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MUNICIPAL WATER SECTOR REVIEW

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Municipal Water Sector Review

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Acronyms and Abbreviations

BOD5	biochemical oxygen demand
BOT	build operate transfer
BYR	Belarusian ruble (value as of March 26, 2013)
BYR_{2006}	Belarusian ruble (average value in 2006)
BYR_{2011}	Belarusian ruble (average value in 2011)
CAPEX	capital expenditures
CIS	Commonwealth of Independent States
COD	chemical oxygen demand
CSO	civil society organization
DBO5	biological oxygen demand
EBRD	European Bank for Reconstruction and Development
ECA	Europe and Central Asia
EU	European Union
GDP	gross domestic product
HBS	household budget survey
IBRD	International Bank for Reconstruction and Development
IBNet	International Benchmarking Network
IEC	International Electrotechnical Commission
IFI	International Financial Institution
IFRS	International Financial Reporting Standards
ILI	infrastructure leakage index
ISO	International Organization for Standardization
KPI	key performance indicator
LLI	leakages loss index
MAC	Ministry of Architecture and Construction
MHU	Ministry of Housing and Utilities
MNRE	Ministry Natuarl Resources and Environment
MOE	Ministry of Economy
MOF	Ministry of Finance
MOH	Ministry of Health
MU	multi-service utility
N	nitrogen
NIB	Nordic Investment Bank
NRW	non-revenue water
OALG	Oblast Association of Local Governments
OECD	Organization for Economic Co-operation and Development
OPEX	operating expenditures

P	phosphorus
PI	performance indicator
PPP	public-private partnership
RWWU	Regional Water and Wastewater Utility
SS	suspended solids
UARL	unavoidable real losses
UNECE	United Nations Economic Commission for Europe
UNICEF	United Nations Children's Fund
US$	United States dollars
VAT	value added tax
WHO	World Health Organization

Executive Summary

This paper offers a diagnostic of the water and wastewater sector, addressing the sector's institutional, organizational, technical, and economic aspects, with a specific focus on urban areas. It documents the achievements made so far, identifies areas that need strengthening, and suggests policies to help guide the government as it seeks to increase the efficiency and sustainability of water and wastewater services.

1. Sector diagnostic

Over the last decade, significant national investment programs enabled Belarus to significantly improve the quality of water and wastewater services, but major challenges remain. The level of service in urban areas is very high: coverage is nearly universal and water is supplied on a continuous basis in almost all utilities at acceptable potability standards. Despite these important achievements, vast new investments are required. In particular, investments are needed to close coverage gaps in rural areas, expand wastewater treatment capacity and align it with European standards, and to address remaining water supply quality issues.

By regional standards, water utilities show an overall acceptable performance that could be improved upon, especially in small towns. With average *non-revenue water* levels of 20 to 35 percent, Belarus performs better than most regional peers and is comparable to many middle-income countries. Further reductions are possible, but may not be achievable in all utilities at an economically justified cost. Needs for improvement are most acute in multi-utilities. In terms of *energy efficiency* special energy audits would be necessary to assess the utilities' performance. *Collection rates* are excellent at close to 100 percent. However, with an average of 7 staff per 1,000 customers, *staff productivity* is far from recommended levels—a conclusion confirmed through utilities visits and that stands even considering the near absence of outsourcing. Small- or medium-size utilities often have a suboptimal level of performance and capacity, perpetuated by the absence of contractual performance requirements from local authorities and a lack of performance-oriented culture.

The sector's legal and institutional framework is, overall, well-defined and functional, but an insufficient operational regulation undermines the efficiency of services. Sector responsibilities are clearly assigned, and the main functions (policy formulation, regulation, service provision) are unbundled, a key condition for good sector governance. However, the lack of performance requirements for service providers hinders sector efficiency. Also, the sector lacks a set of well-defined performance indicators to accurately assess the internal performance of each utility, to define objectives and targets for its development and to perform sector-wide benchmarking.

The water and wastewater sector in Belarus shows a solid but ageing and oversized infrastructure, which urgently requires modernization. Except for recently constructed facilities, the infrastructure is rather old and in dilapidated condition due to lack of maintenance over the past two decades. The current rate of replacement as the networks age does not seem sufficient to reverse their overall deterioration. Water demand has almost halved since 1991, along with a decrease in industrial output and the spread of water metering. As a result water and

wastewater systems are now greatly oversized, resulting in excessive maintenance costs and operating difficulties.

Investment planning is not geared towards the stimulation of efficiency. Existing infrastructure design and sizing norms often lead to excessive investment and operating costs. Investments are often identified without any reference to a master plan and appraised without the clear and transparent procedures required to guarantee the efficiency of capital investments. Infrastructure renewal is often planned without any updated assessment of current needs, perpetuating infrastructure overcapacity.

The socially driven tariff policy leaves the sector dependent upon recurrent budget support and a few large customers to generate revenue. The tariff for water and wastewater services reflects strong social considerations for residential consumers and guarantees them access to services at an affordable cost. Cost recovery ratios are overall acceptable due to significant cross-subsidization between customer categories. Yet, cross-subsidization represents a vulnerability for the entire sector since less than 2 percent of customers account for 30 percent of consumption and 77 percent of revenues. Even with cross-subsidization, about 25 percent of utilities have very low levels of cost recovery. Operational subsidies are allocated on an recurrent basis to systematically cover losses incurred by the utilities, a practice that does not encourage operational efficiency.

Financing sector development and modernization will represent a major challenge in the context of the national government's intention to significantly reduce its financial support. The 2011-2015 Social and Economic Development Program aims to eliminate both operational and cross-subsidies by 2015. This reform of sector financing policies is further complicated by the continuing decrease in residential consumption and the incapacity of local markets to provide funding on terms consistent with the economy of the sector. These daunting challenges call for (i) sound sector policies conducive to economically efficient investment programs and water and wastewater operations, and (ii) financing mechanisms guaranteeing sector sustainability, while ensuring the affordability of services.

2. Recommendations

This review recommends that utilities be regionalized to generate economies of scale; pool the capacities, means, and resources; and facilitate access to funds. Under the proposed arrangement, local governments maintain control over utility assets and form a regional association of local governments at oblast level. This entity would manage a regional operator on the basis of a performance-based delegation contract. The proposed reforms would assist local governments, particularly smaller ones, by: (i) professionalizing water supply and wastewater service providers, (ii) accessing funds for the rehabilitation and development of their infrastructure, and (iii) assuming legal responsibility for providing water supply and wastewater services (setting performance objectives, planning and financing investments). It would also unleash the potential for achieving both investment and operational economies of scale.

Utility regulation needs to be reinforced by the introduction of benchmarking or yardstick competition, and by the set-up of performance-based contracts with their asset-owners. It is essential for sector policy-makers to monitor the performance of utilities, so that asset owners can set adequate performance objectives for their utilities and encourage good management. Sector benchmarking requires utility performance indicators clearly defined and made available by the central government. A regulatory framework can then be developed with a set of incentives and penalties to encourage performance improvements.

Key recommendations to improve the efficiency of utility operations include the development of a performance-oriented management culture and the involvement of the private sector. Efficiency gains could be fostered at all levels by developing a performance-oriented culture, including the recruitment of managers on a competitive basis, the adoption of attractive compensation policies, the development of business management competencies,

and the discontinuation of the norm-based staffing approach. Competitive service contracts with clear performance objectives could provide a first step in improving operational efficiency in areas where the utilities lack resources and experience.

Several actions are proposed to maintain technical and commercial performance at the current level, if not to improve them. First, energy audits could assess the full potential for energy efficiency improvement. Second, in utilities with high or deteriorating non-water revenue, control teams specifically dedicated to the reduction and control of losses could be set up and given performance objectives and remuneration incentives. Third, with the planned reform of residential tariffs and possibly the rise of water theft, utilities' capacity to monitor meter reading and manage customer relations will become increasingly important.

In addition, major improvements in the economic efficiency of capital investments can be achieved through a reform of project design and selection approaches. Design norms and criteria could be extensively revised, with the objective of maximizing economic and financial returns on investments. The submission of master plans containing clear, relevant prioritization criteria would be mandatory for project funding requests. These plans could be prepared at both local and regional levels, the latter enabling managers to identify possible economies of scale achievable by merging certain facilities. The allocation of public funds for infrastructure development would be systematically based on the appraisal of these master plans.

Tariffs could be regulated by contract according to key objectives, such as recovery of costs, increased efficiency, equity between customers, and affordability of services. The recovery of operating costs could ultimately extend to the long-run marginal cost of water, and sector economic regulation could continue to be performed by the Ministry of Economy. Once regionalization is in place, the Ministry of Economy would remain responsible for the definition of tariff principles, structure and setting methodology, while tariff levels would be set by the oblast associations of local governments in collaboration with their concessionaires in their respective regions. A detailed economic and financial model could be prepared to define and update the tariff structure and levels as needed.

The government's objective of eliminating operating subsidies and cross-subsidization by 2015 appears ambitious and will require significant tariff increases in the short-term. Based on preliminary financial modeling, residential tariffs would need to increase at least 78 percent per year to achieve such an objective within two years. Alternatively, residential tariffs could rise more gradually. For example, annual 10 percent increases for five years would create sufficient sales revenue to cover operations and maintenance costs. After 10 years of increases, revenue could be sufficient to cover depreciation and financing costs. Under this scenario the cross-subsidization ratio between legal entities and residential tariffs would be 2 to 1. Entirely eliminating cross-subsidization over that period would require a steeper residential tariff increase, 13 percent per year until 2023. Another option is to first eliminate operating subsidies and then, when sales revenues are sufficient to cover operating costs, gradually eliminate cross-subsidies.

A capital financing strategy could balance contributions from taxpayers and from service users, and be informed by further analyses of: the social impact of tariffs and the fiscal burden of infrastructure financing. The optimal mix of financing sources between development grants, borrowing from local sources and cash generation depends upon factors such as the efficiency of the taxation system, customers' capacity to pay and the availability of local capital markets. Further analyses would be required to propose specific recommendations. In the meantime general recommendations include: (i) maintaining the allocation of capital development grants for projects with a strong "public good" element (e.g. wastewater treatment focused on low-income households), and (ii) assisting asset owners, or their concessionaires, to progressively build their credit record by borrowing from the central government on terms close to those of the local market.

The preparation of a national sector strategy document would help foster understanding and support of the new sector policies from all stakeholders and development partners. Such a document would provide sector guidance for regional and local governments, as well as water supply and wastewater operators. It would serve as a detailed road map for the development of the sector making the issues, actions, and solutions understandable to the widest possible group of stakeholders. This document might also stimulate support for specific aspects of the proposed reform from potential donors, such as international financial institutions.

The timeframe of each recommendation is summarized in Table 1. A level of priority is proposed for each recommendation, on the basis of criteria such as: the expected benefits for the sector and services end users; their ease of implementation; the implementation time requirements; and the need for preliminary analytical design work.

Areas for further research include: (i) a sector review focusing specifically on water and sanitation services in rural areas; (ii) an assessment of costs and potential benefits of the above recommendations, in order to help the government better prioritize them; and (iii) the development of a more detailed financial model of the sector to fine-tune the tariff policy analysis; (iv) an analysis of the fiscal burden of infrastructure financing and of the social impacts of tariffs to identify the optimal cost-sharing arrangement between taxpayers and service users; and (v) a review of the current policy on homeowners' associations and its implications of the efficiency of communal services.

TABLE 1: SUMMARY OF RECOMMENDATIONS PROPOSED IN THIS REPORT

Specific objectives and challenges	Policy/instrument	Seesection (Part II)	Level of priority	0-2 year	3–5 years	5–10 years	Leading agency
OBJECTIVE 1— DEVELOP THE SECTOR POLICY AND LEGAL FRAMEWORK							
Foster consensus and support	Consolidated policy statement	1	High				MHU
	National sector strategy	1	High				MHU
Fill gaps in legislation	Update legislation (sanitation, etc.)	1	Moderate				MHU
OBJECTIVE 2—INCREASE OPERATIONAL EFFICIENCY							
Improve overall operational performance	Regionalization of services	2.1	Moderate				MHU
	Benchmarking and yardstick competition	2.2	Highest				MHU
	Improved social accountability	2.2	High				MHU
	Private sector involvement	2.3	High				MHU
	Improved business planning	2.7	Moderate				MHU
	Financial reporting standards and auditing	2.7	Moderate				MOF
Improve operation and maintenance performance	Energy audits	2.4	High				MHU
	NRW management teams	2.4	Moderate				MHU
Improve commercial performance	Block metering and metering oversight	2.5	Moderate				MHU
	Bulk water billing to hot water utilities	2.5	Moderate				MHU
Improve staff productivity and capacity	Salaries and incentives management	2.6	High				MHU
	Staffing rationalization	2.6	High				MHU
	Diversification of competencies and certification	2.6	Moderate				MHU
OBJECTIVE 3—INCREASE EFFICIENCY OF INVESTMENTS							
Rationalize investments	Review design criteria	3	Highest				MAC
	Projects appraisal and prioritization	3	High				MHU
	Increased responsibility of asset owners in infrastructure financing	3	Moderate				MOF
Achieve economies of scale	Regionalization of services	3	High				MHU
	Regional master plans	3	Low				MHU
OBJECTIVE 4—FINANCE THE DEVELOPMENT OF SERVICES							
Tariff regulation and policy	Tariff setting model	4.1	Highest				MOE
	Target for recovery of operating costs	4.3					
	Potential target for recovery of operating and investment financing costs	4.3					
	Performance-based allocation of operating subsidies	4.1	High				MOF
	Social impact - capacity to pay study	4.4	Highest				MOE
	Social assistance mechanisms (review)	4.4	Moderate				MOE
Enable access to private financing	Development of asset owners/concessionaire's credit records	4.2	Low				MOF

Abbreviations: MHU: Ministry of Housing and Utilities / MAC: Ministry of Architecture and Construction / MOF: Ministry of Finance / MOE: Ministry of Economy

Introduction

Belarus's water and wastewater sector has faced significant financial and institutional challenges since the collapse of the Soviet Union. Over the last decade, the government has conducted a series of ambitious sector development programs, supported recently by several international development partners, especially the World Bank. Given such large-scale engagement, the accumulation of experience, the availability of new information, and the emergence of new challenges, it is appropriate to undertake a review where the sector stands and explore options to move forward.

At the request of the Government of the Republic of Belarus, the Bank conducted a review focusing on the sector's institutional, organizational, technical, and economic aspects. This includes examining a number of policy options for the future. The review documents the achievements made so far, identifies areas that need strengthening, and suggests policies to help guide the government as it seeks to increase the efficiency and sustainability of water and wastewater services.

The review concludes that the coverage, quality, and reliability of services have improved steadily over the last decade, reaching excellent levels of service particularly in urban areas. Despite these successes thus far, issues remain with access to services in rural areas and expansion of wastewater treatment services. Financing sector development presents a major challenge given the rapid reduction of operating subsidies and cross-subsidization planned by the national government. These daunting challenges call for sound sector policies conducive to economically efficient investment programs and water and wastewater operations.

The topics covered in the review were identified after close consultation with the Ministry of Housing and Utilities. To fill in the knowledge gaps, a survey was conducted with 25 water and wastewater utilities. Their random selection was by criteria such as (i) their distribution across the six oblasts, (ii) the representativeness of different types and sizes of utilities found in the sector, and (iii) the absence of other extensive sources of information (i.e. feasibility studies produced during the ongoing Water Supply and Sanitation Project with World Bank financial support and under the Belarus Environmental Infrastructure Facility financed by the European Bank for Reconstruction and Development project).

The specific challenges and solutions relevant to the rural context are not discussed in this review, which focuses primarily on urban areas. In addition, the situation in Minsk is not specifically addressed in the review, since detailed information on the performance of its utility was not made available for the present review.

This review is organized in two parts. The first describes the status of water and wastewater services, current performance, and modernization needs. The second outlines recommendations to foster the sector's development and to improve its efficiency and sustainability. The review does not aim to be an exhaustive study of the issues at hand or provide answers to all the challenges that reform will present for these two sectors. Rather, it is a strategic analysis meant to identify the main pillars of reform that could be implemented based on the results of this study.

Part I
Sector Diagnostic

1 Background

The organization, constraints and challenges of the water and wastewater sector are closely linked to Belarus's political, demographic, and socio-economic features, described in the following subsections.

1.1 Administrative and political organization

Administratively, Belarus is based on a three-tier government model, with the capital city having a status of its own. At the top tier the Republic of Belarus is organized into six regions or oblasts: Brest, Gomel, Mogilev, Vitebsk, Grodno, and the city of Minsk. The capital city, Minsk, has special status. Each oblast is subdivided into districts or raions, 118 in all (as shown in Figure 1). The lowest tier of government is comprised of villages, rural settlements and towns of raion's subordination. The most populous raions are administered from one of the six oblast capitals (including the city of Minsk); the mid-size raions, from one of the 12 cities subordinate to the oblast; and the small raions, from one of the 99 towns subordinate to the raions.

At the regional and local levels, administrative bodies are composed of a council of deputies and an executive committee. Local councils of deputies are elected in each oblast, city, and raion, as well as in villages; these councils form the local legislative authority. Deputies are elected to a 4-year term to deal with local issues, such as health, education, social welfare, trade, and transportation. The executive power is wielded by the executive committee, which implements the decisions made by the council of deputies. In oblasts, the president of the executive committee is appointed by the president; the appointment of heads of executive committees of cities and districts is endorsed by the president.

1.2 Population

Belarus's population is increasingly urbanized and ageing. In the last decade, the rural population decreased by 21.5 percent thus rural areas

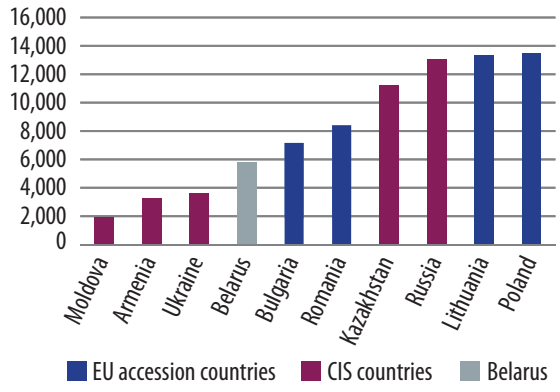
Figure 1: Belarus Republic administrative organization—oblasts and raions

account for 24 percent of the total population; at the same time the urban population has increased by 10.9 percent in the capital city, Minsk, but generally stagnated in other urban areas. Overall, Belarus's total population has been steadily decreasing since 1990, primarily as a result of a dropping fertility rate. For instance, the fertility rate was 1.4 children per woman in 2010, one of the lowest rates in the region and in the world. Details on the demographic evolution by region are provided in Annex I.

1.3 Socio-economic data

Since 2008, following a decade of steady growth, the national economy of Belarus has experienced a significant slow-down in growth. Between 2000 and 2008, GDP grew by an average of 8.1 percent per year, driven by favorable external factors such as underpriced energy from the Russian Federation and strong economic growth among Belarus's main trading partners. In 2008, the Belarus economy was

Figure 2: GDP per capita (US$) in 2012—Belarus and neighboring countries



Source: World Bank Development Indicators 2012

significantly impacted by the global economic crisis, and again in 2011 by a balance of payment crisis.This resulted in the Belarusian ruble losing over 60% of its value and the country's inflation rate increasing to 109%. In 2012, the national economy began

recovering from these crises; GDP is estimated to have grown by 1.5 percent. Belarus remains the strongest economy (per capita) among countries in the Commonwealth of Independent States (CIS), outside of the main energy producers (such as Russia and Kazakhstan), as illustrated in Figure 2.

Household revenues are slowly recovering after the 2011 macroeconomic crisis. Belarus's population was severely affected by the balance of payment crisis, which led to an increase of consumer price index in by a factor of 2.5 between 2011 and 2012.

With a Gini index of 27, Belarus has one of the lowest levels of income inequality in the world. Poverty prevails mostly in rural areas. Each quarter, the government sets the "minimum subsistence budget" for four categories of citizens (adults, pensioners, infants, and children). In May 2013, the average minimum subsistence budget was BYR924,150 or US$111 per month (between BYR763,800 for a pensioner and 1,014,200 for an adult). Budgets below the minimum subsistence budget define people as low-income. In 2011, 7.3 percent of Belarus's population (5.8 percent urban, 11.5 percent rural) was classified as low-income; in 2012, 6.7 percent. Details on population distribution by level of per capita disposable resources are provided in Annex I.

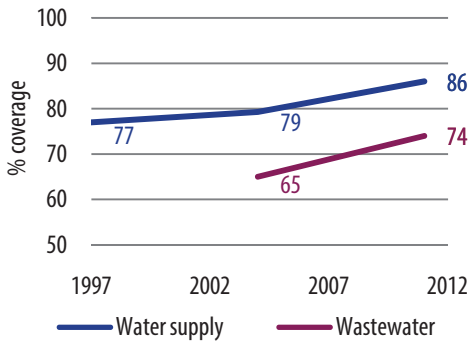
2 Sector Performance

The review of sector performance in the following subsections focuses on the assessment of the current level of services and on the technical, commercial, and financial performance of utilities, as well as their internal capacity and productivity. In many cases, the analysis distinguishes between "vodokanals" and "multi-utilities". Vodokanals are utilities operating mostly in large cities dedicated almost exclusively to water and wastewater services, while multi-utilities are responsible for a diverse range of communal services and usually operate at a raion level. A more detailed presentation of these two types of service providers is provided in paragraph 3.5.3.

2.1 Coverage and quality of services

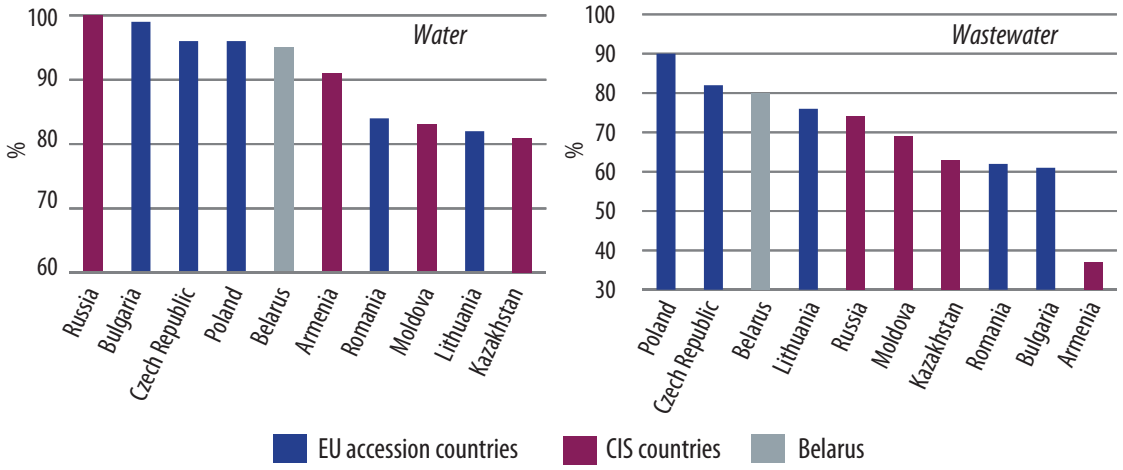
Water supply and wastewater coverage ratios are high by regional standards, and have shown steady improvement in the last 15 years. Water supply coverage in 2011 reached 86 percent and sewerage coverage 74 percent, due to massive investments since 2006. The historical evolution of water and wastewater service coverage is described in Figure 3. Compared with regional peers, Belarus's urban access rates stand out, as shown in Figure 4. In terms of water supply and wastewater coverage, as well as geographically, Belarus stands at the cross-roads between the EU accession countries and CIS countries.

Figure 3: Water and wastewater service coverage 1997–2011



Sources: National Investment Programs (1997–2000, 2006–2010 and 2011–2015)

Figure 4: Comparison of urban access rates in Belarus and for IBNet utilities in regional neighbors



Sources: Selection of IBNet utilities and questionnaires survey

A review of service coverage shows strong contrasts between urban and rural areas. In urban areas served by the utilities surveyed, 95 to 100 percent of the population is served by a centralized water distribution system and a marginal portion through public standpipes in the outskirts of large and medium-size cities. This percentage is slightly lower (90 to 95 percent) for centralized sewerage. The rest of the population in the semi-urban outskirts relies on shallow wells and on-site sanitation. In rural areas 1 in 5 citizens lacks access to centralized water systems and 1 in 3 relies on individual sanitation facilities. Services are in general more developed in "agri-towns", while in villages and hamlets, the population relies mostly on public or private shallow wells and on-site sanitation ("improved" in 97 percent of cases, according to WHO/UNICEF Joint Monitoring Program classification).

Belarus has achieved Western standards of reliability and consumption. Water is reportedly supplied on a continuous basis in almost all water utilities, a major improvement compared to the 1998 situation when 44 percent of the urban population was subject to regular service interruptions. Residential water use (117 liters per capita per day) is comparable to levels found in countries with the most progressive policies regarding water consumption, such as Germany. Both residential and non-residential water consumption were halved between 2000 and 2011, a consequence of the introduction of metering.

Excessive iron content is the main water quality issue in urban areas. Bacteriological tests reportedly fail to comply with national standards in 1 to 3 percent of cases, which could be further improved. The iron content is the utilities' main concern although it is not considered a public health hazard at natural content levels: about 1 in 5 citizens is currently supplied with water whose iron content exceeds national standards (0.3 mg/l). The utility survey confirmed that iron content is the main complaint of customers.

