



NATIONAL RESEARCH UNIVERSITY
HIGHER SCHOOL OF ECONOMICS

Liliana N. Proskuryakova

WATER RESOURCES 2030: POLICY RECOMMENDATIONS

BASIC RESEARCH PROGRAM

WORKING PAPERS

SERIES: SCIENCE, TECHNOLOGY AND INNOVATION

WP BRP 44/STI/2015

This Working Paper is an output of a research project implemented at the National Research University Higher School of Economics (HSE). Any opinions or claims contained in this Working Paper do not necessarily reflect the views of HSE.

WATER RESOURCES 2030: POLICY RECOMMENDATIONS²

The Foresight study presented in this paper is devoted to the sustainable use of water resources in Russia. The authors analyse possible trajectories of development in the three thematic areas (i) sustainability of water systems; (ii) water use by households and in industry; and (iii) new water products and services.

The Foresight methods cover expert interviews and seminars, desk research, and policy analysis. The state and corporate policy recommendations for the water sector offered in this study correspond with the water scenarios earlier identified by Saritas et al.: “Nearly ideal future”, “Losses and accidents”, “Problem conservation”, and “National Priority” [Saritas *et al.*, 2015].

For each of these four scenarios, policy recommendations for water companies were identified covering new solutions (including technological innovations), new values and competencies, organisational changes, modernisation of the infrastructure, financial issues, and legal and regulatory changes. Moreover, we recommend certain policy measures and approaches to state policy in the water sector. The paper concludes with the main directions and instruments for the sector’s development, which should be planned and implemented jointly by the government and businesses, as well as other stakeholders (organisations and people).

JEL: H4, H5, H87, I30, M11, R20, R52, Q01, Q02, Q15, Q18, Q22, Q25, Q26, Q27, Q53, Q54, Q55

Keywords: water resources, sustainable water systems, water use, water goods, water services, scenarios, water policy, water governance, water management, Foresight, Russia.

¹ Leading researcher, Research Laboratory for Science and Technology Studies, National Research University “Higher School of Economics. Email: lproskuryakova@hse.ru.

² The authors would like to show sincere appreciation to the employees of the headquarters and companies of the “Renova” Group for the support of the study. We would like to extend a personal note of thanks to Mr. Viktor Vekselberg. The contributions of A. Likhacheva, M. Kozeltsev, S. Sivaev were instrumental in conducting the research. We would also like to acknowledge the following people for their contribution to the research: Dann Sklarew (George Mason University, USA), Anumita Raj (Strategic Foresight Group, India); Yury Golubkov, Dmitry Vazagashvili and Anna Ryzhova (the RENOVA group); and Ilya Guzeev (Rossiyskiye Kommunalnye Systemy, Russia). Imogen Wade provided useful editing and proofreading assistance.

Introduction

Water use strategies implemented by companies across the world are aimed at greater water saving (for instance, due to water reuse), the application of more efficient technologies and equipment, and limitation of negative environmental impact.

Among key reasons for companies' attention to water use are external conditions (such as more stringent legal and regulatory requirements), and internal reasons (such as the need to increase economic efficiency or comply with corporate social responsibility requirements) [Lambooy, 2011]. At the same time, researchers note that the majority of the world's leading companies working in water-intensive industries do not yet apply highly efficient water management systems and do not disclose sufficient volume of information about own water risks and capacities [CERES, 2010].

The position of and attitude towards the water resources of large industrial companies has a direct impact on the activity of companies concerned with water supply and sanitation (WSS). The volume of water consumed and discharged by large companies has a substantial impact upon WSS companies' financial results. Another important issue concerns the specific pollutants (such as petroleum derivatives and chemical substances), contained in waste-water of industrial enterprises; these require special purification technologies.

Direct or indirect impact upon water deficit and water contamination is an imminent risk for industrial enterprises, which needs attention. Besides assessing actual volumes of water consumption and discharge, a growing number of companies around the world are calculating their water footprint, i.e. the volume of water used and discharged through the entire supply chain (production and sales). Among the approaches applied by them are environmental footprint assessment; life cycle assessment; and environmentally extended input–output analysis. Thus, companies are increasingly considering a move towards integrated environmentally favourable water management - water stewardship [Hoekstra, 2015]. For example, integrated water management strategies among Australian industrial enterprises consist of water audit, pinch analysis and membrane process application. These tools are applied systematically in order to identify water conservation opportunities in water consumption and discharge [Agana *et al.*, 2013].

In the last decade there is a growing interest to the study of various forms of innovations, including green innovations and userinnovation. This attention is grounded in the fact that innovations often become the drivers of economic growth at micro and macro levels [OECD, 2013; PricewaterhouseCoopers, 2013; Hansen, 2007]. In particular, an earlier study throws light upon the impact of consumers on the introduction of eco-innovations (new products) in the water supply and sanitation sector. Hegger *et al.* distinguish between 'upstream' versus 'downstream' and 'core' versus 'non-core' innovations in water supply. They note that managers of WSS companies now consider several innovation paths, including downstream solutions created with due consideration of social patterns in water consumption, as they think of going beyond traditional ways of fresh water supply [Hegger *et al.*, 2011].

Raising the efficiency of governance throughout the entire water cycle by stimulating innovations in WSS companies is not only an issue of research interest, but also of practical importance. Water policy in many countries is directed towards a more sustainable and secure future, and incorporates a set of instruments to stimulate innovation, the success of which depends on multiple factors such as business perceptibility to innovation, demand for new solutions, and so on. Inventors often face inertia and path dependency in the water sector. The studies on this subject undertaken in Austria, China, Bulgaria and other countries, indicate that innovation in WSS do not depend exclusively on existing demand for new solutions in certain regions. New solutions in WSS are also influenced by the interaction of competing innovative solutions and management systems, such as centralisation and decentralisation of the sector, technological and non-technological responses, and integrated and specific technologies. Previous studies show that a decentralised integrated water management system, which is open

to stakeholders, is more effective. Special government instruments to stimulate innovation may vary from economic stimuli to direct funding [Daniell *et al.*, 2014]. In order to assess the potential of public-private partnerships (PPP) for developing water infrastructure, researchers suggest doing a risk assessment of several dozen critical risk factors [Ameyaw, Chan, 2015].

Worldwide, the water supply and sanitation sector is characterised by high capital intensity and long payback periods on investments. Aspects specific to the Russian sector are a high level of depreciation of fixed assets and infrastructure, inefficient use of water resources in industry and agriculture, insufficient waste-water treatment among many Russian industrial enterprises and utilities, and critically low prices for WSS services due to government tariff regulation. Moreover, water resources are distributed rather unevenly across the country. For instance, despite the fact that the river Volga runs across the Astrakhan region, certain parts of the region face a water deficit. In Kalmykia, local water resources provide only 2% of this region's needs.

These issues require comprehensive solutions for planning and implementation for which the government, business sector, research organisations and citizens need to join forces.

Methodology and scope

The paper presents the outcomes of the “Study of Global Challenges and Long-term Trends in Innovation Development” implemented between May 2014 and June 2015 as a comprehensive interdisciplinary study of the processes and instruments for water resources regulation. The research work applies a mixture of methods including desk research, expert meetings and interviews, and policy analysis. The study outlines the state and corporate policy recommendations, which may have a positive impact on the water sector in Russia in the next 15–20 years with a particular focus on three thematic areas: (i) the sustainability of water supply systems, (ii) water use by households and in industry, and (iii) new water products and services.

The state and corporate policy recommendations for the water sector, presented in this study, are based on four scenarios previously developed for the Russian water sector: “Nearly perfect future”, “Problem conservation”, “Losses and accidents” and “National priority” [Saritas *et al.*, 2015]. These scenarios were built with due consideration of trends and uncertainties (‘weak signals’ and ‘wild cards’) forecasted in global and Russian water sectors.

Policy recommendations for the Russian WSS companies are grouped as follows:

- new solutions (including technological innovations);
- new values and competencies;
- organisational changes;
- the modernisation of infrastructure;
- financial issues;
- legal and regulatory changes.

The information sources used in the study are strategies of large Russian and international water companies, expert seminars and interviews, legal and regulatory documents and their drafts, research papers and analytical reports.

The study outcomes may be useful for executive authorities and water companies in planning policy measures for timely adaptation to possible future developments, prevention of certain possible undesirable events, or transition to a more acceptable development path.

Policy recommendations for the Russian water companies

Water management instruments applied by the Russian WSS companies and authorities will depend on the sector's future development trajectories. In previous work scenario analysis allowed four plausible developments to be identified: “Nearly perfect future”, “Problem conservation”, “Losses and accidents,” and “National priority.”

