

St. Petersburg University  
Graduate School of Management  
Master in Public Management Program

**ASSESSMENT OF THE EFFECTS OF PRIVATE COMPANIES' INVOLVEMENT  
INTO PROVISION OF PUBLIC UTILITY SERVICES  
(THE CASE OF WATER SUPPLY SERVICES IN RUSSIAN FEDERATION)**

Master's Thesis by the 2nd year student  
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## ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

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Описание цели, задач и основных результатов	Целью исследования является определение наличия взаимосвязи между типом собственности компании с конечными тарифами на водоснабжение для населения. Для достижения поставленной цели была проанализирована сфера водоснабжения в России, нормативно-правовая база в этой области, а также определены основные факторы, которые могут быть взаимосвязаны с изменением тарифов на водоснабжение. На основании полученных результатов анализа была построена регрессионная модель, исследование основано на панельных данных 2012-2016 года по 21 компании, предоставляющей услуги водоснабжения. В результате исследования было выявлено, что тарифы, установленные частными компаниями, выше, чем тарифы государственных компаний, однако при этом качество инфраструктуры и воды в частных компаниях выше. Также, изношенность инфраструктуры и потери воды отражаются в повышении цен на водоснабжение, в связи с необходимостью для компаний покрывать издержки. Кроме того, увеличение плотности сети в компании способствует экономии на масштабе и снижению тарифов. На основании полученных результатов были выдвинуты рекомендации для государственной политики.
Ключевые слова	Тариф, водоснабжение, жилищно-коммунальные услуги, муниципальное унитарное предприятие, участие частного сектора, государственно-частное партнерство, аренда, концессия

## ABSTRACT

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Faculty	Graduate School of Management
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Academic Advisor's Name	Evgenii V. Gilenko
Description of the goal, tasks and main results	<p>The purpose of the study is to determine, whether the ownership type of the water supply providers has relation to final water tariffs set for consumers. To achieve this goal, the water supply sphere in Russia was analyzed, the regulatory framework in this area was described and the main factors that could be associated with the change in tariffs for water supply were identified. Based on the analysis results, a regression model was estimated. The study is based on panel data for years 2012-2016 for 21 companies providing water supply services. The study revealed that tariffs set by private companies are higher than those of public companies, but the quality of infrastructure and water provision in private companies is higher. Also, the deterioration of infrastructure and water losses are reflected in the increase of prices for water supply, due to the need for companies to compensate costs. In addition, increasing network density in the company contributes to economies of scale and thus lowers tariffs. Based on the obtained results, policy implications were formulated.</p>
Keywords	Tariff, water supply, housing and communal services, municipal unitary enterprise, private sector participation, public-private partnership, lease, concession

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## Introduction

Water has been traditionally considered one of the most important natural resources that makes economic development possible. Likewise, water is a scarce resource that has given rise to numerous conflicts worldwide over its allocation to alternative uses.

The driving forces affecting water utilities have changed through time. In the past, these were the need to decrease costs and to use the utilities to generate funds for municipal services (primarily in big cities). More recently, public health concerns, infrastructure depreciation and maintenance, increases in capacity needs driven by population growth, and reallocation of supplies for environmental purposes have formed significant new costs for water utilities [Westerhoff et al., 1998].

Concerning the Russian Federation, the collapse of the Soviet Union led to many serious structural changes in the country. The tasks of ensuring socio-economic and political stability in the 1990s were the key problems of these countries. The water supply and sanitation sector played the role of the institution of social assistance to population from the state. The low tariffs for water did not cover the operating costs, the infrastructure became worn out and the quality of supplied water – low.

This situation led to the need for reforming the housing and communal services sector of the Russian Federation on the federal level. The goal of the reforming the housing and communal services industry at the moment is the creation of "market conditions" in this sphere and the development of competition.

Management in the water industry has thus become a highly relevant issue. In the last decades, institutional changes in the provision of communal services took place and private investments were attracted to the sector. Water supply service can be managed by different organizational regimes in terms of ownership (different types of companies i.e. public company, private company, mixed ownership). In this respect, differences in terms of organizational objectives lead to diverse price levels and structures.

At the moment, private party participation in the water supply and sanitation sector is mostly developed in these countries: Australia, France, Ireland, UK, US, Canada. First projects in this sphere were initiated in 1980s [Deloitte, 2014].

Though, the water industry allows companies to receive relatively stable profits and have reliable position on the market, it provides them with several challenges:

1. Underpricing of water undermining economic efficiency and leading to higher long-term costs.
2. Upgrading costs and flexibility.

3. Uncertainty about technology and need for innovation.
4. High procurement costs for small-scale projects.
5. Political sensitivity around privatization concerns.

Moreover, customer expectations of high-quality water, along with minimal risks to public health and high levels of environmental protection, provide a water delivery challenge to both the public and private sectors.

Therefore, the motives for changing the ownership structure of water supply companies can be revealed. They include:

- Increasing efficiency and improving service quality.
- External influences (i.e. structural adjustment programs from the World Bank and the International Monetary Fund, support from the banks).
- Fiscal motives (i.e. government decision).

Worldwide, the search for institutional alternatives to the organization of the communal economy, allowing to provide physical and price accessibility of public services for the majority of the population and economic efficiency for communal enterprises, continues.

There is a quite limited amount of studies, which have investigated the relationship that exists between management and/or ownership and residential water tariffs. Moreover, only a few studies have done it for Russian market. Summing up, the research gap tends to be obvious and the relevance of the study is confirmed.

The research question of the work is to identify: How the ownership structure (public or private) of the water supply services providers affects final water tariffs for consumers? The paper is devoted to the examination of the relationship between different ownership regimes and other external factors, which are determinant for changes in the price that consumers should pay for water delivery.

The purpose of this study is to determine, whether the ownership structure of the water supply providers has relation to final water tariffs set for consumers in Russia.

For achieving this goal several tasks are set:

- Describe the regulatory framework affecting the provision of water services and tariffs for them.
- Determine the types of ownership structures in the water supply sector in Russia.
- Conduct a review of the literature on the subject of private companies' involvement into provision of water supply services in international practice.
- Identify the factors associated with the changes of water tariffs and formulate research hypotheses.

- Carry out an empirical study aimed at identifying the impact of private companies' presence on the prices for water supply services.
- Draw conclusions on the work.
- Formulate a list of policy implications according to the results of the study.

The object of the research are the providers of water supply services in Russia. The subject of the study are the effects of the private companies' involvement into provision of water supply services, which are revealed in the changes of the tariffs set on water.

The work is divided into two parts - theoretical and practical. In the Chapter 1 the development of water industry in the world and the overview of water supply sector in Russia is provided along with statistics. After that the regulatory framework in the sphere of water supply is described and the private sector participation in water supply is analyzed. The last part of the first chapter is devoted to the literature overview on the topic of water supply services provision and research hypotheses formulation based on the review.

The second part of the work is reflected as Chapter 2, which consists of research methodology, empirical study, results, policy implications and research limitations. In this part the purpose of the research, research steps and research approach and method are discussed. Also, the description of the sample, variables and their sources is provided. Further, the regression analysis results are discussed and policy implications are formulated.



## CHAPTER 1. ASPECTS OF WATER SERVICES PROVISION

The branches of the communal economy include a wide range of activities. These are: water, gas, heating, electricity, sewerage, collection, removal and utilization of garbage, cleaning of the territory and gardening, and other services of the municipal economy.

In the 1990s, serious institutional changes in the provision of housing and communal services started to take place in many countries around the world. Private capital came in the industry. However, responsibility for public services has always rested with the authorities regardless of who actually provides these services directly.

Worldwide, the search for institutional alternatives to the organization of the communal economy, allowing to provide physical and price accessibility of public services for the majority of the population and economic efficiency for communal enterprises, continues.

A major sector of the Russian communal economy is the water supply and sanitation system (WSS) – this sector will be observed in this study. The policy of reforming Russian water supply in the late XX - early XXI centuries was influenced by models of global practice in the sphere of production, financing and provision of water supply services in the developed countries of Europe. The greatest popularity among Russian scientists and industry experts have got three models called "English", "German" and "French" in accordance with the names of the countries, in which these models were widely used.

The "English model" of the water supply organization prevailing in the UK suggests the complete privatization of the public infrastructure with the state regulation of tariffs for water supply and sanitation services.

