limits.

## 5.8 Integration the Municipal Wastewater Sector to other Economic Sectors

Sustainable wastewater management may involve high initial investments and long-term contracts to cover financial risks and to recover costs. As profits-or "net benefits"-are likely to be higher in other sectors, linking these to wastewater management can reduce the risks involved and enhance the feasibility of new partnerships (WB, 2003b). Developments in other (socio-) economic sectors, for instance water supply or tourism, may create opportunities to address sanitation at the same time. Linking wastewater management with these, ensures better opportunities for faster cost-recovery, risk-reduction, financial stability and sustainability of the actions applied (UNEP/WHO/HABITAT/WSSCC, 2004).

In Georgia there is already an integrated system of wastewater infrastructure with waste supply sector, which was considered at the beginning of the planning process for Gardabani wastewater treatment. Integration of wastewater infrastructure with urban planning, to produce methane and provide neighborhood with gas was also considered. However the emergency outlet, gas holder and methane tank are not yet built due to lack of financial resources.

As it is stated in the sustainability principle, linking wastewater management with other sectors can ensure financial stability and sustainability. Appropriate wastewater management in Georgia requires substantial construction and operational investments into wastewater infrastructure and treatment facilities. To recover the cost will be long process. Therefore to link municipal wastewater with other sectors in addition to the water supply sector could be an opportunity to ensure financial stability. There is an attempt to integrate the wastewater infrastructure with agriculture and with urban planning. Gardabani WWTP whole rehabilitation package includes the introduction of organic fertilizer production as well as the building of a gas holder and methane tank. Georgia, as an agricultural country, will benefit from the production of fertilizer<sup>65</sup>. The building of a methane tank can also provide neighbourhoods with natural gas. The production of fertilizer and methane are the key conditions considered and included by the administration in the long term lease contract of Gardabani WWTP to the foreign investment company.

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<sup>65</sup> Presently the total area filled with well stabilized sludge is around 20 ha and 1-1.5 meter high. This sludge could be used as fertilizer in agriculture. Number of tests performed by the sanitary inspectorate confirmed that the mentioned sludge did not contain heavy metals and could be utilized as a fertilizer in agriculture (EUWI, n. d.)

## 5.9 Public-Private Partnerships, and Public-Public Partnerships

Public-private partnerships, and also public-public partnerships, are important tools to assist local governments in initial financing and operating the infrastructure for wastewater management (UNEP, 2002). New partnerships are important options and potentially useful tools, if the governing regulatory system is strong enough or can be strengthened enough to avoid the negative consequences that can result from private participation in management of public goods (WB, 2003b).

### Public-Private Participation

Costs of investments, operation and maintenance in W&WW infrastructure often outstrip financial capacities of public authorities. Public-private partnerships are important tools to assist local governments in initial financing. Water supply and sanitation projects can benefit from typical private company characteristics, such as their professional managerial capacity, the fact that they are technically better qualified and equipped, and operate at high efficiency levels.

It is a fact that Georgian government does not have the appropriate finances to make high investments in wastewater management infrastructure. Public private participation can be considered as a helpful tool for system rehabilitation. Here it should be noted that the application of the public-private participation tool is useful if the governing regulatory system is strong enough so that it can ensure avoidance of negative consequences that can result from private participation in the management of public assets (World Bank, 2003b). Transfer of responsibilities to the private sector can lead to environmental pollution unless there are adequate regulatory controls and the political and financial backing to enforce them. Clearly, strong governments are needed to actively promote schemes among potential partners, to ensure that necessary tools are in place and that companies comply with their obligations (UNEP/WHO/HABITAT/WSSCC, 2004).

Georgia at this stage does not have appropriate regulatory tools to control foreign investment companies' operations and to avoid undesirable consequences that can result from private participation in the management of public assets. However this is not the only problem that can prevent foreign private company involvement in wastewater infrastructure in Georgia.

The Gruz-vodocanal LLC is working actively in this direction to attract and involve foreign private investor companies who will rehabilitate the wastewater infrastructure in Georgia. Based on the information provided by WWTP administration generally, there is little interest from the foreign private sector to be involved in the provision of W&WW services in Georgia (the interest was low both before, as well as after, the revolution). The country where the revolution happened three years ago can create reasonable debts in foreign firms for making the investments. Water payment should also play important role in the attraction of investments for the rehabilitation of the systems (UNDP/SIDA, 2005). Provision of a W&WW service is absolutely unprofitable in Tbilisi. Revenues from water services do not even cover operational and maintenance cost of the utility.

## **Public-public participation**

In Georgia the third sector is active at a certain level and can influence decision making processes, e.g. there was strong protest from the third sector against the lease contract of Tbilvodo canal LLC to “General Deso”. The result was that the project was suspended. In Georgia, the general public’s right to participate in decision-making is secured by the Constitution of Georgia, Law on Environmental Protection, and Aarhus Convention. (OECD, 2005c). “Yet, the idea of ‘community-based’ resource management, in which local resource users participate in planning and management decisions about their rights to, and responsibilities for, resource use, remains alien – both to communities themselves and to government institutions” (WB, 1995). The Municipal Infrastructure Rehabilitation Project addressed this issue to assist public-public participation; this was included in the institutional development element, through capacity building and awareness raising activities.

The cited comment was made in MIRP, Environmental Assessment Report, in 1995. Problems still exist. To change the attitudes and prepare the population and local municipalities for proactive participation issues a great effort is needed. Currently, the Parliament is reviewing a law on public involvement in the local self-governance authorities, the adoption of which would enhance the influence of the general public on environmental protection issues (OECD, 2005c).

## 6 Conclusions and Recommendation

### 6.1 Conclusions

**I.** The aim of the thesis was to analyse proposed strategies to rehabilitate the W&WW treatment system in Tbilisi with a view to recommending sustainable solutions.

The objectives of the thesis were to:

1. define W&WW sector sustainability criteria
2. draw the general picture of the W&WW sector in Tbilisi
3. identify the problems related to the sector
4. analyse proposed strategies by domestic and international aid organisations for W&WW sector rehabilitation and compare these with the W&WW sector sustainability criteria
5. define the strategies for W&WW sector rehabilitation in Tbilisi to reaching sustainability.

Objective 1 was addressed in Chapter 2 through examining various approaches for sustainable W&WW system management proposed by different international institutions and then choosing the most 'repeated principles'. Objectives 2 & 3 were addressed in Chapter 3 through a literature review, interviews and observation. Objective 4 was addressed in Chapter 5 through analysing proposed strategies against the defined W&WW sector sustainability criteria, and Objective 5 was addressed in Chapter 6, where possible sustainable solutions were recommended.