The “Nearly perfect future” scenario envisages the stable development of the Russian economy, absence of substantial external policy tensions, the diversification of the economy, a better investment climate, and WSS companies’ access to financial resources and new technologies available in the international market, which will provide for a consistent technological development of the Russian water sector. This scenario will allow for a competitive selection of engineering infrastructure management models by the government. Attractiveness for investors will depend not only on sector’s better financial standing, but also on the ability of water enterprises to forecast their revenues in the long-term. We expect advancing entrepreneurship, higher quality of services (client orientation) and their secure provision. Environment protection (as a public good) will remain an unsolved issue (as a public good).

The “Problem conservation” scenario envisages economic stagnation. Under this scenario, the majority of companies will abandon their development roadmaps and implement strategies to minimise losses. Due to high interest on credits³ and rigid tariff restrictions, the number of investment projects will decline including those that deal with application of new technologies and the modernisation or construction of new treatment facilities. Private business will be keen to manage WSS infrastructure only in large cities, but will fall short of funds for modernisation. In five years, the share of private business on the WSS market will grow to 35-40% by implementing private concession-related initiatives stipulated by legislation.

The “Losses and accidents” scenario is characterised by a decreasing GDP due to economic depression and external policy tensions. This will lead to closure or reduction in the activity of many enterprises and a lower population solvency. Unlike the “Problem conservation” scenario, authorities will not only artificially curb housing tariffs at a level lower than inflation, but also “freeze” them in absolute terms.

It is expected that new global technological trends will remain. However, their scope will be limited as compared with the scenario “Nearly perfect future” and “Problem conservation.” External economic pressure on Russia will continue, thus limiting import of WSS technologies and equipment from these countries. Both state-owned and private companies will not be able to provide the necessary funding for R&D, or be able to import new products. As such, solutions from the East (mainly from China) will become the main channel of technology transfer.

The “National priority” scenario may become a continuation of the “Losses and accidents” scenario. A rapidly worsening situation in the WSS sector will force the government to prioritise the sector’s problems and undertake a number of unpopular decisions, in order to make substantial changes to the situation. The undertaken measures may ultimately lead to changes that are described partially in the “Nearly perfect future” scenario: increasing the attractiveness of the WSS sector for investors, calculating tariffs based on the market principles, and improving the financial situation of WSS enterprises. At the same time, the implementation of this scenario will happen alongside an increasing centralisation of the sector and large government investments.

Next, we review water management instruments applicable to each scenario.

“Nearly perfect future” scenario

The main tasks for business in the event of this scenario are:

- to hold active and constructive dialogue with authorities about reforms;
- to create and enhance mechanisms for advancing sector’s interests;
- be ready for competition on the WSS services market with regional (municipal) enterprises, controlled by authorities;
- to widen their WSS market share

Table 1 describes the suggested tools for Russian companies in greater detail.

³The market of bank credits for WSS companies usually offers rates higher than average due to negative profitability of the sector.

Table 1. Policy recommendations for Russian WSS companies for the “Nearly perfect future” scenario

	Sustainability of water systems	Water use by households and industry	New water products and services
New solutions (including technological innovations)	<p>Identification, endorsement and application of new solutions, including:</p> <ul style="list-style-type: none"> - Rainwater harvesting technologies; - Pultrusion technology in water facilities; - Terramesh systems; - Geosynthetic materials in water facilities; - “Smart” information systems (for instance, digitalising data) - “Smart” water systems; - Biodegradable squeeze bottles 	<p>Identification, endorsement and application of new solutions, including:</p> <ul style="list-style-type: none"> - Technical solutions for raising energy efficiency (optimisation of networks operation modes – zoning, raising operational efficiency of manufacturing equipment and machinery due to application of efficient pumping technologies – «return activated sludge»); - Solutions for a radical decrease of water losses in the course of transportation to consumers; - New methods of water and sewage treatment (hydrowave methods of water treatment); - Membrane water treatment and desalination – ultrafiltration, nanofiltration, and reverse osmosis); - Plastic pipes for water supply; - “Smart” data gathering – equipment and software, only in big cities. - Managerial decisions, based on network data, real-time monitoring (for example, <i>Sensus, Arad group, Veolia etc.</i>); - Computerised information - analytical systems for servicing WSS networks and similar systems that allow obtaining emergency and urgent information and regular maintenance operations, input information on the actually performed operations, electric power expenditures and equipment status; - Advanced systems for vibroacoustic diagnostics, such as laser vibroacoustic diagnostics of incipient defects; - Advanced systems of hydraulic modelling of networks and facilities, including those that allow modelling emergency and long-term operating conditions, for peaking, average or minimum water withdrawal, for instance, new models of mathematical modelling based on genetic algorithms; - Waste water meters at all manufacturing enterprises (and, possibly, by multi-apartment houses); - Own electric and heating power generation in WSS companies with the use of sludge; - Use (sale) of sludge for manufacturing of construction materials and agricultural fertilizers; - New water treatment chemicals that allow for smaller quantities or are more efficient 	<p>Identification, endorsement and application of new solutions, including:</p> <ul style="list-style-type: none"> - Systems for water reuse for technical purposes or drinking (for instance, <i>CleanTech</i> in Israel, <i>NEWater</i> in Singapore); - Technologies used in old water pipelines: real-time identification of microorganisms (<i>PREMIER Biosoft, BioSentry sensor, Rigel Life Science Integrated Environmental Monitoring Systems</i>); - Collection of water vapour from the air; - New products and services initiated by consumers; - The use of sea animals and mollusc for air and water quality controls; - Fresh water, enriched with certain elements (those lacking in the region, i.e. iodine), supplied to multi-apartment houses

	Sustainability of water systems	Water use by households and industry	New water products and services
New values and competencies	<ul style="list-style-type: none"> - Special programs for education, professional training, retraining and professional development for WSS different specialists, developed jointly by universities and companies 	<ul style="list-style-type: none"> - Business development due to reduction of overhead costs; - High demand for new positions: consultants and operators for water monitoring systems; bio-IT specialists, engineers for water cycle monitoring, water treatment production engineers, specialists in the water sector big data, etc. - Development of educational and professional training programs partly sponsored by WSS companies and new university departments; - Provide for regular implementation of works in the interest of the sector that were previously performed by research organisations answerable to the ministries; - Attracting foreign specialists 	<ul style="list-style-type: none"> - Knowledge of international markets; - Research competencies, allowing participation in international R&D projects; - Consumer awareness on the possible drop in qualitative and quantitative WSS indicators will raise awareness about the value for money.
Organizational changes	<ul style="list-style-type: none"> - Development of sustainable water management systems; - Construction of new hydrological stations; - Support to nature protection organisations; - Personal responsibility of decision-makers; - Adaptation of systems for changes, i.e. climate change 	<ul style="list-style-type: none"> - Ahead of schedule (before 2020) application of hygienic standardisation norms based on the best available technologies by WSS enterprises; - Development of public-private partnership mechanisms; - Enhance mechanisms for lobbying sectoral interests; - Restoring functions of research institutes formerly subordinate to the federal ministries (concerning periodic update of all standards, academic school, etc.) or their effective transfer to successor organisations 	<ul style="list-style-type: none"> - Establishment of a special unit responsible for advancing additional services to end-users (review of filtration systems, quality monitoring systems); - Consumer-oriented business; - Regional business segmentation; - Planning and implementation of R&D programs
Modernization of infrastructure	<ul style="list-style-type: none"> - Construction of water supply systems (5-10 per year); - Reconstruction of old water facilities (30-40 per year); - Construction of flood protection facilities (200 km per year) 	<ul style="list-style-type: none"> - Reconstruction and modernisation of municipal water supply systems (at least in 100 settlements); - Reconstruction of water supply systems (5000-10000 km per year); - Reconstruction of sewage networks (3000-5000 km per year); - Increasing energy efficiency; - Water networks: water pipeline rehabilitation with the use of “sleeve” methods. 	<ul style="list-style-type: none"> - Organisation of WSS innovation clusters together with Israel, Singapore, Japan, China; - Development of logistics in geographically remote areas

	Sustainability of water systems	Water use by households and industry	New water products and services
Financial issues	<ul style="list-style-type: none"> - Quotas for environment pollution (emissions trading) 	<ul style="list-style-type: none"> - Alleviation of politically motivated tariff regulation; - Tariff setting for WSS services to households considering population solvency; - Improvement of investment climate, attracting private investors; - Widening the participation of Russia's regions in provision of water supply and sanitation services (state guarantees of WSS companies loans, etc.); Transfer of inefficient municipal and state unitary enterprises into concessions; - Widening the variety of interaction modes between organisations-resource providers and WSS companies, including direct relations with consumers; - Lowering tax burden and faster amortisation for construction/modernisation and exploitation of new capital intensive facilities (corporate property tax) 	<ul style="list-style-type: none"> - Insurance of consumers: promotion of real estate insurance in the event of increased number of accidents (with an accent on insurance from floods and draughts); - Insurance of WSS companies (risk management): the use of insurance assets for companies-operator accidents in the event of increased number of accidents (with an accent on insurance from floods and draughts)