The "German model" of water management, developed in Germany, is characterized by a high degree of participation of local authorities not only in the prices control for water services, but also in the production and provision of these services. Municipalities create joint ventures with operators in the form of open joint-stock companies. At the same time, the water supply infrastructure is included in the authorized capital of the OJSC as the contribution of the municipality, allowing to control the majority of shares.

The "French model", which has become widespread in France, involves the transfer of communal property, belonging to the municipality, by local authorities to the management of a private company, on the basis of a long-term (up to 30-35 years) concession agreement. The investor's ownership of the property and newly created facilities is terminated upon expiration of the concession term [Varnavsky et al, 2010].

The ideologists of reforming Russian water supply came to the conclusion that the "French model" of water supply organization would be the most effective in Russia, allowing to attract private business and private investment in the communal sector of economy and at the

same time to control the production of socially important water supply services through the ownership of infrastructure that remains in municipal ownership [Ermishina, 2010].

As it is stated in the “Strategy for the Development of Housing and Communal Services in the Russian Federation for the period until 2020”, approved by the Government of the Russian Federation on January 26, 2016, according to expert estimates, the annual investment needs of the water supply and sanitation sector are at least 200 billion rubles.<sup>1</sup> The government has determined the direction for solving this problem - attraction of private investments in communal infrastructure and transfer of water supply and sewerage facilities, operated by state or municipal unitary enterprises, to private business management on the basis of concession or lease agreements.

The question of the effectiveness of various options for the organization of communal economy is quite natural. Each of the institutional alternatives has its advantages and disadvantages. An indirect criterion of economic and social efficiency of the institutional alternatives of the municipal economy organization is the cost of utility resources and its dynamics.

Many services in the municipal economy (including water and wastewater services) are produced in conditions of natural monopoly. A natural monopoly is the type of monopoly that exists as a result of the high fixed costs or startup costs of operating a business in a specific industry. Additionally, natural monopolies can arise in industries that require unique raw materials, technology or other similar factors to operate. Since it is economically sensible to have some monopolies like these, governments allow them to exist but provide regulation, ensuring consumers get a fair deal.<sup>2</sup>

The unregulated natural monopoly is considered a situation of market inefficiency, which results in overestimation of the socially optimal price and the reduction of socially efficient output. The regulation of natural monopolies in housing and communal sector is aimed at limitation of the desire of monopolies to increase prices, which should in general increase the economic efficiency of the communal economy. In addition, regulated tariffs for utilities are the most important indicators of the availability of services of life support for the most of the population, ensuring social efficiency of the industry.

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<sup>1</sup> Decree of January 26, 2016 №80-p. Strategy for the development of housing and communal services in the Russian Federation for the period until 2020. *Government of the Russian Federation*. Accessed April 15, 2017. Retrieved from <http://government.ru/media/files/odOGmhKTIRIRwsALMIXUYmU6gIjeg2pS.pdf>. (In Russian).

<sup>2</sup> Natural Monopoly. *Investopedia*. Accessed March 1, 2017. Retrieved from [http://www.investopedia.com/terms/n/natural\\_monopoly.asp#ixzz4fBrzn1vY](http://www.investopedia.com/terms/n/natural_monopoly.asp#ixzz4fBrzn1vY).

## **1.1. Water market development in international practice**

In the past, the primary driving forces affecting water utilities were the need to keep costs low, to use the utilities to generate funds for municipal services (primarily in big cities), to relegate utilities to last priority in budgeting, and to delegate utility operations under the “out of sight, out of mind” principle. More recently, public health threats, long-deferred infrastructure maintenance, increases in capacity needs driven by population growth, and reallocation of supplies for environmental purposes have created significant new costs to drinking water utilities [Westerhoff et al., 1998].

At the moment, private party participation in the water supply and sanitation sector is mostly developed in these countries: Australia, France, Ireland, UK, US, Canada. First projects in this sphere were initiated in 1980s.

The most prominent privatization efforts have been in France, where water services privatization started in the mid-nineteenth century, and the United Kingdom, where national water utilities were privatized during the 1980s. The end of the Cold War led to the extension of private contract services in central and eastern European countries. Some European cities, including Berlin, Barcelona, and Budapest, have recently contracted for water and wastewater service.

Concerning the US experience in privatizing water utilities, local officials have been significant forces for change in the industry. Authors in the United States investigated the peculiarities of the water supply system functioning in terms of its relationship with the municipal government. Authors found out the problem of cross-subsidizing of municipal expenditures from municipal water utilities revenues and decided to search for factors influencing this behavior [Deno & Mehay, 1988]. They found out that internal subsidization creates a fiscal illusion for the government, and, what is more, is consistent with vote-maximizing behavior of the officials.

Officials exacted annual contributions from municipal utilities, allowing them not to increase taxes. The higher price of water became an alternative to other local taxes, which was beneficial for officials, as the residents didn't identify higher prices with taxes [DiLorenzo, 1982]. All in all, this led to a positive relation towards the elected officials from the point of view of the population. The involvement of private water provision could change the situation as they could not be obliged to such contributions, thus, in the 1990s their involvement increased.

In the late 1990s, in the US mayors and executives from several states contracted for water service operations to save money and improve performance. Largely because of the need to repay grants when assets are privatized and the lower cost of borrowing available to

municipalities, none of these efforts involved asset transfer or buyout similar to the water privatization effort in the United Kingdom during the 1980s.

Private companies in the world mostly participate in the sector mostly under such forms of public-private partnerships: DB (Design-Build), DBO (Design-Build-Operate), BOOT (Build-Own-Operate-Transfer), Divestiture.<sup>3</sup> So, water and wastewater management, traditionally the province of state and local government, represents a fast-growing area for private sector participation. Many countries have started to use PPP structures to privately finance needed investment in these sectors.

However, the water industry provides the companies along with the stable income and strong position in the market, with several challenges. The cost of water has been low in comparison to charges for energy, telephone, television, and waste recycling costs. Investment deferrals and historic underpricing by many countries sharpened this situation. Underpricing of water services may satisfy political goals, but it also undermines economic efficiency and results in higher long-term costs to users being one of the most important challenges for companies operating in water industry in the world.<sup>4</sup> Other challenges with private sector participation in water supply in international practice include:

1. Upgrading costs and flexibility.
2. Uncertainty about technology and need for innovation.
3. High procurement costs for small-scale projects.
4. Political sensitivity around privatization concerns.

Moreover, customer expectations of high-quality water, along with minimal risks to public health and high levels of environmental protection, provide a water delivery challenge to both the public and private sectors.

## **1.2. Overview of water industry in Russia**

### *1.2.1. Development of the water industry in Russia in 1990s*

The post-Soviet countries of Eastern Europe, the Caucasus and Central Asia (EECCA) inherited from the Soviet Union sufficiently developed water supply and sanitation systems. The Soviet Planning system ensured the development and maintenance of settlements' life support systems at a sufficiently high level, corresponding to the level of developed countries, for instance, in such key indicator as the level of population coverage by water supply and sanitation

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<sup>3</sup> Deloitte (2014). Closing the infrastructure gap: the role of public-private partnerships. Accessed March 5, 2017. Retrieved from [https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/Finance/Corporate%20Finance/2006\\_closing\\_infrastructure\\_gap\\_deloitte\\_ireland.pdf](https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/Finance/Corporate%20Finance/2006_closing_infrastructure_gap_deloitte_ireland.pdf).

<sup>4</sup> Forces of change in the water service industry. *The National Academies Press*. Accessed March 10, 2017. Retrieved from <https://www.nap.edu/read/10135/chapter/5>.

services. The infrastructural facilities built in Soviet times were characterized by high capital intensity, rather high reliability, but at the same time excessively high water consumption norms (economical water consumption was not stimulated) and capacity reserve for the future consumption growth were incorporated during the designing process. This led to excessive capital costs, and the built systems were excessively energy-intensive.

But this situation did not affect the population's payments, since all investments were made from budget funds, and current costs were covered by higher tariffs for industrial consumers (cross-subsidization existed).

The collapse of the Soviet Union led to many serious structural changes in the EECCA countries. The tasks of ensuring socio-economic and political stability in the 1990s were the key problems of these countries. The water supply and sanitation sector played the role of the institution of social assistance to population from the state.