**II.** The sustainable development and management of water resources, which includes the water supply, wastewater management and pollution controls, is one of the critical and complex issues for both rich and poor countries. The main reasons for inefficient and inadequate wastewater management are: lack of political willingness and financial resources, poor policy and institutional frameworks at all levels of governance, neglected stakeholder interests and consumers' preferences, low prestige and recognition of the wastewater sector as well as low public awareness and lack of solidarity, and in addition, inadequacy of the chosen technologies and approaches for sufficient management of resources. It is one of the greatest challenges to provide sustainable water supply and sanitation, especially in low-income areas. The issues are multi-faceted and include technical feasibility, affordability, customs and practices, preferences, and institutional support available. Finding a balance between environmental, social, economic, and political considerations is necessary to address the question of sustainability.

Various international organizations have elaborated different strategies for sustainable management of a W&WW treatment sector. However, all these proposed approaches are quite similar to each other. The most often repeated principles are the following:

- To secure political commitment

- Create an enabling environment for sustainable solutions
- Stakeholders' involvement from the very beginning
- Application of demand-driven approaches
- Pollution prevention at source, water conservation and efficient use of water
- Application of 'the user pays' and 'the polluter pays' principles
- Step-by-step approach
- Integration of the municipal wastewater sector into other economic sectors
- Public-private partnerships, and also public-public partnerships.

**III.** Nowadays, W&WW sector rehabilitation is not among the priorities of Georgia's economic and social policy. This is reflected in a low level of budget financed capital investments. The continuing priority is public order and safety. However, Georgia recognizes the need and is willing to treat environmental issues as an integral part of the overall strategy for economic and social development. The three basic principles of sustainability, equity (everyone has rights) and health promotion (to live in a healthy environment), and protection of the environment (the state undertakes to protect the natural environment) are addressed in the Georgian constitution. After the "Rose Revolution" (2003), the country's economy started to stabilize and, at the same time, the capital investments in W&WW sector have increased. Overall there is low political commitment to address W&WW sector rehabilitation, which is mostly caused due to lack of financial affordability.

**IV.** In Georgia, the W&WW network penetration is high according to international standards; however, the system is in a poor condition and in need of rehabilitation and reconstruction. Wastewater discharges, coming largely from the Tbilisi region, with inefficient or no treatment, are having a serious impact on surface water quality and on downstream communities. Since 1990s' no significant reconstruction works have been conducted within the W&WW infrastructure. At time of writing, treatment plants, including Gardabani regional WWTP, cannot provide any biological purification of municipal sewage, since the technical facilities are out of order; therefore wastewater treatment efficiency is low. A serious problem in the municipal sector is the inefficiency of water resources management. The vast majority of the water transportation infrastructure requires replacement and capital reconstruction. The poor quality of the distribution network results in water losses at a high rate.

**V.** No metering practice and low charges on water create low incentives for water efficiency in households. The high consumption rate is partially overrated by poor technical conditions of the water supply network. However, it is still high; low awareness and cultural issues are among the other reasons of water inefficiency. The third sector is passive in the provision of awareness raising activities about water conservation issues for Tbilisi residents. The raising of tariffs and the implementation of other tools to create incentives for water efficiency improvement is not planned by local/national government. For example, the installation of water meters was

recommended in two projects: Support to the Georgian Government in Developing and Implementing a Financial Strategy for Urban Water Supply and Sanitation in Georgia - Carrying out the Feasibility Analysis (Volume I Financing Strategy), and Municipal Water and Wastewater Sector in Georgia - Background Analysis for Financing Strategy.

**VI.** There are no economic instruments (pollution taxes) in place to create incentives in industry for eco-efficiency. Fines as well as fees are not structured in a way to provide the right incentives to encourage pollution control or investments in eco-efficiency. Poor institutional and regulative frameworks are also among the reasons for eco-inefficiency in industry.

**VII.** Since the sector reform, which was based on the subsidiarity principle (initiated in MDDP and furthered in MDDP II (which is still under implementation)), and since the restructuring of the Georgian government, the local municipalities now have the lead role for the regular operation and development of W&WW utilities. In addition to the local authorities, national government is also responsible for safe W&WW service provision in towns and villages of Georgia. Overall institutional structure, according to the sustainability criteria, is in place in Georgia. However, poorly defined responsibility among local and national authorities, inadequate management, and lack of financial and human resources prevent adequate W&WW service provision.

Decentralisation is a complex process and especially in Georgia, where there is no previous experience in this sphere. There is still much work to be done to increase the effectiveness of local government in the management of infrastructure and the delivery of utility services.

**VIII.** Georgia does not have a suitable environment to ensure the financial sustainability of the W&WW sector. W&WW service provision is not financially profitable for the utility. The sector depends on governmental subsidies. The high level of non-operational water losses, illegally connected consumers, low payment discipline and non-enforceability of the law which would disconnect non-payers from the network, are among the reasons for the financial difficulties of the utility. The inadequate tariff policy does not allow for the creation of sustainable wastewater management with efficient cost-recovery systems.

**IX.** The approved household tariffs in Tbilisi partially cover the operational and maintenance costs of the utility. However, 'the user pays' principle in Georgia is applied in a socially acceptable way, considering the users' willingness and affordability to pay for the service provided. Only the mechanical treatment stage provision is applicable to the Georgian community; no other appropriate wastewater treatment alternatives can be considered for the Georgian community for the long term, and the time span depends on the GDP growth rate. The Georgian government is not planning to raise the household tariff (recommended in the project Support to the Georgian Government in Developing and Implementing a Financial Strategy for Urban Water Supply and Sanitation in Georgia - Carrying out the Feasibility Analysis (Volume II Affordability Analysis), considering the user willingness and affordability to pay for W&WW service. This is even though the TWU has several times raised this issue. Cross-subsidizing is the major social security tool used to preserve low residential charges in Tbilisi and other large towns, to ensure access for all, and thus minimize disease and maximize public health benefits.

**X.** The current situation in Georgia, firstly the “political instability” and secondly the unprofitability of the W&WW service in Tbilisi, creates low incentives in foreign private firms to make investments in the W&WW sector. Hence, Georgia at this stage does not have the appropriate regulatory tools to control foreign investment companies’ operations and to avoid undesirable consequences that can result in the private participation in the management of public assets.

**XI.** In Georgia, the general public’s right to participate in decision-making is secured by the Constitution of Georgia, Law on Environmental Protection, and Aarhus Convention. Generally, the third sector is active at a certain level in Georgia and can influence decision making processes. However, public-public participation is weak in Georgia, since there is no law which would support public involvement in local resource management and planning process.

**XII.** The capital rehabilitation of the wastewater system in Georgia necessitates high initial investments which are not financially affordable for the Georgian government. To avert further deterioration of the service, and improve health and the environment within existing budgetary limits, short term projects were financed rather than longer term or larger ones (which were recommended in the project Water and Wastewater Sector in Georgia - Background Analysis for Financing Strategy).