	Sustainability of water systems	Water use by households and industry	New water products and services
Legal and regulatory changes	<ul style="list-style-type: none"> - Flexible legal and regulatory systems that allow for adaptation to water spatio-temporal changes of water resources; - Transfer of rights for water resources; - Water resources protection at the source; - Calculation of unique standards for each water body taking into consideration its unique features (for instance, commercial fishing standards, depending on fish species, other features), and creating new categories of water bodies (more detailed, with attention to background pollution, etc.) 	<ul style="list-style-type: none"> - Advancing sectoral and tariff regulation, and public-private partnership mechanisms, assuring competition within WSS monopoly markets 	<ul style="list-style-type: none"> - The cost of “virtual water” is included in the cost of products

“Problem conservation” scenario

The main tasks for business, in the event of this scenario, are:

- to win water supply markets in big cities, using the possibility to put initiate concession agreements;
- to attempt to solve the outstanding issues (not linked with direct tariff increase) through legislative changes:
 - multiple forms of PPP, alongside concessions that do not have any investment obligations (management or rent agreements);
 - concession agreements that preview increasing tariffs followed by the improvements in the quality of services;
 - legally define property rights of WSS companies for water meters installed in multi-apartment houses;
- to create and enhance mechanisms for advancing sector’s interests

Table 2 describes suggested tools for the Russian companies in detail.

Table 2. Policy recommendations for the Russian WSS companies for the “Problem conservation” scenario

	Sustainability of water systems	Water use by households and industry	New water products and services
New solutions (including technological innovations)	<p>Identification, endorsement and application of new solutions, including:</p> <ul style="list-style-type: none"> - Reuse of squeeze bottles, used for water; - Monitoring systems at key water bodies (equipment and software) 	<p>Identification, endorsement and application of new solutions, including:</p> <ul style="list-style-type: none"> - Technological solutions with fast pay-off period to increase energy efficiency of pumping and other equipment (frequency drives, optimisation of hydrodynamic modes); - Solutions for decreasing water losses during transportation to consumers; - Managerial systems that allow obtaining information on the status of emergency and regular maintenance operations, input information on the actually performed operations, electric power expenditures and equipment status; - Advanced systems for vibroacoustic diagnostics, such as laser vibroacoustic diagnosticsof incipient defects; - Advanced systems of hydraulic modelling of networks and facilities, including those that allow modelling emergency and long-term operating conditions, for peaking, average or minimum water withdrawal, for instance, new models of mathematical modelling based on genetic algorithms; - Waste water meters at all manufacturing enterprises; - Own electric and heating power generation in WSS companies with the use of sludge; - Technologies that allow monitoring the status of networks and facilities, dispatching control systems (real-time monitoring of actual water consumption and accidents). 	<p>Identification, endorsement and application of new solutions, including:</p> <ul style="list-style-type: none"> - Investments in Russian information systems for WSS companies that are equivalent to those in the international market; - Replacing basic equipment; - Individual filters / water purification facilities in apartment houses /residential houses: pilot projects, PR-campaigns against installation of private filters; - “Smart meters”, reflecting the quality of services provided; - Support to differentiated solutions for consumers; - Recycling of wastewater and its use for technical purposes (e.g. irrigation, cooling of machines)
New values and competencies	<ul style="list-style-type: none"> - Understanding of scarcity of water resources; - Strive for professional development; - Soliciting feedback from consumers 	<ul style="list-style-type: none"> - Attracting state and private (including foreign) investments for modernisation and renovation of equipment and infrastructure; - Consolidation of educational and professional training programs in a few leading universities; - Introduction of systemic approach to R&D in the sector’s interest, which should not be performed irregularly each time by a different organisation; - Restructuring of management and technology cycles 	<ul style="list-style-type: none"> - Increasing competence gap between older and younger generation of specialists; - Investments in education of young specialists; - Launch of at least two educational programs per year: for young and experiences specialists

	Sustainability of water systems	Water use by households and industry	New water products and services
Organizational changes	<ul style="list-style-type: none"> - Transit towards an integrated management of water resources 	<ul style="list-style-type: none"> - Concession agreements in big cities; - concluding concession agreement with tariffs growing as the quality of services improve; - Implementation of PPP mechanisms with no investment obligations towards private business; - Advancing private business interests 	<ul style="list-style-type: none"> - Establishment of a special unit responsible for advancing additional services to end-users (review of filtration systems, quality monitoring systems); - Strengthening focus on consumers
Infrastructure modernization	<ul style="list-style-type: none"> - Maintenance of old hydro-engineering facilities (10-20 per year); - Construction of flood-protecting facilities (100 km per year); - Construction of water supply systems (3-5 units per year); - Development of logistics in geographically remote areas. 	<ul style="list-style-type: none"> - Reconstruction and modernisation of municipal water supply systems (in 30-50 settlements); - Reconstruction of water networks (1000-3000 km per year); - Reconstruction of sewage pipelines (1000 km per year). 	<ul style="list-style-type: none"> - Government and business together join forced to facilitate the creation of the Russian Water cluster (i.e. in St.Petersburg)
Financial issues	<ul style="list-style-type: none"> - Replacing pollution charges with environment protection activities (including modernisation of equipment) 	<ul style="list-style-type: none"> - Policy limitations influencing water tariffs, which grow slower than inflation; - Continued losses of the WSS sector (management of overdue debts); - Increasing tax burden and amortization costs for construction / modernisation and exploitation of new capital-intensive facilities (corporate property tax) 	<ul style="list-style-type: none"> - Development of lines of services based on financial analysis of ‘smart’ meters data; - Assessment of pay-off period for educational events, financial stimuli for highly qualified specialists

	Sustainability of water systems	Water use by households and industry	New water products and services
Legal and regulatory changes	<ul style="list-style-type: none"> - Undertaking tax reform; - Implementation of Russia’s regional initiatives 	<ul style="list-style-type: none"> - Adoption of laws that widen the possible PPP mechanisms, going beyond concessions; - Advancing concession legislation; - Legally define property rights of WSS companies for water meters installed in the multi-apartment houses. 	<ul style="list-style-type: none"> - New insurance options that preview state support for “bad” assets

“Losses and accidents” scenario

The main tasks for business, in case this scenario will play out, are:

- localise business in big cities only;
- to create and enhance mechanisms for advancing sector’s interests;
- resist “governmentalisation” of the sector

Table 3 describes suggested tools for the Russian companies in detail.

Table 3. Policy recommendations for the Russian WSS companies for the “Losses and accidents” scenario

	Sustainability of water systems	Water use by households and industry	New water products and services
New solutions (including technological innovations)	<ul style="list-style-type: none"> - Systems for prevention of emergency waste water discharge which cause pollution of water basins 	<ul style="list-style-type: none"> - Water filtration systems for multi-apartment houses; - Drinking water delivery 	<ul style="list-style-type: none"> - SOS-systems for monitoring; - Experimental systems of information monitoring (equipment and software); - Individual filters/water purification facilities for residential houses only in big cities and only for middle class and well-off citizens

	Sustainability of water systems	Water use by households and industry	New water products and services
New values and competencies	<ul style="list-style-type: none"> - Use of non-traditional water sources; - Industry adaptation to scarcity of water resources 	<ul style="list-style-type: none"> - Anti-crisis management competencies; - No R&D for the benefit of the sector as a whole are held; - Restructuring water cycle management; - Preventing the population's stereotype on water and its purification, with transportation and channelling processes relatively free-of-charge. 	<ul style="list-style-type: none"> - Due to lack of qualified specialists, companies may concentrate resources on training of middle managers; - Launch of at least one training program per year: for middle managers
Organizational changes	<ul style="list-style-type: none"> - Decreasing importance of environment protection activities and contraction of responsible units; - Nullification of costs for R&D, with possibility of termination of existing contracts with research organisations 	<ul style="list-style-type: none"> - Localisation of business in big cities and conclusion of concession agreements which do not preview any investment obligations; - Enterprises may be transferred into state (municipal) property 	<ul style="list-style-type: none"> - Establishment of a special unit responsible for advancing additional services to end-users (review of filtration systems, quality-monitoring systems)
Infrastructure modernization	<ul style="list-style-type: none"> - Maintenance of old hydro-technic facilities (5-10 per year); - Development of logistics in geographically remote areas 	<ul style="list-style-type: none"> - Nearly none 	<ul style="list-style-type: none"> - Widespread replacement of previously used equipment and chemical agents, used by WSS companies with cheap Russian alternatives in order to support national R&D and industrial production in this sphere.