This was reflected in the fact that payments from the population in most countries, including Russia, did not cover even the operating costs for water supply and sanitation systems functioning. However, due to the difficult economic situation almost no budget funds were allocated to maintain the water supply and sewage systems. This situation led to a sharp drop in the quality of water supply and sanitation services. Infrastructure was almost not renovated, the accidents rate increased, the quality of the supplied water dropped significantly. In many territories, water was delivered intermittently, sewage treatment facilities stopped functioning.

These were the reasons for the reformation of the housing and communal services sector of the Russian Federation on the federal level, and in 1997 the concept of the reform was approved.<sup>5</sup>

The legislation requires a gradual replacement of grants provided to housing and communal services organizations for provision of public services, by targeted subsidies to citizens for payment of housing and utilities.

The goal of the reforming the housing and communal services industry at the moment is the creation of "market conditions" in this sphere and the development of competition, instead of sending huge funds from the budget to monopoly enterprises. Therefore, the gradual attraction of private companies in the industry takes place since 2000s, which under competitive bidding receive municipal water systems in temporary possession for a determined period of time.

By 2004, a large number of companies that positioned themselves as national operators in the utilities market appeared. Within the active expansion to the regions, companies concluded many short-term lease contracts for utility systems (without initial investments).

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<sup>5</sup> Reform of housing and communal services in Russia. Accessed March 17, 2017. Retrieved from [http://newsruss.ru/doc/index.php/Реформа\\_ЖКХ\\_России](http://newsruss.ru/doc/index.php/Реформа_ЖКХ_России). (In Russian).

Companies used short-term lease agreements due to the fact that at that time such a path was the only legal possibility of forming contractual relations in the format of public-private partnerships. Long-term lease agreements under Russian law are subject to mandatory registration. In addition, infrastructure that is going to be leased, must be registered and assessed. However, municipal authorities almost did not have documents confirming ownership of communal infrastructure facilities that were managed by municipal unitary enterprises. And the process of registration of these rights required serious time and financial costs. Thus, the short-term lease agreement served as a mechanism for a rapid transition to private management of public utility facilities.

In the subsequent years significant changes in the interaction between government and business in the municipal sector occurred. There was a gradual transformation from short-term leases to long-term contracts with investment obligations for a period of 5 to 49 years. In the water supply and sanitation sector more than twenty such contracts have been signed, covering about 15% of the country's population, or about 20% of the total urban population. The first competitions were held for the management of municipal communal infrastructure systems (on a lease basis) – in Omsk, Berezniki and Volgograd.

Also, in the latest years foreign companies have reduced their activity in the communal sector of Russia. Thus, the French company Veolia Water has made several attempts to rent water supply systems in a number of cities in the central part of Russia, but after the unsuccessful completion of these projects it almost finished its activities in Russia.

### *1.2.2. Current situation in the water industry in Russia*

Currently, in the sphere of water supply and sanitation in Russia there are unitary enterprises in state or municipal ownership and private operators (OJSC/LLC with a share of ownership of private companies) operating in the mode of public-private partnerships.

There are more than 4000 organizations operating in Russia providing water supply and sanitation services. The main volume of production and provision of water supply and sanitation services in Russia is provided by municipal enterprises in the form of municipal unitary enterprises - 86%. Other forms of management account for 14% of the total volume of water supply to the population (see Figure 1), more than 2/3 of them are provided by private companies, 1/5 of the objects and networks of water supply and sanitation are under rent or concession (19,4% - in lease, 0,6% - in concession). The top three private companies account for

11% of the market, according to the Public-Private Partnership Development Center.<sup>6</sup> The activities of foreign operators in the market in Russia are limited, but tend to grow.

The majority of the population still uses municipal providers' services. However, this experience is related to the implementation of concessions on small water channels with a population of about 1 million people in such cities as Volgograd, Rostov, Perm, Krasnodar, Nizhny Novgorod, Dzerzhinsk, Voronezh. In three other cities - Chelyabinsk, Khabarovsk and Orenburg - concession agreements have been concluded with local players.

In Russia, there are already several large players with more than 10 years of experience: 35% of the market for private operators of water utilities are owned by "Rosvodokanal", owned by "Alfa Group", and 35% - by "Russian Communal Systems" ("RKS") associated with the "Renova Group"; JSC "Eurasian" has 20% of the market. The remaining 10% are divided among other small players and newcomers (see Figure 2). A little over a year ago, the close to "Gazprom" structure, "Leader", and the construction company "Morton" came to this market, but the latter is still engaged in water purification systems. The basis for the business projects being implemented by federal private operators is the principle of public-private partnership.

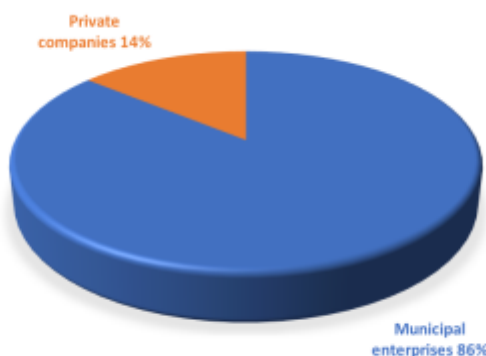


Figure 1. Structure of water supply market management.  
Source: created by the author on the basis of <http://ko.ru/arhive/item/132196>.

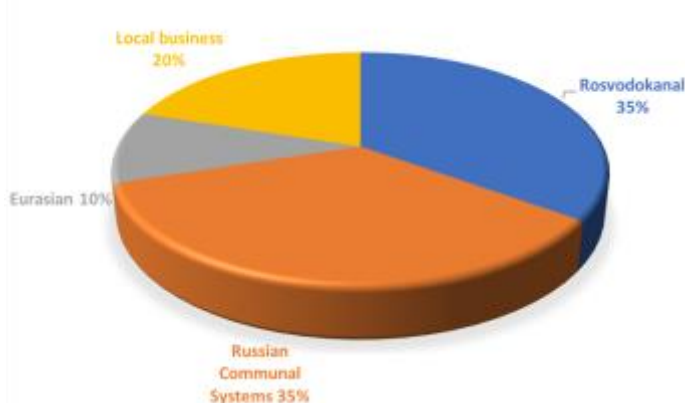


Figure 2. Private sector in water supply market.  
Source: created by the author on the basis of <http://ko.ru/arhive/item/132196>.

<sup>6</sup> Is the business ready to be a partner of the state? *Ko.ru*. Accessed March 15, 2017. Retrieved from <http://ko.ru/arhive/item/132196>. (In Russian).

Despite the legislation requirement (starting from 2009) for the public utilities on the compliance with disclosure standards and provision of free access to the information about main financial indicators, investment and production programs, most utilities' market operators do not have their own sites and do not publish reports.

As of the beginning of 2016, 79% and 73% of the Russian population were provided with water supply and water sanitation services, respectively. Centralized water supply is provided in 100% of cities, 97% of urban settlements and 33% of rural settlements. Centralized water disposal services are provided in 98% of cities, 84% of urban settlements and 5% of rural settlements.<sup>7</sup>

Russia's main sources of water supply are the rivers and water reservoirs. According to the results of 2015, the average volume of water consumption per capita was 196 liters / day. Also about 70% of the population of Russian Federation obtains drinking water from surface water sources. In rural areas, more than one-third of the population uses drinking water from non-centralized sources [Dudarev et al, 2013].

Russian water and sewage system is characterized by a deterioration in the state of infrastructure: in 2015 44% of the 372 thousand km of water supply networks and 35% of 81 thousand km of sewerage networks needed to be replaced. The number of accidents on the water networks is maintained at 35-38 accidents per 100 km of networks per year, the same figure for sewerage networks over the past 5 years has increased to the level of 37 accidents / 100 km of networks. The share of leaks and unaccounted consumption of water in the last years was 18-20% without any tendency for reduction.<sup>8</sup>

The quality of services of water supply and sanitation remains low: the treatment is only provided for 55-60% of water, for cleaning 85%-90% of waste water is served, with less than half of the drains being purified to a standard condition.

Water industry has the smallest annual revenue: water supply and water disposal brings 348 billion rubles, when heat supply - 900 billion and electricity – 1,2 trillion. It turns out that the water industry is underestimated. Moreover, the industry operates below the cost price: over the past 10 years, the average financial loss was 7,3 billion rubles. With the rise in electricity prices and the crisis in the economy, the financial situation of the WSS has dramatically worsened: in 2012 there were 10,8 billion rubles of net losses, in 2015 - 20.4 billion rubles. In

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<sup>7</sup> Living conditions. *Federal State Statistics Service*. Accessed May 1, 2017. Retrieved from [http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru/statistics/population/housing/#](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/population/housing/#). (In Russian).