In rural areas, individual water sources are frequently contaminated and inappropriate for human consumption. High levels of nitrates are found in the water, especially in rural shallow wells, due to extensive use of fertilizers for agriculture; despite strict rules requiring the protection of the zones around water intakes. Overall, in rural areas, water from shallow wells is reportedly subject to bacteriological and chemical contamination in 16 percent and 40 percent of cases, respectively.

Wastewater treatment seems satisfactory in terms of organic pollution removal, but significant efforts are needed to treat nutrient and industrial pollution. The quality of treated effluents discharged to the environment generally appears to comply with regulatory standards, particularly in terms of organic pollution: according to the United Nations Economic Commission for Europe (UNECE) report

on Compliance to the Protocol on Water and Health (2010), compliance rates for BOD5 were 94 percent in 2009. However, this figure does not seem fully consistent with the condition of ageing wastewater treatment infrastructure, as observed during the utilities survey. Most municipal wastewater treatment plants were built in the 1970s and 1980s and were therefore not designed to remove nutrients, nitrogen, and phosphorus. Only half of all industrial effluents are subject to pre-treatment before being discharged into municipal sewerage systems. Overall, about 1 percent of wastewater is reportedly discharged in the environment without sufficient treatment.

2.2 Technical performance

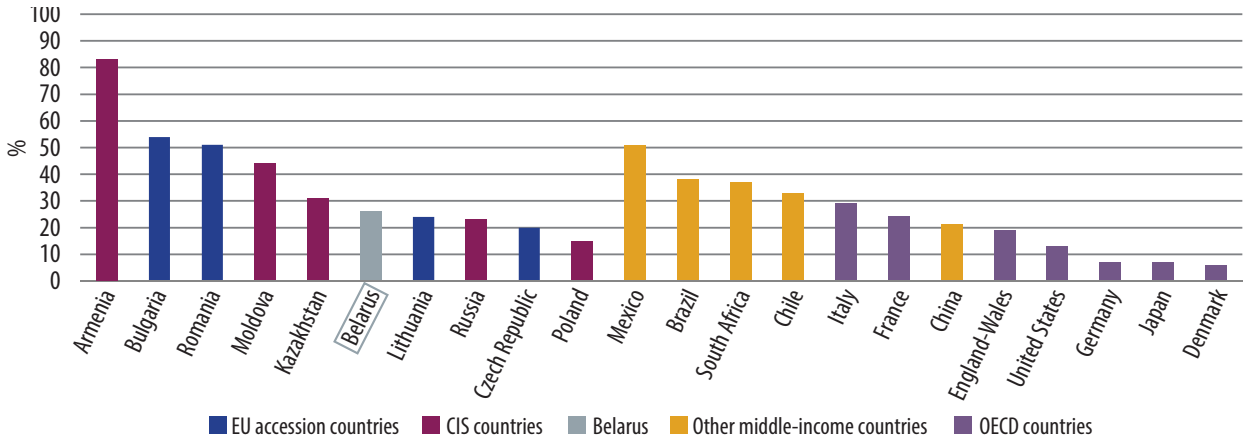
Belarus shows lower levels of non-revenue water (NRW) than most regional peers. NRW levels commonly range between 20 and 35 percent. Based on such figures, Belarus performs relatively well compared with its regional neighbors, as shown in Figure 5. This may be due to factors such as the absence of service interruption and network depressurization, networks' overcapacity enabling moderate service pressures, and very low residential tariffs that do not encourage water theft. A more detailed assessment of non-revenue water levels is provided in Annex II.

The cost necessary to significantly reduce water losses might exceed the potential benefits, but detailed investigations will be necessary to confirm that assessment. NRW reduction objectives should be designed by putting in perspective the economic costs required to achieve such target and the potential benefits (reduction of operating costs, increased revenues).

Unreliable operational records do not allow a precise assessment of the prevalence of pipeline breakages and sewer blockages. Incomplete MHU statistics for 2011 indicate a ratio of one repair for every 20 km of water pipes per year and one blockage for 35 km of sewers per year. These blockage rates are rather low for aged systems. On the other hand, the utility survey shows a more realistic ratio of 0.5 to 1 repair per kilometer per year (and 0.1 to 10 blockages per km per year). This discrepancy may reflect that wastewater pipeline blockage repair works and interventions are not always properly monitored and recorded by the utilities.

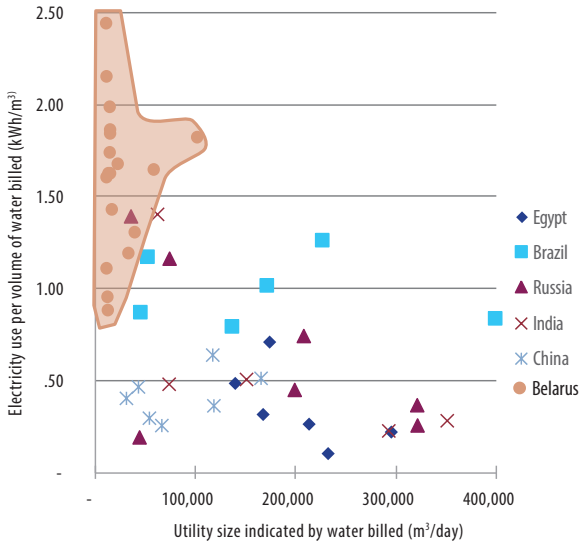
Due to structural factors inherent in local geography and hydrogeology, the operation of water and wastewater services requires very high energy inputs. With the exception of the Minsk Vodokanal, all water utilities use groundwater for their urban and rural water supply through well fields of deep boreholes. In terms of investment cost optimization and operational simplicity, this approach makes sense. Its main drawback is that it requires very high

Figure 5: Non revenue water in Belarus, in IBNet utilities of regional neighbors and across other middle-and upper-income countries



Source: IBNet

Figure 6: Energy intensity of water billed for utilities in several countries



Source: utilities survey for Belarus and IBNet (other countries)

energy inputs of between 0.8 and 1.8kWh per m^3 of billed water (depending on the depth of the borehole) just for water abstraction. Compared to several other countries, this range is above the average expenditure by utilities for their full cycle of water and wastewater services, as illustrated in Figure 6.

2.3 Commercial performance and customer relationship

Collection rates are very high, but are likely to deteriorate if tariffs increase significantly and meter reading is not performed by the utilities. Currently, residential customers read their meters themselves monthly and send their payment to the bank or to "accounts clearance centers" that inform the utility of payment. Utilities reportedly check customer meters once a year. Other customers, such as industrial enterprises, provide the utility with their monthly meter readings, then the utility issues a bill to be paid by within one month. This self-reporting practice as part of the payment procedure (shared with other communal services) is particularly effective in terms of money collection, as long as customer satisfaction is high and residential tariffs are very low. As revealed by the utility survey, the collection rate within the prescribed time is nearly 100 percent and there are few disputes, which may also stem from the very low residential tariffs.

The absence of bulk water metering can be detrimental to the utilities' commercial performance in certain circumstances (supply to residential building or to hot water systems). Water is systematically billed on the basis of individual water meters, including when they are installed inside private properties. In the case of residential buildings, water services providers are therefore de facto responsible for the common internal piping until "condominiums"[1] become fully operational. Note that the volume of hot water delivered to the customers is billed by the water utility, while the energy cost is billed by the heating and hot water company. The volumes of water delivered to the heating points, however, are not metered. Therefore, the water utility cannot control leakage in the hot water system between the heating point and the customer meters. Such losses are therefore borne by the water company.

Customer relations are still emerging in most utilities, although progress was observed. The utility has little or no contact with residential customers because they read their own meters. The culture at most utilities is essentially a technical one, but some steps toward a more customer-oriented culture have been taken. A complaint book is available in each utility and almost all utilities or local executive committees have a website offering general information on the services, in compliance with the law "On Consumer Rights Protection in Utility Services" of 2009. According to the survey conducted by the Centre of System Business Technologies (SATIO) in 2013, customers are increasingly dissatisfied with several aspects of communal services, such as (i) delays in reaction to complaints; (ii) the low quality of works and the lack of information on their justification and planning; and (iii) the lack of transparency with regards to the structure of utility bills, and utilities' budgets and expenditures.

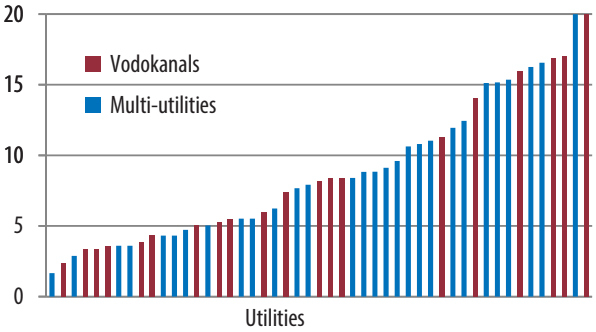
1 Condominiums were established under the Law on Owners' Association, revised in 2009.

2.4 Utility staff productivity and internal capacity

Utilities' staff productivity is most often very low, far from the levels found in well-operated utilities — a situation particularly critical in multi-utilities. The ratio of employee[2] per 1000 customers is 7, far from the ratio of 1 to 3 for well-operating utilities (e.g., efficiently organized, properly automated) in other countries. Observations made during utilities' site visits confirmed that there is a room for improvement in that perspective. The ratio-based comparison must be moderated to some extent by the fact that in Belarus all activities are performed in-house, with practically no outsourcing, and that the automation of facilities is still limited. As shown in Figure 7, this ratio varies considerably between utilities. Less than 20 percent of utilities have a staffing ratio in the optimum range. Overall, vodokanals have slightly higher ratios than multi-utilities.

Human resources policies are clearly not geared towards the stimulation of efficiency and performance. This overstaffing stems essentially from the application of the Norm on Staffing of Water and Sewerage Utilities of 2010. These staffing norms set the amount of manpower required for any task and are still in use in all utilities, even if most of them do not fully reach the normative level. Similarly, salaries are normalized based on a national public salary scale. Incentives, essentially non-monetary bonuses, are rare and generally not linked to the achievement of objectives and targets. In some utilities, the contract between the director and the executive committee specifies incentives to be attached to the attainment of indicator targets.

Figure 7: Utilities staff productivity ratio



Source: IBNet and utilities survey)

2 Women generally account for 30 percent to 40 percent of the overall staff, an acceptable gender balance that could be improved on.

Utilities focus almost exclusively on technical activities, as illustrated by their organizational structure, staff composition, and career development policies. The organizational structures of utilities are generally characterized by (i) an almost exclusively technical orientation, with the large majority of the staff (up to 90 percent) under the chief engineer[3]; and (ii) the marginalization of key functions, such as customer management or human resources management. Training is mostly technical and engineering oriented, and between 20 and 30 percent of the staff reportedly benefit from training each year. A professional certification system is in place at the national level, but it focuses on specialized types of activities, particularly technical ones.

2.5 Business planning

In their current format and content, the business plans prepared on a regular basis by utilities lack many of the key characteristics required for such types of instruments. Business plans are prepared annually by the utility in accordance with the provisions of MOE Ordinance 186 of October 2007 and relevant guidelines from the MHU. The business plan is not a long- or even medium-term plan[4] ; it provides forecasts for the year to come, based on the analysis of the current and previous years. Reduction of costs is clearly addressed in the business plan, but it is focused on electricity consumption, not on the organization of operations or on human resources. The plans reviewed for this study

3 For example, in the Sianno multi-utility (Vitebsk Oblast), the chief engineer is responsible for all activities (heating & hot water, water and sanitation, saunas, hotel, transportation, etc.). His department includes 505 persons, out of a total of 543.

4 Ordinance 186 from the MOE also provides detailed contents and structure for the 5-year "forecast" plan, which is more prospective than the business plan. In 2012, this 5-year forecast plan became a 3-year "modernization plan." Such medium-term plans, addressing all aspects of utility development (investments, management, human resources, etc.) have been prepared by each utility for the period 2013-2015.

do not specify how the utility can meet the targets set for the year to come.

The sector lacks a set of well-defined performance indicators; including key indicators essential to accurately assess the internal performance of each utility and define objectives and targets for its business development plan. Reports from utilities, business plans, and modernization plans, as well as consolidated reports from oblasts and the MHU, include a great number of indicators, but little of this information is translated into indicators that would allow managers to assess the level of performance in the sector (benchmarking) and to monitor progress toward objectives and targets. A list of recommended performance indicators is provided in Annex VII.

2.6 Financial performance

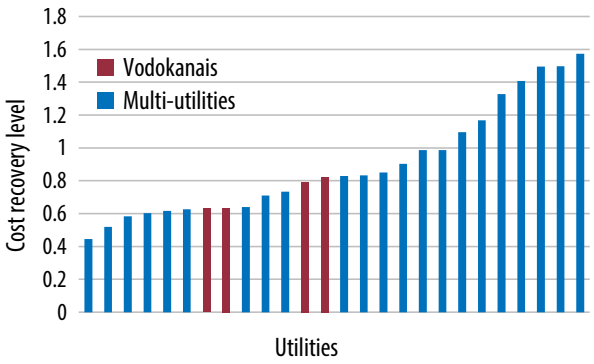
The review of sector financial performance puts into perspective the costs of services, the revenues generated by the sale of services, and the need for their subsidization. A full presentation of sector financial indicators, key ratios and flow of funds for 2011 is provided in Annex V.

2.6.1 Costs of service

The average operating cost countrywide is US$0.75/m3 but costs vary significantly across individual utilities. Based on 2011 statistics, the average cost of services is about BYR 6,000/m3 (equivalent to US$0.75), or about five times the lowest residential tariff block in 2011 (BYR890); these averages include operational costs and depreciation but not repayment of investment loans. As illustrated in Figure 8, vodokanals in Minsk oblast have lower operating costs than average multi-utilities, a likely reflection of their respective operating efficiencies.

Energy and labor costs generally represent the main operating cost items. On average across the sector, energy and labor charges account for more than half of operating costs, as shown in Table 2. Cost structures vary greatly among utilities. For example, personnel costs can represent up to 50 percent and electricity costs up to 35 percent of total operating costs.

Figure 8: Operating costs in utilities of Minsk oblast



Source: Minsk Oblast statistics 2011)

TABLE 2: OPERATING COST STRUCTURE

Type of cost	%
Material	16.0%
Energy	28.4%
Labor + social charges	28.8%
Depreciation	12.0%
Others	14.8%

Source: MHU annual statistics 2011

Certain key operating cost items are too aggregated to allow an appropriate monitoring and control of utility costs. In accordance with the Ministry of Housing and Utility (MHU) rule of June 2011, the costs are divided into four groups: (i) materials (including electricity costs), (ii) personnel and associated charges, (iii) depreciation, and (iv) others. "Materials" (without electricity) and "others" include a large variety of costs, but no details are provided in reports sent to the oblasts and the MHU, and cost control over these items, which account for about 30 percent of the total costs, is almost impossible.

Environmental taxes collected by national and regional authorities represent a significant part of operating costs. The cost category "others" includes environmental taxes, imposed for water abstraction and discharge of effluents. Taxes for the discharge of effluents represent between 16.5 percent (BYR470/m3) and 22.1 percent (BYR630/m3) of the average operating costs of wastewater services. The water abstraction tax represents about 1.4 percent (BYR50/m3) of the average operating cost for water services.

Further details on applicable tax rates are provided in Annex IV.

No clear information could be collected on the accounts receivables and payables of utilities. Available statistics for 2011 do not provide information on the level of receivables and payables. Very limited financial statements[5] (balance sheets and profit and loss statements) were made available during the survey. Based on the financial statements received, receivables account for an average of 2.1 months of sales and the payables 1.3 months, both of which are reasonable.

2.6.2 Utility revenues

The utilities' revenues originate predominantly from urban areas and non-residential customers. Urban areas contributed 95 percent of the revenue in 2011. Residential customers accounted for 22.7 percent of revenue, whereas they accounted for 70 percent of the total consumption and more than 98 percent of connections. This discrepancy is due to the heavy cross-subsidization between residential and non-residential customers. Of the total revenues for 2011, 53.9 percent came from water services and 46.1 percent from sewerage services.

The tariff for water and wastewater services reflects strong social considerations for residential consumers. The Social and Economic Development Program issued every five years by the Council of Ministers defines the maximum percentage of the total costs of communal services that should be covered by the population. This percentage is currently 60 percent. The corresponding costs are updated every year, taking into consideration projected income increases. In 2012, for water and sanitation services, residential customers contributed below 10 percent of actual costs. The tariff-setting procedure is described in Annex III.

The current residential tariff levels guarantee access to services at an affordable cost, despite recent increases. At current levels, services are largely affordable even to low-income households: in June 2012, an average monthly household consumption of 3.5 m^3 would lead to a water and wastewater bill of BYR5,100, which represents less than 1.2 percent of the monthly disposable resources for more than 99.8 percent of the population. In addition, low-income households may request financial assistance from the local executive committee to settle their housing and utility bills. Table 3 demonstrates that the residential tariff has rapidly evolved over the last two years. The tariff adjusted to a change in tariff structure in January 2011 (see the following paragraph) and to a major devaluation of the Belarusian ruble that same year. Despite these changes, services remain affordable even to low-income households.

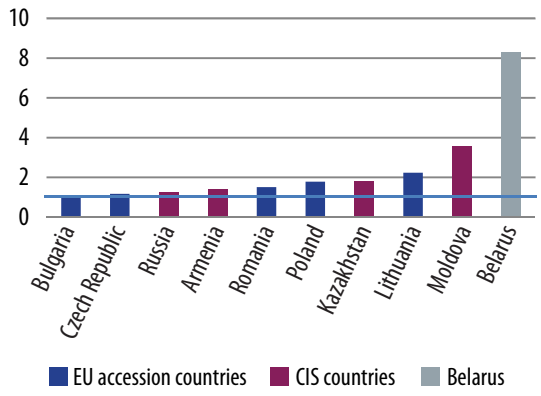
The residential tariff structure ensures equity among customers. The residential tariff has two parts: the base tariff for a maximum daily

TABLE 3: RESIDENTIAL TARIFF—RECENT EVOLUTION (WATER/SANITATION) IN CONSTANT BYR/M3

Service	Tariff	January 2010	January 2011	January 2013	Evolution 2010–2013
Water	Average	1,164	1,767	1,447	+24%
	Base		*1,350*	*900*	
	Additional		*4,150*	*3,750*	
Wastewater	Average	732	1,071	970	+32%
	Base		*700*	*550*	
	Additional		*3190*	*2800*	

5 Financial statements are prepared according to the Belarus accounting system. IFRS is expected to be introduced progressively.

Figure 9: Cross-subsidization levels (average domestic tariff/average non-domestic tariff) —average in Belarus and for IBNet utilities in regional neighbors



Source: MHU 2011 for Belarus; IBNet utilities for all other countries)

consumption of 140 liters per person and, an additional tariff for consumption exceeding 140 liters per person[6]. The application of this residential tariff based on consumption per person, rather than per household, implies that the number of persons in the household is known and updated, which is currently the case in Belarus. As such, a high level of equity among residential customers is ensured.

The residential tariff structure does not encourage demand management, but this is no longer a priority in Belarus. The very low tariff levels and the 140 liters per person per day threshold are inadequate to encourage conservative consumption habits from residential customers. That is, the current average daily consumption is 117 liters per person per day. As a result, only 15 percent of the total volume consumed by residential customers is billed at the higher tariff rate. Given the existing level of residential consumption and tariff structure, the scope for further decrease seems very limited.

The current cross-subsidization between customer categories is extremely high by international standards—a clear source of financial vulnerability for the entire sector. At the country level, non-residential tariffs are on average 8 times residential tariffs, a cross-subsidization level considerably higher than in any neighboring country, as illustrated in Figure 9. The highest non-residential tariff is more than 20 times the base residential tariff, according to the utility survey. As a result, large industrial enterprises may have strong incentives to develop their own water supply, thus making the sector's financial situation vulnerable.

The prospective cancellation of cross-subsidization among customer categories will entail major challenges for the sector. As planned by the Ministry of Economy, all cross-subsidization will be eliminated by 2015, consistent with the Decree of the Council of Ministers of the Republic of Belarus N 97, "On the Concept of Housing and Communal Services Development to 2015" (February 08, 2003). To maintain the current level of revenue, an elimination of cross-subsidies would require a multiplication of the current average residential tariff by 2.6. Achieving this objective by 2015 may represent a major social and political challenge, and a postponement of this milestone might be prudent to consider

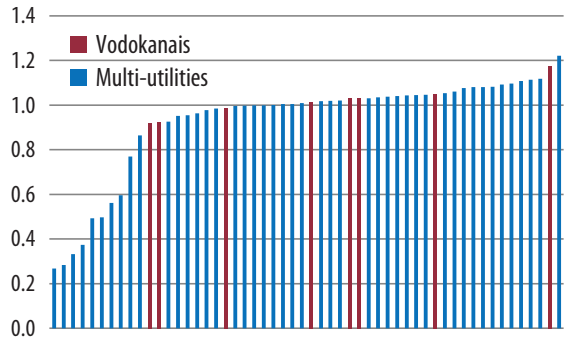
2.6.3 Utilities subsidization

Subsidies allocated on an ad-hoc basis by the central government to cover operational losses represent a major source of funding for water utilities. On average in 2011, operational costs for both water and sanitation services were BYR5749/m3 and BYR6530/m3, with and without operational subsidies, respectively. With revenue per cubic meter of BYR6279/m3, the cost coverage ratio was close to 1 (i.e., 1.08 with subsidies and 0.96 without subsidies), due to the very high cross-subsidization. Subsidies represented in 2011 BYR215 million, an average 10.6 percent of utilities' total revenues, with a range of 4 to 26 percent. In comparison, heating services were subsidized at 44.5 percent and solid waste services at 3.0 percent.

Cost recovery levels appear insufficient in about 25 percent of utilities in the Minsk and Vitebsk Oblasts. Even with operational subsidies, cost recovery levels vary significantly between utilities. Figure 10 illustrates that in Minsk and Vitebsk Oblast 25 percent of utilities remain far from recovering their

6 The additional tariff was introduced in 2011 and was designated as a "tariff allowing for a full recovery of economically justified costs".

Figure 10: Cost recovery levels for utilities in Minsk and Vitebsk Oblasts (2011)



Sources: Minsk Oblast statistics (2011) and Vitebsk Oblast statistics (2012)

costs despite very high cross-subsidization among customer categories.

Subsidy allocation procedure does not encourage operational efficiency. Operational subsidies are allocated on the basis of short-term needs to cover losses incurred by the utilities. Subsidy calculation is not based on utilities' medium-term financial forecast, or commitment to improve performance. As such, it does not encourage utilities' efficiency, and perpetuates their dependence on budget support.

The planned cancellation of operational subsidies will require major residential tariff increases and impact the affordability of services for low-income populations. Like cross-subsidization, operational subsidies should be phased out in 2015, according to the Decree of the Council of Ministers of the Republic of Belarus "On the Concept of Housing and Communal Services Development to 2015." The present level of cross-subsidization is not sustainable, especially if, as planned by the Ministry of Economy, operational subsidies are phased out in 2015. Full cost recovery will require an increase in the residential tariff by a factor of about 3.1, which is beyond the affordability limits of the poorest segment of the population.

2.7 Conclusion on sector performance

In summary the water and wastewater sector in Belarus shows:

1. A reasonable and steadily improving **level of service.** Sector strengths and weaknesses in that respect are shown in Table 4.

TABLE 4: STRENGTHS AND WEAKNESSES OF SECTOR PERFORMANCE—LEVEL OF SERVICE

Strengths	Weaknesses
Water services	
+ **Urban coverage** almost universal + Continuous and **reliable** (24/7) supply practically everywhere + Conservative **consumption** levels + High level of **affordability**, including for low-income households	- Water **quality** issues: excessive iron content for 20 percent of country population & frequent contaminations in shallow wells in rural areas. - Rural **coverage** (80 percent) still insufficient (but improving)
Wastewater/sanitation services	
+ Major increase of **urban coverage** (but still 25 percent gap) + High compliance in terms of treatment of **organic pollution** + Most **individual sanitation** facilities are improved	- Lack of **nutrients treatment** capacity (but improving) - Few **industrial pre-treatment** facilities

2. Overall operational performance is acceptable, by regional standards, but there is room for improvement. Sector strengths and weaknesses in that respect are shown in Table 5.

TABLE 5: STRENGTHS AND WEAKNESSES OF SECTOR PERFORMANCE—OPERATIONAL PERFORMANCE

Strengths	Weaknesses
+ Overall acceptable levels of **NRW** (especially in vodokanals) + **Metering** almost universal + High **collection rate**	- Overall poorer performance in **multi-utilities** - Limited **meter-reading** oversight - Limited **customer relationship** culture - High **staffing ratio**

3. Operational capacity is focused on engineering and overall potential is underexploited. Potential capacity is limited by the lack of performance incentives and the diversification of activities in multi-utilities. Sector strengths and weaknesses in that respect are shown in Table 6.

TABLE 6: STRENGTHS AND WEAKNESSES OF SECTOR PERFORMANCE—LEVEL OF SERVICE

Strengths	Weaknesses
+ Strong **technical** expertise (in particular in vodokanals) + **Training** opportunities in vocational education + Reasonable **gender** balance	- Lack of generalized **performance-oriented** culture and instruments - **Commercial, human resources** functions marginalized - Norm-based approach of **staffing** - Normalized salary scales insufficient to retain **qualified** staff - In **multi-utilities**: lower level of sector expertise, professionalism and equipment

4. Financial performance is mediocre, characterized by a strong dependence on budget support and by massive cross-subsidization between customer categories. Sector strengths and weaknesses in that respect are shown in Table 7.