	Sustainability of water systems	Water use by households and industry	New water products and services
Financial issues	- Minimising environment pollution payments or implementation of environment protection activities	- “Frozen” tariffs; - Worsening of WSS companies financial situation; - Management of overdue debts; - Outsourcing claims on overdue debts; - Promoting the insurance of WSS companies’ assets under the conditions of growing accidents (with a focus on floods and draughts) – <i>insurance of companies</i> (risk-management); - Assuring availability of accessible loans for investments and operation activity of WSS companies (subsidizing and budgetary guarantees) – as an instrument of Utilities Foundation.	- Lowering costs associated with products and services; - Search for new sources of revenues under the conditions of frozen tariffs; - Developing lines of cheap products and services for low-income consumers
Legal and regulatory changes	- advancing legal and regulatory changes: tariff indexing and other sector’s interests		

“National priority” scenario

The main tasks for business, in the event of this scenario, are:

- resist “governmentalisation” of the sector
- demonstrate own efficiency in comparison with government sector enterprises, compete for a greater market share;
- advance and support comprehensive reforms in the water sector.
-

Table 4 describes suggested tools for the Russian companies in detail.

Table 4. Policy recommendations for the Russian WSS companies for the “National Priority” scenario

	Sustainability of water systems	Water use by households and industry	New water products and services
New solutions (including technological innovations)	<ul style="list-style-type: none"> - Systems for emergency prevention of waste water discharge and pollution of water basins; - Experimental systems of information monitoring (equipment and software) 	<ul style="list-style-type: none"> - Instalment of meters takes place under considerable administrative pressure as a response to the rising tariffs and the costs are covered from the state budget 	<ul style="list-style-type: none"> - Obligatory instalment of simple and cheap water saving solutions, such as spray nozzles
New values and competencies	<ul style="list-style-type: none"> - The use of non-traditional water sources; - Adaptation to water scarcity 	<ul style="list-style-type: none"> - Technologies of obtaining and spending of state budget funds, crowing risks of corruption; - Organisation of 1-2 pilot educational programs/professional training programs supported by the state 	<ul style="list-style-type: none"> - Due to lack of new qualified specialists and funds for staff education/ retraining, companies may attract the necessary specialists through service contracts; - Launch of not more than one training program per year.
Organisational changes	<ul style="list-style-type: none"> - Decreasing importance of environment protection activities and contraction of responsible units; - Nullification of costs for R&D, with possibility of terminating existing contracts with research organisations 	<ul style="list-style-type: none"> - Transfer of enterprises into state (municipal) property; - Consolidation of WSS enterprises in order to integrate profitable and unprofitable business 	<ul style="list-style-type: none"> - Concluding agreements with foreign organisations to import cheap technologies and products

	Sustainability of water systems	Water use by households and industry	New water products and services
Infrastructure modernization	<ul style="list-style-type: none"> - Maintenance of old hydro-technic facilities (5-10 per year); - Reconstruction of water networks (500 km per year); - Development of logistics in remote areas 	<ul style="list-style-type: none"> - Reconstruction and modernisation of municipal water supply systems (in 10-20 settlements); - Reconstruction of water sewage pipeline (300-500 km per year); 	<ul style="list-style-type: none"> - Minimising risks in the course of widespread replacement of water treatment equipment by cheap imported alternatives to support national R&D and manufacturing
Financial issues	<ul style="list-style-type: none"> - Minimising environment pollution payments or implementation of environment protection activities 	<ul style="list-style-type: none"> - Provide for stable functioning of the sector; - Assure reasonable loans / credits for investments and operational costs (subsidising and state budget guarantees) – as an instrument of the Foundation for Housing and Utilities Infrastructure 	<ul style="list-style-type: none"> - Lowering costs associated with products and services; - Resolving and set of issues associated with a transfer of enterprises in state /municipal property
Legal and regulatory changes	<ul style="list-style-type: none"> - Allocation of substantial state budget funds for the modernisation of WSS infrastructure; - A leap in tariffs following the period when they were frozen: waiver of sector’s limiting coefficients and the possibility to overcome limiting coefficients for service prices paid by households; - Transition of many enterprises to state / municipal property; - Consolidation of many WSS companies; - Lifting the obligations of WSS companies to treat substances that they are incapable of treating at the companies’ treatment facilities; - Industrial enterprises are obliged to install own wastewater treatment facilities, capable of treating wastewater so that it fits the quality of residential wastewater 		

There remain certain difficulties in training specialists who possess the skills necessary to work with new equipment and new technologies in WSS companies. All new systems require a fine adjustment: the mode has to be adjusted, and certain activities should be performed in the course of exploitation (such as tuning and fit up). The majority of enterprises ordering R&D assume that the contractor should install and start the equipment. However, it is not that easy: the customer should develop technical regulations for starting up and adjustment, as well as for exploitation of the equipment, to cut costs and time for training. Specialists working with new equipment and technologies should have at least some basic understanding about the principles of their operation, as it is impossible to teach them everything in detail on the job. For greater efficiency, a qualified specialist should supervise each process, but the customer often attempts to save funds and not to have a multiple-task specialists. Usually, within half a year to one year the enterprise is forced to repeatedly call on the contractor due to frequent equipment breakdown and manhandling.

As for R&D in the “Nearly ideal future” scenario, companies will require methodological support of standards and processes, as well as methodological recommendations, as they need updating. Under all scenarios, the demand for impact assessment of various anthropogenic processes on the environment (i.e. petrochemicals and other types of pollutants) will rise. However, under the scenario “Nearly perfect future”, these issues will receive less attention and under the scenarios, “Losses and accidents” and “Problem conservation”, companies will most likely not have sufficient resources to carry the impact assessment. Under the scenarios “Losses and accidents”, “Problem conservation” and “National priority” it will be necessary to undertake a risk assessment across the WSS sector, including accidents at hydraulic facilities, saturation, floods, and WSS system failures. Under all scenarios, development of reference books and application of the best available technologies will gain priority.

A transition to the best available technologies will encourage environment protection. After 2020, if enterprises adhere to the best available technologies (listed in special reference books), they will not be charged with environmental pollution penalties. After 2020 only the largest WSS companies will be obliged to apply the best available technologies (operating in cities with wastewater discharge of at least 20 000 m³ per day⁴). Another solution is that enterprises will continue to follow the existing regulations based on discharge standards for water bodies. Today it is obvious that in case the scenarios “Problem conservation”, “Losses and accidents” and “National Priority” play out, only big cities are likely to comply with the best available technologies, and many settlements where treatment facilities are old or are not in place will fall behind. The problem is that these WSS companies that work in relatively small settlements will be unable to start applying the best available technologies; instead, a coefficient (of the environment pollution payments) 100 will be applied to them. Consequently, this situation will result in widespread bankruptcy of WSS companies operating in relatively small settlements (implementation of the “Losses and accidents” scenario).

Membrane technologies suggested for use in several scenarios are rather expensive. However, with the current cheapening of the materials price, reasonable planning of the technology chain, and the right selection of equipment, these technologies will be in demand even during economic stagnation and downturn, since they contribute to cost reduction and enable a transformational transit to new technological processes.

As the above analysis shows, among the recommended corporate policy tools in all scenarios is the development and enforcement of tools to lobby for the WSS sectoral interests. Among such tools is the pooling of companies in sectoral associations and interaction with authorities at expert platforms.

Sectoral associations, expert and analytical organisations represent the joint position of the WSS sector in Russia. They facilitate the development and modernisation of the sector, increase in the quality and accessibility of water supply and sanitation services. They enable the

⁴Cities with population 100 000 persons and more.

growth of infrastructure, implementation of projects aimed at development of prospective technologies and manufacturing facilities, and represent the interests of WSS companies in government bodies, assuring interaction with the international water community (e.g. the World Water Council, Global Water Partnership, or International Water Association).

The joint provision of WSS companies in Russia is represented by sectoral associations, as well as expert and analytical centres: the Russian Association of Water Supply and Water Disposal (RAWW), a non-for-profit partnership, the “Russian Water Society” and a non-for-profit partnership “Utilities Development”. The RAWW, established in 1990, unites more than 80% of organisations working for centralised water supply and water disposal in Russia: 243 WSS companies, research and design centres; private operators; sectoral expert and analytical organisations; non-for-profit partnerships; environment protection foundations, international thematic unions and associations; providers of equipment, technologies and services for utilities. RAWW takes part in the activity of Russian public, policy and research organisations and is a member of the International Water Association (IWA) that unites 157 sectoral associations around the globe. It is the organiser of the annual all-Russia Congress of WSS companies, where participants discuss acute issues facing the sector’s development and their possible solution, including concepts and drafts of strategic, legal and regulatory documents.