<sup>8</sup> The same link.



the water supply and sanitation, negative return on capital is fixed: for 1 ruble invested, 0,44 rubles are received.<sup>9</sup>

Out if this, it can be concluded that the tariff water supply and sanitation is economically unreasonable. For example, St. Petersburg gets profit from the tariff for operating activities 30% less than it is needed. Moreover, the tariff is main source of revenue for companies to cover maintenance costs, but the problem of non-payments in housing and communal services at the moment is crucial and has a systemic nature.

### **1.3. Regulatory framework**

Reforming the housing and communal sector is one of the strategic tasks for the development of the Russian economy. State policy in the industry provides, along with the preservation of tariff regulation for utilities, the gradual elimination of the monopoly position of the state in this market and the development of competition.

The state policy in Russia's public sector in recent years has been, on the one hand, the formation of a business environment in the sector through the development of privatization processes and the use of public-private partnerships and, on the other hand, addressing the issues of tariff regulation at the federal level, which is one of the main risk factors for attracting investment resources to the communal sector.

To improve the quality of the service and attract investments there is a policy of attracting private operators to the industry being implemented in Russia since the beginning of the 2000s. More efficient activities in the context of public-private partnerships should contribute to higher labor productivity in the industry, lower costs and, as a result, lower tariffs for water supply and sanitation services.

#### *1.3.1. Policies and legislation*

In 2011, the Federal Law №416-FZ “On water supply and sewerage” was entered into force. Mainly, this law regulates only economic and financial issues. The law regulates the following sections: the powers of the authorities in the sphere of water supply and sewerage, the procedure for the implementation of water supply and sewerage, the quality of drinking water, the protection of the environment in this area, the regulation of tariffs, the planning and development of centralized water supply and sanitation systems.<sup>10</sup>

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<sup>9</sup> Water utilities suffer losses. *Russian newspaper*. Accessed March 1, 2017. Retrieved from <https://rg.ru/2015/09/11/vkh.html>. (In Russian).

<sup>10</sup> Federal Law "On Water Supply and Sanitation" of 07.12.2011 №416-FZ. *Consultant Plus*. Accessed April 15, 2017. Retrieved from [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_122867/](http://www.consultant.ru/document/cons_doc_LAW_122867/). (In Russian).

Other main legislative acts governing water management are the following regulatory instruments:

- Water Code of the Russian Federation № 74-FZ of 3 June 2006.
- Inland Water Transport Code of the Russian Federation № 24-FZ of 7 March 2001.
- Federal Law on Hydrotechnical Structures Safety № 117-FZ of 21 July 1997.
- Federal Law on Water Supply and Sanitation № 416-FZ of 7 December 2011.
- Federal Law on Melioration № 4-FZ of 10 January 1996.

In 2010, the Government approved the Clean Water Federal Target Program till 2017, the main result of which shall be the access to the required amount of clean potable water for the entire community of the country. According to experts, this may improve the life expectancy in the country by 5-7 years. Its main objectives are the replacement of obsolete equipment, improvement of water quality and, generally, building a new efficient water industry.<sup>11</sup>

The program concerns everyone, including the government, the business, and the community. Regions play the main role in implementation of the program and almost all regions have submitted their water projects. A number of regions, such as the Republic of Bashkortostan, Volgograd, Novgorod, Orenburg, Penza, and Yaroslavl regions have already started the implementation of the water projects on their own through attracting private investors and using the public-private partnership approach [Dudarev et al, 2013; Likhacheva, 2011; RWA, 2016].

The Russian Water Association has initiated the Water 2050 Foresight Project to conduct special studies to review the status of water resources in the Russian Federation and all over the world and to develop possible water challenge scenarios.

Moreover, in 2014 the “Guidelines for establishing the recommended performance management of state and municipal enterprises engaged in housing and communal services, and recommended criteria for assessing the efficiency of management of state and municipal enterprises, operating in the field of housing and communal services” were established by the Ministry of Construction and the Ministry of Economic Development of Russia. In the sphere of water supply the assessment criteria among others include:

1. Percentage of water samples that do not comply with sanitary rules and regulations and the availability of a plan of measures for bringing water quality in line with standards.

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<sup>11</sup> Decree of December 22, 2010 №1092. On the Federal Target Program "Pure Water" for 2011-2017. *Government of the Russian Federation*. Accessed April 15, 2017. Retrieved from <http://docs.cntd.ru/document/902256587>. (In Russian).

## 2. Percentage of disruptions in the water supply from the total number of deliveries.

According to this assessment, 30% of all municipal unitary enterprises were officially admitted to be inefficient. If these companies do not provide a plan for liquidating infringements, they should be transferred into concession in a certain time period, according to this decree.<sup>12</sup>

### 1.3.2. Institutions

The main institutions related to water resources management are:

- The Ministry of Natural Resources and Environment (MNRE), which is responsible for public policy making and regulation in the field of the study, use and conservation of natural resources, including the subsoil, water bodies, forests, fauna, hydrometeorology, wastewater, environmental monitoring and pollution control.
- The Russian Water Association (RWA), which was established by the Prime Minister in 2009. Its primary goal is to support the water industry players' joint efforts aimed at reforming and modernization of industry to improve the performance of the Russian water enterprises, to liaise with the international water community and to represent the country's water-related interests abroad.

### 1.3.3. Ownership right to water infrastructure

According to the Federal Law "On Melioration" № 4-FZ of 10 January 1996, ownership of constituent entities of the Russian Federation includes state-owned melioration systems and stand-alone hydrotechnical structures that are not owned by the Russian Federation, municipalities, individuals or legal entities. This includes, among others, WSS systems servicing several municipalities.<sup>13</sup>

Finally, municipalities own centralized municipal WSS systems and district heating systems, though they could also be in rent or for a limited period of time in private property, if operated under various PPP arrangements (foremost, leases and concessions).<sup>14</sup>

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<sup>12</sup> Decree of July 7, 2014 №373/428. On the Approval of the guidelines for establishing recommended performance management of state and municipal enterprises engaged in housing and communal services, and recommended criteria for assessing the efficiency of management of state and municipal enterprises, operating in the field of housing and communal services. *Ministry of Construction and the Ministry of Economic Development of Russia*. Accessed April 15, 2017. Retrieved from [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_169013/](http://www.consultant.ru/document/cons_doc_LAW_169013/). (In Russian).

<sup>13</sup> Chapter III. Ownership of land reclamation systems and separately located hydraulic structures. Federal Law of 10 January 1996 №4-FZ "On Land Melioration". *Information-legal portal Garant.ru*. Retrieved from [http://base.garant.ru/10108787/3/#block\\_300](http://base.garant.ru/10108787/3/#block_300). (In Russian).

<sup>14</sup> OECD (2013). Economic instruments for water resources management in the Russian Federation. *Organization for Economic Co-operation and Development*. Accessed April 14, 2017. Retrieved from [https://www.oecd.org/env/outreach/EIs%20for%20WRM%20in%20Russia\\_English\\_Final%20web.pdf](https://www.oecd.org/env/outreach/EIs%20for%20WRM%20in%20Russia_English_Final%20web.pdf).

According to the Federal Law №416-FZ, “transfer of ownership and (or) use of centralized systems of hot water supply, cold water supply and (or) water disposal, separate objects of such systems, which are in state or municipal property, is carried out under leases of such systems and (or) objects that are in accordance with requirements of civil law, antimonopoly legislation of the Russian Federation and adopted in accordance with other normative legal acts of the Russian Federation, or the concession agreements entered into in accordance with the requirements of the Russian legislation on concession agreement”.<sup>15</sup>

According to the lease contract, the landlord is obliged to provide the tenant such systems, or individual objects of such systems for payment for temporary possession and use or for temporary use. According to the concession contract for a certain period of time a private investor must build (reconstruct) the transferred public property and has the right to receive income from its use.

#### *1.3.4. Tariff policy*

In the last decade regulated tariffs for housing and communal services in Russia are growing at a rapid pace, several times ahead of inflation. At the same time, network wear remains high, increasing the risks of accidents and reducing the quality of service delivery. In the last eight years the tariff for cold and hot water supply was growing. The major growth was in years 2009, 2010 and 2012 – more than 13% a year. It is significant, that only in years 2014 and 2015 water price growth rate was lower than inflation rate, in all other years – it was higher, in some years even twice (see Figure 3).