**XIII.** All money allocated to W&WW infrastructure from projects financed by international organizations (MDDP and MDDP II), as well as from local budgets was primarily used for waster supply and wastewater distribution network repair reconstruction activities, in order to reduce water losses through leakage and address water efficiency measures. During the last years, rehabilitation activities in the W&WW sector in Tbilisi have resulted in water supply service improvement in comparison with previous years, and significant water sieving measures have been implemented in certain districts of Tbilisi city.

**XIV.** Mtkvari river resources are used as potable water by the Azerbaijan community, and inefficiently treated wastewater which is discharged to Mtkvari river causes an impact on the water quality as well as discontentment in society. However, the downstream communities’ interests in W&WW sector management are not accounted for by the Georgian government.

**XV.** Integration of the wastewater infrastructure with the waste supply sector is already in place in Georgia; it was considered at the beginning of the planning process for Gardabani WWTP. Hence, there is an attempt to integrate wastewater infrastructure with agriculture and with urban planning. The Gardabani WWTP whole rehabilitation package includes the introduction of organic fertilizer production as well as the building of a gas holder and methane tank, which would provide the neighbourhoods with natural gas.

Note: Below is summary Table 6-1 which matches domestic and international strategies with identified sustainability principles.

Table 6-1 Wastewater Treatment Infrastructure Matched Against the Identified Principles of Sustainable Sound Wastewater Sector Development

Identified Principles	Match with Principles	
	Addressed Generally	Addressed Through Projects <sup>66</sup> as well
To secure political commitment	There is low political commitment. Waste water treatment sector is not a national priority.	
Create an enabling environment for sustainable solutions	Poor institutional, financial, policy and regulatory frameworks prevent adequate W&WW service provision.	4 & 5
Stakeholders' involvement from the very beginning	Not all stakeholders' interests in W&WW sector management are taken into account	3
Application of demand-driven approaches	addressed	7
Pollution prevention at source, water conservation and efficient use of water	There are no incentives for water/eco-efficiency either in households or in industry	2, 3, 4, 5, 6, 8
Application of 'the user pays' and 'the polluter pays' principles	User charges are lower than the real price of W&WW service; there is not pollution taxes employed in Georgia.	6
Step-by-step approach	addressed	8
Integration of the municipal wastewater sector to other economic sectors	The potential to integrate wastewater with other sectors is not exploited.	
Public-private partnerships, and also public-public	There are low incentives for private firm participation;	1, 3

<sup>66</sup> See numbers of the projects in Table 4-3.

Identified Principles	Match with Principles	
	Addressed Generally	Addressed Through Projects <sup>66</sup> as well
partnerships	public participation is not supported by law.	

As can be seen from the table, most of the principles for W&WW sustainability are poorly addressed in Georgia. The country’s strategy is focused on step by step approaches, hence users’ willingness and affordability to pay for services provided are taken into account. At the same time, the strategies proposed by international organisations are mostly low investment oriented and are focused on water efficiency measures.

### Concluding remarks

In Georgia, the reasons for inefficient and inadequate wastewater management are: lack of political commitment; poor policy, institutional and regulatory frameworks, and neglected stakeholder interests - hence inefficient use of water. However, the main factor which stands behind the abovementioned reasons is lack of money and financial affordability. With limited financial resources, the country’s policy is focused on implementing immediate measures in order to solve current (existing) problems and to avert further degradation of the sector. In this way, it is only possible to maintain current conditions and it is not possible to improve or rehabilitate the sector. However, the current condition of the W&WW sector corresponds to the social conditions of the population; taking into consideration the social environment of the population, the country’s service is set at the level which the population can afford to have.

In addition, there is no overall strategy or plan that would spell out the future conditions for the W&WW sector in Georgia, and consider the country’s development potential and the needs of future generations.

## 6.2 Recommendations

According to the identified problems, and taking into account the financial ability of country to invest in wastewater sector rehabilitation, the following immediate measures are recommended to be realised to achieve sustainability in W&WW sector management:

- The wastewater treatment sector should be prioritised. Therefore, the ongoing consultations with local authorities and governmental bodies should be held by wastewater treatment administrators to create political commitment and ensure financial support from governmental bodies.
- Since there is no strategic plan in Georgia for W&WW sector improvement, and implemented actions in W&WW sector are reactive rather than proactive, clear targets should be set for the level the system should be restored/rehabilitated to. Thus a strategic plan needs to be developed for W&WW system rehabilitation and long term goals should be set. In designing an “appropriate” (feasible, socially acceptable, effective) W&WW sector, the needs of future generations, the country’s development potential and

all interested stakeholders' interests should be taken into account. At the same time, short term steps should be defined and a "strict" timetable for reaching the targets should be framed. In defining the short term steps the current social needs and the country's economic potential should be reflected. Hence, all implemented activities should be reviewed and evaluated and new plans and strategies should be framed for the continuing improvement and development of the W&WW sector.

- The capital rehabilitation of the wastewater system in Georgia necessitates high initial investments which currently is not financially affordable for the Georgian government. The implementation of low investment approaches, such as water efficiency and pollution prevention at source, are reasonable tools to be used in Georgia for W&WW infrastructure sustainability. The introduction of economic instruments which will create incentives in households and in industry for water and eco-efficiency should be initiated by the Georgian government in the first instance. This includes the introduction of metering practices in households and the introduction of 'the polluter pays' principle for industry. Ultimately, low investment approaches will result in a reduction in wastewater quantity and in investment savings relating to the operation and maintenance of sewerage systems and treatment facilities. Hence, revenues from pollution taxes should be used for W&WW sector development. At the same time, the introduction of 'the polluter pays' principle should be supplemented by adequate regulatory mechanisms in order to ensure its successful implementation.
- Despite the fact that in Georgia user charges are employed according to the users' ability to pay for the service provided, low charges on W&WW collection and treatment are among the reasons for the financial insustainability of the sector. The tariffs on water should be raised to the level of the actual price of water delivery to the end users and for the treatment necessary. But the increase in tariffs on water should be supplemented by awareness raising activities to make a basis for households' willingness to pay. Therefore, a special grant programme should be announced by local municipalities and awareness raising activities for water efficiency should be launched in the first instance.
- Georgia at this stage does not have appropriate regulatory tools to control foreign investment companies' operations and to avoid undesirable consequences that can result from private participation in the management of public assets. However, public-private participation can be considered as a helpful tool for system rehabilitation, since the Georgian government does not have appropriate finances to make high investments in the wastewater management infrastructure. The national government should facilitate the involvement of foreign private companies in the W&WW sector and the negotiation process should be held with appropriate representatives. However this process should be supplemented by the creation of adequate regulatory settings. Therefore, additional money should be allocated from the central budget for the improvement of regulatory settings and responsibilities of the local and central governments should be defined clearly. Hence, continuing priority should be given to the decentralisation process in order to increase the effectiveness of local government in the management of infrastructure and delivery of utility services.