The “Russian Water Society” was established in line with the decree №1881-p by Prime Minister Putin in 2009. The Russian Water Society facilitates government WSS policy implementation, development and implementation of investment and innovative water projects, and organises “Pure Water,” an annual international forum.

“Utilities Development” and the working group on utilities of the Expert Council by the Government of the Russian Federation are a joint platform for the development of efficient solutions in the housing and utilities sector. As part of the implementation of the Decree of the Government of the Russian Federation № 961 dated 20 September 2014 “On the organization of work for the establishment of the publicly accessible database on the most efficient technologies for the modernisation (construction, creation) of the utility facilities,” “Utilities Development” is developing a reference book on the most effective technologies in heating, gas supply, electricity supply, water supply and sanitation. In March 2015, it prepared a draft reference book on the best available technologies. A similar reference book on sanitation is in the pipeline.

Policy recommendations for the governance of water resources

The water supply and sanitation sector should be profitable for the private sector and simultaneously solve the tasks of social importance and security that are identified by the state. This goal may be achieved through the right tariff policy, a transition to rational management of natural resources, and a balanced and economically efficient development of WSS activity. Of importance are also stability, predictability, absence of double standards, and lack of corruption.

However, there are many unresolved issues in the Russian water sector. Here are a few examples. First, the laws and regulations regarding the water sector are often disconnected and lack coordination. Second, state authorities are distributed in such a way that surface waters are in the competence of one institution, while underground waters are under the jurisdiction of another. Third, there is a lack of regulatory documents with regard to operating and managing companies. Previously, research institutions under the supervision of the ministries provided regular review and update of all standards. However, as they are now independent of the government, they do not cover this area of work. The existing procurement system does not allow the customer to fully define and assess the qualification of a contractor, and often the WSS activities are performed by organisations that lack the necessary qualifications and experience.

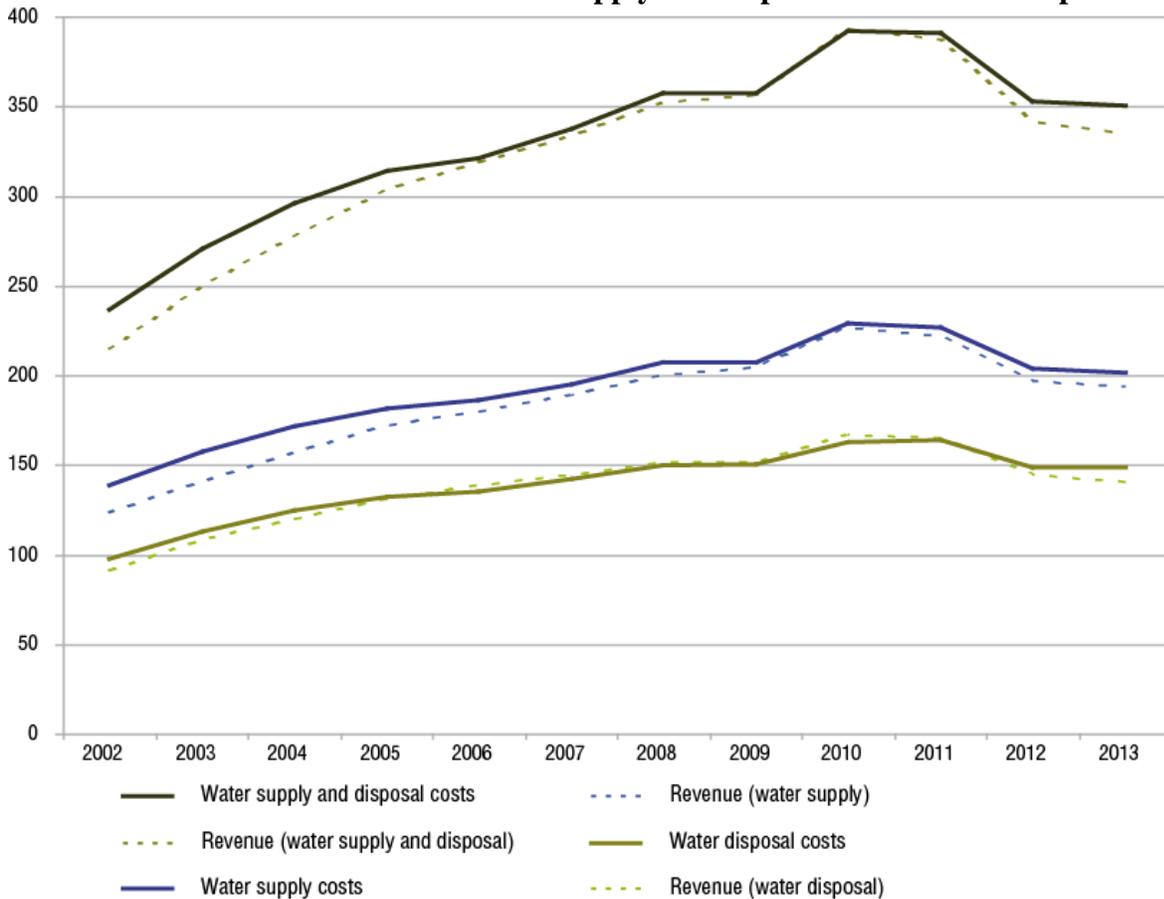
Investments in WSS infrastructure amount to RUB 67.5 bn per year on average (18% of revenues). At the same time, co-financing by the government amounts to RUB 15.8 bn per year on average (4% of revenues). Since 2012, this figure has decreased by more than 2.5 times.

Moreover, the WSS has very low return on assets – 0.44. In other words, one rouble invested in assets provides RUB 0.44 in revenues [RAWW, 2015]. The return period for large investments in WSS (i.e. replacement or modernisation of large volumes of equipment) is more than ten years. For comparison, a return period in heating is only three years. If the government adopts a water policy for ten years or longer, companies may calculate their costs payoff period for investment projects and other important financial parameters.

Companies' financial indicators point to the unprofitability of the WSS sector. Since 2012, the sector's financial situation has experienced a sharp deterioration: in 2012 and 2013, the total net loss amounted to RUB 9.6 and 15.4bn respectively. With the remaining constant costs, there is a sharp decrease of revenues - by 14% in 2011-2012 [RAWW, 2015].

The mentioned organizations may take forward the above recommendations on advancing the sector's interests, in particular those related to legal and regulatory changes. However, efforts of these organizations and their members, as well as other companies in the sector will not be sufficient. It is necessary that the changes agreed within the WSS sector and with consumer groups are understood and shared by the state and society at large.

Picture 1. Revenues and costs of water supply and disposal services in 2014 prices



Source: [RAWW, 2015].

An important problem of the WSS companies is the growing non-payments of customers, and growing amount of bills receivable. At the same time, there are many customers who cannot be disconnected from WSS services. Further, the ways to penalise debtors are limited. There is a need for advance payments to energy providers and a possible obligatory provision of bank guarantees in the conditions of non-payments. This situation forces WSS companies to take credits to cover running costs, thus adding to their overall costs. A possible solution here would be to cancel advance payments to electricity and gas providers. Alternatively, advance payments for WSS services may be introduced.

The lengthy procurement procedures observed by the WSS companies often do not allow them to make perform urgent procurements (for instance, in case of an accident) or to replenish the existing vehicle park of a certain brand. Further, any violation of the competition procedures as set by legislation implies a risk of prosecution or fine. A possible solution here could be the creation of a closed e-store of verified WSS suppliers by making the necessary legislative changes enabling buyers to directly purchase from these suppliers without going through the standard procurement procedure.

A positive solution for citizens and WSS companies could be the creation of a direct channel of communication and transaction, i.e. conclusion of a direct agreement between

a WSS company and a household without mediators (including those with bad credit). This option will resolve the problems of neglecting water losses in the networks, rainfall infiltration in utility sewage networks and incomplete measurement of water consumption and sewage of multi-apartment houses. Moreover, this will allow companies to directly address the issue of debts, settlement of payments, and public consumption of services.

Clearly state science and innovation policy in the WSS sector should have certain specific features. The experts interviewed are of the opinion that there are few technological uncertainties in the Russian water sector. The RAWW together with the Russian Ministry of Industry and Trade plan to develop an Action Plan for WSS Technological Development, which aims at import substitution, adoption and localization of technologies and high-tech products manufacturing; raising the quality of investment projects and justification of tariff decisions through technical standardization [RAWW, 2015].