TABLE 7: STRENGTHS AND WEAKNESSES OF SECTOR PERFORMANCE—FINANCIAL PERFORMANCE

Strengths	Weaknesses
+ Residential tariffs affordable and equitable + A number of (large) utilities achieve cost recovery (on operations)	- High dependence on subsidies (investment and operational) - Extreme cross-subsidization between categories of customers - Lack of transparency in financial management of water services in multi-utilities - A significant proportion of utilities with very low cost recovery levels (on operations).

3 Legal and Institutional Framework

The assessment of the sector legal and regulatory framework focuses essentially on three key aspects discussed in the following sub-sections: (i) the relevance and comprehensiveness of sector-related legislation, (ii) the clear formulation of sector policy and strategy, and (iii) the functional allocation of responsibilities between sector stakeholders.

3.1 Sector-related legislation and regulations

The water and sanitation sector is governed by two key legislative documents defining the main components of its institutional and regulatory framework: the Water Code and the Law on Potable Water. The Water Code of 1998 establishes the legal framework on protection and use of water resources. It defines the responsibilities of central and local authorities, the rights and obligations of water users, and the role of citizens and public associations, and it sets the rules regulating the intake of water and discharge of pollution. The new version, which is under review by the parliament and should be approved and implemented in 2013, is expected to introduce the concept of river basin management, based on the prevailing EU model. The Law "On Consumer Rights Protection in Utility Services" of 2008 (and the related Resolution of the Council of Ministers of 2009) enlists the rights of citizens with regards to public utilities. The Law on Potable Water of 1999 (amended in 2009) specifies the respective roles and responsibilities of the central, regional, and local councils, the rights and obligations of the drinking-water providers, the protection of potable water sources, the information to be provided to customers, etc. The law has been supplemented by the Resolution of the Council of Ministers "On State Control and Supervision in the Field of Potable Water Supply" (1999).

This legal framework is complemented by a number of laws, decrees, orders, and rules. These include:

- The Law on Sanitary and Epidemiological Welfare (2012), which addresses the monitoring of potable water quality;

- The Law on Environmental Protection, which focuses on the discharge of effluents in the environment;

- The Law on Local Self-Governance (2010), which addresses the responsibility of the local authorities in organizing public services;

- The Housing Code (2012), which governs the relations between the residents and the entities providing housing and utilities services;

- The Law on Owners' Associations (revised 2009), which provides guidance for the relationship between the owners' associations and the service providers;

- The Presidential Decree (last amended November 2011) "On Measures to Improve the Efficiency of the Housing and Communal Services";

- The Presidential Decree (April 2006) "On the State Program on Water and Sanitation, 'Clean Water,' for the Years 2006–2010," which details the investment program for 2006–2010, including the funding sources;

- The Resolution of the Council of Ministers (September 2011) "On the State Program on Water and Sanitation, 'Clean Water,' for the Years 2011–2015," which details the oblast investment program for 2011–2015;

- Rules prepared by the MHU (April 1994) on the operation and maintenance of water and sanitation systems; and

- Standard regulations for utilities, such as the utility charter and the service contract with the utility's customers.

The sector's legal framework is consistent and comprehensive over all, but some aspects could be further elaborated. Aside from effluent discharge standards, there is no specific legislation on sanitation (such as there is for water supply) defining the role of the state, regional, and local authorities; the technical, environmental, and managerial options and constraints; and the obligations of both the service providers and the customers (residential and industrial).

3.2 Technical standards and norms

Technical standards are being continuously updated, with the objective of harmonizing them with international, particularly Russian, standards. Technical regulation, standardization, metrology, and certification are to a large extent under the responsibility of the State Committee for Standardization. Technical normative acts include technical regulations, technical codes of good practices, and government standards (GOST). The government's policy is to harmonize the standards in Belarus with international standards and with the standards of the Custom's Union (Belarus, Russia and Kazakhstan). The harmonization with international standards has been 60 percent achieved.

Infrastructure design and sizing norms appear very conservative, a partial reason for the frequent overcapacity of existing infrastructure. The very low rate of usage of production and treatment facilities (as illustrated in section 4) suggests that design standards may be particularly conservative. Two examples clearly confirm this assessment:

- To size water and sewerage facilities in Belarus, design institutes use water consumption norms of 180 to 210 liters per day (a yearly average), well above the consumption of 105 to 110 liters per capita per day recorded during the utility survey. As an alternative, the norm allows designers of water and wastewater systems to use the consumption statistics for the past three years, but this practice is reportedly rare. Network or treatment plant design based on actual needs instead of such consumption norms could enable savings of up to 30%.

- A large safety margin must be taken into account in designing water infrastructure: water systems should be designed in such a way that they can handle all major supply incidents, for example, incidents requiring a doubling of transmission lines in large towns and cities or the systematic

creation of supply loops on all distribution antennas.

Belarus has issued standards for potable water and for wastewater treatment that are close to those of the European Union. The main potable water quality standards (presented in Annex IV) are largely aligned with WHO recommendations and with EU standards. With regard to treated effluent quality standards, the new maximum concentration requirements are comparable to those of the European Union (outside of environmentally sensitive areas). These standards do not depend on the quality of the water being treated, and are defined for the entire country or territory.

Technical standards do not include many alternatives in terms of technology and level of services in rural areas. Technical standards are mostly dedicated to the provision of services through centralized wastewater systems. In rural areas, such systems are often very suboptimal, both in terms of investments and operation costs.

3.3 Sector strategy

The government's current policy orientation in the water and wastewater sector is clearly identified, but they are not specifically framed in a national strategy document. Sector policy orientation includes (i) full coverage of services, including in rural areas; (ii) continuous provision of safe potable water; (iii) affordable services for all segments of population; (iv) improvement of systems' operational efficiency (with reduction of water losses and increased energy efficiency); and (iv) protection of the environment. These orientations are reflected in the following measures:

- Two 5-year "clean water" national investment programs (2006–2010 and 2011–2015), which set clear nation-wide baselines and targets for indicators such as coverage of services and the quality of potable water and treated wastewater. These programs reflect a strong political will and the government's determination to improve the sector by developing and modernizing infrastructure. Average investments within these plans represent about US$60 million (2006–2010) and US$40 million (on-going plan) per year.
- The universalization of metering in the late 2000s as a strong tool for demand management and control of water losses.
- The reduction of electricity expenses, a major component of the utility costs, through the national Energy Saving Program.
- A socially driven residential tariff policy framed by the Social and Economic Development Programs.

There is no stated organizational strategy even though the decentralization of services (from national to regional/local authorities) seems to be emerging. This trend is particularly visible with regard to the definition and financing of investment programs. Reportedly, in the early 90s, legislation on local governments vested the local councils with full responsibility for the public water supply and sanitation services. The difficulties that many local governments faced in providing these services—due to limited capacity and resources—have led to a strengthening of the oblasts' role in supervising and advising the local utilities and coordinating their work.

3.4 Sector stakeholders

The water supply sector in Belarus is strictly regulated and vertically integrated from local councils to the central government. The central government develops sector policy and strategy and controls their implementation.

At the national level, the Ministry of Housing and Utility (MHU) is the sector line ministry, coordinating management of the sector with four other national authorities. The MHU is the pivotal actor coordinating the sector for the government. MHU implements the state water policy, monitors and supervises water provider operations, provides managerial guidance and training to the operators, and compiles sectoral data. Other key stakeholders include (i) the Ministry of Natural Resources and Environment (MNRE), which manages water resources and controls their quality; (ii) the Ministry of Health (MOH), which monitors and supervises potable water quality and

environmental health; (iii) the Ministry of Finance (MOF), which allocates funds for investments in, and subsidies to, the sector; and (iv) the Ministry of the Economy (MOE), which reviews and approves the tariff for water and wastewater services.

Regional administrations are closely involved in sector coordination, while local authorities and their service providers are responsible for service provision. At the oblast level, the key sector stakeholders are: the oblast council of deputies and the oblast executive committee—the latter being the coordinator of the sector activities in the oblast. In Minsk City, this role is played by the city council of deputies and the city executive committee. At the district (raion) and city level, the local council of deputies and the executive committee are ultimately responsible for water and wastewater services. These services are provided in major towns by utilities specialized in the provision of water and wastewater services, vodokanals. Elsewhere multi-utilities provide services across several sectors.

Civil society organizations (CSOs) are marginally involved in the sector. Potential sector stakeholders could include the few CSOs or non-governmental organizations (NGOs) that currently focus on environmental protection (especially river basin pollution) at the central level, as well as those in local communities affected by pollution issues. Their involvement in the water and wastewater services sector (e.g., participation in revising the Water Code, monitoring of water quality, public education in rural areas) remains very limited.

3.5 Overview of sector functional organization

The following sub-sections describe the roles and responsibilities attached to key sector functions: policy formulation, asset ownership and development, financing, regulation, and service provision.

3.5.1 Policy formulation

Sector policy is defined at presidential level. The central government formulates water supply and wastewater sector policies, such as service standards, institutional arrangements, financing, and cost recovery mechanisms. The Presidential Administration defines the main sector policy orientations, and their implementation lies primarily with the Ministry of Housing and Utilities (MHU), as well as the Ministry of Health (MOH) and the Ministry of Natural Resources and Environment (MNRE).

3.5.2 Assets ownership and infrastructure planning

Water and wastewater infrastructure is owned by local councils. According to the Civil Code (Art. 215), state property can be either property of the Republic of Belarus or communal property, which is property of administrative territorial units (oblast, raion, city, etc.). All water and wastewater infrastructure, including land, is city/district property. Initially republican property, it has become municipal property, e.g., belonging to the local council of deputies, and cannot be leased or sold without the council's formal consent. Assets are "transferred" to the utility for "economic management," but ownership remains with the local council.

Infrastructure planning is a cumbersome process that involves a wide range of stakeholders at all levels of government. Investment proposals are formalized by local councils based on utilities' recommendations and often with the technical assistance of oblast agencies. Projects are subject to the oblasts' appraisal and selection. In addition, the MHU must verify their consistency with sector strategy and policies before it endorses their integration into the national Clean Water Program. Until the 2002-2005 Clean Water Program, the MHU played a stronger role in the projects' identification process, but the government's current policy clearly encourages a decentralization of such responsibilities to local and regional authorities.

The identification and appraisal of investments are often conducted without the clear and transparent procedures required to guarantee the efficiency of capital investments. Priority investments are identified by the utilities based on their perception of the rehabilitation needed in their facilities, recommendations from the MNRE on environmental protection,

complaints from users regarding water quality and taste, and requests for extensions of water and wastewater systems. Generally, these investments are identified without reference to a water/wastewater master plan. Except for large facilities, no economic and financial analyses (e.g., rate of return) are done. The lack of strict and transparent project appraisal procedures necessary to keep an arms-length relation between those who need public funds (the utilities) and those who provide them (so far, mostly the central and oblast governments) is likely to undermine the efficiency of capital investments. The process of preparing, implementing, and supervising Clean Water Programs is presented in Annex III.

3.5.3 Service provision

Services are operated by "unitary enterprises" accountable to district or municipal authorities, which are ultimately responsible for the provision of water and wastewater services. Water and wastewater services are the responsibility of local authorities (city or district council of deputies), who have established the services as "unitary enterprises" accountable to the local executive committee on the basis of a charter (Articles of Association). The charters specify that the service provider is a legal entity and a state-owned enterprise, whose assets remain the property of the city or district. Only one vodokanal has a different status: the Slonim Vodokanal is a joint stock company, the board of which currently includes oblast/raion officials, vodokanal staff members, and private individuals. This peculiarity does not set it apart from the unitary enterprises in terms of its supervision by the oblast and by the MHU.

The service providers' charter permits the providers to engage in virtually any public or private service (as long as it appears to be profitable), and this has led to the development of two types of service providers, water and wastewater utilities and multi-service utilities. The vodokanals operate mostly in large cities. In addition to water and wastewater services, these organizations may have "water-related" activities, such as a bottled water business and plumbing services, on the side. The multi-service utilities (MUs) are responsible for a diverse range of communal services across the raion.[7] The water and wastewater sector comprises a total of 25 vodokanals and 120 MUs, each type covers close to 50 percent of the total population.[8] As "commercial organizations," the MUs (and to a limited extent vodokanals) are often engaged in a variety of other activities completely unrelated to their core services, including hotel management, hairdressing, and funeral services. These side businesses are supposed to contribute to the financial viability of the multi-utility. The expansion of services is generally encouraged by local governments. However, as found during the utility survey, such diversification of activities is often done at the expense water and wastewater services in terms of management focus and staff professionalism.

Water and wastewater service providers often lack clear performance objectives and obligations. The vodokanals and MUs, as unitary enterprises, are operated in relative autonomy from local authorities. As unitary enterprise, they exercise economic control over local governments' assets. Their charters lack clearly defined objectives and targets. The chairman of the local executive committee appoints directors of utilities with a 3 to 5 year contract. This contract includes generic objectives but usually has no specific targets.

Currently, many customers operate their own water and wastewater systems, a potential factor of vulnerability for the sector. Many industries have developed their own water production and sometimes wastewater treatment systems, as a result of the very high water tariffs levels for non-residential customers. In a country with widespread and abundant water resources, leaving the market of service provision open can be seen as economically sound as it stimulates competition and therefore efficiency among the existing and

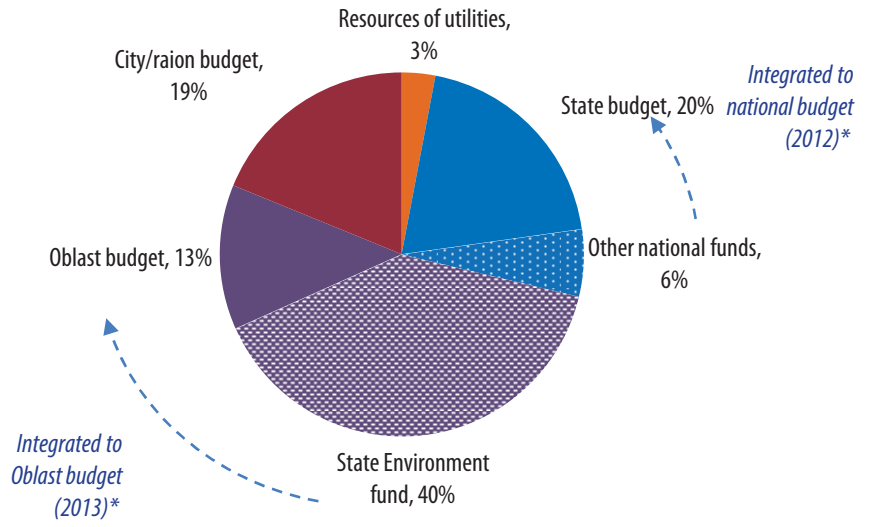
7 In a few cases two MUs operate in the same raion.

8 In addition, water and wastewater services are currently and marginally rendered (i) by "agro-towns" (a total of about 1,500), whose water and sanitation services are progressively transferred to the district multi-utilities; (ii) by some industries that have developed their own systems and are providing wastewater services; and (iii) by the railway administration, which provides water services to settlements along the railroad network.

potential service providers. On the other hand, the lack of long-term visibility of their perimeter of services may significantly complicate infrastructure planning for public operators, and undermine the efficiency of their investments.

3.5.4 *Sector financing*

Figure 11: Origin of public investment funds in the water and wastewater sector 2006–2010



* a marginal part is transferred to state budget
Source: " Clean Water" Program 2006-2010

Capital investments are mostly financed through public grants, more than 75 percent of which should now originate from local or regional authorities. The development of water and sanitation service infrastructure relies essentially on public grants from state, oblast, and city/raion budgets, and on grants and credits from international financial institutions (IFIs). For instance, as demonstrated in Figure 11 two thirds of the 2006-2010 Clean Water Program was financed from state budget and funds, while the contribution from the utilities' cash generation was. In the 2011–2015 Clean Water Program, up to 70 percent of investments are to be financed from the budget, and 30 percent from an IBRD loan. This loan, denominated in US dollars, is 70 percent serviced by the central government. The remaining 30 percent is on-lent in BYR to oblast authorities under conditions of the parent loan. In the 2011-2015 program, at least 75 percent of public resources allocated to the program must originate from local or regional budgets (the central government shares with local governments the revenues from national taxes). This represents a major shift towards decentralization of financial responsibilities compared to the previous program.

Financing of operations relies significantly on subsidies allocated on a yearly basis by the central government and distributed through local authorities. Subsidy needs are calculated at the national level for all communal services by the MHU, based on information on cost and revenues reported by utilities to city/raion executive committees, and further consolidated at the oblast level. Subsidies earmarked for communal services are distributed in return by the MOF to oblast authorities and further transferred to the city/raion level. The distribution of operational subsidies to the different communal services is then made at local authority's discretion. The process of calculating and allocating operation subsidies is presented in Annex III.

International financial institutions (IFIs) have greatly increased their support to sector development, becoming a major source of funding for the sector in recent years. The current Clean Water Program incorporates, and is complemented by, projects implemented with the financial support of IFIs, notably IBRD, the European Bank for Reconstruction and Development (EBRD) and the Nordic Investment Bank (NIB). With a loan of US$60 million approved in 2008, the IBRD-supported project focuses on the rehabilitation, modernization, and upgrading of 10 water systems and 12 wastewater systems in all six oblasts of the country. The EBRD and NIB have set up a Municipal Environmental Infrastructure Framework Facility comprising a sovereign loan of

up to EUR30 million to finance wastewater treatment, power production from biogas in wastewater treatment plants, and other municipal services. The NIB is co-financing the facility with a sovereign loan of up to EUR25 million. In the framework of the new projects supported by EBRD and by NIB, several large utilities are, for the first time, financing major investments on loan terms.

3.5.5 Regulation

In the absence of an independent regulator, regulation is performed through various decisions, rules, decrees, etc., from the responsible ministries and state organizations. How the sector is regulated economically and technically is described below.

Tariff regulation, performed by the MOE and by oblast authorities, lacks transparent tariff adjustment instruments, which would enable customers to anticipate tariff changes. The residential tariff applies nation-wide. It is recommended by the Ministry of Economy and set by the Council of Ministers. Its regulation is performed in compliance with socio-economic directives provided by the Presidential Administration through the Social and Economic Development Programs, and is based on sector financing needs identified by the MHU. Non-residential tariffs, which are proposed by utilities to cover their financing gap, are submitted to local councils and then to oblast authorities for approval. There is, however, no transparent regulatory instrument or tariff adjustment mechanism enabling customers to anticipate tariff changes.

Operational information is by oblast authorities and consolidated by the MHU, but there is no monitoring of performance data that would enable benchmarking or yardstick competition. The MHU prescribes the "rules" and "norms" relative to all aspects of utility management.[9] Oblast authorities supervise utility operations,[10] with monthly and quarterly reports. These reports lack relevant and actionable performance indicators. There is reportedly little or no feedback on these reports from the oblast or the MHU. To date, 21 utilities report on their annual performance to the MHU through the International Benchmarking Network (IBNet). However, these data are not currently integrated in the sector reporting and monitoring process conducted at the MHU and oblast level. More generally, there is no systematic use of benchmarking methods to help utilities understand their operational weaknesses and to positively impact managerial decisions in future.

Operational monitoring is also performed by the MNRE, the MOH and by local authorities, but penalties for non-compliance are not systematic. The MNRE allocates the rights for water abstraction and permits for the discharge of effluents and defines wastewater treatment standards. The quality of discharged effluents, treated or untreated, is closely monitored by MNRE's local offices. Penalties for non-compliance are in general not applied to utilities that demonstrate that they are proactively upgrading their treatment facilities. The recent Technical Code issued by the MNRE specifies the procedures for setting the permissible levels of industrial effluents. These levels are currently determined by the oblast authorities, in consultation with the industries. Local authorities are often reluctant to penalize non-compliant industries that contribute greatly to local economy. The MOH is responsible for setting potability standards. The quality of water supplied through centralized systems is tightly monitored by the utility laboratory and controlled by the MOH local entities.

3.6 Private sector participation

Although still in its first stage of development, the private sector is Belarus is growing steadily. According to the National Bureau of Statistics, the number of small private enterprises jumped from

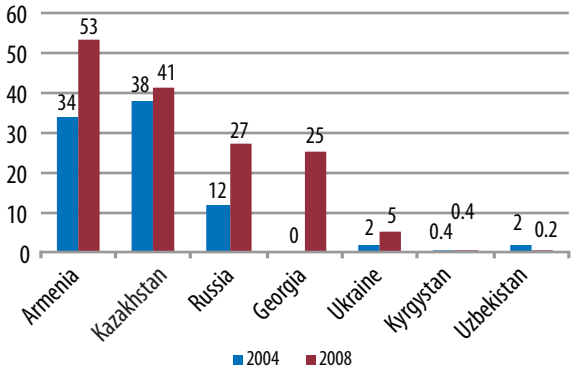
9 In particular: rules for the technical operation of water and sanitation services (1994); the procedure for preventive maintenance of centralized water supply and sanitation systems (2006); and the calculation of norms for losses and non-revenue water (2005).

10 Except in two oblasts (Vitebsk and Mogilev), this control of the utilities is essentially an administrative monitoring based on quarterly reports from utilities, and the oblasts do not provide operational support to the utilities; in Mogilev, a separate entity in the oblast administration (oblast Vodokanal) provides operational advice and operational support to subscribing utilities in the oblast, whereas in Vitebsk, the support from the oblast vodokanal is limited to the four vodokanals of the oblast.

about 28,000 to 89,000 between 2001 and 2011, and its share of GDP from 6.5 to 15.7 percent, i.e., an annual growth rate of 8.5 percent.

The legal framework needed to support the participation of the private sector in the water and wastewater services is still evolving. Chapter 4 of the "Program of Socio-Economic Development of the Republic of Belarus for 2011-2015," approved by Presidential Decree 136 of April 4, 2011, emphasizes the importance of creating the conditions for a full partnership of the private and public sectors. A draft law on private sector participation is being prepared by the MOE and should reportedly be discussed in the parliament in 2013. This law would establish a framework for the progressive development of public private partnerships in the future, including outsourcing of specific utilities functions.

Figure 12: Share of population served by private operators in 2004–2008 (%)



* a marginal part is transferred to state budget

Source: OECD—Ten years of water sector reform in Eastern Europe, Caucasus and Central Asia

Private sector involvement in the water sector is still marginal in Belarus compared to other CIS countries. Although the present government policy is to keep the water and sanitation sector and its assets in public hands, the private sector is already modestly involved in sector activities. Local and international private consulting and construction firms are involved in implementing the Clean Water Program, but, for the time being, the private sector is not involved in the sector operations. In contrast, the private sector is becoming more and more involved in some countries of the former Soviet Union, as illustrated in Figure 12. Since 2008, private sector involvement has further increased, most notably in Russia, but no recent data are available.

3.7 Conclusion on legal and institutional framework

In summary, the water and wastewater sector in Belarus shows the following:

1. A consistent and functional **legal framework and strategy,** despite its fragmentation and some gaps, as shown in Table 8.

TABLE 8: STRENGTHS AND WEAKNESSES OF THE LEGAL FRAMEWORK

Strengths	Weaknesses
+ Consistent sector **policies** + Comprehensive legislation on **water resources** and **water supply** services + Ongoing development of legislation for **PPP** in public services	- Lack of **consolidated statement** on sector policies and strategy - Lack of comprehensive legislation on **sanitation** - Very conservative **design norms** - Lack of differentiated design norms for **small towns and rural areas** (in particular for individual sanitation)

2. In general, a well-defined and functional **institutional framework**, but its vertically integrated infrastructure development process, politically driven tariff setting, and lack of performance obligations for service providers may hinder sector efficiency. Table 9 lists the main strengths and weaknesses of the sector at that level.

TABLE 9: STRENGTHS AND WEAKNESSES OF THE INSTITUTIONAL FRAMEWORK

Strengths	Weaknesses
+ Clear allocation of **responsibilities** among sector stakeholders + A reasonable **unbundling** of key functions (policy, regulation, ownership of assets, service provision)	- **Prioritization** of investment projects not always based on economic criteria or master plan - Lack of contractual **performance objectives** for utilities - Lack of transparent instruments for residential and legal entities **tariff regulation** - Lack of **technical regulation** instruments (such as benchmarking) - **Regulation of industrial effluent discharges** undermined by a conflict of interest for local authorities.

4 Water and Wastewater Infrastructure—Status and Challenges

The review of water and wastewater infrastructure in the following subsections focuses on three main topics: (i) the challenges inherent in external factors, such as water resources and water demand, (ii) the current condition of the infrastructure, and (iii) the adequacy of infrastructure maintenance and planning policies from operational, financial, and technical perspectives.

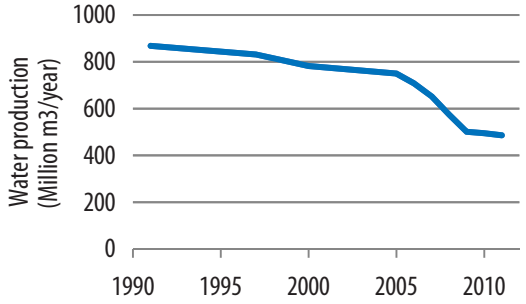
4.1 Water resources and demand

Belarus is a relatively water-rich country, and the available water resources are sufficient to meet both current and future demands. Groundwater resources are abundant, and the yearly volume of fresh water abstraction represents less than 3 percent of the total volume of fresh water generated. Water utilities are the main user of water resources: 31 percent of the water is used for agriculture, 20 percent for industries and the remaining 49 percent for residential consumption. A large majority (about 84 percent) of the country's water supply needs are met by groundwater supplies, with the notable exception of the capital city, Minsk, where surface water is used for the production of potable water.[11] Groundwater is abundant and well distributed all over the country, allowing a high density of small autonomous systems in rural areas.