The above outlined points are depicted in Figure 6-1 below.

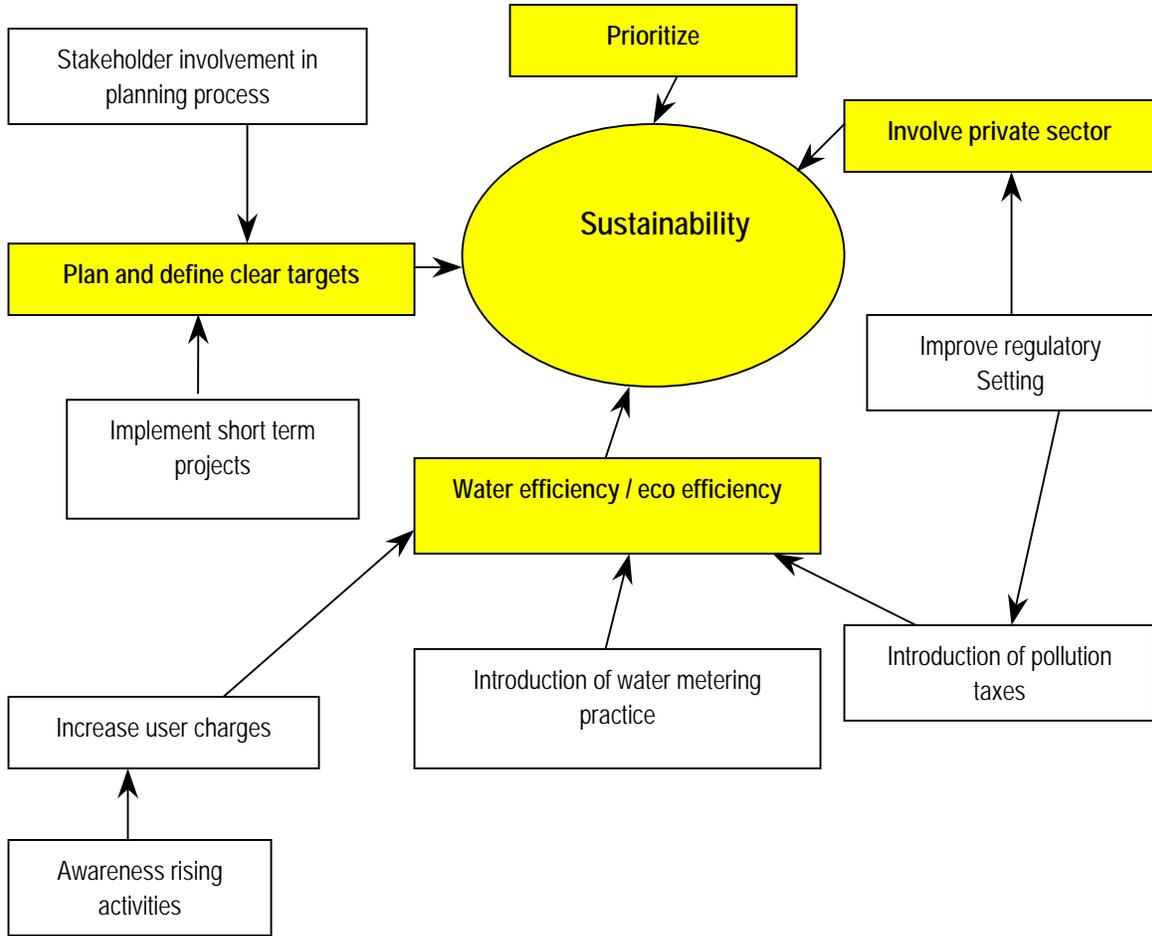


Figure 6-1 Immediate Measures Needed to Be Taken in Georgia to Achieve Sustainability

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## **Abbreviations**

Danish EPA – Danish Environmental Protection Agency

EUWI - European Union Water Initiative

GDP – Gross Domestic Product

GEF - United Nations Development Programme Global Environment Facility

GEL – Georgian Lari (The average annual exchange rate in 2005 was: 1 USD= 2.16 GEL)

GPA - UNEP Global Programme Action

GWU - Georgian Water Utility

HABITAT – United nations Human Settlements Programme

IIIIEE - International Institute for Industrial Environmental Economics

IWLEARN - International Waters Learning Exchange and Recourse Network

LGU - Local Government Units

LLC – Limited Liability Company

MDDP - The Municipal Development and Decentralization Project

MDF - Municipal Development Fund of Georgia

MDG – Millennium Development Goals

MIRP - Municipal Infrastructure Rehabilitation Project

MoE - Ministry of Environment Protection and Natural Resources of Georgia

NEAP – National Environmental Action Plan

NIS – Newly Independent State

OECD – Organisation for Economic Co-operation and Development

SIDA – Swedish International Development Cooperation Agency

TA - Technical Assistance

TACIS - Technical Aid to the Commonwealth of Independent States

TWU – Tbilisi Water Utility

UN – United Nation

UNDP - United Nations Development Programme

UNECE - United Nations Economic Commission for Europe

UNEP - United Nations Environment Programme

UNCCD - United Nations Convention to Combat Desertification

USSR – Union of Soviet Socialist Republics

W&WW - Water and Wastewater

WB – World Bank

WHO- World Health Organization

WSS - Water Supply and Sanitation

WSSCC - Water Supply and Sanitation Collaborative Council

WSSD - World Summit on Sustainable Development

WWTF – Wastewater Treatment Facilities

WWTP - Wastewater Treatment Plant

## Appendix I: Key Principles for Sustainable Municipal W&WW System Development

Table I-1 Sustainability Principles for Municipal W&WW System Development

N	Operation and Maintenance Working Group of the Water Supply and Sanitation Collaborative Council	World Bank (Demand Oriented Approach)	The UNDP, World Bank, Water and Sanitation Programme	Factor determining success of W&WW projects	WHO	UNEP/GPA	UNEP/WHO/HABITAT/WSSCC
1.				Political commitment			Secure political commitment and domestic financial resources as absolute prerequisites for appropriate wastewater management
2.			Responsive institutional arrangements	Adequate institutional frameworks.		create and an enabling environment for action	Create an enabling environment for sustainable solutions at both national and local levels.
3.	Services should normally be set at a level that users are	Sustainable provision of water and sanitation service	Economic replicability/ Choices on		Provide impetus for the development of a range of		Apply demand-driven approaches.