It should be noted that the Russian water treatment school laid a solid scientific foundation, but often this solid scientific foundation is forgotten or lost. This is due to the retraction of the educational system and the shortage of specialists. Previously, there was a system of education for young specialists (universities) and the academic school (large research centres subordinate to the ministries, doctoral programmes, dissertation councils, and research and technology councils). Today, all these components have been shifted to universities. While the research centres are detached from the ministries and government funding, universities often face difficulties applying their research outcomes in the sector of manufacturing.

The Russian federal law “On education in the Russian Federation” (#273 dated 29.12.2012) and “On higher and post-graduate professional education” (# 125 dated 22.08.1996) set out the goals, principles and indicators for the water sector. It also set guidelines for professional, public accreditation of educational programmes to be implemented by organisations that educate specialists for the sector. Considering that the use of professional standards is obligatory for employers in the mid-term perspective, special attention should be paid to forming the necessary professional competencies [RAWW, 2015].

The water sector in the Russian Federation is regulated by a set of documents on strategy and planning. The Water Strategy of the Russian Federation until 2020 (approved by the decree of the Government of Russia #1235-p dated 27 August 2009) sets out the main development paths for the sector. According to the document, the water sector development should be aimed at “securing sustainable water use, water bodies protection from the negative impact of pollution, as well as building competitive advantages of Russian water resources.” Moreover, the strategy charts the basic principles of the government policy respecting water bodies, water ecosystems, and government support to efficient interaction of water stakeholders.

Government housing and utilities policy is directed towards overcoming the main problems in this area: inefficient water use; water deficits in certain Russian regions; sub-standard quality of drinking water consumed by a large share of population; as well as limited access of population to centralised water supply systems. Therefore, the government’s priority is to guarantee provision of water resources to the population and sectors of economy, protect and restore water aquifers, and assure protection from the negative water effects (i.e. floods).

An important tool for implementing the Russian Water Strategy is the action plan up to 2020 (approved by the Government of Russia Decree #1235-p dated 27 August 2009), which envisages close interdepartmental coordination of multiple federal executive authorities i.e. the implementing bodies of the action plan (e.g. Russia’s Ministries of Natural Resources, Energy, Construction and Utilities, Economic Development, Finance, Foreign Affairs, Agriculture, and Russia’s federal agencies for water resources, sub-surface resources management, fishery, and hydrometeorology and environment monitoring).

Among other tools for enacting the Water Strategy is the State Programme “Clean Water,” the implementation of which is planned primarily in the form of public-private partnership projects and regional programmes. The State Programme “Clean Water” is oriented towards reforms and modernisation of the water supply and sanitation sector, inter alia by amending and adding to the Russia’s legislation, and funding the Programme through special mechanisms. Among the Programme's key tasks are the development of an efficient business environment and conditions for attracting private investment in the water supply and sanitation sector, creation of a system of government liabilities, and assuring systematic control in the sector, provision of financial support to implement the sector’s investment programs, stimulation of Russia’s new equipment, technologies and materials manufacturing, guaranteed provision of drinking water to the social infrastructure facilities, increasing information transparency, creation of a joint information-analytical data base, development of a new model of citizen and other water consumer behaviour. The State Programme “Clean Water” will be implemented in the following sectors of the economy: housing and utilities; agriculture, hunting and forestry; chemical and petrochemical industry; forest, pulp and paper and woodworking industry; consumer goods; food industry; medical industry; fishery [State Program “Pure Water”, 2010]. Implementation of the State Programme has for a long time been postponed, but was restarted in 2015 and anticipates the allocation of RUB 2bn annually in 2015, 2016 and 2017 [Interfax, 2014].

The new version of the State Programme of the Russian Federation “Provision of Affordable Housing and Utility Services for the Citizens of the Russian Federation,” (approved by the Government of the Russian Federation Decree #323 dated 15.04.2014) contains changes that preview full reflection and unconditional implementation of assignments stated in the Presidential decrees dated 7th May 2012. One of the three sub-programmes entails the implementation of the Federal Programme “Pure Water” for the years 2011–2017, approved in December 2010 by the Russian Government (the responsible agency for which is the Ministry of Housing and Utilities). The main outcome of this sub-programme will be aimed to ensure access to safe drinking water in sufficient quantity (Table 5). Table 6 below gives an overview of the Federal Programme, “Development of the Russia’s Water Industry in 2012-2020,” (under the responsibility of Russia’s Ministry of Natural Resources). There is also a programme called “Protection of Lake Baikal” that aims to develop the Baikal natural area in the years 2012- 2020.

Table 5. Implementation of the federal programme “Pure water” in 2011- 2017

	2011	2012	2013	2014	2015
Budget appropriations per year, total (mln RUB)	3000,0000	3000,0000	3000,0000	-	2000,0000

Actual funding of the programme as per federal treasury, total (mln RUB)	3000,0000	2996,2755	2681,1676	-	- *
--	-----------	-----------	-----------	---	-----

* Data as of 01.04.2015

Source: Federal Programs of Russia, 2015a.

The data for calculation of performance indicators of the program the responsible ministry was able to obtain from the Federal State Statistics Service only in mid-2014. Therefore performance assessment by the responsible ministry was made only after 1 June 2014.

From 2013 to 2015 the majority of units were put into operation on time. Among the main reasons for delays at the remaining units are the change of the responsible ministry and the related transfer of functions from the Russian Ministry of Regional Development to the Federal Agency for Construction and Housing, non-provision or late provision of cost estimation verifications by Russian regions, unsatisfactory work by contracted organizations, lengthy procedures for contract termination and undertaking new public auctions.

Due to budgetary difficulties certain regions had to quit the program (for instance, Khakassia republic in 2013) or to curtail their obligations. The program attracted 80,6% of the total volume of planned co-financing from regional budgets. In 2013 from other (non-budgetary) sources the Program also attracted less than originally planned (41,5%).

Among the Program outcomes in 2015 are: an increase of the share of population living in water-stressed regions, water provision to which was secured, by 600 thousand persons. Additional water storage reservoirs were established, water works facilities at existing multi-purpose water storage reservoirs were upgraded (seven in total). The share of polluted waste waters that require purification in the total volume of water discharged in surface water units decreased by 8,5 %. 180 water development facilities were brought in line with technical safety requirements. 180 km of engineering and coast protection units were constructed and reconstructed. 577 units of level gauges and hydrologic laboratories as part of the state monitoring network were modernized or newly opened [Federal Programs of Russia, 2015a].

Table 6. Implementation of the federal programme “Development of the water sector in the Russian Federation in 2012-2020”

	2012	2013	2014	2015
Budget appropriations per year, total (mln RUB)	14809,6281	18161,1639	14942,2014	16608,3766
Actual funding of the programme as per federal treasury, total (mln RUB)	14311,2963	17786,3899	14921,1245	1727,4736*

* Data as of 01.04.2015.

Source: Federal Programs of Russia, 2015b.

It may be noted that activities in this Program, with a few exceptions, are implemented on time. The Program is co-funded by Russian regions and non-budgetary sources. In 2014 less than half of planned funds was attracted from the first source (3 255 RUB146,8 thousand against planned RUB 7 713 418,3 thousand), which may be due to

budget deficits of most Russian regions, as well as exceeding the targets in 2013 (145,1 % of the planned amount). At the same time the Program attracted 175% of the planned amount from the non-budgetary sources, mainly as capital investments (RUB 23 059 733,3thousand). In 2013 business also invested in Program activities more than planned (162,4%).

Among the Program outcomes in 2015 are the decreased share of sub-standard water samples in the water supply system by 1,26% for sanitary-chemical and by 0,45% for microbiological indicators as compared with 2010. The volume of treated waste waters in the total volume of waste waters increased to 98%. The share of street water supply system that requires replacement decreased to 36%, sewage network that requires replacement to 31%. The share of population using centralized water supply services will reach 81%, centralized wastewater disposal services - 78%. The share of capital investments in the total volume of revenue of water supply and sanitation organizations increased by 16%, while the share of loans in the total volume of capital investments increased by 15% as compared with 2010[Federal Programs of Russia, 2015b].

The approaches to water industry governance often differ substantially from governance over many other economic sectors. They require close interdepartmental interaction of multiple government bodies; and inter-sectoral interactions of state, business, and society. Water industry governance is not in line with classic economic laws. Moreover, water policies should be harmonised at micro-level with other policies, including budget and tax, social, financial, and international trade policies.