Water demand has been almost halved over the last two decades, along with the decrease of industrial output and the spread of water metering. As evidenced by water production records and illustrated in Figure 13, water demand decreased by 44 percent between 1991 and 2011. The decrease is largely driven by a decrease in industrial output in the 1990s and then, in the late 2000s, by the spread of water metering. In some places, water production has also been affected by the response of industries to high industrial tariff. The average tariff of BYR22,500/m3 (US$2.60) is about 15 times the residential tariff in the utilities surveyed. This situation resulted from the cross-subsidization between residential and industrial tariffs. In response, many industries

11 Minsk's supply from the Vileika reservoir will be phased out in 2020, and replaced by groundwater sources.

Figure 13: Water intake for residential use (Mm3)



Source: National Statistical Committee, MHU

developed their own water supply systems, as noticed during the utility survey

4.2 Water supply and wastewater infrastructure status and condition

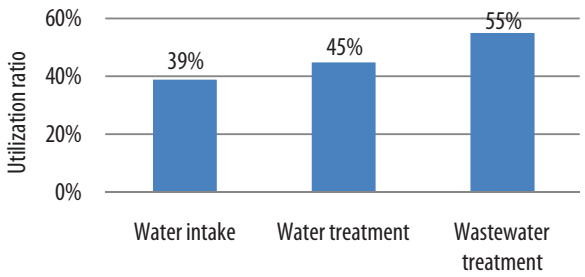
Almost all centralized water and wastewater systems operated in Belarus present similar technical and technological features, which appear fully adapted to local needs and constraints. With the unique exception of the capital city existing water supply schemes usually consist of one or several well fields (composed of deep boreholes). Iron-removal plants, which generally employ an aeration/filtration process, are more and more in use. Power supply to utilities is ensured everywhere on a continuous basis. In general, there is no systematic disinfection for systems using groundwater. Wastewater collection is always ensured by separate sewerage systems (i.e. storm water is collected in different systems). Wastewater treatment is available in all large and most medium-size cities and towns. It generally includes a conventional process that comprises a pre-treatment (screening, grit and grease removal), primary treatment (sedimentation), secondary treatment (biological), and sludge processing. In some places, other treatment processes, such as infiltration ponds, are still in use. Annex V presents an inventory of the water supply and wastewater infrastructure in Belarus in 2011.

Industrial effluents are often discharged into municipal sewerage systems without pre-treatment, in many cases an illegal practice that is highly detrimental to the performance of wastewater treatment plants. Sewerage systems collect these effluents along with residential wastewater. Without pre-treatment, certain types of industrial effluents can seriously impair the performance of the treatment facilities. This is particularly true for effluents from dairies, which contain casein. The current legislation governing the discharge of industrial wastewater in public sewerage systems dates back to 1995.

As a result of decreasing water demand and conservative design norms, water and wastewater systems are greatly oversized. Water systems are oversized for present conditions because they were designed based on "generous" criteria (in terms of water demand, safety margin, etc.), because of the absence of systematic reference to master plans, and because of the recent decrease in water demand. Statistics indicate a low utilization ratio (actual production or treatment/installed capacity) of water production and treatment facilities, as illustrated in Figure 14 (see Annex V for details per oblast and in Minsk). This underutilization is most likely detrimental to the systems' energy efficiency and to performance of water and wastewater treatment.

The water supply and sewerage networks are ageing, and their current rate of replacement does not seem sufficient to reverse their overall ageing. On average the systems are 30 years old with most of the systems' infrastructure dating back to the 1970s and 1980s. Most water pipelines are made of cast iron and steel. For a decade, they have been progressively but slowly replaced by plastic (polyethylene or PVC) pipes. Most collection systems are made of concrete,

Figure 14: Infrastructure utilization ratio



Source: MHU statistics 2011

ceramic, or asbestos-cement pipes. The MHU statistics on leaks and breakages for 2011 estimate that about 8 percent of water and sewerage networks require replacement, which is a low percentage for 30-year-old pipes.

Infrastructure renewal is often planned without an up-to-date assessment of current needs, thus perpetuating infrastructure overcapacity and leading to excessive investment and operating costs. At the local level, investment focuses on the renewal of pumps, construction of iron-removal plants, etc., often without questioning the overcapacity of the existing systems. This perpetuates the present situation and the resulting need for extensive repairs.

Metering of water distribution is almost universal, but the meters' accuracy may deteriorate in small utilities, due to the lack of calibration capacity and policy. All production facilities (boreholes, treatment plants) are reportedly metered, and residential customer meters have been widely installed in the last five years. Cold water meters—one, two, even three—have been installed in apartments, as well as one or two hot water meters. These meters are installed by the customers and remain under their ownership. Meters have to be registered at, and approved by, the National Institute for Metrology. They are reportedly checked every 10 years, or on customer request. Most vodokanals have their own meter calibration and repair workshop; however, this facility is not available in most MUs where the maintenance and control of meters are problematic. Although some bulk meters were installed decades ago, there is no real policy for checking their accuracy and replacing them; therefore, the metered production is likely to be slightly underestimated.

4.3 Water and wastewater infrastructure management

Except for recently constructed facilities, the water and wastewater infrastructure is rather old and in dilapidated condition due to lack of investment in maintenance and rehabilitation. Most utilities plan for preventive maintenance, in accordance with the "Procedure for preventive maintenance of centralized water supply and sanitation systems" approved by the MHU in 2006; however, their preventive maintenance plans are often only partially implemented, and the maintenance is essentially emergency repair, as found during visits to utilities. This situation is due in part to lack of financial resources and in part to lack of a maintenance culture

Adequate equipment to operate and maintain water and wastewater systems is clearly lacking in small utilities. Getting modern operational tools and equipment is the privilege of a few vodokanals that have the financial resources to recruit specialists and purchase specialized equipment for meter testing and calibration, leak detection, sewer jetting, etc. These resources are clearly lacking in MUs, which cannot call on the private sector to provide the services needed. The small scale of the MUs prevents them from accessing modern tools and technology.

Cooperation between utilities is very limited. Utilities very rarely share equipment or expertise. The only exception is in the Mogilev Oblast where the oblast administration has established an "oblast vodokanal" to provide technical and operational support to the vodokanals and multi-utilities for an annual fee. The Vitebsk Oblast Vodokanal provides such support only to the four vodokanals in the oblast.

4.4 Infrastructure development programs

The government's policy implementation is based on 5-year programs called the Clean Water Programs. These programs started in 2002 with a 4-year program (2002-2005), followed by a 5-year 2006-2010 program and the current 2011-2015 program. The current and previous programs included major investments aimed at increasing the level and quality of services and at preserving the environment, as detailed below.

The 2006–2010 Clean Water Program enabled the achievement of major improvements in the quality of services. Over the 2006-2010 period, investments averaged US$58 million per year. As a result of this program, water supply coverage was extended to an additional 7 percent of the population and

TABLE 10: 2006–2010 CLEAN WATER PROGRAM – TYPES AND COSTS OF INVESTMENTS

Investments	Cost estimate (BYR2006 billion)	Cost estimate (million US$*)	% of Program
Development/rehabilitation of water and sanitation systems	564	263	90.3%
Rehabilitation/renovation of agri-town systems	40	18	6.3%
Support to villages in the Minsk area	5	2.3	0.8%
Management tools and equipment	10	4.6	1.6%
Technical rules and procedures	0.1	0.1	0.0%
Control and monitoring equipment	6	3.0	1.0%
Total for the program	625	291.0	100%

**average exchange rate in 2006*: US$ 1 = BYR 2150
Source: Clean Water Program 2006-2010

sewerage coverage to an additional 9 percent. It also enabled the opening of about 50 new iron-removal plants, reducing the number of people whose water contained excessive levels of iron by about one million. The program also stressed the need for introducing advanced technologies, improving utility management and structure, and reducing costs through energy-saving technologies, optimization of processes, etc. However, the program has been almost exclusively infrastructure oriented, as shown in Table 10.

While the current program remains largely aligned with the previous one in its objectives and financial means, its target this time includes the reduction non-revenue water (NRW). Along with external financing support (see following section), yearly capital investments in the sector represent an average US$40 million per year. The stated priorities of the program are to (i) provide quality potable water through centralized systems in urban areas and townships to 98 percent of the population by 2016; (ii) provide centralized water supply systems in agricultural towns (with 80 percent of the population served by 2016); (iii) reduce water loss and NRW by 5 percent; and (v) extend sewerage systems in oblasts to cover an additional 1.6 to 5 percent of the urban population and 1 to 3 percent of the rural population.

4.5 Conclusion on water and wastewater Infrastructure

The water and wastewater sector in Belarus shows a solid but ageing infrastructure largely inherited from the Soviet Union and urgently requiring modernization. Sector strengths and weaknesses in terms of infrastructure are summarized in Table 11:

TABLE 11: STRENGTHS AND WEAKNESSES OF WATER AND WASTEWATER INFRASTRUCTURE

Strengths	Weaknesses
+ Abundant renewable **resource** (with good chemical and bacteriological quality). + **Metering** almost universal + Increasing **IFI** financial support to the sector (in the context of decreasing central government financial involvement)	- **Ageing** infrastructure - Excessive **installed capacity** - Insufficient preventive **maintenance** - Water utilities bear losses in **hot water** systems and residential buildings' **internal piping**.

5 Conclusion of the Diagnostic

Following more than a decade of strong and sustained commitment by the Government of Belarus, the sector has achieved very positive results in the area of water and wastewater services, with direct impacts on quality of life and economic development. The coverage, quality, and reliability of services have improved steadily, reaching excellent levels of service in urban areas in particular.

Despite these important achievements, vast investment needs are still required to close coverage gaps in rural areas, to expand wastewater treatment capacity, to align the sector with European standards, and to address remaining water supply quality issues. In addition, without sustained modernization efforts to renew an ageing and oversized infrastructure, the operational performance of services will deteriorate, with immediate consequences in terms of quality and cost of services.

Financing the achievement of these ambitious objectives will represent a major challenge given the decreasing water consumption, the Central Government's intention to limit public financing of infrastructure, and the highly distorted tariff structure, which leaves the sector dependent upon a few large customers to generate revenues. The viability of service provision in small utilities, in particular, may be jeopardized without centralized financial support.

These daunting challenges call for sound sector policies conducive to economically efficient investment programs and water and wastewater operations. The sector is currently organized in a clear and functional institutional framework, but the conservative design norms and investment appraisal and prioritization approaches, often devoid of clear economic criteria, may hinder the economic efficiency of investments. The operational efficiency of water and wastewater operators is generally acceptable (in particular in large cities) but improvable. Small utilities (in general multi-utilities) often show a suboptimal level of performance and capacity, perpetuated by the absence of contractual performance requirements from local authorities and a lack of performance-oriented culture and management instruments within these organizations.

Improving the sector's economic efficiency is a particularly acute priority in the framework of the Social and Economic Development Program for 2011-2015, in which the government envisages phasing out cross-subsidies and operational subsidies (which currently account for 10 percent of sector revenues) by 2015. From this perspective, a redefinition of financing mechanisms is required to guarantee sector sustainability while ensuring the affordability of services.

A number of specific recommendations are offered in Part II of the present report.

Part II

Recommendations

The following sections offer a number of recommendations to strengthen the water supply and wastewater services sector. The recommendations support four objectives: (i) to develop a legal and policy framework for the sector, (ii) to increase operational efficiency, (iii) to increase the efficiency of investments, and (iv) to finance the development of services.

1 Developing a Policy and Legal Framework for the Sector

A national strategy that consolidates sector policies and strategy in a single document can serve as a key instrument to foster consensus and support for upcoming sector reforms. Three recommendations addressing this problem are presented below.

Formulate a policy statement that specifies the commitments and key orientations of the government in the sector and the corresponding objectives. The statement could include a description of the present sector situation, identify the main challenges to sector development and describe the government's commitments, principles and objectives for the medium- and long-terms. The statement would cover objectives (setting targets and a timeframe to reach them) such as: improving service coverage and level of service, enhancing the quality of service, ensuring affordability of services, ensuring equitable treatment of customers, clarifying sector responsibilities, achieving financial autonomy and protecting the environment.

Formulate a strategy for the sector, providing a detailed road map for the achievement of policy objectives. To comply with the above commitments, principles, and priorities, and meet the policy objectives, the proposed strategy could focus on (i) increasing efficiency in water supply and wastewater operations, (ii) increasing efficiency of water supply and wastewater infrastructure development, (iii) securing financing of the water supply and wastewater services, and (iv) improving sector regulation. The strategy would be defined in line with both the government's "Socio-Economic Program" and its sector policy, and would be prepared and issued by the Ministry of Housing and Utilities. It would provide sector guidance for regional and local governments, associations of local governments, and water supply and wastewater operators. It would be intended to serve as a detailed roadmap for the development of the sector and to make the issues, actions, and solutions understandable to the widest possible group of stakeholders. It would present in a transparent manner the mechanisms to access public grants and credits. These strategic proposals are developed in the following sections.

Update the sector legal framework with specific additions or clarifications on topics such as sanitation and the right for users to develop services substitutes. A law on sanitation could be prepared, reflecting the diversity of contexts (in terms of size and density of settlements) and possible approaches in small towns and rural areas. In parallel, an updated version of the law on water could optionally be prepared, thus allowing a comprehensive vision of the legal framework of both services. It would be advisable to identify and clarify specific circumstances in which legal entities may or may not be allowed to develop their own water or wastewater systems, to mitigate financial risks for the utilities.

2 Increasing Operational Efficiency

The utilities' operational efficiency can be improved in many areas, including technical, commercial, organizational, and financial. Several recommendations of the study—particularly the regionalization of water and wastewater services and the involvement of the private sector—would entail significant changes to the way services currently operate in Belarus.

2.1 Regionalization of services

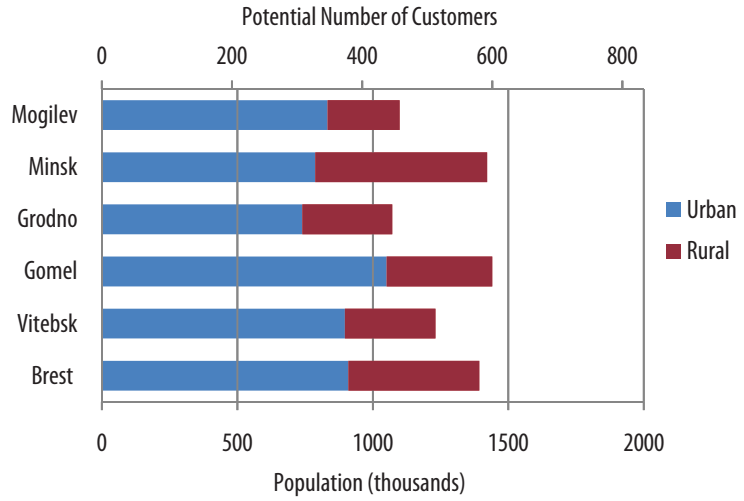
Regionalize services to attain greater efficiency and higher quality in the provision of local public services by facilitating access to funding and promoting independent, well-managed and financially sustainable operations. The following paragraphs present the rationale and principles of the regionalization approach.

Regionalizing the provision of services would address investment and operational efficiency, financing and other challenges of the sector. Raion multi-utilities (MUs) are, on average, far too small to develop sufficient professional capacity, and as result they are largely inefficient and unsustainable. With an average of 12,000 customers, raion MUs are far from the minimum size, 50,000 to 100,000 customers, needed to ensure acceptable economies of scale in the water sector. Utilities operated at the regional level would (i) generate economies of scale, (ii) develop more professional services, (iii) pool capacities, means and resources, (iv) allow small utilities more access to funds; and (v) develop urban/rural solidarity. The regionalization of water and wastewater services could be adopted following the same model as other countries with similar sector characteristics and challenges, such as Romania.

Geographic factors make it more practical for the regionalization to be aligned with existing administrative divisions. Ideally, because the sector is intimately associated with water resources, the regionalization of services could be designed in accordance with river basin perimeters. However, in Belarus, river basins are very fragmented and disconnected from the administrative organization of the country and therefore not suitable for a water services organization. Another

option is to align sector organization on the existing administrative divisions through oblasts and raions; this option has the advantage of not disrupting the present sector organization. In the recommendation developed in this report, a regional water and wastewater utility would be established in each oblast, and each would potentially provide services to a population of 1.0 to 1.5 million people, i.e., about 400,000 to 600,000 customers, as shown in Figure 15.

Figure 15: Oblast urban & rural population in 2009
(thousands)

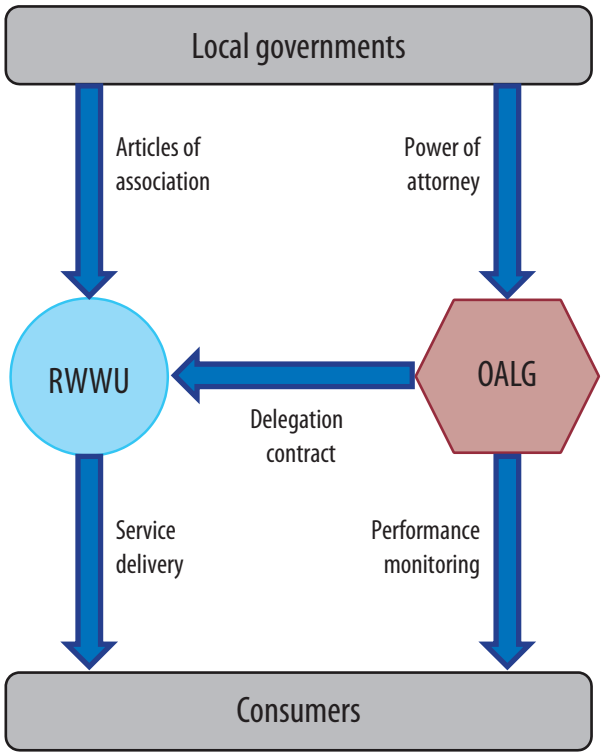


Source: National Statistical Committee (population data)

The proposed institutional set-up would maintain local governments' control over the assets and enable them to manage jointly a performance-based delegation of services. Vodokanals and multi-utilities have been established by local governments to ensure the economic management of their assets. The proposed institutional framework is designed to preserve the responsibility of the executive committees in the provision of services, and to allow them to access investment funds through regional loans contracted by the regional water and wastewater utility (RWWU). Another set-up could foresee the transfer of assets management to an asset-holding company established at regional level, and responsible for capital investment financing. Such an entity should have the capacity to maintain a continuous dialogue with the operator on business strategy and to quickly raise funds when needed. This would represent a serious challenge considering the number of local governments that would compose its board. The considered arrangement is illustrated in Figure 16:

- Asset owners represented by the local governments would form an "Oblast Association of Local Governments (OALG)", whose exclusive function would be to provide water and wastewater services to its members. Membership would imply that each local government grants a power of attorney to the association.

Figure 16: Allocation of responsibilities under the regionalized sector set-up



Source: World Bank Staff, on the basis of Romania regionalization model

- The RWWU could be a joint stock company whose board would comprise all OALG members, as well as representatives of the oblast administration and civil society. Assets would remain the property of the local governments, but would be transferred to the RWWU for economic management.

- The association would sign a long-term delegation contract with the RWWU, specifying annual objectives and targets. The regional utility's operations and performances would be supervised and monitored by the OALG through performance indicators and targets specified in the contract.

The RWWU would be managed from the oblast capital city and be operated from sub-regional branches. Headquarters in the oblast capital city would be responsible for management and development issues. Several sub-regional branches, created by the expansion of existing vodokanals to neighboring towns, cities, and raions, would be dedicated exclusively to operations. Ideally, each branch should cover a population of 200,000 to 300,000 consumers—an average of five operational branches per oblast.

To overcome any implementation difficulties and possible reluctance on the part of stakeholders, a progressive rollout of the regionalization scheme is recommended, along with close consultation with all those concerned. The implementation should not disrupt operations and service to the customers, and the expected benefits of this process will need to be communicated at all levels. Also, the reform implies that water and wastewater operations in MUs should be disassociated from the other activities, and vodokanals should abandon their sideline activities. To allow for potential roadblocks, the regionalization reform should be implemented progressively, starting with a pilot project in one or two oblasts. Also, the OALG could be formed with several local governments within on oblast and then progressively develop as other interested local governments join in.

The regionalization process would not be compulsory, but it could be accelerated through financing incentives offered by national and oblast authorities. Local governments could be encouraged to join the OALG through the opening of public financing windows only available to the RWWU. Even in the case of localities that did not join the regional operator, the allocation of public development grants could be conditioned on the projects' compliance with regional investment plans approved by the RWWU and OALG.

2.2 Stimulate utilities' performance through yardstick competition and social accountability

Promote benchmarking as a key tool for utilities to identify priority interventions, set performance objectives and foster yardstick competition. It is essential for sector policy-makers to identify best practices and performance gaps among utilities so that asset owners can set adequate performance objectives for their utilities and encourage good management. Proper sector benchmarking would require (i) developing of a set of well-defined performance indicators (a list of recommended indicators is given in Annex VII), (ii) developing utilities' capacity to produce regular and reliable information, (iii) setting up a dedicated benchmarking management unit in MHU responsible for collecting, benchmarking, and disseminating results to sector stakeholders, and (iv) developing policy makers', asset owners' and utilities' knowledge of relevant benchmarking approaches for sector regulation and planning. If properly introduced, a regulatory framework can be developed with a set of incentives and penalties to encourage performance improvements.

Enhance service providers' accountability to their end users. The publication of utilities' performance information and MHU benchmarking analyses could foster customers' demand for improved services at a lower cost. It could become a condition to the allocation of budget support to utilities. Reinforcing social accountability would also require stimulating customers' feedback to both utilities and local governments through clear and transparent mechanisms to redress grievances.

2.3 increased capacity and efficiency through public–private partnerships

Encourage the involvement of the private sector through public-private partnerships (PPPs) to reach immediate and significant efficiency gains in areas where utilities lack experience and capacity. PPPs have two main objectives: (i) increasing quality and efficiency of the water and wastewater services through enforceable contractual obligations; and (ii) raising financing from capital markets. Both are particularly relevant objectives in the context of Belarus. Private sector involvement in the public sector may take various forms, including service contracts (outsourcing), management contracts, lease/affermage contracts and concession/BOT (Build-Operate-Transfer) contracts.[12] For these PPP contracts, fixed assets, i.e., infrastructure facilities, managed by the operator remain under public ownership. In the short-run, service contracts appear to be the most appropriate option to initiate these types of partnerships.

Delay extensive PPP arrangements (e.g., concessions, BOTs) not be immediately applicable in the short-term. Such contracts have to be financed mostly from funds raised on the local capital markets. The local capital markets may not be able to provide funds on terms compatible with a sector that depreciates its assets over a long period and thus requires loans that mature over 12 to 15 years. Consequently, such forms of PPPs are highly risky.

Consider management contracts as an option if a large vodokanal shows very significant potential to improve its performance. Management contracts (usually for 4 to 5 years) are considered when major improvements in operational performance and capacity are required at all levels. Such a level of assistance may not be relevant in most large water utilities in Belarus, where the potential for performance improvement often seems limited, but it could be considered if one of them demonstrates particularly poor levels of performance. Small raion utilities, which have the most significant performance deficiencies, would not have the scale of operations required to attract professional private operators. Lease/affermage contracts would require the setting-up of asset holding companies, which is not part of the present recommendations.

Ensure that service contracts set out clear performance objectives in areas where the utilities lack resources and experience. In the context of Belarus, this type of contract could include (i) outsourcing of the construction of new water and sewerage connections, (ii) unblocking and cleaning of sewerage connections and pipes, (iii) implementing a leak detection campaign, (iii) maintaining hardware and software, and (iv) improving some aspects of commercial operations. Involving the private sector through service contracts would require careful attention to ensure that the service contractor has the required capacity and that contracts are awarded on a competitive basis. Also, the contract should include clear performance objectives to ensure that this contractual arrangement is profitable to the utility, not only financially but also in quality of service and timeliness.

Ensure that all stakeholders thoroughly understand the benefits and challenges associated with PPPs. The involvement of the private sector in the water and wastewater services operations, if it occurs, would clearly be a cultural change for the main stakeholders. It is important that it be carefully managed and that thorough information on the pros and cons of such an involvement be provided to decision-makers. This could be achieved through meetings with sector officials and utility managers from countries with experience in PPPs, meetings with private operators, and seminars/workshops focusing on the legal and contractual aspects of PPPs.

2.4 Improving operation and maintenance performance

Perform energy audits to assess the potential for improving utilities' energy efficiency. Energy audits could be carried out at a utility level. Such audits would not only assess the current performance of electromechanical equipment, they would also

12 See World Bank, Water & Sanitation PPP Toolkit for a full description of each type of partnership.

analyze the relevance of operational policies (particularly regarding water pumping and storage) and possibly formulate recommendations to restructure the systems' hydraulic architecture with a view to reducing energy consumption.