N	Operation and Maintenance Working Group of the Water Supply and Sanitation Collaborative Council	World Bank (Demand Oriented Approach)	The UNDP, World Bank, Water and Sanitation Programme	Factor determining success of W&WW projects	WHO	UNEP/GPA	UNEP/WHO/HABITAT/WSSCC
	willing to finance.	depended on the extent to which consumers preferences and willingness to pay were incorporated in the investment planning and implementation process	technologies and service levels.		systems that are applicable to different cultural and environmental conditions.		
4.				Use of appropriate, environmentally sound technologies.	Create a demand for systems that move increasingly towards safe reuse and recycling of wastewater.	low-cost and environmentally sound sanitation and wastewater treatment technologies	Prevent pollution at the source; use and re-use water efficiently; and apply appropriate low cost technologies for wastewater treatment
5.	Water should be managed as a						Make water users and polluters pay

N	Operation and Maintenance Working Group of the Water Supply and Sanitation Collaborative Council	World Bank (Demand Oriented Approach)	The UNDP, World Bank, Water and Sanitation Programme	Factor determining success of W&WW projects	WHO	UNEP/GPA	UNEP/WHO/HABITAT/WSSCC
	commodity: its use should be financially sound.						for services based on social equity and solidarity to reach cost-recovery.
6.							Use time-bound targets and indicators for environmental integrity as well as on public health or economic welfare to make actions successful.
7.			Step-by-step actions which unbundled services both vertically and horizontally				Implement measures step-by-step while exploring alternatives to reach long-term management

N	Operation and Maintenance Working Group of the Water Supply and Sanitation Collaborative Council	World Bank (Demand Oriented Approach)	The UNDP, World Bank, Water and Sanitation Programme	Factor determining success of W&WW projects	WHO	UNEP/GPA	UNEP/WHO/HABITAT/WSSCC
							goals.
8.		The demand oriented approach should include the needs of all those affected by sanitation services.		Community participation in all stages of project planning, design, implementation, management and operation, with consideration of gender issues	Encourage governments, nongovernmental organizations, the private sector and donors to review their sanitation policies.  / Involve in the design process people for whom the systems are being built.		Involve all stakeholders through partnership from the very beginning to secure their commitment as well as ensure transparency in management and decision-making processes.
9.				Intersectoral coordination and collaboration.			Link the municipal wastewater sector to other economic sectors to ensure financial

N	Operation and Maintenance Working Group of the Water Supply and Sanitation Collaborative Council	World Bank (Demand Oriented Approach)	The UNDP, World Bank, Water and Sanitation Programme	Factor determining success of W&WW projects	WHO	UNEP/GPA	UNEP/WHO/HABITAT/WSSCC
							stability and sustainability.
10	Water supply and sanitation systems should be managed and operated in accordance with the principles of good business practice.	community members may participate in construction, operation, and maintenance		Involvement of the private sector through sound regulatory and controlling mechanisms.		innovative financial mechanisms / appropriate partnerships	Introduce innovative financial mechanisms, including private sector involvement and public-public partnerships
11				Human resources development in all its forms and at all levels / Self-improvement of communities			
12				Better hygiene and sanitation / Improved environmental sanitation in	Help to prevent environmental pollution and degradation.		

N	Operation and Maintenance Working Group of the Water Supply and Sanitation Collaborative Council	World Bank (Demand Oriented Approach)	The UNDP, World Bank, Water and Sanitation Programme	Factor determining success of W&WW projects	WHO	UNEP/GPA	UNEP/WHO/HABITAT/WSSCC
				communities.			
13				Improved information management.	Treat sanitation as a major field of endeavor in its own right, with sufficient investment to revitalize training programmes and professional standing		

## Appendix II: Environmental Taxes

The tax on environmental pollution is meant to encourage polluters to reduce pollution and to promote the rational use of natural resources, as well as to rise funding for environmental activities.

The effectiveness of environmental taxes was hampered and it did not provide real incentives to reduce pollution. Taxes were levied on a high number of pollutants. Pollution taxes could be applied more effectively if they were levied on fewer priority pollutants. There was no adequate equipment to measure the emissions therefore the taxes were not related to actual emissions. To provide real incentives, the tax should be based on actual emissions (OECD, 2003).

Non compliance fee just provided the incentives to reduce pollution to the permissible level but not further (OECD, 2003). Furthermore, the service due to lack of financial resources, was unable to carry out regular inspection to see whether the approval emission limits was met (UNECE, n. d. b);

Generally due to the inadequate management and complexity of the taxation system, lack of finances to conduct regulatory monitoring and inspection processes, institutional weakness - weak enforcement of tax laws, the large shadow economy and widespread corruption the total revenues from all environmental taxes were too low in Georgia (UNECE, n. d. b).

All revenues from environmental taxes collected by tax collection department were primarily used for social purposes such as salaries and pensions and other urgent needs; No environmental fund to support environmental investments has ever been established (UNECE, n. d. b).

## **Appendix III: Information about Municipal Development Fund of Georgia**

Municipal Development Fund: was established in pursuance of the Order of the President No. 294 of 17 June 1997. The main task of the Fund is mobilization of financial resources of international financing institutions, agencies, donors, central and local authorities, for making these resources more accessible for municipalities to invest to the municipal infrastructure and services sector (EUWI, n. d.)

The financing of investment projects by the MDF is made on the following conditions: 20 % is covered by the client of MDF (a local self-government), 40 % - from the governmental grant (International Development Association) and 40 % - from the credit of the Municipal Development Fund. The annual interest rate is 15%, repayment period is 10 years, and grace period is one year (EUWI, n. d.)

## Appendix IV: Wastewater Treatment Stages

The flow scheme of a sewage<sup>67</sup> treatment plant is generally the same for all countries and includes: mechanical, biological and chemical treatment stages. Effluents treatment is conventionally divided into next levels:

**Pre-treatment:** industrial facilities or agricultural processing may create pollutants that can be most effectively treated at the point of generation. Such treatment prior to discharge into a sanitary sewer is called pre-treatment. In many countries, licenses for industrial discharge to sewers require that the influent meet certain water quality standards (WB, 2003 b).

### Primary treatment

Primary treatment is to reduce oils, grease, fats, sand, grit, and coarse (settleable) solids. This step is done entirely with machinery, hence the name mechanical treatment.

### Secondary treatment

Secondary treatment is designed to substantially degrade the biological content of the sewage such as are derived from human waste, food waste, soaps and detergent. The majority of municipal and industrial plants treat the settled sewage liquor using aerobic biological processes.

### Tertiary treatment

Tertiary treatment provides a final stage to raise the effluent quality to the standard required before it is discharged to the receiving environment (sea, river, lake, ground, etc.) More than one tertiary treatment process may be used at any treatment plant. If disinfection is practiced, it is always the final process. It is also called **Effluent polishing**.

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<sup>67</sup> Sewage is the liquid waste from toilets, baths, showers, kitchens, etc. that is disposed of via sewers. In many areas sewage includes some liquid waste from industry and commerce. Much sewage also includes some surface water from roofs or hard-standing. Municipal wastewater therefore includes residential, commercial, and industrial liquid waste discharges, and may include storm water runoff (Wikipedia, 2006).