It is not always possible to provide for competition in the sector, as there are market segments that are natural monopolies. There is also a comprehensive multi-level management and regulatory system in the sector, which previews harmonisation of goals, tasks and action plans of regulatory and controlling agencies. For instance, municipal water supply and sanitation companies must comply with the requirements of up to 40 controlling and regulatory agencies (at federal, regional and local level), which are at times contradictory.

There is no single best management model that suits all countries continuously. Certain principles of good governance include governance of the entire water cycle, strategic planning and harmonization of policy tools (including goal-setting and performance functions), clear distribution of rights and obligations, and sufficient provision of resources.

Moreover, informed managerial decisions require reliable and verifiable data and information, which may be obtained through special studies or regular monitoring. Besides monitoring, it is important that organisations and authorities assess their implementation and correct the decisions if necessary. The activity of water companies should be transparent and involve all stakeholders (through the organisation of water basin councils, disclosure of key performance and environmental indicators, etc.). The development of the water industry should be based on dialogue and cooperation, including trans-boundary cooperation (water diplomacy).

The best international practice is the application of integrated water resources management, which previews:

- management of water resources at the level of water basins;
- supply optimisation and demand management;
- assurance of equal access to water resources;

- development of more effective and comprehensive legal acts and regulations, institutional frameworks;
- Inter-sectoral approaches to problem-solving.

When organising the water industry, government is faced with a fundamental choice between two models: a model based on privatisation of profits and socialisation of losses and major share of costs; or a model organised on the principles of “welfare state”.

Clearly, management of the water industry cannot be based exclusively on the principles of economic efficiency. Assuring water security, namely guaranteed water supply for all (affordable supply of safe water in sufficient quantity), also needs to be taken into consideration. The attainment of this goal – assuring water security for all – requires higher efficiency of water use and risk management (disruptions in water supply / infrastructure failures, negative water effects, such as floods). Key water policy measures are listed in Table 7.

Table 7. Examples of water policy instruments

Category of policy instruments	Examples of policy instruments
Administrative	Strategic planning (for different time horizons in line with the federal law # 172 “On strategic planning”). Strategic planning should be based on informed decision making about the future of the sector (based on research, data bases and monitoring). Databases are often absent or are semi complete / not updated (for instance, on underground waters - their existence, reserves, including proven reserves, their quality, etc.; lack of data on business models used in the water sector)
Regulatory	Technical – standards and norms, sanitary and epidemiological, environmental* and economic, including tariff issues (standards set at the designing stage) and regulatory asset base (RAB)
Economic	Tax, price/tariff and subsidies / government support. The basis for “tariff, taxes and transfers” policy is the balance of principles: <i>beneficiary pays, polluter pays, water security for all</i> . Moreover, the water supply and sanitation services should be affordable (instrument: targeted support to low-income households, small farmers)
Market instruments	Privatisation, trade of rights for withdrawal of certain amount of water, or for discharge of certain quantity of pollutants. These tools may be either useful or counterproductive, depending on their design and application
Government support	Including many costly and inefficient or even counterproductive forms of government support. Example: free of charge water for irrigation
Information	Obligatory information disclosure on the key performance indicators, including environmental, etc.
Partnership building, public participation	Public consultations, establishment and performance of consultative bodies, establishment and performance of non-commercial sectoral associations.

Source: Martoussevitch, 2015.

Attracting private investors in the water industry is a complex – and long overdue – task for the government. It is especially acute in Russia since the tariffs for water services do not produce necessary level of revenues. Moreover, in the course of the last 10 years maximum indices for tariff change have been in place, thus imposing double regulation.⁵ Previous years' gas, electricity and heating energy tariffs have been growing faster than inflation. It is necessary to level off the growth pace of the utility services tariffs with those for water services, which lag behind. Another option would be to plan for lowering electricity, gas and heating tariffs in regions, where the pipelines or equipment (for water supply and discharge) are worn out, or where major water treatment at the source is required.

One of the components for raising the efficiency of tariff policy could be the introduction of a double rate tariff for water supply and discharge. It is particularly acute where meters for commercial cost accounting have been widely installed. The double rate tariff means that each consumer should contribute to the compensation of relatively constant water supply costs through the access fee (capacity fee aimed at keeping the networks operational), even if she consumes no water (payment for water that should cover water companies' costs for electrical energy and chemicals). At present, if a consumer is connected to a network and does not use the service, the water company is not compensated for the cost of keeping the networks in good order and the availability of their service.

In planning the tariff policy for water supply and sanitation services at the level of Russian regions, one should keep in mind that the existing equipment and its condition in big cities and in small settlements may vary substantially. Small settlements often have older or worn out equipment, or do not have any equipment at all and thus require larger investments (for relatively small regions they may amount to RUB 400mln). At the same time, the population solvency in small settlements is usually lower than in cities. The tempting administrative solutions to integrate the unprofitable water companies working in small settlements with the larger, financially sustainable water companies working in cities may cause a crisis situation in the latter.

Regarding tax policy, we propose a review of the industry's taxation policy. This concerns the revision of corporate property and income tax and the creation of a mechanism for faster amortization to create a source of funding for investment programmes and repayment of existing loans.

The quality of WSS services remains unsatisfactory: only half of discharge water and sewage that goes through the treatment facilities meets the standards. This is attributable to the lower quality of water from the source, an absence of funds to upgrade equipment and other reasons listed above. If drinking water does not meet the legally defined standards it is considered industrial. Companies are prohibited to supply 'industrial' water through the centralised water supply systems (companies are obliged to pay substantial fines and/or may face a curtailment of their activities). Obviously, there is no other choice but to allow companies to supply industrial water to the population: "industrial water" in the water supply systems should be honestly acknowledged. The population should be able to receive such water under the condition of additional delivery of drinking water.

⁵ As of 2016 the maximum sectoral indexes for certain types of utility services will be abolished and replaced with maximum indexes for all utility services used by households.

Of particular importance is the problem of transit organisations. Growth in the number of such organisations leads to the decrease in revenues of the “guarantor organisation”. The funds which were previously directed towards network maintenance and repair are now spent on covering the costs of the organisations’ services, which are largely overhead costs. At the same time, it is the “guarantor organisation” that bears the full responsibility for the quality and uninterrupted supply of services. To resolve this problem, it is necessary to set the selection criteria for transit organisations (for instance, extent of networks or capacity) and mechanisms to force the owners to lease their assets to the “guarantor organisation” – service supplier (as is done with the criteria of the territorial network organizations in the electrical energy industry).

Under all scenarios, it is necessary to pay greater attention to environmental protection. The problem is that the treatment facilities of many WSS companies are capable only of residential waste water treatment (this was their main goal when they were constructed in the second half of the 20th century). The majority of WSS companies’ facilities are biological (e.g. live bacteria or active sludge). However, metals, petroleum and other industrial wastes cannot be treated biologically, and the WSS companies have no funds to upgrade their equipment due to lack of financing. Furthermore, the instalment of new equipment cannot usually be done on a phased basis; it is necessary to demolish everything that exists and build anew.

Today, government bodies often oppose the implementation of environmental protection suggestions by WSS companies instead of levying pollution charges. The companies have to assert their rights through court action. Here federal and regional authorities have to harmonise their efforts to change this practice.

A noteworthy green practice is own power and heating energy generation by WSS companies using sludge, sale of usable waste as fertilizers to agricultural producers or to manufacturers of construction materials. However, these options are not economically sound for many WSS companies. The government could stimulate innovation through creating favourable conditions, e.g. by:

- changing the terms for participation in wholesale electricity trading, allowing the WSS companies to directly purchase electrical energy at this market;
- localising equipment manufacturing for the mentioned sludge use options or establishing national manufacturing, as imported equipment is quite expensive;
- stimulating the replacement of existing electrical equipment with new equipment that is more advanced and efficient, i.e. has reduced-voltage start.

One of the factors impeding the use of renewable energy sources (for power supply and heating) in water supply and sanitation (besides absence of access to the unified grid and low tariff, which does not cover costs) is the lack of standby capacities equivalent to the amount of energy produced for internal use. That is, in case of an accident at the facility it will be necessary to complete the full grid-connection procedure with associated financial, technological and time expenses.

At the same time the standards for water discharge in water bodies are stringent (more stringent than drinking water quality and, therefore, nearly unfeasible) as most water bodies (including ponds) are formally designated for commercial fishery. Here, it is important to bear in mind that penalties imposed for the discharges into water bodies the companies put off on consumers (citizens and industry). Therefore, the following

suggestion should be considered: each manufacturing enterprise should install a water treatment facility on its territory that will purify the discharge water from several specific pollutants according to the type of business activity. This solution complies with the regulation that manufacturing enterprises should discharge wastewater that is close to residential water in sewage facilities. If the responsibility for observing this regulation by manufacturing enterprises – customers of WSS companies will rest with the latter, this will entail difficulties. For instance, the employees of WSS companies may be denied access to the territory of an enterprise to control the quality of wastewater. In case of untreated water, the manufacturing enterprises are subject to civil liability, and WSS companies may pursue litigation for years. If the situation is changed, manufacturing enterprises will be accountable to the state which can suspend their activity. It should be remembered that state environment protection agencies will have to control many organisations, and manufacturing enterprises will have to purchase the necessary equipment and closely follow the wastewater treatment standards.