Set up control teams specifically dedicated to the reduction and control of water loss in utilities that have high or deteriorating levels of non-revenue water (NRW), and provide them with performance objectives and remuneration incentives. The NRW level appears acceptable across the sector, but operational performance varies significantly among utilities and the scope of improvement needed may be very significant in some cases. The control teams set up to manage these cases would receive specific training on NRW management, special equipment, etc. This control team set-up as a transversal unit would directly report to the utility director. Short and long-term objectives for the NRW ratio should be given to this NRW control team. For example, a long-term objective could be reaching and maintaining a given NRW ratio, with appropriate remuneration incentives.

Clarify the costs for municipalities to cope with the discharge of untreated industrial effluent discharge to centralized sewerage systems. An assessment of the current insufficiencies in terms of industrial wastewater pre-treatment capacity would first help understand the associated impacts for utilities and asset owners. This analysis would clarify the costs for both municipalities and industries to maintain the status quo or to enforce local regulation on effluent discharge, and would thereby help municipalities select the most economically rational approach.

2.5 Modernizing commercial operations to improve their efficiency

Install and monitor bulk meters for residential buildings, and increase meter oversight. Such an arrangement (already in place in Minsk vodokanal) would enable utilities to check the information provided by customers regarding their water consumption and thereby help reduce NRW. The introduction of meter reading and preparation of bills by the water utilities would be an opportunity to introduce new technologies, such as automatic meter reading (AMR). Also, with the planned increase in the water tariff, the utilities could verify on a frequent, but random, basis the adequacy of consumption volumes reported by customers living in residences other than apartment buildings. This might lead to the conclusion that meter reading should be fully internalized by the utility in the future.

Clarify the allocation of responsibilities between customers and utilities as soon as owner associations are in place. An association of owners would be set up in each residential building to take care of all common property.[13] A bulk meter would be installed at the entrance of the building to indicate the aggregate consumption of cold water, and building residents would be charged through the owners' association, which would divide the water bill among the households. This scenario assumes that forming an owners' association becomes compulsory. A deadline for instituting bulk metering for apartment buildings could then be set, with utilities given the right to discontinue supplying buildings that have not signed a customer contract.

If owners' associations remain noncompulsory, provide formation incentives for building residents. Associations of owners should be charged at the residential tariff, not at the legal entities tariff. In addition incentives could be proposed by utilities, such as: the (one-time) repair of internal piping leakages and installation of bulk meter free of charge given the formation of an owners' association and signing a customer contract.

Install bulk meters at water heating points and charge (at the residential tariff) to the hot water company hot water volumes as measured by these meters. Under such arrangement, the water utility would no longer bear the consequences of the possible leaks in the hot water networks.

13 Utilities could consider providing internal piping maintenance services to the owners associations (as is currently the case in Bobruisk and Mogilev vodokanals), but that cost should not be borne by customers outside of the building.

2.6 Optimizing organization and human resources

Recruit managers on a competitive basis and develop attractive compensation and incentive policies that link compensation to achievement. This strong recommendation is in line with the "Program of Socio-Economic Development of the Republic of Belarus for 2011–2015" approved by Presidential Decree 136 of April 4, 2011 and the Presidential Decree 181 of May 2011. It will enable utilities to attract and retain talented professionals. Employment conditions should be comparable with that of the private sector in Belarus and recruitment of utilities' management should be done on a competitive basis. Combined with redeployment of the staff, the proposed salary upgrade should not increase the total payroll of the utilities.

Develop economic, financing, and business management competencies, and enhance their quality through national certification systems. To develop and manage water utilities as modern and economically efficient companies, those in charge of hiring and training management staff could seek a better balance among areas of competency (management, economics, finance and engineering). A certification program for key utility management functions based on intensive training programs and clear certification procedures would be recommended to develop high professional standards, in particular for non-traditional functions. Strengthening customer relations and human resource functions in the utilities' organizational structure will also be beneficiary, considering (i) the expected increase in the residential tariff and (ii) the proposed restructuring of staffing policies.

Improve staff productivity by (i) discontinuing the norm-based approach, (ii) assessing real needs, and (iii) rationalizing staff inputs, on the model of well-performing utilities. The "Program of Socio-Economic Development 2011–2015" states that the structural transformation of the economy is based on personnel restructuring to achieve higher productivity and on optimizing the number of employees in line with the real needs of production. Most well-performing utilities do not use staffing sizing norms and determine the right organizational structure and staff size empirically, i.e., based on their own experience. They strive to minimize their personnel costs through a rationalized organization, the pooling of resources, the development of automation, the outsourcing of non-core activities, etc. It is therefore recommended that the utilities' managers, notably the human resources managers, become familiar with such empirical approaches of staffing through regular contacts or, ideally, a twinning with performing utilities. If staff retrenchment is envisaged, staffing plans should be prepared identifying the associated social and financial costs and identifying options to mitigate them (staff redeployment, voluntary retirement, etc.).

2.7 Improving utilities' business planning

Consider preparing 3-year rolling business plans, including clear objectives measurable through performance indicators and action plans to reach them. Business planning is the comprehensive roadmap of the utility, and a monitoring tool for its contracting authority. It is recommended that the Ministry of Housing and Utilities prepare a model for business plans specific to water and wastewater utilities—under a standard format with clear instructions. The business plan should be action-oriented and limit the presentation of statistics to indicators that can suggest and support specific actions; all objectives should be measurable through performance indicators. The business plan would address all functions of the service provider (finance and accounting, investments, operation and maintenance, customer management, organization and human resources, etc.). The content should be short and actionable to allow for an easy and unambiguous dialog between the utility and the contracting authority.

Prepare regular financial reports on a regular basis, according to IFRS standards. A utility's access to external funds would be conditional on its preparing full financial reports. They would include a transparent and detailed breakdown of costs so that potential areas of operational cost reduction or optimization can be identified. These reports would

be subject to systematic independent audits. As long as operating subsidies remain necessary for a number of utilities in the sector, such reports would enable public authorities to plan their allocation on the basis of medium-term financial forecasts issued by utilities. Such a requirement would facilitate dialogue between utilities and their financiers on the development of and commitment to operating efficiency targets.

3 Increasing Efficiency of Infrastructure Development

Revise the norms and standards used for the sizing and design of facilities, with the objective of maximizing economic and financial returns on investments. With regard to water demand norms, statistical data should be used more systematically in designing and sizing facilities. The safety-first principle in use in western countries is not based on the doubling the number of facilities, but on the quick and effective intervention of repair and maintenance teams to fix the problems. Such norms could be extensively revised, taking into consideration funding limitations. A clear differentiation of technical and technological standards for urban and rural areas would be as well strongly recommended. More generally, a comprehensive revision of the norms and standards in use for the sizing and design of facilities could be considered, and these design rules could be updated to maximize economic and financial returns of investments. It is believed that savings of up to 30% can be achieved in many types of capital investments.

Make the preparation of regional and local water and wastewater master plans mandatory for project funding requests. Once the regionalization of services is in place, regional master plans would be prepared to identify long-term changes in the current arrangements, especially regarding the possible economies of scale that might result from the grouping of facilities serving several settlements. The master plans could also identify which areas are eligible for centralized systems and which areas are better suited (technically and economically) for collective water services (standpipes, collective wells) and on-site sanitation. Complementary to the regional master plans, local master plans would be prepared on a systematic basis, based on local urban or rural development plans. These long-term master plans would prioritize projects on the basis of transparent criteria (such as economic rate of return). That prioritization should be transparent and justified in the master plans and subject to appraisal. Funding for infrastructure development would be allocated on the basis of master plan appraisals by potential financing entities (public authorities, IFIs, etc.).

4 Financing the Development of Services

Financing the development of the water and wastewater sector will represent a major challenge in a context characterized by (i) regularly decreasing residential consumption; (ii) high dependence on the behavior of legal entities that represent only 2 percent of the customers but 77 percent of sales revenues; (iii) a prospective rapid phase-out of operating subsidies and capital grants planned by the central government; (iv) the need for rehabilitation of facilities that have excess capacity; and (v) the incapacity of the local capital market to provide funds on terms compatible with the economy of a sector that depreciates its assets over long periods. This chapter offers general recommendations regarding tariff and investment financing policies, a number of which are supported by a sector financial model elaborated for this study.

4.1 Tariff regulation and allocation of operating subsidies

Regulate tariffs by contract on the basis of transparent economic and financial models. Proper economic regulation of the sector does not necessarily require a "regulator," and it can be performed by the government (here the Ministry of Economy) on the basis of clear and well accepted regulatory instruments, such as financial and economic models (as is the case in France, the Czech Republic, and South Africa, among others). To succeed, an independent regulator would need to be fully predictable, free of political interference, transparent, and participatory, which may not be fully achievable in the short-term in Belarus. A detailed economic and financial model could be prepared to define and update the tariff structure and levels. Tariffs would ideally be automatically adjusted according to a simple cost index formula to protect revenues against inflation. Once the regionalization process has been completed, regional tariff levels could be set by the OALG according to the methodology and principles defined by the Ministry of Economy.

Set tariffs with the objectives of covering operating costs (and ultimately the long-run marginal cost of water), stimulating economic

efficiency, and ensuring equity and affordability.[14] The primary objective of tariffs is to recover "financial" costs, i.e., operation and maintenance, depreciation, and financing costs. Also, utilities can be motivated to improve their operational (and CAPEX) efficiency if tariffs are set just below the level enabling them to recover operating costs. Tariffs could be set to ensure equity among categories of customers through reduction of cross-subsidization between customer categories, rationalization and homogenization of the categories, and setting of residential consumer tariffs[15] at national level, or at regional level after the regionalization of services is implemented.

As long as operating subsidies remain necessary for a number of utilities in the sector, set-up allocation mechanisms encouraging the improvement of their operational efficiency. The allocation of operating subsidies could integrate performance incentive mechanisms such as: linking their provision (at least to a certain extent) to utilities' level of performance, or to the preparation of audited financial reports and business plans (as described in section 2.7).

4.2 Infrastructure development financing

The overall capital investment needs of the sector in the years to come could not be assessed as part of the present study, but developing a master plan for providing water and wastewater services would help clarify the sector's investment needs in the short-, medium- and long-terms.

Identify the optimal infrastructure financing strategy balancing contributions from taxpayers and from service users. Financing asset development through tariff revenues can present several advantages for the sector: (i) utilities rely on more predictable financial sources and are less vulnerable to authorities' budget constraints; (ii) concentrating planning and debt repayment responsibilities encourages asset owners or their concessionaires to increase the efficiency of investments. Financing services through fair and efficient taxation can also be appropriate economically, and help maintain tariffs at a more affordable level to all customers. Either financing approach (or a mix of them) can be found among performing water and wastewater sectors in the developed world. Detailed analyses of the fiscal burden of infrastructure financing and of the social impacts of tariffs would be recommended to identify the optimal cost-sharing arrangement.

The selected financing approach could maintain development grants for certain types of projects and develop lending from the central government to help asset owners or their concessionaires build a credit record. Development grants could remain primarily targeted to projects with a strong "public good" element, such as environmental protection or service to the poor. With regard to borrowing options, commercial lenders are unlikely to be able to provide debt on terms compatible with the economy of the sector, which depreciates its assets over long periods and therefore requires long-term loan maturity of, say, 12 to 15 years, without a guarantee from the central government. In the absence of a municipal development bank, the only source of local debt is likely to be the central government. On-lending conditions should be similar to those of the local market in order to help asset owners or their concessionaires build their credit record and enable their future access to capital markets.

4.3 Sector financing policy discussion

A consolidated financial model of the water supply and wastewater sector was prepared to assess the relevance of various sector financing policies. The model reconstitutes the income and cash flow statements of the sector, taking into consideration available data on operational characteristics, costs, and revenues in 2011, as well as capital investment

14 Demand management is usually considered a key principle of tariff setting. However significant progress has already been accomplished with regard to reducing consumption to European levels. With an average daily consumption of 117 liters per person per day, this objective is not considered a priority in Belarus.

15 Residential tariffs would also apply to services supplied to owners' associations even though these associations are considered legal entities.

programs and partnerships with donors.[16] The objective of this preliminary analysis is to identify key principles and milestones for sector financing policy in the next 10 years. Briefly summarized below are (i) the key assumptions and scenarios considered in the analysis, and (ii) the main results and conclusions drawn from the financial model, in particular, the setting of realistic milestones for the elimination of subsidies.

The elimination of operating subsidies and cross-subsidization by 2015 would require significant residential tariff increases in the short-term. Two approaches have been considered, as shown in Table 12: (i) if legal entity tariff is maintained at its current level, residential tariff would need to increase by 158 percent per year to achieve the objectives set by the current government policy; and (ii) if legal entity tariff is reduced down to operating cost recovery level in 2015, an increase of residential tariff by at least 78 percent per year would be required.

16 Note: A key limitation of this model stems from its consolidated structure as operating losses of some utilities are compensated for by the profits of others. However, with the recommended regionalization of services, such an approach would become fully relevant in the medium-term. Until this consolidation of resources is achieved, the model is likely to present a slightly more optimistic picture of the overall sector financial situation than it may be in reality.

Three other scenarios are tested on the basis of alternative tariff policies and recommended investment financing approaches. Three tariff policy scenarios have been defined as shown on Table 13, considering that: (i) an increase of more than 10 percent per year in the residential tariff may be difficult to implement from social and political perspectives, and (ii) the elimination of cross-subsidies may require lowering the current tariff level for legal entities, a distinct possibility if tariffs are not adjusted for inflation. Results are presented in Table 14. The scenarios assign different priorities to the two major and competing objectives of the government: eliminating operating subsidies and eliminating cross-subsidies between categories of customers. Capital financing scenarios are built considering the mix of development grants, loans and cash generation as a long-term objective (a more demanding assumption than the current approach exclusively based on development grants).

The twin goals of eliminating both operating subsidies and cross-subsidization in the short- or medium-term appear ambitious. The recovery of operating costs and elimination of cross-subsidies between categories of customers are competing objectives. All scenarios assume a CAPEX of 350 billion BYR per year (US$40 million/year). As seen in Scenario A in Table 14, operating subsidies

TABLE 12: TARIFF ADJUSTMENT OPTIONS TO ACHIEVE THE ELIMINATION OF OPERATING SUBSIDIES AND CROSS-SUBSIDIZATION BY 2015

Approach	Legal entity tariff unchanged	Legal entity tariff down to operating cost recovery level
Residential tariff adjustment	+158%/year	+78%/year
Non-residential tariff adjustment	no change	-31%/year
Unified tariff level in 2015	BYR15,030/m3	BYR7,190/m3
Operating costs in 2015	BYR7,190/m3	
Operating + capital financing costs in 2015	BYR8,080/m3	

TABLE 13: TARIFF INCREASE SCENARIOS

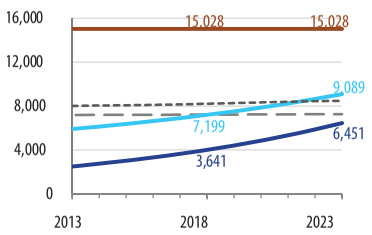
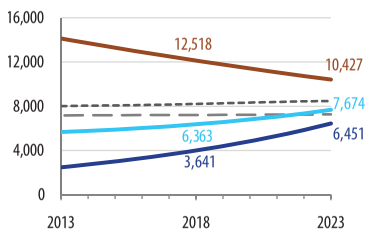
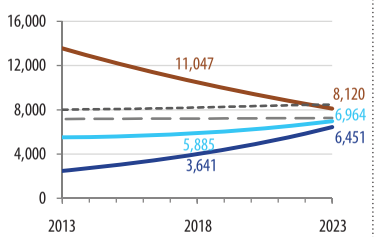
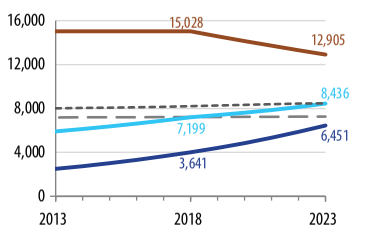
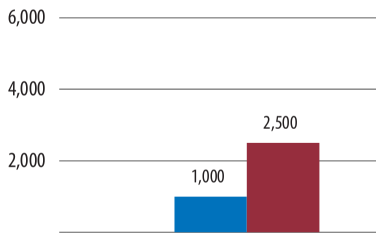
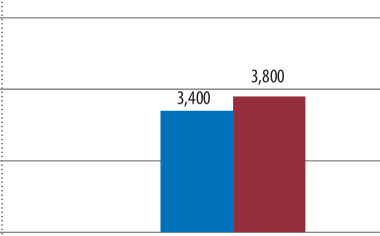
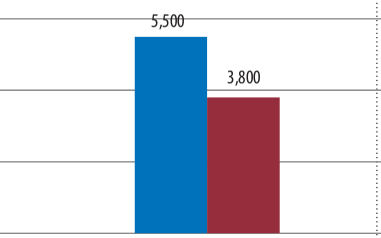
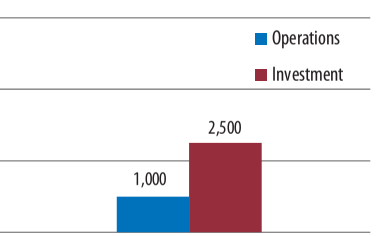
	Scenario A	Scenario B	Scenario C
Main priority	Reduction of operating subsidies	Balanced between both objectives	Reduction of cross-subsidies
Residential tariff	+10%/year	10%/year	10%/year
Non-residential tariff	+0%/year	-2%/year	-5%/year

could be phased out in 2017, but the cross-subsidy ratio would still be 3.8 in 2018. In Scenario C, cross-subsidies can be eliminated by 2023, but operating subsidies may still be needed by that date. Scenario B assumes a sustained residential tariff increase and industrial tariff decrease. Under this scenario, sales revenues should be sufficient to cover depreciation and financing costs about three years after operating costs are recovered.

Another option would be to sequence tariff adjustments to first eliminate operating subsidies and then gradually eliminate cross-subsidies as soon as sales revenues are sufficient to cover operating costs. This approach (Scenario D, summarized in Table 14 and presented in detail in Annex VIII) is in line with both government economic policy objectives, but delays the achievement of full cost recovery (including for CAPEX) and the phasing out of development grants. Under this scenario, cross-subsidization reaches a ratio of 1 to 2 in 2023. The elimination of cross-subsidies would require, in a variant of this Scenario D: (i) a continuous increase of residential tariffs by 13 percent per year until 2023; and (ii) a decrease by 11 percent per year of legal entity tariffs between 2018 and 2023. Overall, the definition of an optimal tariff policy would require the fine tuning of scenarios into a more detailed and reliable financial model taking into account an updated assessment of capital investment needs.

A sensitivity analysis conducted on the basis of Scenario D, the recommended scenario, confirms the urgency of reducing cross-subsidization and improving utilities' commercial and customer relations management. Sector financial stability would be significantly impacted by a reduction of residential consumption levels, potentially triggered by the planned substantial increase in the water tariff. To better understand and anticipate the impact, a study of consumers' capacity to pay for services is recommended. A rapid increase of commercial NRW would also greatly affect sector financial situation. An assessment of the level of effort required to develop sound commercial and customer relations management will most likely demonstrate their relevance and urgency from an economic perspective. Finally, the sector is highly vulnerable a reduction of industrial consumption levels, which confirms the urgency of reducing cross-subsidization. Details of the sensitivity analysis are presented in Annex VIII.

TABLE 14: FINANCIAL MODEL SCENARIOS: TARIFF ASSUMPTIONS AND COST RECOVERY ANALYSES

	SCENARIO A Priority: subsidies reduction		SCENARIO B Balanced priorities		SCENARIO C Priority: cross-subsidies reduction		SCENARIO D Sequenced priorities	
Tariff increase	Residential	+10%/year	Residential	10%/year	Residential	10%/year	Residential	10%/year
	Non-residential	No change	Non-residential	-3%/year	Non-residential	-5%/year	Non-residential	No change then -3%/year
Average tariff: Residential Legal entities Average **Cost recovery tariff:** OPEX OPEX + depreciation + interests *Unit: BYR billion*								
Cross-subsidy ratio in 2018	3.8		3.0		3.8		3.8	
Cross-subsidy ratio in 2023	2.3		1.8		2.0		2.0	
OPEX recovered in:	2019		2022		~2024		2019	
OPEX + interests + depreciation recovered in:	2022		~2025		>> 2024		2023	
Total subsidies 2013–2023 (operations and investments) *Unit: BYR billion*								

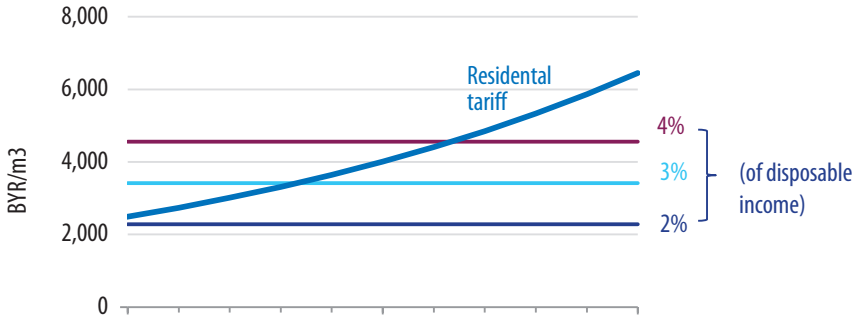
4.4 Impact on affordability

Setting residential tariff rates at a level sufficient to recover operating costs will significantly affect the affordability of services for low-income populations. At the current highly subsidized tariff levels, services are affordable to low-income households. Currently, the disposable income available to the poorest 8 percent of the population (with the exception of the very lowest 0.2 percent) is between BYR16,000 and BYR32,000 per month (US$3.7/month), according to Belarus National Statistical Committee. Affordability limits for water services are usually considered to be between 2 and 4 percent of expenditures. With a 10 percent yearly increase in the average residential tariff, the impact on affordability of services is likely to be acceptable until 2017 (see Figure 17). After that, an average residential tariff of more than BYR4,000 per m3 (US$0.46/m3) may not be affordable to the poorest households of this income group.

Vouchers to struggling low-income households may be more economically appropriate than any cross-subsidization scheme. Three approaches can be considered to tailor the cost of services to low-income household budgets: (i) direct financial assistance from the local executive committee to settle their utility bills, as is currently the case in Belarus; (ii) cash transfers from local executive committees to their utilities to compensate for a discount on their bills (ii) a very low tariff block covering essential water needs (for example 30 liters per capita per day), ensuring that the water bill would not exceed 2 to 4 percent of the poorest household's budget. The first approach best targets financial support to the poor since in the second option, every customer—regardless of needs, would benefit from the cross-subsidized tariff for the first trench of consumption. To the extent that local executive committees maintain the capacity to clearly identify low-income households, direct financial assistance appears to be the most effective option, potentially complemented by cash transfers.

Conduct an analysis of social impacts of a tariff increase, in tandem with the study of consumer's capacity to pay. A detailed assessment of the social impacts would enable policymakers to adjust accordingly the perimeter and scope of direct financial assistance. Thus, a study analyzing the effect of water bills on low-income households' budgets, public attitudes and expectations regarding water prices, and existing coping mechanisms could prove a valuable tool.

Figure 17: Share of residential water bill within the disposable income for the lowest income group (hypotheses: 10% yearly tariff increase; consumption of 117 liters per capita per day)



Source: National Statistical Committee, MHU

Annexes

Annex I: Demographic Characteristics

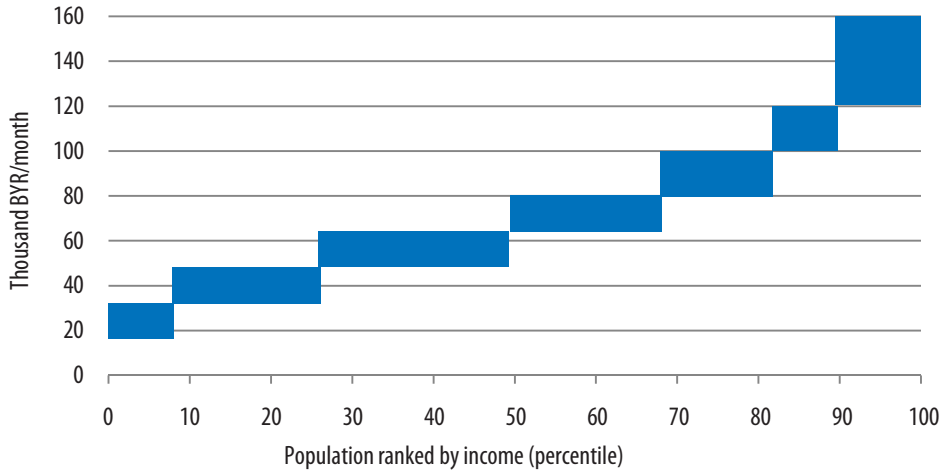
This annex provides background information on population trends in rural and urban areas, on the distribution of population by level of per capita disposable resources.

TABLE 15: POPULATION TRENDS IN RURAL AND URBAN AREAS—2002/2012

Population (thousands)	2002	2012	% in 2012	Evolution (2012/2002)
Urban population	6,982	7,175	76%	+ 2.8%
Minsk City population	1,699	1,885	20%	+ 10.9%
Urban population (except Minsk City)	5,283	5,290	56%	+ 0.1%
Rural population	2,917	2,290	24%	- 21.5%
Total Belarus population	9,900	9,465	100%	- 4.4%

Source: Belarus National Statistical Committee

Figure 18: Distribution in percentage of the population by level of per capita disposable resources at national level was as follows for the second quarter of 2012.