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<sup>15</sup> Article 41.1. The peculiarities of the transfer of ownership and (or) use of centralized systems of hot water supply, cold water supply and (or) water disposal, or separate objects of such systems, located in state or municipal ownership. Federal Law "On Water Supply and Sanitation" of 07.12.2011 №416-FZ. *Consultant Plus*. Accessed April 15, 2017. Retrieved from [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_122867/df62c48b076dfc9331533e7d37d135f8b97c98ad/](http://www.consultant.ru/document/cons_doc_LAW_122867/df62c48b076dfc9331533e7d37d135f8b97c98ad/). (In Russian).

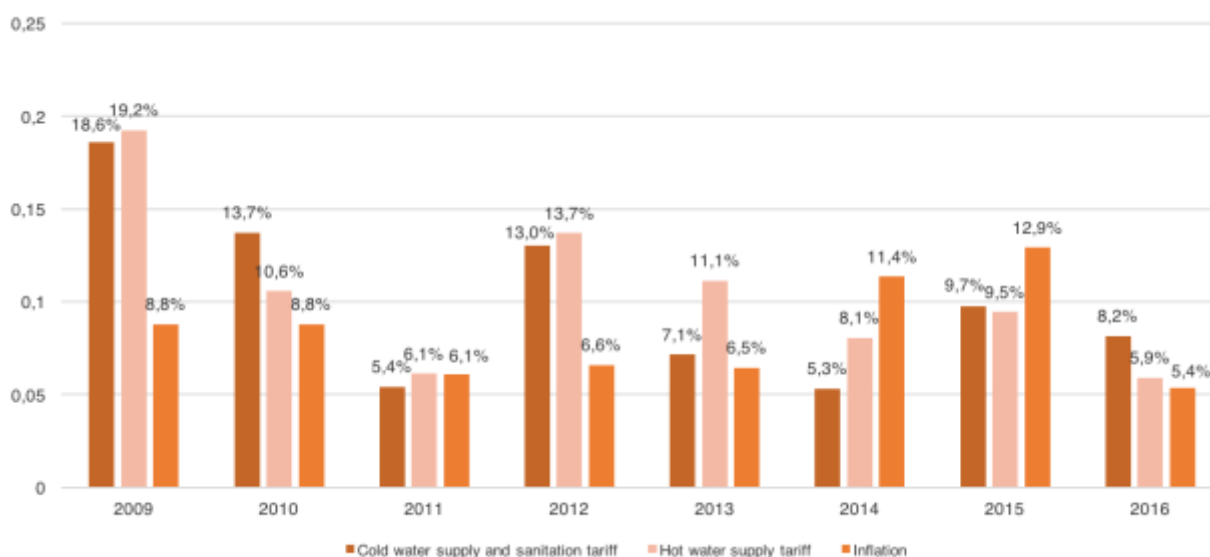


Figure 3. Comparison of water prices growth ratio and inflation rate.

Source: according to <http://www.inflation.eu/inflation-rates/russia/historic-inflation/cpi-inflation-russia.aspx> and <http://www.gks.ru/>.

Despite the fact that the level of tariffs for WSS services remained acceptable for the vast majority of the population (the share of total costs for the payment of both services in 2008 was 0,75% of per capita income), the level of cost recovery by the population was 90% for sewerage services and 93% for the water supply service. For the last nine years the average price for 1m<sup>3</sup> of cold water supply and sanitation was 34 rubles. More than half of consumers pay for utilities and water supply services on the basis of consumption standards.

Preservation of the level of tariffs ensuring the availability of water supply and sanitation services for consumers predetermined an acceptable level of collection of payments from the population (94%).

The current water supply and sanitation tariff-setting procedure has been in effect since 2003. At that time, major amendments were introduced to the Law “On the Fundamentals of Housing Policy” (Federal Law № 52 of 6 May 2003<sup>16</sup>). These amendments give the Government of the Russian Federation control over pricing in the housing and public utilities sector, including WSS. The government revises federal standards for housing and public utilities payments annually. Public authorities of constituent entities of the Russian Federation are authorized to set regional standards for housing and public utilities payments.

Despite the fact that serious work has been done in Russia to develop the regulatory framework for tariff regulation, the legally established three-level system of tariff regulation (the Federal Tariff Service - Tariff Regulatory Authorities of the Subject of the Russian Federation -

<sup>16</sup> The Law of the Russian Federation "On the Fundamentals of the Federal Housing Policy". *JSC Codex*. Accessed April 20, 2017. Retrieved from <http://docs.cntd.ru/document/9003426>. (In Russian).

Local Self-Government Bodies) dilutes the responsibility for the adopted tariff decisions and does not contribute to the establishment of a balanced relationship between private operators and municipal / state authorities.

According to the tariff regulation system, the powers of *the Government* of the Russian Federation in the field of water supply and sanitation include, among others:

1. Approval of the rules for tariff regulation in the sphere of water supply and sanitation.
2. Approval of the procedure for exercising state control (supervision) in the field of tariff regulation in the sphere of water supply and sanitation.
3. Approval of the rules for cancellation of decisions of tariff regulation bodies adopted in violation of the legislation of the Russian Federation.
4. Approval of the procedure and time limits for considering disputes arising between tariff regulation bodies and organizations engaged in hot water supply, cold water supply and (or) water disposal, with respect to the established tariff values.
5. Approval of the procedure and terms of pre-trial consideration of disputes arising between tariff regulation authorities, organizations engaged in hot water supply, cold water supply and (or) water disposal, and subscribers in establishing and (or) applying tariffs for water supply and sanitation.

The powers of *the federal executive body* in the field of state regulation of tariffs include, among others:

1. Creation of a federal information system to provide access to information on tariffs in the sphere of water supply and sanitation, standards for the consumption of public services for hot water supply, cold water supply, sanitation and maintenance of its operation.
2. Consideration of disagreements arising between tariff regulators and organizations engaged in hot water supply, cold water supply and (or) sanitation, with respect to established tariffs.
3. Realization of federal state control (supervision) in the field of regulation of tariffs in the sphere of water supply and sanitation.
4. Approval of the forms of provision of cold water supply and (or) water disposal by organizations providing hot water supply, tariff regulation bodies of information subject to disclosure in accordance with this Federal Law, rules for filling in these forms.

5. Control over observance of information disclosure standards in the sphere of water supply and water disposal by the executive authorities of the constituent entities of the Russian Federation in the field of state regulation of tariffs.
6. Revocation of decisions of the executive authorities of the constituent entities of the Russian Federation in the field of state regulation of tariffs on approval of tariffs for organizations engaged in hot water supply, cold water supply and (or) water disposal, adopted by them in violation of the legislation of the Russian Federation.
7. Coordination of decisions of tariff regulation bodies in cases established by the Government of the Russian Federation in the manner established by the federal executive authority in the field of state tariff regulation.
8. Pre-trial examination of disputes arising between tariff regulation authorities, organizations engaged in hot water supply, cold water supply and (or) sanitation, and subscribers in setting and (or) applying tariffs for water supply and sanitation.

Among the powers of *the executive authorities of the constituent entities* of the Russian Federation in the sphere of water supply and sanitation are, among others:

1. Establishment of tariffs in the sphere of water supply and sanitation.
2. Monitoring the compliance with information disclosure standards by organizations engaged in hot water supply, cold water supply and (or) water disposal, as well as by local governments exercising the powers delegated to them in the field of tariff regulation.
3. Choice of methods for tariff regulation of an organization that provides hot water, cold water and (or) water disposal.
4. Implementation of regional state control (supervision) in the field of tariff regulation in the field of water supply and sanitation.

Concerning the tariff-setting procedure, in accordance with the Federal Law №210-FZ of 30.12.2004 “On the Basics of Tariff Regulation of Communal Enterprises”<sup>17</sup>:

1. *Organizations* that provide regulated types of activities in the sphere of water supply and sanitation calculate the costs associated with the supply of water and submit applications and reasonable proposals (statement with accompanying supporting materials) to the body of executive power of the constituent entity of

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<sup>17</sup> Federal Law "On the Basics of Tariff Regulation of Communal Enterprises" of December 30, 2004 №210-FZ (last version). *Consultant Plus*. Accessed April 15, 2017. Retrieved from [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_51037/](http://www.consultant.ru/document/cons_doc_LAW_51037/). (In Russian).

the Russian Federation. According to this indicator and the tariffs approved by state bodies, the final cost for the consumer is determined.