## Appendix V: Equipment Used in Gardabani Regional Wastewater Treatment Plant



*Figure V-1 Mechanical Filter (out of order)*



*Figure V-2 Sedimentation Tanker (out of order)*

## Appendix VI: Water Consumption Trend in Industry Sector

The major water consumers in Georgia are households, industrial enterprises and agriculture sector (European Union Water Initiative, n. d.).

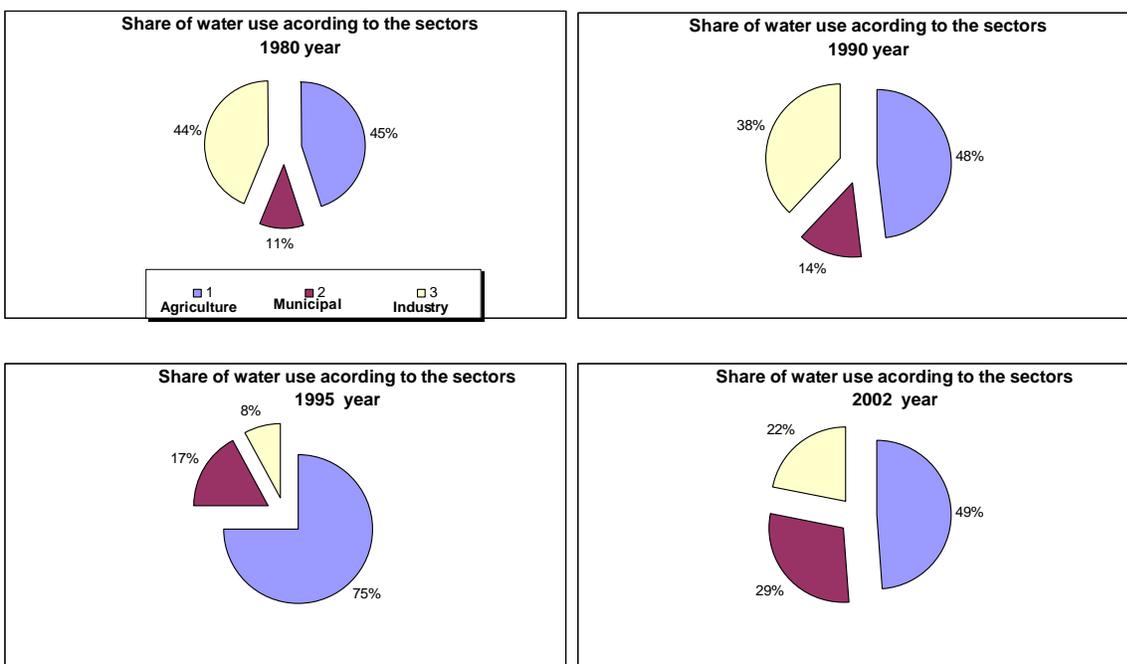


Figure VI-1 Dynamics of Water Use According to the Sectors

Source: UNDP/SIDA, 2005

As it can be seen from Figure VI-1 in 1980 when all sectors of industry worked with full load the water use in agriculture and industry was nearly similar (44 and 45% correspondingly) the share of municipal service was only to 11%; but it has increased from 11% to 29% in 2002 and the share of industry in water use was subject to significant decrease from 44% to 22% in 2002 (UNDP/SIDA, 2005).

After the collapse of the Soviet Union, most large industrial enterprises in Georgia stopped functioning or disintegrated into small ones. Therefore during the last 20 years water consumption in the industrial sector decreased sharply. As it is depicted on the Figure VI-2 below water consumption for the industrial uses declined approximately 9 times (UNDP/SIDA, 2005).

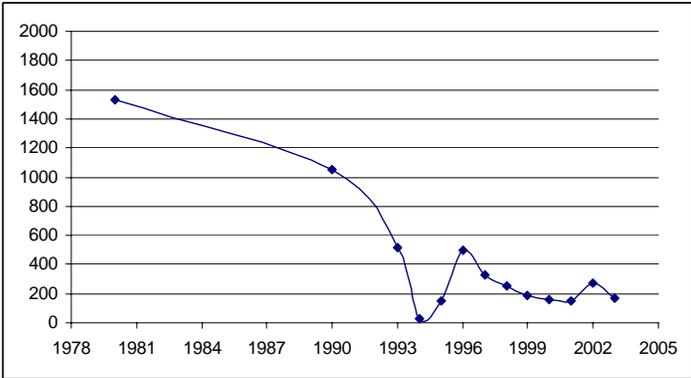


Figure VI-2 Water Use Dynamics in Industry (Million m<sup>3</sup>)

Source: UNDP/SIDA, 2005

## Appendix VII: MDDP Results

### Rehabilitation of Water Supply and Sewerage Systems in Tbilisi

Problem Statement	Inputs	Outputs	Results and Outcomes
Faecal substances from adjacent area were flowing into 'Tbilisi Sea', source of potable water for most of the inhabitants of the city of Tbilisi; This was due to depreciated pumping station and pipes as well as unavailability of electricity for pumping.	Number of projects: 1 Project title: <b>Tbilisi Sea Effluent Project</b> Project Cost – GEL 266,427.81	1. Replacement of the damaged concrete, asbestos cement and ceramic pipes with plastic d=300mm. 576 m. length pipes. 2. Installation of the new collector by using d=200mm. 655m. length, d=300mm. 917m. length, and d=350mm. 691 m. length plastic pipes. 3. Installation of 17m. depth discharge borehole with appropriate processing plants. 4. Rehabilitation of the old and installation of the new inspection wells - 66 pieces – along the full length of the routing.	Faecal substances do not flow into the Tbilisi Sea from the adjacent area as they are directed and self-flowing to a collector.  Project implementation has saved 30-40 thousand kw. power monthly and pumping station maintenance costs which is about GEL 70,000 annually .
Reliability of the water main was poor and it was highly likely to break down. The water main was passing under the cemetery and in case of breakdown it would have been very difficult to undertake repairing works. There was a danger of contamination of water.	Number of projects: 1 Project title: <b>Rehabilitation Works for Carrying-over Vake-Saburtalo Main Pipeline</b> Project Cost – GEL 453,874.26	Carrying over water main d=500mm. – 1460 m. and d=300mm. – 40 m. Installation of precast wells.	Currently the water main is located far off the cemetery and its repair is possible. Hence threat of water contamination is mitigated.
Due to dilapidated underground communications system there was threat of collapse of historic (more than 100 year old buildings) and religious buildings in the center of Tbilisi; underground leakages of drainage and sewage water's constituted 90% of natural underground waters.	Number of projects: 1 Project title: <b>Works for Improving Ground Water Problem in Old Tbilisi</b> Project Cost – GEL 62,5722.85	Installation of: Water pipeline: length – 1140m. pipe diameter – 100-300mm. Sewage System: length – 1975m. pipe diameter – 100-300mm. Storm water inlet system - length – 265m. pipe diameter - 300mm. Cleanout of: d=2000mm. length – 400m. collector; d=1000mm. length – 2110 m. collector ditch.	underground leakages of drainage and sewage water's were reduced to 10% which does not jeopardise safety of the buildings situated in the area.  Elimination of the threat of the buildings' further collapse through rehabilitation of the underground communications.
Water availability, quality	Number of projects: 5	Total length of replaced	Improved operation of the