Source: Belarus National Statistical Committee

Annex II: Note on the Assessment of Non-revenue Water

Various sources of information suggest that NRW levels commonly range between 20 and 35 percent: (i) 23 percent country-wide according to government statistics 2011; (ii) 26 percent for across the 40 utilities participating to the IBNet (International Benchmarking Network) in 2011; and (iii) 33 percent in average in the 25 surveyed utilities (see Annex V), where NRW levels have reportedly been deteriorating in recent years.

The comparison of utilities' or countries' performance in terms of non-revenue water indicators is however biased because losses depend to some extent on contextual factors outside the control of the utility (such as topography, age and type of network, length of network per connection, water use per capita, etc.). A more relevant assessment of non-revenue water levels can be conducted on the basis of indicators, such as the unavoidable real losses (UARL) and the infrastructure leakage index (ILI)[17]. These indicators make it possible to compare the current level of physical losses with a minimum, unavoidable level considering network characteristics. Their applicability is limited by the lack of available information on the specific levels of physical and non-physical losses.

Three assumptions have been tested in a preliminary calculation of these indicators, as illustrated in Table 16:

TABLE 16: INFRASTRUCTURE LEAKAGE INDEX (ILI)

Indicator	Unit	Assumptions[18]		
	% of total NRW	50%	75%	100%
Physical losses	m3/day	72,703	109,054	145,405
UARL	m3/day	70,068		
ILI	no dimension	1.0	1.6	2.1

With ILI in the range of 1 to 2, physical losses could be considered at an acceptable level, and further efforts to reduce them may be uneconomic.[19] Detailed investigations at the utility level would be required to refine this analysis and to identify cost-effective NRW reduction strategies adapted to the context of each utility.

17 ILI (no dimension) = Total Physical Loss (m3/year)/UARL (m3/year)
With:
- Total Physical Losses (m3/year) = Volume of water supplied into the networks (m3/year) - Volume of water billed (m3/year)
- UARL (Unavoidable Real Loss) (l/con/day) = (18 Lm/Nc + 0,8 + 25 Lp/Nc) x p (in m), where:
Lm is the network length in km, Lp is the length of service pipelines in km and Nc is the number of service connections

18 Considering the very low domestic tariffs, non-physical losses (meter inaccuracies, inadequate meter reading and water theft) represent probably less than 50 percent of total NRW

19 World Bank, December 2006: The Challenge of Reducing Non-Revenue Water in Developing Countries

Annex III: Investment Planning and Tariff Setting Procedures

This present annex provides background information on the investment planning process, and on the tariff setting and operational subsidies allocation process.

Figure 19: Flowchart on investment process

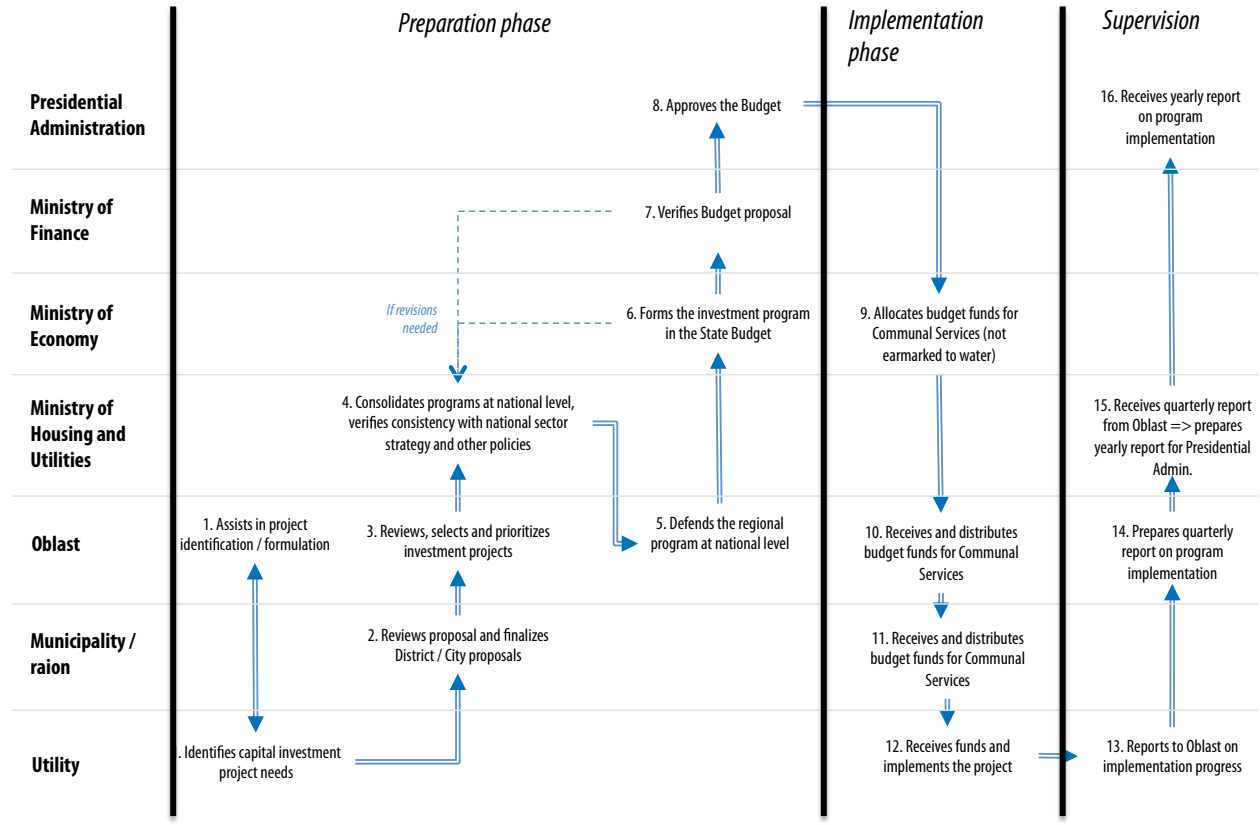
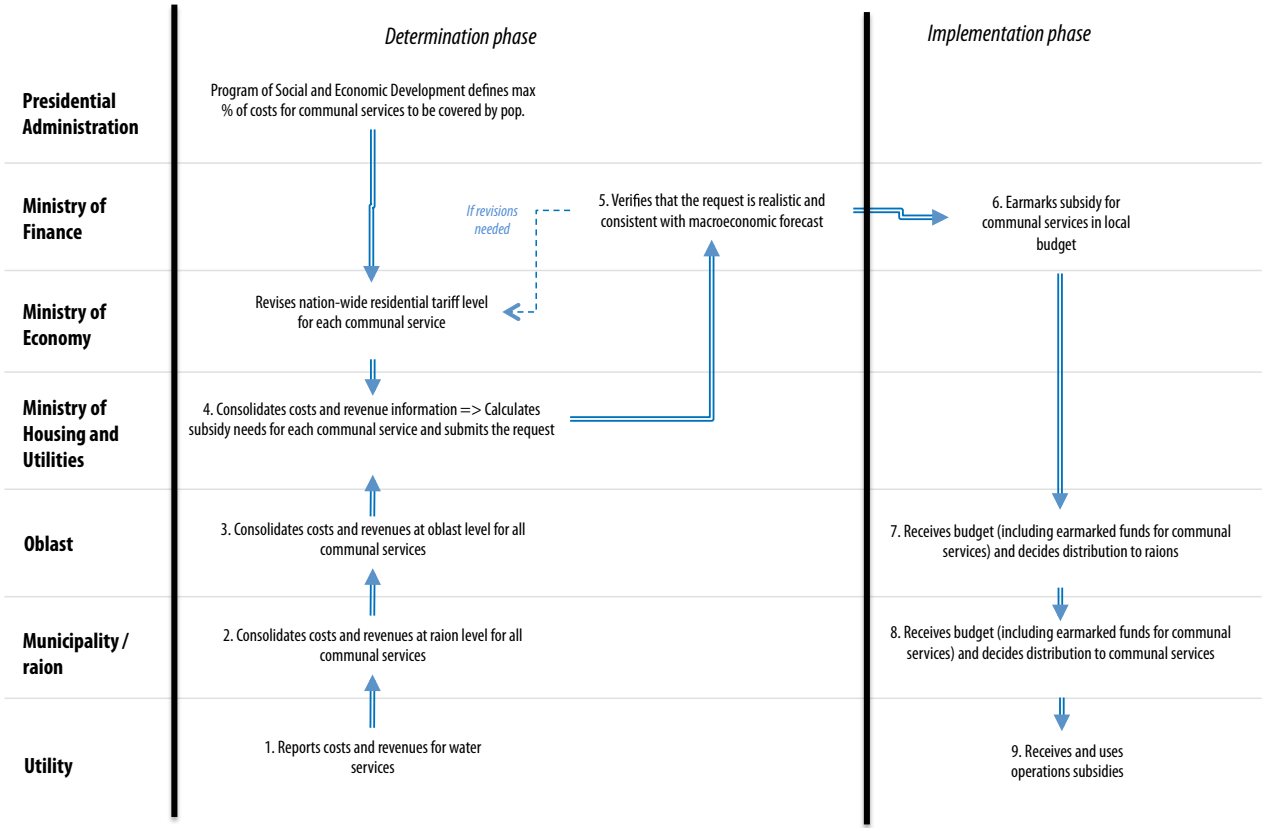


Figure 20: Tariff setting and operational subsidies allocation process



Annex IV: Water / Wastewater Quality Standards and Environmental Tax Rates

This annex provides background information on the current potable water quality standards, including the maximum admissible concentrations of the main pollutants, and on the prevailing environmental tax rates.

TABLE 17: BELARUS & INTERNATIONAL POTABLE WATER QUALITY STANDARDS

Parameter	Belarus	EU£	WHO
Iron (mg/l)	0.3	0.2	0.3
Manganese (mg/l)	0.1	0.05	0.1
Nitrate (mg/l)	45	50	50
Total coliform	0.001	0	Absence

TABLE 18: BELARUS STANDARDS FOR EFFLUENT QUALITY (AVERAGE VALUES)

Equivalent population	COD mgO2/l	BOD5 mgO2/l	SS mg/l	Ammonium mg/l	N total mg/l	P total mg/l
<500	125	35	40	N/A	N/A	N/A
501 – 2000	120	30	35	20	N/A	N/A
2001 – 10000	100	25	30	15	N/A	N/A
10001 – 100000	80	20	25	N/A	20	4.5
>100001	70	15	20	N/A	15	2.0

TABLE 19: ENVIRONMENTAL TAX RATES FOR WATER ABSTRACTION (2013)

Purpose	Tax (BYR/m3)	% of average operating cost for water services
Residential water supply	50	1.4%
Food producers (byproducts of animal/plant origin)	3	0.1%
Production of beverages	17,840	498%
Other use	170	4.7%

Sources: Tax code of the Republic of Belarus

TABLE 20: ENVIRONMENTAL TAX RATES FOR UNTREATED EFFLUENTS DISCHARGE (2013)

Place of discharge	Tax (BYR/m3)	% of average operating cost for wastewater services
Waterway	470	16.5%
Earth reservoir, groundwater through filtration fields	630	22.1%

Sources: Tax code of the Republic of Belarus
Note: A coefficient of 1.5 to the above rates applies to unmetered abstractions and discharges.

Annex V: 2011 Statistics (oblasts and Minsk City)

This annex provides background information water and sewerage facilities and on sector operational, economic, and financial indicators at oblast level.

TABLE 21: INVENTORY OF WATER AND SEWERAGE FACILITIES AT OBLAST LEVEL

Indicator	№	Belarus			Brest Oblast	Vitebsk oblast	Gomel oblast	Grodno oblast	Minsk oblast	Mogilev oblast	City of Minsk
		Total	Urban areas	Rural areas	Total	Total	Total	Total	Total	Total	
I. Water and sewerage facilities											
Water facilities											
Quantity, unit											
water pipelines	01	5,175	248	3,826	612	1,101	761	473	1,146	1,081	1
standpipes	02	60,203	21,407	26,904	2,813	11,892	13,633	2,219	9,097	19,460	1,089
artesian boreholes	03	9,513	2,540	5,373	1,236	1,600	1,429	1,030	2,039	1,828	351
iron removal plants	04	462	158	198	91	106	67	84	42	70	2
2nd and 3rd lift pumping stations	05	836	646	101	149	89	93	51	99	59	296
water towers	06	3,991	272	2,916	528	803	603	386	998	667	6
storage reservoirs	07	742	391	212	168	139	82	77	134	96	46
fire hydrants	08	54,847	36,205	12,455	7,484	6,187	14,032	4,733	6,448	8,842	7,121
fire protection storage tanks	09	145	33	73	10	39	33	1	56	6	0
laboratories	10	92	72	13	25	7	20	12	13	11	4
of which accredited	11	84	65	13	24	6	19	12	11	10	2
Length, km		*32,885.7*	14,234	13,892	4,907.9	4,760.0	6,914	2,983	5,757	5,988	1,576
transmission pipelines	12	4,807.7	2,689	1,380	647.6	739.0	934.8	545.4	626.0	595.7	719.2
distribution pipelines	13	22,635.2	7,921	11,375	3,320.8	3,339.0	4,918.5	1,742.3	4,504.0	4,810.6	
internal networks (inside buildings/blocks)	14	5,442.8	3,624	1,137	939.5	682.0	1,061.1	694.9	627.0	581.7	856.6
Length of pipelines (km), per age of service											
up to 5 years included	15	3,595.4	1,484	1,694	875.5	417.0	714.6	353.4	526.0	655.5	53.4
5 to 15 years included	16	5,115.8	2,292	2,373	751.0	451.0	1,213.3	502.4	966.0	986.7	245.4
15 to 30 years included	17	12,357.9	4,167	6,465	1,525.1	1,726.0	2,569.0	829.6	2,604.0	2,501.4	602.8
more than 30 years	18	7,875.2	4,155	2,143	733.7	1,577.0	1,356.3	602.3	1,204.0	1,407.6	994.3
Length pipes requiring replacement											
transmission pipelines	19	391,777	210,820	91,595	45,935	89,362	82,640	16,655.0	77,948	5,296.0	73,941
distribution pipelines	20	1,816,569	318,450	1,016,428	56,831	481,691	412,088	65,373.0	722,365	71,303.0	6,918
Installed production capacity (m3/day)											
1st lift pumping stations	21	4,811,074	2,801,278	1,076,096	395,545	933,700	652,743	472,628	737,258	664,300	954,900
water treatment plant	22	2,707,912	1,885,689	91,223	179,510	731,000	440,334	311,390	183,078	317,500	545,100
of which iron removal plants	23	2,312,862	1,494,077	87,785	179,512	731,000	365,282	311,390	183,078	317,500	225,100
transmission pipelines	24	4,843,271	2,807,418	1,107,153	354,800	928,700	801,937	399,586	735,048	668,300	954,900
Sewerage facilities											
Quantity, unit											
sewerage network	30	1,365	174	1,028	323	163	244	224	197	213	1
with direct discharge to the environment	31	180	83	45	20	52	14	33	35	25	1
WWTP	32	1,315	163	986	314	166	222	204	203	205	1
of which are filtration ponds	33	1,120	99	919	297	102	229	170	175	146	1
sewerage pumping stations	34	2,707	996	1,409	660	302	616	337	431	310	51
of which main pumping stations	35	1,212	211	903	344	98	192	205	213	158	2
laboratories	36	91	76	3	17	12	11	16	25	9	1
of which accredited	37	77	67	1	15	9	11	13	20	8	1
Length, km		*17,359.1*	9,482	4,677	2,652	3,200	3,086	1,844	2,705	2,220	1,653
main collectors	38	4,606.6	2,517	1,468	775.6	621.9	955.0	511.7	857.0	537	348.2
secondary sewerage network	39	6,757.8	3,516	2,565	1,075.6	676.9	1,266.0	723.6	1,250.0	1,152	613.9
internal networks (inside buildings/blocks)	40	5,994.7	3,449	644	800.5	1,901.3	865.0	608.7	598.0	531	690.7
Length of sewer (km), per age of service											
up to 20 years included	41	5,227.2	2,973	1,842	1,043.5	412.4	1,081.9	631.6	679.0	767.3	611.5
20 to 30 years included	42	5,821.9	2,939	2,113	925.8	770.1	1,124.4	695.0	1,071.0	927.8	307.8
30 to 50 years included	43	3,832.4	2,446	714	579.4	672.7	698.6	460.2	887.0	336.2	198.3
more than 50 years	44	1,125.9	1,056	24	44.4	46.1	182.2	57.2	70.0	190.8	535.2
Length sewer requiring replacement											
main collectors	45	350,229	172,410	67,819	22,266	110,000	89,770	27,731	85,802	14,607	53
secondary sewerage network	46	352,764	114,548	80,970	15,673	157,246	52,917	37,776	74,704	10,078	4,370
Installed wastewater treatment capacity (m3/day)	47	3,039,715	2,457,906	288,699	461,580	293,110	132,795	295,073	427,157	660,000	770,000
Installed sludge treatment capacity (ton/day)	48	452.1	431	21	113.9	0	21.6	38.2	38.0	64.0	176.4
Sludge dispoal areas (thousand m2)	49	3,277.1	2,227	486	308.5	564	171.4	376.5	722.0	455.0	679.5
Of the total of sewerage facilities - those not in operation	50	10	3	7	2	0	7	0	1	0	0

Source: MHU statistics 2011

TABLE 22: OPERATIONAL INDICATORS OF WATER AND WASTEWATER SERVICES AT OBLAST LEVEL

Indicator	№	Belarus			Brest Oblast	Vitebsk oblast	Gomel oblast	Grodno oblast	Minsk oblast	Mogilev oblast	City of Minsk
		Total	Urban areas	Rural areas	Total	Total	Total	Total	Total	Total	
II. Operation of water and sewerage facilities											
Water supply											
Pumped water by 1st lift pumping stations (thousand m3)	55	**681,151**	561,633	45,502	**74,117.9**	**74,016.0**	**103,422.8**	**65,298.8**	**79,531.1**	**80,915.0**	**203,849.4**
of which from groundwater sources	56	**608,981**	489,683	45,284	**74,171.9**	**74,014.0**	**101,542.1**	**65,299.8**	**79,312.8**	**80,915.5**	**133,724.9**
Water injected into distribution network (thousand m3)	57	**651,554**	533,445	47,108	**72,348.8**	**70,948.0**	**96,990.1**	**63,393.0**	**81,169.5**	**78,674.8**	**187,977.1**
including:											
pressurized	58	**644,484**	529,686	44,277	**71,944.5**	**70,522.0**	**93,315.2**	**63,206.7**	**79,313.1**	**78,205.8**	**187,977.1**
gravity-fed	59	**63**	0	59	**59.0**	**4.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
purchased from other organizations	60	**7,007**	3,759	2,773	**345.3**	**475.0**	**3,674.9**	**186.3**	**1,856.4**	**469.0**	**0.0**
Water processed through treatment plants (thousand m3)	61	**441,686**	377,008	8,179	**62,428.1**	**56,498.0**	**80,551.7**	**55,453.5**	**33,555.1**	**61,090.2**	**92,108.9**
Water supplied to (thousand m3)	62	**497,849**	409,398	35,885	**60,428.3**	52,567.0	**73,786.0**	**51,266.7**	**61,651.4**	**57,191.2**	**140,958.5**
including:											
for customers (connections)	63	**493,239**	405,554	35,504	**60,036.6**	**52,181.0**	**72,990.8**	**50,841.0**	**60,887.9**	**55,343.2**	**140,958.5**
including:			0	0							
for population	64	**346,494**	281,367	26,268	**44,730.0**	**38,859.0**	**50,616.4**	**34,260.9**	**39,641.8**	**36,878.9**	**101,507.2**
for administrative needs	65	**98,721**	81,763	6,594	**9,841.4**	**10,364.0**	**13,648.4**	**11,774.0**	**11,834.0**	**14,583.1**	**26,675.8**
for industrial needs	66	**48,024**	42,424	2,642	**5,465.2**	**2,958.0**	**8,726.0**	**4,806.1**	**9,412.1**	**3,881.2**	**12,775.5**
to other distribution systems	67	**4,610**	3,843	381	**391.7**	**386.0**	**795.2**	**425.7**	**763.5**	**1,848.0**	**0.0**
"Technical" water consumption (thousand m3)	68	**44,295**	35,872	3,230	**2,788.0**	**5,192.0**	**11,495.0**	**2,445.4**	**2,678.5**	**3,823.3**	**15,872.3**
Losses and unaccounted for water (thousand	69	**145,405**	119,826	8,906	**11,544.9**	**16,673.0**	**21,915.7**	**11,586.7**	**16,839.7**	**19,826.8**	**47,018.6**
% losses and unaccounted for water		***22%***	1	1	***16%***	***24%***	***23%***	***18%***	***21%***	***25%***	***25%***
Electricity consumption for water production and supply, thousand kWh	70	**1,173,735**	407,364	713,383	**785,471.6**	52,988.0	**79,178.5**	**49,960.7**	**49,971.4**	**51,566.6**	**104,598.2**
Sewerage											
Collected wastewater (thousand m3)	75	**462,207**	443,314	18,893	**62,260.4**		**60,725.8**	**48,505.5**	**66,099.0**	**77,369.4**	**147,246.6**
including wastewater :											
from population	76	**274,099**	261,454	12,645	**39,213.7**		**37,761.7**	**29,802.0**	**34,969.3**	**30,888.5**	**101,463.6**
from administrative needs	77	**88,014**	83,438	4,575	**9,556.2**		**13,045.1**	**7,501.6**	**13,071.6**	**15,345.5**	**29,493.6**
from industrial needs	78	**91,204**	90,064	1,140	**12,585.9**		**6,450.9**	**10,583.5**	**14,600.1**	**30,966.8**	**16,016.6**
from other distribution systems	79	**8,891**	8,358	533	**904.6**		**3,468.1**	**618.4**	**3,458.0**	**168.6**	**272.8**
Wastewater processed through treatment plants (thousand m3)	80	**549,936**	532,460	17,476	**80,135.2**		**76,096.1**	**62,190.1**	**68,146.1**	**86,786.4**	**176,582.0**
of which, for full biological (physical-chemical) treatment	81	**538,319**	523,084	15,235	**80,873.5**		**66,167.5**	**62,190.1**	**66,212.1**	**86,293.6**	**176,582.0**
of which with tertiary treatment	82	**180,123**	179,843	279	**63,301.8**		**11,127.3**	**0.0**	**31,990.8**	**73,702.9**	**0.0**
discharge of wastewater to natural water bodies	83	**398,684**	395,684	3,000	**70,043.7**		**57,322.8**	**58,827.9**	**1,528.5**	**36,800.1**	**174,161.0**
of which, insufficiently treated	84	**3,811**	3,636	175	**0.0**		**0.0**	**90.4**	**2,280.2**	**0.0**	**1,440.0**
Transfer of wastewater to other sewerage systems (thousand m3)	85	**21,840**	17,399	4,441	**663.6**		**16,144.4**	**1,083.3**	**2,804.5**	**722.2**	**422.0**
Electricity consumption for wastewater transfer and treatment, thousand kWh	86	**287,054**	275,629	11,425	**41,027.7**		**44,118.3**	**37,116.7**	**37,341.3**	**47,625.7**	**79,823.9**