2. The *bodies of executive power of the constituent entities* of the Russian Federation (having powers in the field of regulation of tariffs for goods and services of utility companies), establish tariffs for goods and services of communal organizations in accordance with the marginal index established by *the federal executive body* in the field of regulation of tariffs and allowances for the relevant subject of the Russian Federation.<sup>18</sup>
3. Taking into account the *investment programs* of communal complex organizations approved by *representative bodies of local self-government*.

The ultimate indices established by public authorities of the subjects of the Russian Federation determine the maximum and minimum border of tariff changes.

Concerning the type of tariffs, regulators have a right to set the following two types of tariffs:

1. Flat-rate, which is a fee rate for consumption of 1 m<sup>3</sup> of hot water, cold water (and sanitation); and for discharge and treatment of 1m<sup>3</sup> of wastewater, respectively.
2. Two-part, which comprises: (a) a fee rate for consumption of 1 m<sup>3</sup> of hot water, cold water, and for discharge and treatment of 1 m<sup>3</sup> of wastewater, respectively; and (b) a fee rate for maintenance of hot water supply system, cold water supply system, sanitation system and wastewater treatment facilities per unit of connected capacity (in m<sup>3</sup> per day), respectively.

According to the Federal Law "On Water Supply and Sanitation" № 416-FZ, calculation of tariffs in the sphere of water supply and sanitation is based on the volume of delivered goods and services and the amount of necessary gross proceeds calculated by one of the following methods:

1. By the method of economically justified expenses. This method is regarded as the basis for tariff-setting. The calculation shall be based on economically feasible expenses (costs) required for the implementation of investment and production programs.
2. The indexing tariff rates method. The calculation is carried out taking into account changes in prices for used in carrying out regulated activities goods, works, services.

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<sup>18</sup> Federal Law "On the Basics of Tariff Regulation of Communal Enterprises" of December 30, 2004 №210-FZ (last version). *Consultant Plus*. Accessed April 15, 2017. Retrieved from [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_51037/](http://www.consultant.ru/document/cons_doc_LAW_51037/). (In Russian).



3. The return on invested capital. The calculation of tariffs takes into account the return on invested capital and the receipt of income equivalent to the income from its investment in other industries, the activities in which are carried out with comparable risks.
4. By comparing the analogs (benchmarking).<sup>19</sup>

In the field of cold water supply and sanitation, the calculation is based on the tariffs or economically justified costs of the guaranteeing organization for the same regulated activity in comparable conditions.

In relation to the organization operating centralized hot water, cold water and (or) water disposal systems, separate facilities of such systems in state or municipal ownership, under a concession agreement or lease agreement for such systems and (or) facilities, the tariff regulation body decides on the choice of the method of regulation corresponding to the method established by the tender documentation and agreed by this body in the manner established by Government of the Russian Federation and the Russian Federation legislation on concession agreements.<sup>20</sup>

When calculating tariffs in the sphere of water supply and sanitation, the expenses of organizations engaged in hot water supply, cold water supply and (or) water disposal, necessary for the implementation of investment and production programs, as well as planned values of reliability, quality, energy efficiency indicators are taken into account. Namely:

- Electricity costs.
- The cost of acquiring components for water treatment and other components that are required to meet water standards of Sanitary rules and regulations.
- Expenses for laboratory water quality studies.
- Remuneration of employees of the organization, including contributions to social funds and income tax.
- Lease of necessary property.
- Expenses for maintenance of facilities and networks, cost of repairs.
- Amount of water tax.

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<sup>19</sup> Federal Law "On Water Supply and Sanitation" of 07.12.2011 №416-FZ. *Consultant Plus*. Accessed April 15, 2017. Retrieved from [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_122867/](http://www.consultant.ru/document/cons_doc_LAW_122867/). (In Russian).

<sup>20</sup> Chapter 6. Regulation of Tariffs in the Sphere of Water Supply and Sanitation. Federal Law "On Water Supply and Sanitation" of 07.12.2011 №416-FZ. *Consultant Plus*. Accessed April 15, 2017. Retrieved from [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_122867/f1559fdca634deb30fc9411503efdcc15d15f526/](http://www.consultant.ru/document/cons_doc_LAW_122867/f1559fdca634deb30fc9411503efdcc15d15f526/). (In Russian).

- Costs associated with the preparation of documentation, waste management, ecology etc.<sup>21</sup>

Tariffs in the sphere of cold water supply and sanitation are established in the form of single, double or multiple tariffs in the order determined by the pricing principles in the sphere of water supply and sanitation approved by the Government of the Russian Federation.

Tariffs in the field of hot water supply can be established in the form of two-component tariffs using the component for cold water and the component for thermal energy in the order determined by the pricing principles in the sphere of water supply and sanitation approved by the Government of the Russian Federation.

As mentioned previously, the norms of consumption of services have a serious impact on the tariff policy. They serve as a base for planning the incomes of water supply and sanitation enterprises, determining the total payments of the population, the volume of services provided, the payment of benefits and subsidies, and also solving resource-saving problems. Almost all regions of Russia have approved overestimated standards of water consumption, which include irrational expenses, part of losses and leaks. In accordance with the current legislation (Government Decree of 23.05.2006 № 306 "On Approval of the Rules for Establishment and Determination of Standards for the Consumption of Public Utilities"), the following increasing coefficients for hot and cold water for households without special meters are introduced:

- From January 1, 2015 to June 30, 2015 - 1,1.
- From July 1, 2015 to December 31, 2015 - 1,2.
- From January 1, 2016 to June 30, 2016 – 1,4.
- From July 1, 2016 to December 31, 2016 – 1,5.
- From 2017 – 1,6.<sup>22</sup>

## **1.4. Private sector participation**

### *1.4.1. Motives for water utilities privatization*

The motives for water privatization differ from one case to the other, and they often determine the choice of the mode of privatization: management and lease contracts are used to increase efficiency and improve service quality, while asset sales and concessions primarily aim

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<sup>21</sup> Tariffs of 2015-2016 for hot and cold water with and without meters. *TerraFaq.ru - housing and land issues*. Accessed April 20, 2017. Retrieved from <http://terrafaq.ru/kommunalnoe-hozyaystvo/uslugi/novye-tarify-navodu.html>. (In Russian).

<sup>22</sup> Decree of the Government of the Russian Federation №306 of May 23, 2006 "On Approval of the Rules for Establishing and Defining Standards for Consumption of Public Utilities and Standards for Consumption of Communal Resources for the Purpose of Maintaining Common Property in an Apartment Building". *Consultant Plus*. Accessed April 15, 2017. Retrieved from [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_60527/](http://www.consultant.ru/document/cons_doc_LAW_60527/). (In Russian).

to reduce the fiscal burden or to expand access. Ideological motives and external influences also play a role. So, the described motives are:

- *Increasing efficiency and improving service quality*

Proponents argue that public utilities may be poorly managed. This can take the form of low bill collection, high water losses of more than 50% and intermittent water supply, sometimes lasting only for a few hours a day or a few days per week.

- *External influences*

External influences, such as from the World Bank and the International Monetary Fund (IMF), often play a role. This may take the form of structural adjustment programs. Other aid agencies (several banks) have also supported water privatization.

- *Fiscal motives*

In some cases, where access is already universal and service quality is good, fiscal motives dominate, as it was the case in Germany. In Berlin the state government sold a 49,9% share of its water utility in 1999 for 1,69bn Euros in exchange for a guaranteed profit for the private shareholders amounting to the interest rate on 10-year government bonds plus 2 percent, as specified in a contract that was kept confidential until the state government was forced by a referendum to make it public. However, tariffs increased and the state government's revenues from the company declined compared to the situation before privatization (168m Euro profit for the state in 1997 compared to a 10m Euro loss in 2003).

#### *1.4.2. Legislation on public-private partnerships in Russia*

According to the Federal Law №224-FZ, Public-private partnership is a legal partnership between a public partner and a private partner, legally formalized for a certain period of time and based on the pooling of resources and the distribution of risks, which is carried out on the basis of an agreement on PPP, aiming to attract private investments to the economy, ensure the availability of goods, works and services and improve their quality.<sup>23</sup>

The PPP agreement is a civil law contract between a public partner and a private partner, concluded for a period of not less than three years in the manner and under the conditions established by the mentioned Federal Law.