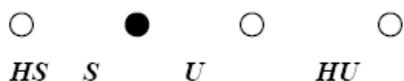
<p>and reliability were inadequate and obsolete sewage system created danger of sewage flowing out on the streets and giving rise to epidemic diseases. Danger of water leakages spoiling road paving.</p>	<p>Projects titles:</p> <ol style="list-style-type: none"> <li><b>1. Rehabilitation Works for Sewer System on Akaki Tsereteli Avenue in Tbilisi</b></li> <li><b>2. Rehabilitation Works for Uridia Street Water Supply and Sewerage Networks in Tbilisi</b></li> <li><b>3. Rehabilitation of Underground Water and Sewerage Lines on Vazha-Pshavela Avenue in Tbilisi</b></li> <li><b>4. Rehabilitation of Underground Water and Sewerage Lines on Nutsbidze Street in Tbilisi</b></li> <li><b>5. Rehabilitation Works for Water Supply Network on N. Dumbadze Avenue, and Davit Aghmashenebeli Avenue, Rehabilitation Works for Water Supply and Sewerage Networks on Ketevan Tsamebuli Avenue, Reinstallation of the Pipeline on Nutsbidze Plateau, Mark "603" in Tbilisi</b></li> </ol> <p>Total cost of the projects: GEL 2,053,268</p>	<p>amortized water and sewer system pipes is 8,561 m. Diameter of the pipes are as follows: 25, 50, 80, 100, 150, 200, 300, 400, 500, 600, 710, 800, 1000 mm. Sewer manholes were installed using precast concrete elements.</p>	<p>sewer main; decreased possibility of faults in the sewer system causing damages to the central avenue and mitigation of threat of spreading epidemic diseases. Possibility of road paving damage through water leakages was reduced.</p>
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Figure VII-1 Rehabilitation of Water Supply and Sewerage System in Tbilisi (MDDP Results)

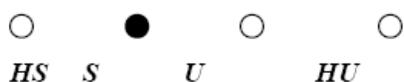
Source: WB, 2003c

**HS = Highly Satisfactory, S = Satisfactory, U = Unsatisfactory, HU = Highly Unsatisfactory**

**Preparatory Work (Audit, sociological surveys, etc)**



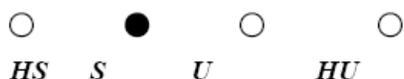
**Internal Financial Management and Accounting**



**Procurement**

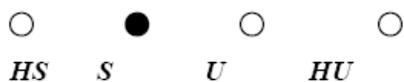


**Drafting of MDA (including FARPs)**

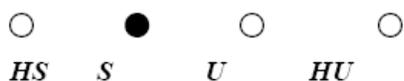


**Implementation of FARPs:**

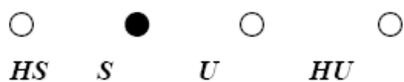
*Financial Management*



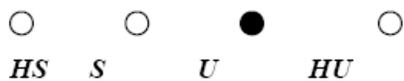
*Administrative and Human Resource Management*



*Transparency of Management and Public Participation*



*Informational Management*



*Training-seminars*

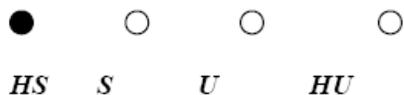


Figure VII-2 MDDP Results

Source: WB, 2003c

## Appendix VIII: MDDP II Results

Table VIII-1 Solving the Road Problem for Lotkini Settlement in Tbilisi

Problem Statement	Inputs	Outputs	Results and Outcomes
<p>About 70% of the main streets of the Lotkini settlement, population 25,500, connecting the area to the major road arteries of the city are damaged due to leakages in water supply and sewerage networks and absence of drainage system. Because of this private and public transportation is limited in the area. Leakages of feces aggravate environmental conditions and intensify the potential of disease outbreaks. Due to breakdowns of the networks the utilities incur considerable incremental operation and maintenance costs.</p>	<p><b>Rehabilitation of Water and Sewerage Systems on Tseronisi, Akhtala and Zakaraia Streets</b></p>	<p>Total length of amortized water and sewer system pipes replaced is 9,250 m. Diameter of the pipes is as follows: 20, 25, 80, 100, 150, 200, 300 mm. Sewer manholes will be installed using precast concrete elements.</p>	<p>Rehabilitation of the Water and Sewerage networks prevents deterioration of the road paving, improves provision of services to the population, pipeline will save at least about USD 37,000 annually, eliminates the threat of disease outbreaks.</p>

Source: MDF of Georgia, 2005.

Table VIII-2 Solving the Road Problem for Svaneti Settlement in Tbilisi

Problem Statement	Inputs	Outputs	Results and Outcomes
<p>About 70% of the main streets of the Svaneti settlement, population 15,200, connecting the area to the major road arteries of the city are damaged due to leakages in water supply and sewerage networks. Because of this private and public transportation is limited in the area. Leakages of feces aggravate environmental conditions and intensify the potential of disease outbreaks. Due to breakdowns of the networks the utilities incur considerable incremental operation and maintenance costs.</p>	<p><b>Rehabilitation of Water and Sewerage Systems on Graneli, Lami and Davitasvili Streets</b></p>	<p>Total length of amortized water and sewer system pipes replaced is 4,329 m. Diameter of the pipes is as follows: 20, 25, 110, 160, 225, 315, 450, 500 mm. Sewer manholes were installed using precast concrete elements.</p>	<p>Rehabilitation of the Water and Sewerage networks prevents deterioration of the road paving, improves provision of services to the population, pipeline will save at least about USD 37,600 annually, eliminates the threat of disease outbreaks.</p> <p>Improved environmental conditions.</p>

Source: MDF of Georgia, 2005.

Table VIII-3 Rehabilitation of Road Pavement and Water Supply System on Panaskerteli-Tsitsishvili Street in Tbilisi

Problem Statement	Inputs	Outputs	Results and Outcomes
<p>About 80% of Panaskerteli-Tsitsishvili Street, connecting the Ikalto Mta Settlement (population 15,500) to the major arterial roads of the city is damaged due to leakages in water supply system and absence of road maintenance. Due to breakages in the network the water utility incurs considerable incremental operation and maintenance costs.</p>	<p><b>Rehabilitation of Water System on Panaskerteli-Tsitsishvili Street</b></p>	<p>Total length of amortized water pipes replaced is 1,445 m. Diameter of the pipes is as follows: 25, 75, 100, 150, 250, 300 mm.</p>	<p>Decrease of annual O&amp;M costs for Water Supply System by GEL 76,200 from GEL 143,700 to GEL 67,500 due to elimination of leakages and absence of breakages in the system.</p>

Source: MDF of Georgia, 2005.