Source: MHU statistics 2011

TABLE 23: ECONOMIC AND FINANCIAL PARAMETERS AT OBLAST LEVEL

Indicator	№	Belarus			Brest Oblast	Vitebsk oblast	Gomel oblast	Grodno oblast	Minsk oblast	Mogilev oblast	City of Minsk
		Total	Urban areas	Rural areas	Total	Total	Total	Total	Total	Total	
III. Economic and financial paremeters (million BYR)											
Revenues from the operation (net of value added tax, excise duties and other charges)	90	1,807,294	1,260,558	55,496	213,045.7		337,052.0	430,226.3	154,188.8	275,439	397,343
waterworks		1,039,721	678,211	36,006	112,744.0	122,691.0	187,199.0	218,061.9	15,613.7	141,282.9	242,128.0
sewerage		890,265	582,347	19,490	100,301.7		149,853.0	212,164.4	138,575.1	134,155.6	155,215.0
including, from population:	91	397,413	293,057	25,845	61,359.5		42,050.0	75,367.6	36,462.1	52,112.0	130,062.0
waterworks		268,615	174,169	17,841	36,733.3	24,032.0	28,598.0	39,433.3	23,976.1	35,205.4	80,637.0
sewerage		152,830	118,888	8,004	24,626.2		13,452.0	35,934.3	12,486.0	16,906.6	49,425.0
Operation costs	92	1,879,349	1,272,083	72,182	233,481.3		275,189.0	395,194.4	259,895.5	277,358.2	438,231.0
waterworks		1,174,110	689,768	46,419	124,315.0	132,562.0	154,887.0	200,807.9	150,474.6	143,600.3	267,463.0
sewerage		837,802	582,316	25,763	109,166.3		120,302.0	194,386.5	109,420.9	133,757.9	170,768.0
including:											
material expenditure	93	834,488	585,345	21,872	90,145.6		112,390.0	163,792.6	114,880.5	117,298.5	235,981.0
waterworks		533,876	326,033	15,888	52,580.7	55,462.0	66,465.0	83,291.8	70,028.4	61,091.7	144,956.0
sewerage		356,075	259,313	5,985	37,564.9		45,925.0	80,500.8	44,852.1	56,206.8	91,025.0
of which: energy costs	94	534,013	387,123	12,206	42,957.6		72,357.0	122,123.7	62,326.6	70,293.7	163,954.0
waterworks		312,140	217,787	9,443	23,511.7		46,244.0	62,079.2	38,665.6	36,661.0	104,978.0
sewerage		221,873	169,336	2,763	19,445.9		26,113.0	60,044.5	23,661.0	33,632.7	58,976.0
labor costs	95	398,769	257,490	16,577	59,404.9		64,561.0	87,724.5	60,140.9	54,108.8	72,829.0
waterworks		253,254	140,693	10,049	29,814.7	34,248.0	34,645.0	44,564.5	33,618.8	27,712.5	48,650.0
sewerage		179,764	116,797	6,529	29,590.2		29,916.0	43,160.0	26,522.1	26,396.3	24,179.0
deductions for social needs	96	141,685	91,628	5,951	20,840.2		22,996.0	30,936.6	21,109.3	19,702.5	26,100.0
waterworks		90,931	50,065	3,620	10,483.8	13,080.0	12,331.0	15,703.2	11,835.3	10,059.0	17,439.0
sewerage		63,833	41,563	2,331	10,356.4		10,665.0	15,233.4	9,274.0	9,643.5	8,661.0
depreciation and amortization	97	224,655	150,059	12,460	28,826.0		35,285.0	50,932.9	26,850.8	27,928.8	54,831.0
waterworks		138,461	76,602	8,220	16,016.8	17,687.0	20,247.0	25,985.8	15,705.1	13,191.1	29,628.0
sewerage		103,881	73,457	4,240	12,809.2		15,038.0	24,947.1	11,145.7	14,737.7	25,203.0
other expenditures	98	279,454	187,561	15,321	34,264.6		39,658.0	61,807.8	36,914.0	58,319.6	48,490.0
waterworks		157,289	96,375	8,643	15,419.0	12,085.0	20,899.0	31,262.6	19,287.0	31,546.0	26,790.0
sewerage		134,250	91,186	6,679	18,845.6		18,759.0	30,545.2	17,627.0	26,773.6	21,700.0
Background information											
Iron concentration in water networks (mg/l)	100										
Number of breakdowns											
on water works	101	1,882	53	251	304	161	1008	0	409	0	0
on sewerage systems	102	582	0	16	16		465	0	101	0	0
Number of employees at year end											
on water works	103	13,015	5,867	934	1813	1,818	2414	1,201	1982	1861	1926
on sewerage systems	104	9,944	5,166	586	1753		2241	1,134	1951	1621	1244

Source: MHU statistics 2011

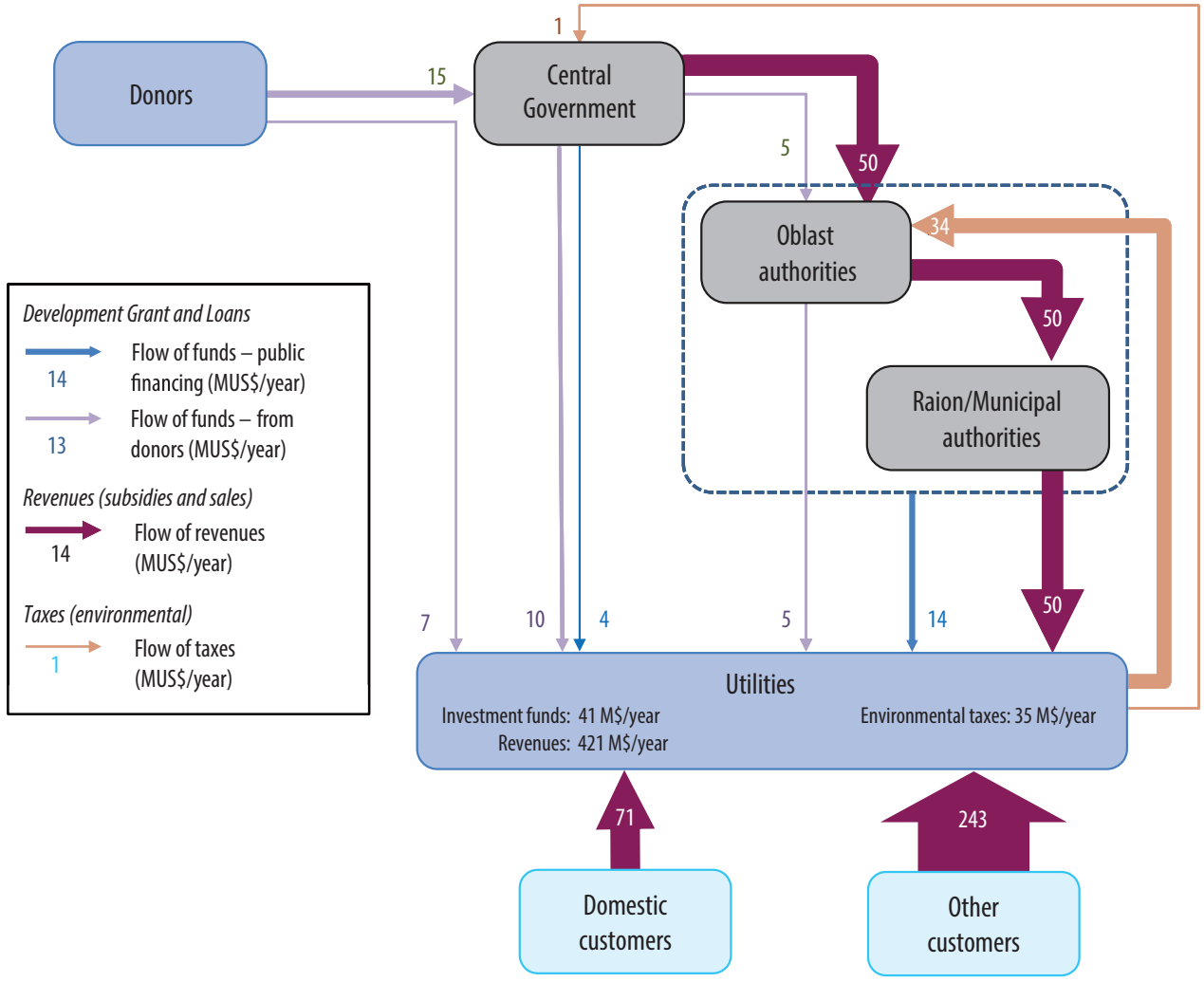
TABLE 24: KEY FINANCIAL RATIOS (2011)

Indicator / Oblast	Belarus (except Vitebsk)	Brest	Vitebsk*	Gomel	Grodno	Minsk	Mogilev	Minsk City
Operational costs/consumption (BYR/m3)	3,755	3,409		3,287	6,820	3,828	4,507	2,720
Water	2,089	1,804		1,845	3,463	2,213	2,356	1,687
Wastewater	1,665	1,605		1,442	3,356	1,614	2,151	1,033
Total costs/consumption (BYR/m3)	4,265	3,889		3,770	7,829	4,268	5,012	3,109
Sales from operations/consumption (BYR/m3)	4,101	3,549		4,618	8,523	2,532	4,977	2,819
Water	2,081	1,878		2,565	4,320	256	2,553	1,718
Wastewater	2,020	1,671		2,053	4,203	2,276	2,424	1,101
Cost coverage ratio (all revenue included)	1.08	1.02		1.37	1.13	0.83	1.15	0.97
Cost coverage ratio (subsidies excluded)	0.96	0.91		1.22	1.09	0.59	0.99	0.91
Contribution of internal sources to invest. %								
Subsidization ratio (subsidies/revenue)	10.6%	10.6%		10.7%	3.7%	28.2%	13.6%	6.7%

Source: MHU statistics 2011
** incomplete information on Vitebsk Oblast*
***not available*

The flow of funds in the sector, both for investment financing and for revenues, is illustrated in Figure 21. Revenue flows are indicated for the reference year 2011 and calculated on a 2011-2015 average for investment funds, based on the Clean-Water financing plan. In the absence of complete revenue data for Vitebsk oblast, the resulting revenue amounts are indicative only.

Figure 21: Indicative flow of funds in the sector



Source: World Bank team own elaboration, based on:
- *Investment flows as an average of 2011-2015 programs (Clean Water, donors programs)*
- *Revenues and subsidies calculated based on MHU operational and financial statistics 201*
- *Tax fund flows estimated based on MHU operational statistics 2011 (for quantities), and 2013 tax code (for rates and allocation rules)*

Annex VI: Utilities Survey

The present annex provides background information on the utilities survey conducted in December 2012 in the framework of the present study. It is composed of five sections:

A. Questionnaire (template and example received)

B. List of utilities surveyed

C. List of feasibility studies reviewed

D. Main conclusions

E. Survey data

A. Questionnaire (template and example received)

NAME OF WATER/WASTEWATER UTILITY:

Utility

Contact details of the officer responsible for questionnaire completion:

Name, position: _____

Phone number, e-mail: _____

A. Overview

1. Legal status of the utility : unitary enterprise
   Please specify and attach copy of the Charter if any (copy of the Articles of Association attached)

2. Area of service (km²)

3. **Population:**

3.1 total in service area	2010:	2011:
3.2 served (water)	2010:	2011:
3.3 served (wastewater)	2010:	2011:

4. **Level of service (water supply)** % (01/01/2012)
   4.1 In-house (connected to distribution system):
   Fountains:
   4.2 Other sources:

5. **Level of service (wastewater)** % (01/01/2012)
   5.1. Through sewerawge system:
   5.2. On-site sanitation:

B. Quality of services

6. **Reliability of service**

hours/day of water availability (average)	2010:	2011:

7. **Water quality:** % of samples in conformity with standards (2011)
   7.1 Bacteriological parameters:
   7.2 Chemical parameters:
   7.3 Physical parameters:
   7.4 **Specify nature of quality problems(if any)**

C. Technical aspects

8. Metering (water)

8.1 Bulk metering at production: % of production metered: 100%
8.2 Customer metering: % of customers metered: 100%

9. Water supply system

9.1 General layout of water supply system (sketch on a separate sheet)
9.2 Specify water sources, treatment, pumping, supply and storage
9.3 Production capacity (m3/day):

9.4 Average production (m3/day)	2010:	2011:
9.5 Length of supply pipes (km)	2010:	2011:

9.6 Main pipe materials:
9.7 Storage capacity (m3):

10. Water distribution system

10.1 Volume distributed (billed) (m3/year)	2010:	2011:
10.2 Length of distribution pipes (km)	2010:	2011:
10.3 Number of leaks repaired	2010:	2011:

11. Sewerage system

11.1 Length of sewers (km) and materials:
11.2 Main pipe materials:

11.3 Number of blockages fixed	2010:	2011:

11.4 Wastewater treatment facilities:
11.4.1 Date of construction/recent reconstruction:
11.4.2 Capacity : (m3/day) : 8100
11.4.3 Treatment type : mechanic other : _____
11.4.4 Water samples meeting standards % (2012):

12. Energy consumption (kWh)

12.1 Water supply :	2011 : /	2012 : /
12.2 Wastewater :	2011 : /	2012 :

D. Commercial aspects:

13. Connections (water/wastewater) numbers on January 1 (active connections)

13.1 residential	2011 :	2012 :
13.2 privileged companies	2011 :	2012 :
13.3 industries	2011 :	2012 :
13.4 others	2011 : _____ _____	2012 : _____

14. Water consumption (per category of consumers) cum/year billed

14.1 residential	2011 :	2012 :
14.2 privileged companies	2011 :	2012 :
14.3 industries	2011 :	2012 :
14.4 others	2011 : _____	2012 : _____

15. % of volumes billed according to meters **2011 : 1408137** **2012 :** 1144651

16. Billing and collection (in BYR)

16.1 total billing	2011 : 3 419 893 714	2012 : 4 772 745 860
16.2 total collection	2011 : 3 375 435 096	2012 : 4 677 290 943

E. Human resources

17. Staffing

17.1 total staff (January 1)	2011 :	2012 :
17.2 - % technical (O&M)	2011 :	2012 :
17.3 - % commercial	2011 :	2012 :
17.5 - % management/administration	2011 :	2012 :
17.5 average age	2011 :	2012 :
17.6 average seniority	2011 :	2012 :

F. Financial aspect

18. Financial management
Please provide a copy of the most recent financial statements :balance sheet, revenue & expenditures.

19. Cost structure: % of operating costs:

19.1 % personnel costs	2011 :	2012 :
19.2 % energy costs	2011 :	2012 :
19.3 % chemicals	2011 :	2012 :
19.4 % maintenance	2011 :	2012 :
19. Cost structure: % of operating costs:		
19.1 % personnel costs	2011 :	2012 :
19.2 % energy costs	2011 :	2012 :
19.3% chemicals	2011 :	2012 :
19.4 % maintenance	2011 :	2012 :

20. Subsidies

20.1. From Municipal and Regional (local) budgets (rub)		
20.1.1 for operating costs:	2010: _____	2011: _____
20.1.2 for investments:	2010:	2011: _____
20.1. From the State budget		
20.1.1. for operating costs:	2010: _____ 2011: _____	
20.1.2. for investments:	2010: _____ 2011: _____	

21. Tariff (BYR/m3)

21.1 residential	2010:	2011 :	2012 :
21.2 privileged companies	2010 :	2011 :	2012 :
21.3 industries	2010 :	2011 :	2012 :
21.4 others	2010 : _____	2011 : _____	2012 :_____

22. Depreciation rates %/year for :

22.1 civil works—

22.2 electrical/mechanical equipment—

22.3 pipes—

G. Monitoring

23. Major performance indicators in use

Please specify performance indicators in use in the utility and provide indicator values for 2010 and 2011

PERFORMANCE INDICATORS.

B. List of utilities surveyed and feasibility studies reviewed

TABLE 25: SELECTED UTILITIES (AND POPULATION)

Population (City)	Oblast Vitebsk	Gomel	Grodno	Minsk	Mogilev	Brest	Total
> 50,000	Orsha 117,200	Gomel 484,300		Molodechno 94,200			3
> 10,000	Postavy 19,800	Kalinkovichi 38,400	Volkovysk 44,000	**Vilejka** 26,800	Gorki 32,600	Bereza 29,400	13
< 50,000	Lepel 17,400	Dobrush 18,300	Smorgon 36,200	Dzerzhinsk 25,200	Osipovichi 32,400 Kliev 17,900	Luninets 23,600	
< 10,000	Sianno 8,000 Obol 3,000 (Orshevsky District)	Petrikov 10,600	Dyatlovo 7,800 Ross 6,200 (Korelichi District)	**Miadel** 7,200	Dribin 3,100	David-Gorodok 6,500 Gorodich 2,000 (Baragoritchsky District)	9
Total	5	4	4	4	4	4	25

In **bold** = selected places for site visits – underlined = Vodokanals
In addition, the **Minsk** Vodokanal was visited, but the questionnaire has not been returned.

TABLE 26: FEASIBILITY STUDIES REVIEWED FOR THE DIAGNOSTIC

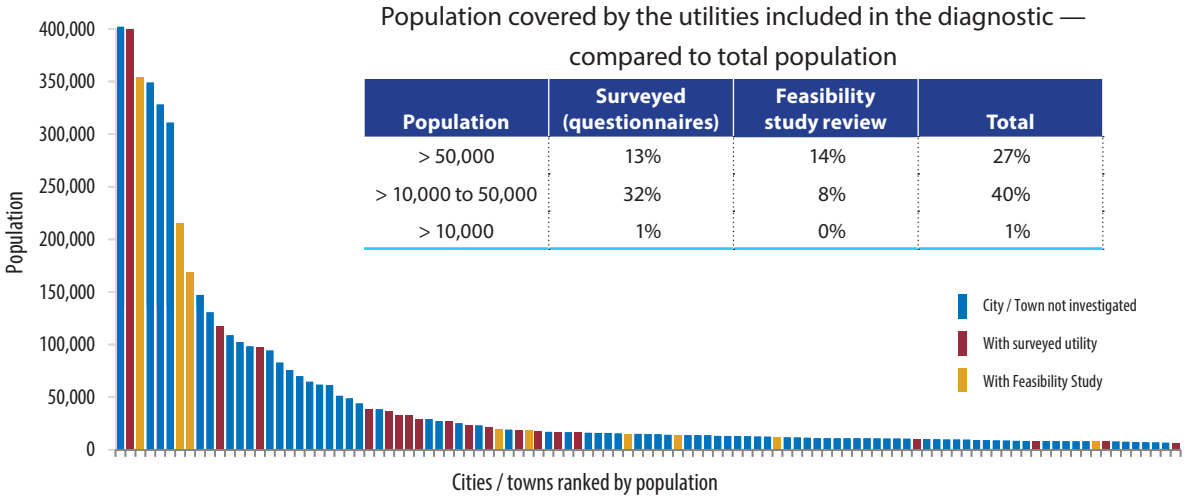
City (Oblast)	Population	City (Oblast)	Population
Vitebsk (Vitebsk) *	386,000	Mariina Gorka (Minsk) **	21,400
Mogilev (Mogilev) **	354,000	Glubokoye (Vitebsk) **	18,200
Bobruisk (Mogilev) **	215,000	Smolevichi (Minsk) **	15,100
Baranovitchi (Brest) * & **	168,200	Berezino (Minsk) **	12,000
Slonim (Grodno) *	48,800	Verkhnedvinsk (Vitebsk) **	7,300

Note: * EBRD financed Feasibility Study
** IBRD financed Feasibility Study

Selection criteria for the utility surveys were: geographical distribution across the 6 Oblasts, variety of sizes and no participation to an IFI-financed project (information on the utility would otherwise already be available through the Feasibility Studies).

Overall, the study collected information on utilities covering 21% of the total population supplied by centralized water systems in Belarus (including 21 of the 50 largest utilities).

Figure 22: Utilities covered by the diagnostic, through the survey and through review of feasibility studies



Population	Surveyed (questionnaires)	Feasibility study review	Total
> 50,000	13%	14%	27%
> 10,000 to 50,000	32%	8%	40%
> 10,000	1%	0%	1%

C. Main conclusions

1. Only 22 utilities answered the survey questionnaire (5 Vodokanals and 17 multi-utilities).

2. Quality of answers is very uneven. Inconsistencies are frequent especially in small multi-utilities; they generally reflect a lack of control of statistics, orders of magnitude, and understandings of indicators.

3. There is no problem regarding availability of water resources.

4. Production capacity is often several times the actual production. No issue of production capacity and permanent supply.

5. Storage capacity is generally satisfactory (more than ½ day of production).

6. Water quality is not a concern for utilities, except for the presence of iron. A small percentage—but significant in terms of public health risk—of bacteriological tests does not conform to the norms. The disinfection of water—and facilities—would avoid this limited but serious risk.

7. The large variations in number of leaks and blockages by kilometer of pipes and sewers likely reflect the lack of proper monitoring and recording of incidents, and analysis for planning replacements or improvements

8. The number of people with residential connections is low (average # 2.5), and the average daily consumption is generally around 100 liters per capita per day, e.g. markedly below the tariff threshold of 140 liters per capita per day.

9. Multi-utilities have obvious difficulties in identifying specific information regarding water and sanitation services among their multiple activities, especially in terms of staffing, billing and collection, subsidies, and even the real number of customers

10. In some places, utilities mix information between the district and the district capital.

11. Subsidies for operations are received from the local or regional authorities, never from the central government.

12. The customer categories called "privileged institutions" and "others" are not always clearly distinct, and it appears that the utilities are giving their own definitions to these categories, hence a feeling of opacity in the customer management. For both categories tariff is being generally close to - or even more than— the industrial tariff.

13. Despite the small size of the utilities' commercial departments (mostly due to the self-reading and cashing practices), the productivity ratio (staff/connections) is, for consistent information, around 10 e.g. far above standards for performing utilities (1 to 3). However, visited utilities claimed that their staff is below the "norms" issued by the MHU. The lack of outsourcing and the modest level of automation cannot, by themselves only, explain this poor productivity ratio.

14. The cost structure presented by the utilities is somewhat confusing; it appears that cost accounting procedures should be improved, with a clear definition of each cost item and category. Sharing the costs in multi-utilities among a large number of activities is visibly challenging, and is definitely a source of confusion and opacity.

15. The present organization of the customer cycle leads to a collection rate close to 100%. Utilities where collection rates below 95% are therefore considered to be lax.

16. Average non-revenue water ratio is about 30%, clearly above the 2011 statistics from MHU (about 23%). The situation should be looked at carefully, case by case, for both physical and non-physical losses (in particular bulk and customer metering and meter reading potential problems)

17. Specific energy consumption is generally between 1and 1.5 kwh/m3 produced; this quasi-uniformity reflects the fact that most production facilities have very similar features.

18. Operational subsidies in 2011 concern half of the Vodokanals, and a large majority of multi-utilities, where they are supposed to subsidize the whole of the activities, not only the water and sanitation ones.

19. The industrial tariff is hugely higher than the base residential tariff, often more than 20 times. This is clearly an incentive for large industries and businesses to develop their own water supply, and a threat for the sustainability of the utilities.