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<sup>23</sup> Federal Law "On Public-Private Partnership, Municipal-Private Partnership in the Russian Federation and Amendments to Certain Legislative Acts of the Russian Federation" of July 13, 2015 №224-FZ (last version). *Consultant Plus*. Accessed April 15, 2017. Retrieved from [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_182660/](http://www.consultant.ru/document/cons_doc_LAW_182660/). (In Russian).

### **Federal Law on Public-Private Partnerships (№ 224-FZ)**

Federal Law № 224-FZ “On Public-Private Partnerships”<sup>24</sup> (entered into force on 1 January 2016) regulates the issues of preparation, conclusion, execution, termination of agreements on public-private and municipal-private partnership with respect to the closed list of public infrastructure facilities (transport, social, municipal and engineering).

The basic provision for this law is the emergence of private property on the object of an agreement on public-private partnership - it is the rule that first of all distinguishes the law on PPP from the law on concessions and state orders. It allows the use of new, effective and balanced PPP models in Russian law enforcement practice, taking into account, on the one hand, state interest, on the other - the need for business in various mechanisms of state support.

### **Federal Law "On Concession Agreements" (№115-FZ)**

Federal Law №115-FZ "On Concession Agreements" is aimed at solving the problem of attracting private businesses and investing in the public sector. It was adopted in July 2005 with the aim of building effective relationships between public entities and private businesses in the use of property, located in state or municipal ownership. In the years 2007-2009 the work to improve this law continued in order to encourage the conclusion of concession agreements, including the field of water supply and sanitation.

As an innovation in favor of the concessionaire, it is possible to note the possibility for the concessionaire (the concession organizer) not to provide a concession fee, provided that the concessionaire sells goods, works, services at regulated prices (tariffs), and in case the concessor has incurred part of the costs for creation, reconstruction of the object. The use of this opportunity in the implementation of the concession agreement will help to increase the investment attractiveness of projects in the field of water supply and sanitation.

The sphere of water supply and sanitation in terms of PPP is regulated by the Federal Law №115-FZ "On Concession Agreements”, due to the reason that the WSS systems cannot be transferred to absolute permanent ownership to a private partner, but only for a lease or concession for a certain period of time.

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<sup>24</sup> Federal Law "On Public-Private Partnership, Municipal-Private Partnership in the Russian Federation and Amendments to Certain Legislative Acts of the Russian Federation" of July 13, 2015 №224-FZ (last version). *Consultant Plus*. Accessed April 15, 2017. Retrieved from [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_182660/](http://www.consultant.ru/document/cons_doc_LAW_182660/). (In Russian).

### *1.4.3. Forms of private sector participation in water supply and sanitation services provision*

#### **Lease model**

So far, the long-term lease model (25-49 years) for municipal property is currently the most common mechanism of public-private partnership in this sphere in Russia. A private operator concludes a lease contract for the municipal property of communal infrastructure system with the administration of the municipality or with a municipal unitary enterprise. On the basis of the lease agreement, the use of communal infrastructure facilities is transferred to the investor. The landlord is a municipal unitary enterprise that owns the lease on the right of economic management.

Often such contracts provide obligation for the investor to overhaul or improve the leased property. Sometimes a lease agreement involves the implementation of a certain investment program in relation to the relevant facilities.

Interest of business consists in reception of an opportunity to collect a payment for rendered services from the population.

Due to the requirements of the antimonopoly legislation, conducting the lease of municipal property is possible only on the basis of the results of the competitive procedures. Thus, the rental model has lost its main advantage - the speed, with which the contract was concluded, and it is likely that other forms of PPP will be used more widely in Russia to attract private businesses to the management of the water and sewerage systems.

#### **Concession**

The concession agreement provides the obligation of the private partner (concessionaire) to create and / or reconstruct the property defined by this agreement, the ownership right to which belongs or will belong to the public partner (concessor).

The concession is the most convenient mechanism for attracting private capital, because, on the one hand, it allows to retain ownership of infrastructure objects for a concessor, and, on the other hand, provides wide opportunities to attract private capital to create new and upgrade existing facilities, and ensuring their effective use.

Concession agreements for municipal infrastructure are successfully applied in the world practice, however in Russia this form of PPP has not yet been widely applied in practice, especially for small and medium-sized businesses with local and regional authorities. In many respects, the situation was caused by the imperfection of the legal regulation.

#### **Privatization**

During privatization, municipal unitary enterprises that own infrastructure are transformed into open joint-stock companies, in payment for the authorized capital of which these infrastructure facilities are paid. The initial owner of the shares is the municipality. Further,

the shares of the newly established joint stock company may be sold to a private investor or continue to remain in the ownership of the municipality.

This model is considered as the most stable one, due to the presence of significant administrative and judicial experience in its application.

#### *1.4.4. PPP projects in communal sector of Russia*

As of 2017, there were at least twenty-six contracts with private companies for managing water utilities with the first one being started in 1993. The overall investment commitment of these contracts is almost 2 billion US dollars. Twenty-one contracts cover entire utilities and 5 contracts cover individual plants. Three of these contracts were signed before 2002, 17 – in the 2003-2006 period and two contracts were signed in 2012 and 2015.

Ten out of twenty-six contracts are held by the conglomerate “Alfa Group” either directly or through its subsidiary “Rosvodokanal”. Its Russian competitor “Integrated Energy Systems Holding (IES)” holds eight lease contracts.

While some of these contracts were awarded through competitive bidding, most were awarded after direct negotiations.

#### **Experience in using a lease model**

Among relatively positive examples of the lease scheme usage as a PPP model in the communal sphere are the following:

- “Russian Communal Systems” and its subsidiaries and dependent companies that operate electric, heating, water and sewerage systems in such regions of the Russian Federation as: Amur, Bryansk, Vladimir, Kirov, Tambov and Tver regions, Altai and Perm Krai, the Republic Karelia.
- The PPP lease scheme is applied by the subsidiaries and affiliates of “Russian Communal Systems” in the regions of the Russian Federation since 2003.
- “The Rosvodokanal” group of companies operates municipal water supply and sewage systems in Barnaul, Krasnodar, Omsk, Orenburg, Tver, Tyumen, Lugansk (Ukraine), and Kaluga region.
- The company of the holding "Eurasian" operates the water supply and sewerage system of the city of Rostov-on-Don (OJSC "PO Vodokanal"), as well as the city of Sochi and

other settlements of the Azov-Black Sea coast of the Krasnodar Territory (“Yugvodokanal Ltd”).<sup>25</sup>

### **Experience in using the concession model**

At present, there are very few examples of the concession agreement usage as a form of PPP in the municipal sector:

- In the city Irkutsk, heating supply systems were given to the concession of CJSC “Baikalenergo” (a subsidiary of “Irkutskenergo”) even before the approval by the Government of the Russian Federation of a concession agreement model in January 2007.
- On April 27, 2007, the Sortavala municipal district as a conessor and “Energetik CJSC” as a concessionaire concluded a concession agreement regarding the municipal property of the Sortavala municipal district for the generation, transmission and distribution of thermal energy.
- On the terms of the concession agreement signed between the regional distribution company Karelenenergo and the Sortavala municipal district on June 18, 2007, the rights of possession and use of municipal electric grid facilities were transferred for 40 years.
- On September 20, 2007, a concession agreement was concluded between the municipality of the city Kataisk (a conessor) and CJSC “Tobolenergo” (concessionaire) regarding thermal networks for the transmission of heat energy.
- In Stavropol region in 2007, a tender was announced for the right to conclude a concession agreement with respect to the state (regional) property of the Stavropol region of the water and sewage system, which, however, was canceled unilaterally without explanation.
- In September 2007, Vologda City Administration announced an open tender for the right to conclude a concession agreement for the landfill of solid domestic and non-toxic wastes in the Pasyukovo tract (the agreement was signed on May 28, 2008).<sup>26</sup>

### **Experience in the use of the privatization**

A very small number of municipalities went through the privatization of unitary enterprises. And, for the most part, they stopped at the first stage - the corporatization of the

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<sup>25</sup> PPP in communal sphere in crisis conditions. *Vegas Lex*. Accessed March 1, 2017. Retrieved from <https://www.vegaslex.ru/analytics/publications/32470/>. (In Russian).