Table VIII-4 Rehabilitation of Tbilisi Water Supply Facilities in Aragvi Gorge

Problem Statement	Inputs	Outputs	Results and Outcomes
<p>The natural calamity taking place in May-June of the current year resulted in disastrous increase of water level and respective serious damage to Tbilisi water industry and communications located in Aragvi Gorge. Within a short period of time, repeating floods and mudflows have caused damage to the buffer ponds, infiltration grounds, idle spillway, settlers, check dams and infiltration ground feeding ducts.</p>	<ol style="list-style-type: none"> <li>1. <b>Rehabilitation Works for D=1100mm Water Pipe at the Junction of the Rivers Tedzami and Aragvi</b></li> <li>2. <b>Rehabilitation Works for Dusheti Gorge Channel and Standby Headworks in Zhinvali</b></li> <li>3. <b>Emergency Rehabilitation Works for Zhinvali Hydro Power Station Discharge Channel, Cleaning the Dusheti Gorge Channel and Temporary Rehabilitation of the Damaged Site</b></li> <li>4. <b>Rehabilitation of the d=700mm duct feeding the Bulachauri water supply infiltration grounds on the right bank of the River Aragvi</b></li> <li>5. <b>Rehabilitation of the d=900mm damaged duct for Choporti and Misaktsieli settlers in the active bed of the River Aragvi</b></li> <li>6. <b>Cleaning Works for Zhinvali Hydro Power Station Discharge Channel, Dusheti Gorge Channel, Buffer Pond and Standby Headwork Dam's Head and Tail Races, Installation of Temporary Channel and Water-intake Crater</b></li> <li>7. <b>Rehabilitation of the Misaktsieli check dam</b></li> <li>8. <b>Rehabilitation of Choporti reservoir water intake and check dam</b></li> <li>9. <b>Rehabilitation of Abanoskhevi check dam</b></li> <li>10. <b>Rehabilitation of Saguramo reservoir check dam</b></li> <li>11. <b>Cleaning Choporti reservoir</b></li> <li>12. <b>Installation of the By-pass Raw Water Pipeline and Rehabilitation of the existing #1, 2, 3 and 4 Settlers, Infiltration Grounds and Drain Pipes of Natakhtari Water Supply System</b></li> </ol>	<p>Dredged main buffer pond and five settlers.</p> <p>Rehabilitated three ducts and four check dams.</p>	<p>Provision of reliable water supply for Tbilisi City.</p> <p>Improved quality of potable water supplied to the City.</p> <p>Protection of water supply facilities against raised water level in the river Aragvi.</p>

Source: MDF of Georgia, 2005.

## **Appendix IX: Millennium Development Goals**

Georgia is one of the countries which signed the Millennium Declaration, thus undertaking the integration of the MDGs into the national development strategies, as well as periodical reporting on the goal achievement progress.

Following the undertaken obligations, on 26 August 2003, the Georgian Government Decree on establishment of a governmental commission for preparation of a MDGs implementation report was signed. After the revolution of November 2003, a new Georgian Government renewed the commission and assigned its activity on a permanent basis (Governmental Resolution No. 7, 31 March 2004).

Goal 7 of the MDGs is sustainable environmental development. The aim is that, before 2015, the number of the population who do not have sustainable access to safe drinking water and "basic sewerage" should be reduced by half. In spite of the fact that the MDGs (including those related to water supply and sewerage) were formulated in 2000, the baseline year was accepted as 1990.

### **Sustainable drinking water access in MDGs terminology means:**

- Access to an adequate amount of safe water (including treated surface water, as well as untreated but not polluted water sources, such as springs and wells)
- In urban areas, water sources may be a fountain or a stand-pipe tap located no further than 200 m from a dwelling
- it is assumed that rural households should not spend considerable time to get water;
- An adequate amount of water is a volume corresponding to physiological/metabolic, hygienic and domestic consumption requirements.

### **Access to "basic sewerage" in MDGs terminology means:**

- Defecation facilities preventing the contact of people, animals and insects with the excrements
- Appropriate facilities are understood in MDGs as simple, but protected cesspools and toilets discharging into the sewerage piping
- To ensure effective performance, the facilities should be duly constructed and operated.

## Appendix X: Result of Metering Practice in Yerevan (Armenia) and Moldova

In Yerevan, Armenia, a metering programme resulted in about 80 per cent of connections being metered by 2004. This has had the effect of driving down consumption as well as production, which in the case of Moldova have decreased by about 60 per cent, with a water consumption level of 0.15 m<sup>3</sup> per capita per day close to EU levels.

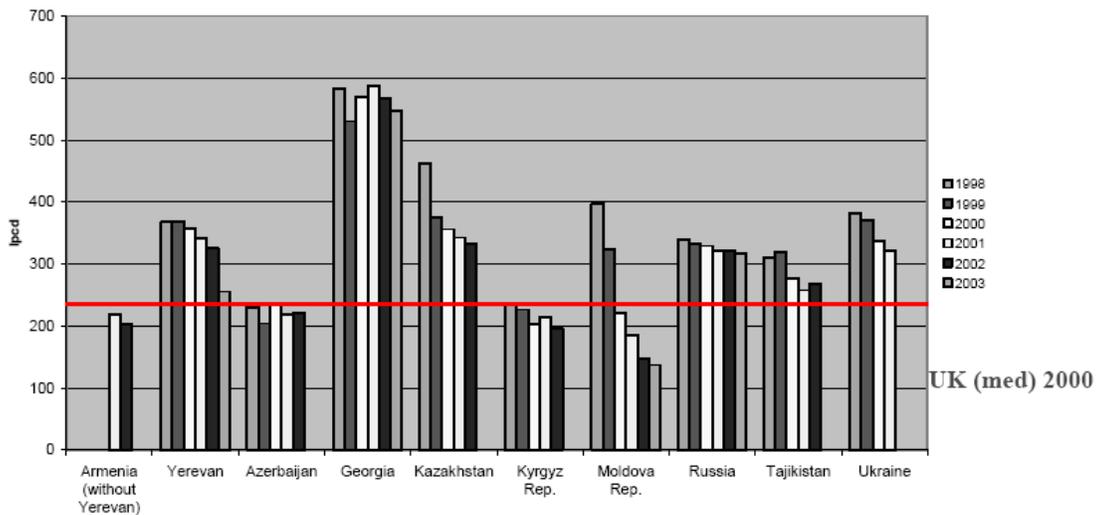


Figure X-1 Total Water Consumption (litres<sup>68</sup> per capita per day)

Source: OECD, 2005 b

<sup>68</sup> 1000 litre = 1 m<sup>3</sup>