D. Survey data (see next page)

TABLE 27: RESULTS FROM THE UTILITIES SURVEY

Indicators / Utilities	Molo-dechno	Vileika	Orsha	Gomel	Luninec	Osipo-vichi	Postavi	Dobrush	Kalin-kovich	Lepel	Djatlov-skoe	Dribin	Gorki	Klichev	Mjadel	Rechica	Sianno	Shumi-linsk	Smor-gon	Volko-visk	Jerginsk	Rossk
Total population in service area	108400	26740	137510	507700	71000	49640	28890	21550	38880	17350	7585	11370	30930	7333	28090	71120	24210	2635	36740	55780	25410	5390
Population served (water)	102700	24200	137510	505600	45340	42250	22370	18525	13160	13310	4590	8885	30930	7135	12050	63130	19300	2320	35020	41960	25110	5100
Population served (sewerage)	84200	18610	116885	443700	29600	29600	14050	7180	9300	11060	4505	5900	22270	N/A	8153	55700	12590	1994	32230	41520	19760	3240
Coverage Water % population	95%	91%	100%	100%	64%	85%	77%	86%	34%	77%	61%	78%	100%	97%	43%	89%	80%	88%	95%	75%	99%	95%
Coverage Wastewater % population	78%	70%	85%	87%	42%	60%	49%	33%	24%	64%	59%	52%	72%		29%	78%	52%	76%	88%	74%	78%	60%
% population served connected (water)	N/A	91%	88.8%	99.6%	98%	94.8%	N/A	97.6%	91.7%	86%	87.8%	97%	100%	95.5%	N/A	97%	77%	65%	97%	95%	98.8%	94.6%
Reliability water /24h	24	24	24	24	24	24	24	24	24	23.9	24	24	24	23.8	24	24	24	24	24	24	24	24
Conformity bacteriology %	100	98.2	98.5	99.6	100	100	100	98.5	99.8	100	100	100	100	100	99.3	99	93.1	100	100	100	100	100
Conformity chemical %	99.6	94.3	84.2	99.6	82	18	5.2	40	96	90	66.1	64.3	100	94	68.9	50	81.7	80	100	98	100	100
% metering (bulk)	100	98	100	100	100	100	100	100	100	100	100	99	100	100	100	100	100	100	100	100	100	100
% metering (customers)	90	100	98	96.7	94.5	92	73.4	97	90	99	85	72	100	100	77	100	100	80	98	85	98	100
Production capacity m3/d	66500	14300	61900	169000	22200	28400	24860	6530	20000	5284	2640	1730	15200	2700	17100	48000	2000	1488	12000	12800	15360	5700
Average production m3/d	24030	4874	29200	130700	N/A	8621	5470	4000	11000	2567	1367	1510	5600	1674	2659	14211	2000	513	10000	10234	4500	952
Utilization ratio %	36%	34%	47%	77%		30%	22%	61%	55%	49%	52%	87%	37%	62%	16%	30%	100%	34%	83%	80%	29%	17%
Storage capacity m3	31265	4000	9400	65400	1155	1445	6290	3950	7900	2818	300	2100	4800	800	1800	124000	1025	200	6800	6270	3500	2000
% storage/average production (hours)	31	20	8	12		4	28	24	17	26	5	33	21	11	16	209	12	9	16	15	19	50
Unaccounted-for Water UFW %	27%	21%	34%	31%	32%	40%	90%	58%	37%	13%	34%	9%	45%	72%	27%	24%	28%		26%	38%	35%	24%
Length distrib. system km	298	93	337	985	257	19.6	86	106	135	71	39	193	87	12.7	88	220	60	11	64	50	81	15
Leaks repaired	171	5	78	532	34	31	136	8	63	23	10	27	40	7	25	250	139	136	35	512	10	16
Leaks repaired/km/year	0.6	0.1	0.2	0.5	0.1		1.6	0.1	0.5	0.3	0.3	0.1	0.5	0.6	0.3	1.1	2.3		0.5		0.1	1.1
Length sewerage syst. Km	188	55	239	570	144	131	86	20	80	47	19	145	59	19	101	149	22	9	80	77	81	21
Blockages fixed	980	100	1522	7271	83	58	1460	12	70	43	1	28	50	84	100	1012	112	96	367	803	10	48
Blockages /km/year	5.2	1.8	6.4	12.8	0.6	0.4	17.0	0.6	0.9	0.9	0.1	0.2	0.8	4.4	1.0	6.8	5.1	10.7	4.6	10.4	0.1	2.3
WWTreatment capacity m3/day	43245	N/A	57000	180000	N/A	29500	6300	N/A	N/A	5200	610	4000	10000	569	8400	40000	3000	849	19300	18500	11300	4200
Conformity effluent %	100	100	95.4	100	100	100	100	80	N/A	98	100	100	100	100	100	100	96.5	90	100	100	100	100
Total electricity consumption 1000xKwh	10776	2411	9170	56558	3008	3435	2242	534	2404	1319	812	546	3101	273	2834	6571	1830	2561	4339	4078	2103	589
Energy total cons. Kwh/m3	1.23	1.71	1.31	1.73	1.45	1.81	11.62	0.87	0.95	1.62	2.47	1.09	2.74	1.62	4.01	1.66	3.46		1.60	1.77	1.97	2.22
Domestic water connections	42141	7515	56224	178680	14169	18175	11000	7508	14090	7100	2704	2759	13254	2253	12580	40131	18695	N/A	13050	16818	6273	2062
Privileged customers connections	21	14	14	0	23	5	1	0	19	25	7	0	16	3	24	4	1	N/A	6	4	0	4
Industrial & other water connections	95	147	44	2059	18	192	52	0	229	93	2	28	6	108	0	53	2	N/A	337	11	2	0
Other connections	727	0	554	0	270	33	0	146	1	0	67	4	144	70	71	284	65	N/A	20	357	197	21
Total water connections	42984	7676	56836	180739	14480	18405	11053	7654	14339	7218	2780	2791	13420	2434	12675	40472	18763	N/A	13413	17190	6472	2087
Persons/domestic connection	2.4	3.2	2.4	2.8	3.2	2.3	2.0	2.5	0.9	1.9	1.7	3.2	2.3	3.2	1.0	1.6	1.0		2.7	2.5	4.0	2.5
Domestic consumption 1000 m3/year	3867	844	4224	21829	1342	1444	149	576	1332	404	255	199	636	154.4	435	2981	397	N/A	1352	1885	830	193
Privil.customers consumption 1000 m3/year	549	103	16	0	8	52	2	0	114	57	12	0	406	13.5	17	12	2	N/A	18	124	103	1
Industrial consumption1000 m3/year	1960	461	566	9675	249	287	42	0	635	351	5	205	4	0.3	0	293	3	N/A	1106	103	18	0
Other consumption 1000 m3/year	43	0	2182	1254	474	111	0	39	454	0	57	98	86	0.3	255	681	127	N/A	235	191	119	71
Total water consumption 1000 m3/year	6419	1408	6988	32758	2073	1894	193	615	2535	812	329	502	1132	168.5	707	3967	529	N/A	2711	2303	1070	265
Domestic consumption lcd	103	96	84	118	81	94	18	85	277	83	152	61	56	59	99	129	56		106	123	91	104
Household consumption m3/month	7.6	9.4	6.3	10.2	7.9	6.6	1.1	6.4	7.9	4.7	7.9	6.0	4.0	5.7	2.9	6.2	1.8		8.6	9.3	11.0	7.8
Total billing BYR million 2011	26721	3420	23536	136371	7978	9059	943	780	9840	2081	642	241	3264	507	6431	30045	792	N/A	13934	4587	4848	883
Total collection BYR million 2011	26594	3375	23771	137682	7681	7671	915	740	9407	1994	546	241	3003	487	6431	29876	762	N/A	13934	4280	4122	742
Collection rate % 2011	99.5%	98.7%	101.0%	101.0%	96.3%	84.7%	97.0%	94.9%	95.6%	95.8%	85.0%	100.0%	92.0%	96%	100%	99%	96%		100%	93%	85%	84%
Utility staff (water & sanitation)	482	164	506	N/A	266	358	116	123	1127	59	29	N/A	218	22	105	650	38	48	129	29	125	97
Utility staff / 000s population served	4.7	6.8	3.7		5.9	8.5	5.2	6.6	85.6	4.4	6.3		7.0	3.1	8.7	10.3	2.0	20.7	3.7	0.7	5.0	19.0
Utility staff / 000s water connections	11.2	21.4	8.9		18.4	19.5	10.5	16.1	78.6	8.2	10.4		16.2	9.0	8.3	16.1	2.0		9.6	1.7	19.3	46.5
Operational subsidies BYR million	0	0	3809	0	2391	7141	3253	3036	0	1158	1856	3190	4650	1196	2089	3023	3865	2122	1242	1567	0	1400
Operat. Subsidies/total sales %	0	0	16%	0	30%	79%	345%	389%	0	56%	289%	1324%	142%	236%	32%	10%	488%		9%	34%	0%	159%
Base domestic tariff (W+S) BYR/m3	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450
Privileged customer tariff (W+S) BYR/m3	6550	9606	N/A	N/A	7450	N/A	19685	N/A	28460	14674	N/A	N/A	16935	1450	17181	32460	23887	26171	7706	N/A	N/A	11579
Industrial tariff (W+S) BYR/m3	26697	28449	9578	20188	13200	N/A	20770	34172	28950	21797	N/A	N/A	16601	8688	N/A	33617	31643	29365	16315	N/A	N/A	21299
Indust./Domest. Tariff ratio	18.4	19.6	6.6	13.9	9.1		14.3	23.6	20.0	15.0			11.4	6.0		23.2	21.8	20.3	11.3			14.7
Legend		Vodokanals			Multi-Utilities		N/A = Information not available or inconsistent															

Annex VII: Performance and Key Performance Indicators

The present annex proposes a list of performance and key performance indicators to be used for planning and reporting purposes.

TABLE 28: PROPOSED PERFORMANCE (PI) AND KEY PERFORMANCE (KPI) INDICATORS

Indicator	Type	Unit	Concept
Employees per connection	KPI	No/1000 connections	Nb. of full time equivalent employees/nb. of active service connections x 1000
Pipe rehabilitation	PI	% per year	Length of transmission & distribution pipes rehabilitated during the year/total length of pipes x 100
Service connection rehabilitation	PI	% per year	Nb. of service connections replaced or renewed during the year/total nb. of active service connections x100
Pipe failures/repairs	PI	No/100 km/year	Nb. of pipe failures during the year/total pipe length x 100
Service connection failures/ repairs	PI	No/1000 connections/year	Nb. of active service connections failures during the year/nb. of active service connections x 1000
Sewer rehabilitation	PI	% per year	Length of sewers rehabilitated during the year/total length of sewers x 100
Sewerage connection rehabilitation	PI	% per year	Nb. of sewerage connections replaced or renewed during the year/total nb. of connections x100
Sewer failures/blockages	PI	No /100 km/year	Nb. of sewer blockages during the year/total sewer length x 100
Sewerage connections blockages	PI	No/1000 connections/year	Nb. of sewerage connections blocked during the year/nb. of connections x 1000
Population coverage (water/sewerage)	KPI	%	Resident population served/total resident population
Supply by standpipes	PI	%	Resident population served through standpipes/total resident population x 100
Continuity of Supply	KPI	%	Nb. of hours of availability of water during the year/24/365 x100
Quality of water supplied	KPI	%	Total nb. of treated water tests complying with legislation/total nb. of tests performed x 100
Quality of treated effluents	KPI	%	Total nb. of treated effluents tests complying with legislation/total nb. of tests performed x 100
Energy saving (water)	KPI	%	Energy consumed for water services (kwh/m3 produced)- Evolution from past year
Energy saving (wastewater)	KPI	%	Energy consumed for wastewater services (kwh/m3 produced)- Evolution from past year
Customer complaints (on quality of service)	KPI	No complaints/connection/year	Nb. of complaints of quality of service during the year /nb. of active service connections
Unit operating costs	KPI	BYR/m3	Annual operating costs/authorized consumption
Unit total costs	PI	BYR/m3	(Annual operating + capital costs)/authorized consumption
Average water charges	KPI	BYR/m3	Annual water sales revenue/total authorized consumption
Operating cost coverage	KPI	%	Annual revenue/annual costs
Receivables	KPI	Months of billing	Receivables at year end/Average monthly billing during the year
Payables	KPI	Months of expenses	Payables at year end/Average monthly expenses during the year
Contribution of internal sources to investment	KPI	%	Investments financed by the cash flow/total investments x 100
Current ratio (liquidity ratio)	KPI	%	Current assets/current liabilities
Non-revenue water (NRW)	KPI	%	(Volume produced – Volume billed)/Volume produced

Source: IWA performance indicators

Annex VIII: Financial Model

The present annex provides assumption and calculation details from financial model, in the case of scenario D. It also provides detailed outputs from the sensitivity analysis.

A. Financial model details—Scenario D

TABLE 29: ASSUMPTIONS USED IN THE FINANCIAL MODEL FOR SCENARIO D—CONSUMPTION VOLUMES AND OPERATING COSTS

	Unit		2014-18	2019-23	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
General																	
Change BYR - USD		Annual change	3%	3%	5675	8400	8652	8912	9179	9454	9738	10030	10331	10641	10960	11289	11628
Population		Annual growth	-0.2%	0.0%	9.43	9.41	9.39	9.37	9.35	9.33	9.31	9.29	9.29	9.29	9.29	9.29	9.29
Consumption and Production																	
Water supply																	
Water coverage	%	Annual growth	1.2%	1.0%	86%	87%	88%	89%	90%	91%	92%	93%	94%	95%	96%	97%	98%
Sewerage coverage	%	Annual growth	1.8%	1.4%	74%	75%	77%	78%	79%	81%	82%	84%	85%	86%	87%	89%	90%
Water services beneficiaries	mio people				8.11	8.19	8.27	8.35	8.43	8.52	8.60	8.69	8.78	8.86	8.95	9.04	9.13
Wastewater services beneficiarie	mio people				6.97	7.09	7.20	7.31	7.43	7.55	7.67	7.79	7.90	8.01	8.12	8.24	8.35
Residential consumption																	
Per capita consumption	lcd		-1%	-1%	117	117	116	115	114	113	111	110	109	108	107	106	105
Industrial consumption																	
Industrial output increase		Annual growth	2.5%	2.5%													
Industrial consumption to output			1														
Water volumes																	
Residential	mio m3/year				347	350	350	350	350	350	350	350	350	350	350	350	350
Industrial	mio m3/year				99	101	104	107	109	112	115	118	121	124	127	130	133
Administrative/other	mio m3/year				48	48	48	48	48	48	48	48	48	48	48	48	48
Under Domestic tariff	mio m3/year				347	358	365	366	366	366	366	366	367	367	367	368	368
Under Legal entities tariff	mio m3/year				132	135	137	140	142	144	147	149	152	155	158	160	163
under Privileged tariff	mio m3/year				15	7	-	-	-	-	-	-	-	-	-	-	-
Total	mio m3/year				494	500	503	505	508	510	513	516	519	522	525	528	531
Non revenue water	mio m3/year				145	145	146	146	147	148	149	150	150	151	152	153	154
Non revenue water	%	Annual growth	0.0%	0.0%	23%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%
Non revenue water (comm)	%	Annual growth	0.0%	0.0%													
Water production	mio m3/year				639	645	648	652	655	658	662	666	669	673	677	681	685
Wastewater volumes																	
Domestic wastewater collection	mio m3/year				274	278	280	281	283	285	286	288	289	290	291	292	294
Per capita domestic wastewater	lcd				108	108	106	105	104	103	102	101	100	99	98	97	96
Industrial wastewater collected	mio m3/year				91	92	95	97	99	102	104	106	108	110	112	114	116
% of industries only connected to WW					9%	10%	10%	10%	10%	10%	10%	11%	11%	12%	13%	14%	14%
Admin/other wastewater collected	mio m3/year				97	98	99	100	100	101	101	102	102	103	103	104	104
Under Domestic tariff	mio m3/year				274	288	299	301	303	305	307	309	310	311	313	314	316
Under Legal entities tariff	mio m3/year				169	172	174	177	179	182	185	188	190	192	194	196	198
under Privileged tariff	mio m3/year				19	10	-	-	-	-	-	-	-	-	-	-	-
Total wastewater collected	mio m3/year				462	469	473	478	482	487	492	496	500	503	507	510	514
Operating costs and revenues																	
Energy costs																	
Consumption (kWh/m3)		Annual growth	0.0%	0.0%													
Tariff (R/kWh)		Annual growth	2.0%	2.0%													
Energy costs					825	849	871	892	915	938	962	987	1,012	1,038	1,065	1,093	1,122
Staff costs																	
Staffing ratio		Annual growth	0.0%	0.0%													
Unit staff cost		Annual growth	0.0%	0.0%													
Staff costs	BYR billion				908	908	908	908	908	908	908	908	908	908	908	908	908
Provision for bad debts		% of billing	-2.0%	-2.0%													
Other revenues			1.0%	1.0%	79	80	80	81	82	83	84	84	85	86	87	88	89
Maintenance costs			0.0%	0.0%	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375
Adminsitrative costs			0.0%	0.0%	451	451	451	451	451	451	451	451	451	451	451	451	451

TABLE 30: ASSUMPTIONS USED IN THE FINANCIAL MODEL FOR SCENARIO D — TARIFF POLICY AND FINANCING PLAN

			2014-18	2019-23	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Tariff policy																	
Average tariff																	
Water						3.2											
Residential	BYR/m3	Annual growth	10.0%	10.0%	1,193	1,312	1,444	1,588	1,747	1,921	2,113	2,325	2,557	2,813	3,094	3,404	3,744
LE & Privileged	BYR/m3	Annual growth	0.0%	-3.0%	8,101	8,101	8,101	8,101	8,101	8,101	8,101	8,101	7,858	7,623	7,394	7,172	6,957
Wastewater																	
Residential	BYR/m3				863	949	1,044	1,148	1,263	1,389	1,528	1,681	1,849	2,034	2,237	2,461	2,707
LE & Privileged	BYR/m3				6,926	6,926	6,926	6,926	6,926	6,926	6,926	6,926	6,718	6,517	6,321	6,132	5,948
Water+Wastewater																	
Residential	BYR/m3				2,056	2,261	2,487	2,736	3,009	3,310	3,641	4,006	4,406	4,847	5,331	5,865	6,451
LE & Privileged	BYR/m3				15,028	15,028	15,028	15,028	15,028	15,028	15,028	15,028	14,577	14,140	13,715	13,304	12,905
Water+Wastewater average	BYR/m3				5,916	5,897	5,911	6,132	6,369	6,625	6,901	7,199	7,388	7,604	7,849	8,125	8,436
Average cost recovery tariff	BYR/m3				7,204	7,166	7,173	7,180	7,188	7,196	7,204	7,212	7,221	7,230	7,239	7,249	7,259
Average full cost recovery tariff	BYR/m3						8,016	8,049	8,081	8,113	8,144	8,206	8,267	8,328	8,386	8,441	8,467
Operating subsidies	BYR billion				388	532	532	532	532	0	0	0	0	0	0	0	0
Income taxes		%	20.0%	20.0%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Financing Plan																	
CAPEX	BYR billion						350	350	350	350	350	350	350	350	350	350	350
Cash generation		% of CAPEX					0	0	0	0	0	120	120	120	120	120	120
Development grants		% of CAPEX					350	350	350	350	350	120	120	120	120	120	120
Debt (new loans)		% of CAPEX					0	0	0	0	0	110	110	110	110	110	110
Maturity	years		15														
Interest rate	outstanding ppal		15%														
Grace period	years		3														
Debt service (existing loans to utilities)																	
Ppal outstanding	BYR billion					0	2	1	0	5	20	20	20	20	20	20	20
Interest	BYR billion							1	2	3	3	3	3	2	2	2	2
Debt service (new loans)																	
Loan disbursment (annual)	BYR billion						0	0	0	0	0	110	110	110	110	110	110
Loan disbursment (cumulative)	BYR billion						0	0	0	0	0	110	220	330	440	550	660
Ppal repaid (annual)	BYR billion						0	0	0	0	0	0	0	0	9	18	28
Ppal repaid (cumulative)	BYR billion						0	0	0	0	0	0	0	0	9	28	55
Ppal outstanding	BYR billion						0	0	0	0	0	110	220	330	431	523	605
Interest	BYR billion						0	0	0	0	0	17	33	50	65	78	91
Depreciation																	
Fixed assets	BYR billion				9,886	10,236	10,586	10,936	11,286	11,636	11,986	12,336	12,686	13,036	13,386	13,736	13,736
Depreciation	BYR billion	4%	4%		395	409	423	437	451	465	479	493	507	521	535	549	549

TABLE 31: SECTOR INCOME STATEMENT AND CASH FLOW STATEMENT IN SCENARIO D

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Income Statement													
Sales revenues													
Water			26%	28%	29%	31%	33%	35%	37%	40%	43%	46%	48%
Domestic	414	469	527	580	639	703	774	852	938	1,032	1,136	1,251	1,377
Legal entities	1,072	1,093	1,111	1,130	1,150	1,170	1,190	1,211	1,195	1,180	1,165	1,151	1,137
Privileged	119	61	0	0	0	0	0	0	0	0	0	0	0
Sewerage													
Domestic	236	273	292	323	357	395	437	484	534	590	652	720	795
Legal entities	1,172	1,189	1,207	1,224	1,242	1,261	1,280	1,299	1,274	1,249	1,225	1,202	1,179
Privileged	130	66	0	0	0	0	0	0	0	0	0	0	0
Provision for bad debts	-32	-31	-33	-34	-36	-37	-39	-41	-43	-44	-46	-48	-50
Other revenues	79	80	80	81	82	83	84	84	85	86	87	88	89
Total revenues (net of subsidies)	3,190	3,200	3,185	3,305	3,435	3,574	3,725	3,889	3,984	4,094	4,220	4,363	4,526
Operating subsidies	388	532	420	321	214	98	0	0	0	0	0	0	0
Total operating revenues	3,578	3,732	3,605	3,626	3,649	3,672	3,725	3,889	3,984	4,094	4,220	4,363	4,526
Energy costs	825	849	871	892	915	938	962	987	1,012	1,038	1,065	1,093	1,122
Staff costs	908	908	908	908	908	908	908	908	908	908	908	908	908
Maintenance costs	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375	1,375
Administrative costs	451	451	451	451	451	451	451	451	451	451	451	451	451
Total operating expenses	3,559	3,583	3,605	3,626	3,649	3,672	3,696	3,721	3,746	3,772	3,799	3,827	3,856
EBIDTA	0	0	0	0	0	0	29	168	238	321	420	536	670
Debt service (interests)													
Existing loans				1	2	3	3	3	3	2	2	2	2
Future loans			0	0	0	0	0	17	33	50	65	78	91
Depreciation	395	409	423	437	451	465	479	493	507	521	535	549	549
Taxable income	-395	-409	-423	-438	-454	-468	-453	-345	-305	-252	-182	-94	28
Income tax	0	0	0	0	0	0	0	0	0	0	0	0	6
Net income	-395	-409	-423	-438	-454	-468	-453	-345	-305	-252	-182	-94	22
Cash Flow Statement													
Cash beginning of year	50	50	50	48	46	44	36	42	51	113	242	456	771
Net income	-395	-409	-423	-438	-454	-468	-453	-345	-305	-252	-182	-94	22
Depreciation	395	409	423	437	451	465	479	493	507	521	535	549	549
Development grants	350	350	350	350	350	350	350	120	120	120	120	120	120
Loan disbursed	0	0	0	0	0	0	0	110	110	110	110	110	110
Total inflow	350	350	350	349	348	347	376	379	432	499	583	686	802
Debt repayment (principal)													
Existing loans	0	0	2	1	0	5	20	20	20	20	20	20	20
Future loans	0	0	0	0	0	0	0	0	0	0	0	0	0
CAPEX tested	350	350	350	350	350	350	350	350	350	350	350	350	350
Total outflow	350	350	352	351	350	355	370	370	370	370	370	370	370
Cash end of year	50	50	48	46	44	36	42	51	113	242	456	771	1,203
Financing plan													
CAPEX	350	350	350	350	350	350	350	350	350	350	350	350	350
Cash contribution	0	0	0	0	0	0	0	120	120	120	120	120	120
Development grants	350	350	350	350	350	350	350	120	120	120	120	120	120
Debt to utilities (IFIs)		0	0	0	0	0	0	110	110	110	110	110	110
Debt total servicing		0	2	2	2	8	23	39	56	72	87	100	112

B. Sensitivity analysis

The reaction of residential consumers to tariff increases is expected to have a major impact on sector financial planning. The planned substantial increase in the residential tariff is likely to drive down consumption levels, with immediate consequences for sector revenues. Depending on the reaction of residential consumers to tariff increases, the time needed for cost recovery may vary significantly, as shown in Table 32. To better understand and anticipate the impact, a study of consumers' capacity to pay for services is recommended.

TABLE 32: SENSITIVITY OF SECTOR FINANCIAL PROJECTIONS TO THE EVOLUTION OF PER CAPITA CONSUMPTION (LITERS PER CAPITA PER DAY)

Scenario	Consumption (level in 2023)	Date of achievement of cost-recovery for:		Total operating + investment subsidies 2013–2023 (bil. BYR)
		OPEX	OPEX + depreciation + interests	
Base	117 down to 105	2019	2023	3500
High	Constant at 117	2018	2022	3300
Low	Down to 90	2020	~ 2027	5300
	Span of variations	**2 years**	**~ 5 years**	**2,500**

Note: cells are darkened proportionally to the deviation from the base scenario

The financial stability of the water and wastewater sector depends strongly on the condition and behavior of the industrial customers, which confirms the urgency of phasing out cross-subsidization. Two factors can cause significant variation in industrial water consumption[20]: (i) the evolution of industrial output (which is closely linked to industrial water consumption), and (ii) industries' strategy regarding water supply and wastewater services (development of autonomous systems or connection to municipal systems, reduction of average water consumption per output). The preliminary sensitivity analysis indicates that the sector's financial stability is strongly dependent on industrial water consumption, as shown in Table 33. This confirms the urgency of moving away from the current extreme cross-subsidization level.

TABLE 33: SENSITIVITY OF SECTOR FINANCIAL PROJECTIONS TO THE EVOLUTION OF INDUSTRIAL CONSUMPTION

Scenario	Consumption (level in 2023)	Date of achievement of cost-recovery for:		Total operating + investment subsidies 2013–2023 (bil. BYR)
		OPEX	OPEX + depreciation + interests	
Base	Constant at 2.5%	2019	2023	3500
High	Constant at 5%	2017	2021	3300
Low	Constant at 0%	2021	~2026	4000
	Span of variations	**4 years**	**~ 5 years**	**1,500**

Note: cells are darkened proportionally to the deviation from the base scenario

An insufficient focus on the commercial management and customer relations could entail a major cost for the sector and enhance its dependence on budget support. With the planned increase in water tariffs, commercial losses may increase. This may be particularly critical if utilities do not put in place tools to help mitigate the risk, such as direct meter reading, bulk metering of residential buildings, and customer care services, described in Section 2.5 above. As shown in Table 34, an increase of 5 percentage points of commercial NRW would

20 A review of the evolution of industrial water consumption and of industrial output in Belarus over the 1991-1997 period suggests an elasticity of 1.

require additional financial assistance from the budget of about 700 billion BYR (US$80 million) over the next 10 years. An assessment of the level of effort required to develop sound commercial and customer relations management will most likely demonstrate their relevance and urgency from an economic perspective.

TABLE 34: SENSITIVITY OF SECTOR FINANCIAL PROJECTIONS TO THE EVOLUTION OF NON-REVENUE WATER (COMMERCIAL LOSSES)

Scenario	UFW (evolution)	Date of achievement of cost-recovery for:		Total operating + investment subsidies 2013–2023 (bil. BYR)
		OPEX	OPEX + depreciation + interests	
Base	Constant at 23%	2019	2023	3500
High	Up to 28%	2019	-2024	4200
	Span of variations	**0 years**	**1 year**	**700**

Note: cells are darkened proportionally to the deviation from the base scenario

The potential impact of energy efficiency or electricity cost variations appears more limited than with the previously discussed parameters. Two operational parameters directly impact energy costs, a key component of operating expenditures: the cost of purchasing electricity (outside of the utilities' control) and energy efficiency (which can be optimized by appropriate management of assets). Sensitivity analyses (see Table 35 and Table 36) show that the impact of variations in these costs on sector financial planning does not seem as significant as for the parameters previously analyzed. Utility energy audits would be useful to assess the potential for further energy efficiency improvement and to adjust the conclusions, if necessary.

TABLE 35: SENSITIVITY OF SECTOR FINANCIAL PROJECTIONS TO THE EVOLUTION OF ELECTRICITY COSTS

Scenario	Industrial output (evolution)	Date of achievement of cost-recovery for:		Total operating + investment subsidies 2013–2023 (bil. BYR)
		OPEX	OPEX + depreciation + interests	
Base	+ 2% per year	2019	2023	3500
High	+ 3% per year	2019	2025	3700
Low	+ 1% per year	2018	~2023	3400
	Span of variations	**3 years**	**~ 4 years**	**300**

Note: cells are darkened proportionally to the deviation from the base scenario

- Parameter: energy efficiency

TABLE 36: SENSITIVITY OF SECTOR FINANCIAL PROJECTIONS TO THE EVOLUTION OF UTILITIES' ENERGY EFFICIENCY

Scenario	Energy efficiency (change by 2023)	Date of achievement of cost-recovery for:		Total operating + investment subsidies 2013–2023 (bil. BYR)
		OPEX	OPEX + depreciation + interests	
Base	No change	2019	2023	3500
High	+10%	2018	2023	3400
Low	-5%	2019	~2024	3600
	Span of variations	**3 years**	**~ 3 years**	**200**

Note: cells are darkened proportionally to the deviation from the base scenario