Taking into consideration the spread territory of Russia and the particular features of borderline and transboundary water units attention should be given to transboundary water management issues, set in international agreements and other legally binding documents. The key multilateral documents are the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) of the UNECE, which came into force on 6 October 1996, and Convention on the Law of the Non-navigational Uses of International Watercourses of 1997 (UN Watercourses Convention or the New-York Convention). The obligations of signatory countries are to prevent, limit, and reduce the substantial transboundary impact; facilitate fair and rational use of water basins; and foster cooperation on these issues. The transboundary impact refers to the impacts on security and human health, flora, fauna, soil, air, climate, landscape and historical monuments and other tangible objects, as well as socio-economic conditions.

When implementing investment projects, positive and negative externalities should be taken into consideration. If a greater share of rent and benefits is not included in the balance sheet of project sponsors, the development stimuli are undermined. Therefore, the main project sponsor and owner of the fixed assets should be the organisation which will account for the biggest share of benefits and costs. At the same time, the company-operator may be sub-contracted. Moreover, compensation mechanisms, such as partial redistribution of rent in order to achieve a mutually beneficial balance of interests, should be allowed (as done, for example, in the water relations between Russia and Finland and in the Lake Baikal basin).

International relations on transboundary water resources are of importance to Russia. The previously unified water system of the USSR was divided into separate parts; today, we see new forms of interactions developing, such as those on the border of Russia-Kazakhstan and Kazakhstan-Kyrgyzstan (interacting in the frame of bilateral Chu-Talas Water Commission⁶). Such relations should be regulated by agreements. At the same

⁶ The project “Development of Cooperation on Chu and Talas rivers” (Chu Talas II) was implemented with the support of OSCE and UNECE in 2008-2011. It is a continuation of the project “Promoting the Creation of the Commission for the Chu and Talas between Kazakhstan and Kyrgyzstan” (Chu Talas I). Both projects were aimed at providing support to these countries in implementation of the Agreement on the Use of Water Facilities of Inter-Governmental Use on the Chu and Talas Rivers concluded between the Government of Kyrgyz Republic and the Government of the Republic of Kazakhstan on 21 January 2000.

time, the Russian water sector scenarios should imply different paths for international relations in transboundary water basin management. The best option for sustainable development of transboundary water resources for the common benefit of countries is the good neighbourhood policy that implies delimiting water resources and avoiding using them to the detriment of neighbours.

Conclusion

Water supply and sanitation is first, a commercial activity that has a guaranteed market even during crises. However, this business has to take into consideration the social implications of its key performance functions, as well as the need to assure security by providing reliable and uninterrupted services.

In most regions of Russia, the quality of WSS services has been improving slowly. Enterprises demonstrate higher quality control, client-orientation, and transparency.⁷ At the same time, the industry is unprofitable: since 2012, there has been a sharp decline in the financial standing of WSS companies. Tariffs set without duly considering economic feasibility will prevent modernisation and development. Further, the budgets of Russia's regions are insufficient to provide the required support. Given the considerable wear (and in many settlements absence) of fixed assets and infrastructure, the sector needs a change of tariff and tax policies, considerable governmental and private investment, a personnel training system, and it must resolve many other urgent issues.

Even with due consideration of the international best practice in water supply and sanitation it is impossible to offer a single universal management model, suitable for each Russia's regions under any conditions. Nevertheless it may be noted that the best approach here is the governance throughout the entire water cycle. This integrated water resources management at the national level requires undertaking several steps, including harmonising the water policy tools with those in related areas (e.g. energy, environment protection, and utilities and housing), long-term comprehensive legal, regulatory and institutional framework, and integrating efforts of interested government agencies for the resolution of existing problems.

The implementation of the policy tools proposed for each of the scenarios requires consolidated positions by companies in the WSS sector and more efficient advancing of companies' interests. Moreover, they require support from society to create a water-saving culture (such as avoiding introduction of additional capacities and, thus, lowering costs), and environmentally friendly attitudes to water bodies, that will allow companies and government to save resources for their treatment and rehabilitation. Equally important is a considerate attitude to water infrastructure. In future, manufacturing companies and citizens should show understanding to compelled and justified tariff increase that will allow WSS companies to minimise the number of accidents and raise the quality of services.

⁷Such as more stringent information disclosure standards – publication of information on revenues and expenditures online and in the media; and the opening of phone hotlines and reception desks for citizens.

References

Agana B.A, Reeve D, Orbell J.D. (2013) An approach to industrial water conservation - A case study involving two large manufacturing companies based in Australia. *Journal of Environmental Management* 114 (2013) 445-460.

Ameyaw E.E., Chan A.P.C. (2015) Evaluation and ranking of risk factors in public-private partnership water supply projects in developing countries using fuzzy synthetic evaluation approach. *Expert Systems with Applications* 42 (2015) 5102-5116.

CERES (2010) UBS, Bloomberg, MURKY WATERS? Corporate Reporting on Water Risk. A Benchmarking Study of 100 Companies, February 2010, authored by Brooke Barton (CERES), with scoring and analysis by Shirley Morgan-Knott (UBS Investment Research), pp. 4, 30-36, Available at: <http://www.ceres.org/Page.aspx?pidj1200> Accessed: 04.06.2015.

Daniell et al. (2014) Politics of innovation in multi-level water governance systems. *Journal of Hydrology* 519 (2014) 2415-2435.

Hegger et al. (2011). Consumer-inclusive innovation strategies for the Dutch water supply sector: Opportunities for more sustainable products and services. *NJAS - Wageningen Journal of Life Sciences* 58 (2011) 49-56.

Hoekstra A.Y. (2015) The water footprint of industry In: *Assessing and Measuring Environmental Impact and Sustainability*, Chapter 7, p. 221-254.

Lambooy T. (2011). Corporate social responsibility: sustainable water use. *Journal of Cleaner Production* 19 (2011) 852-866.

Saritas S., Proskuryakova L., Sivaev S. (2015). Russia's water resources 2030: the four plausible scenarios. HSE Basic Research Program Working Paper WP BRP 42/STI/2015.

Water Strategy of the Russian Federation until 2020 and the action plan on its implementation until 2020 (2009) Approved by the decree of the Russian Government #1235-p dated 27 August 2009.

Federal Program "Pure Water" (2010). Adopted by the decree of the Russian Government #1092. Available at: <http://gos-water.ru/> Accessed: 04.06.2015.

State Program of the Russian Federation "Provision of affordable and comfortable housing and utility services to citizens of the Russian Federation" (2014). Approved by the decree of the Russian Government #323 dated 15.04.2014. Available at: <http://government.ru/docs/11914/> Accessed: 04.06.2015

Interfax (2014) 3 June 2014 г. State Program “Pure Water” will renew in 2015. Available at: <http://www.interfax.ru/realty/realtyinf.asp?sec=1461&id=383993> Accessed: 04.06.2015.

Martoussevitch A. (2015) Presentation at the seminar “Water strategies”, 10 April 2015, Moscow.

RAWW (2015). Russian Association of Water Supply and Water Disposal. Concept of the Water Supply and Sanitation Strategy for the Russian Federation until the year 2030 (in Russian).

Federal Programs of Russia (2015a) Federal Program “Pure Water” (2010). Adopted by the decree of the Russian Government #1092. Available: <http://fcp.economy.gov.ru/cgi-bin/cis/fcp.cgi/Fcp/ViewFcp/View/2015/393/> Accessed: 07.07.2015.

Federal Programs of Russia (2015b) “Development of the Russian water sector in 2012-2020”, Available at: <http://fcp.economy.gov.ru/cgi-bin/cis/fcp.cgi/Fcp/ViewFcp/View/2015/403/> Accessed: 04.06.2015.

Federal Program of Russia “Protection of the lake Baikal and social-economic development of the Baikal natural area for the years 2012- 2020”. Adopted by the decree of the Russian Government #847 dated 21.08.2012.

L. Proskuryakova

Leading researcher, Research Laboratory for Science and Technology Studies, National Research University “Higher School of Economics. Email: lproskuryakova@hse.ru.

Any opinions or claims contained in this working paper do not necessarily reflect the views of HSE.

© Proskuryakova, 2015