<sup>26</sup> In the same source.

corresponding unitary enterprise and the preservation of 100% of the shares in the newly created joint-stock company in the ownership of the municipality. These examples include:

- “Nizhegorodsky Vodokanal”,
- “Yaroslavlvodokanal”,
- “Vodokanal Cheboksary”,
- “Vodokanal-Chita”,
- “Teploset” (Mytishchi District, Moscow Region) and a number of other enterprises.

A stable legal model of PPP using instruments of Russian privatization and investment legislation for municipal water supply and sewage systems is now implemented only in the city of Rostov-on-Don.<sup>27</sup>

## 1.5. Literature review

In the foreign literature, the results of the functioning of various institutional alternatives to the organization of the communal economy in the sphere of water supply are actively studied. However, only a small number of empirical works are devoted to the study of the relationship between the institutional options for the organization of the communal economy and the tariffs for water.

The study of the relationship between the ownership regime of the enterprise and the price set to the consumers on water supply services has not yet yielded an unambiguous result, and indicates a different direction of the relationship for these two factors in different countries. And therefore, an overview of the literature on the subject of private companies’ involvement into provision of water supply services in international practice will be conducted in this part.

In the article [García-Valiñas M.A., González-Gómez F. and Picazo-Tadeo A.J., 2013], observing 386 Southern Spanish municipalities, authors assess the relationship between provider ownership and the price of water for residential use. The techniques and policy implications from this article which were applied to Spanish water supply system can be observed on Russian water utility services as well.

In the empirical part of the research several Heckman sample selection models [Heckman, 1976, 1979], which account for the possible presence of sample selection bias in both externalization and privatization processes, were estimated.

This study reveals the relationship between various institutional options for the organization of the communal economy and the level of urban water prices for the population by

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<sup>27</sup> PPP in communal sphere in crisis conditions. *Vegas Lex*. Accessed March 1, 2017. Retrieved from <https://www.vegaslex.ru/analytics/publications/32470/>. (In Russian).



the example of municipalities in the southern Spanish province of Andalusia. The form of water supply management, which leads to the lowest water prices for the population, was the provision of services by the municipality itself. On the second place - the enterprises of city water supply, managed by private operators under the contract. But municipal enterprises, according to the study, set higher prices than utility companies with private sector participation.

The research [Martinez-Espineira R. et al., 2009] attempts to explain differences in the average price of domestic water supply services in Spain, paying special attention to the effects of privatisation of the service on price levels.

The main aim of the study consists of testing, if there is a relationship between the ownership of water supply services and urban water price levels in Spain. The empirical analysis is based on the application of a 'treatment effects' model on a sample of 53 Spanish medium-big municipalities, which either have more than 100 000 inhabitants and/or are a provincial capital. The municipalities included in the sample represent 33,5% of the Spanish population.

This model accounts for the fact that municipalities do not randomly distribute themselves between a group using strictly public ownership and management and a group where all or part of the service has been delegated to a private firm. It is found that, once this endogeneity is taken into account, there seems to be a positive and significant effect of privatisation on water price levels.

In order to examine how the factors are related to each other regression was conducted. Along with the type of the company, several features of the municipality were incorporated, in order to approximate the socioeconomic environment where water suppliers operate and check, whether they do make the costs for the provider higher. Those variables are the size in terms of population and surface, the population density, the economic level and several features of the housing stock in order to observe the urban planning model.

The next set of factors includes two climate variables which can also explain price differences. An additional set of variables is related to water quality and other technical characteristics.

The obtained results match set hypotheses: local governments appear more likely to relinquish the management when they operate under more complex environments, while private firms seek to take over the service in those areas where it is easier to obtain higher profits. That is, private firms tend to gravitate towards areas where revenue is more stable and household income is higher.

Additionally, once the factors describing the operational environment have been accounted for, it was shown that private firms set on average higher prices than public ones. This result lends support to the idea that private firms do exploit their dominant position.

So, the major result obtained from the study is that privatization leads to an increase in the price of water in large urban Spanish municipalities.

Another study [Chong E., Huet F., Saussier S., Steiner F., 2006] is devoted to the study of water utilities in France. What is important, this was the first empirical study on a large sample with precise details of contracts signed between local authorities and private operators in France.

The main goal of the paper is to explore the impact of organizational choice of PPP on performance as measured by consumer prices.

A switching regressions model was estimated to account for the endogeneity of organizational choice. Theoretical developments of other authors were used to specify a model that was applied to an original database of 5000 organizational choices and associated retail prices in French municipalities in 2001, to explore the empirical link between organizational choice and performance in water distribution. A variety of econometric techniques was used to assess the impact of organizational choice on performance. In all specifications, the authors in France found that the choice of any form of public-private partnership in place of direct state / municipal management is likely to lead to an increase in the cost of urban water supply services

Another investigation was performed by [D. Hall and E. Lobina, 2004] and is based on empirical evidence from developed, transition and developing countries. Authors look at how the introduction of private operators' interests into the water supply/sanitation and energy sectors may conflict with public interests in socio-economic, environmental and political dimensions.

Several case studies were used to illustrate the dynamics of these interactions, covering such phenomena as unsolicited proposals, misrepresentation and corruption; the exploitation of established positions by taking advantage of asymmetry of information and negotiating capacity in relation to public authorities; and exit from contracts or concessions when acceptable profitability cannot be attained.

This study empirically proves that privatization of water supply enterprises sometimes leads to unreasonable price increase. The authors conclude that policies relying on corporate activity in these sectors are unnecessarily risky, and that policy development should focus on building strong public sector institutions to provide these services.

J. Capentier et al. [J. Capentier et al. 2006] also compare public and private water utilities in France, finding that prices are higher under private management mostly because private operators are facing a tougher external environment. In addition, this article concludes that the desire of local authorities to privatize urban water supply services is stimulated by the technical complexity of their provision.

Ruester S. and Zschille M. [Ruester & Zschille, 2010] study the relationship between the forms of management of water supply enterprises (using cross section data of 765 German water suppliers in 2003) and the prices for consumers, controlling economies of scale and the technical and structural characteristics of the water utilities. The main conclusion of this study is that private sector involvement leads to an increase in water prices.

Garcia et al. [Garcia et al. 2005] focused on the analysis of the effects of technical factors, competition and strategies of private firms on water prices in France, showing that local strategies of operators have a significant impact on the level of prices. Private companies can set prices below or above costs depending on the specific situation.

The paper written by [Molinos-Senante M., Sala-Garrido R. 2015] investigates the impact of two privatization approaches (the privatization of public water and sewerage services (WSS) and the privatization of water companies' ownership) on changes in productivity in the water industry.

To assess growth in the productivity of water companies, the Luenberger productivity indicator (LPI) was computed for a sample of Chilean water and sewerage companies (WaSCs) for the period 1997–2013. The results evidenced that productivity in the Chilean water industry decreased after its privatization. However, in the three subperiods, in which the ownership of WaSCs was privatized, the productivity of the water industry increased due to technical improvements.

So, the main conclusions of the study are: on the one hand, the identification of the privatization approach, in which the productivity of water companies has improved the most, is very valuable information for regulators across the world that are increasing the privatization of their national water industries. On the other hand, managers of WaSCs should implement different strategies to improve productivity, depending on their efficiency change and technical change indicators.

Peda P., Grossi G. and Liik M. (2011) studied 43 water companies in Estonia. Their analysis revealed no statistically significant differences between the efficiencies of public, private or public-private WSSs. The authors assumed that this result was caused by the lack of centralized economic regulation in the sector.

The same result was found by Abbott M. and Cohen B. (2009). According to their study, there is no consensus on the role of ownership on the performance of WSSs. Authors suggest that privatization can only promote the improvement of WSSs performance through economic regulation, depending on the monopoly conditions of the sector.

There is a lack of such qualitative empirical studies of the economic and institutional changes in the process of reforming the Russian housing and communal services. There are no

studies devoted to the research of impact of institutional factors, which include changes in the forms of management of communal enterprises, on the results of the tariff policy in the industry.

#### *1.5.1. Working hypotheses*

According to the conducted literature overview, major research hypotheses can be formulated for the study of Russian water supply market.

If the responsibility of service provision is transferred from the public to the private sector, market forces should enhance the performance of service provision via ex-ante competition. Private operation should lead to:

- Higher efficiency
- Improved quality
- And higher incentives to develop innovations.

Hence, we would expect higher overall efficiency and lower consumer prices for operators where a private partner is involved in service provision [García-Valiñas M.A. et al., 2013].

**Hypothesis 1:** The participation of private companies in the operation of water supply should lead to lower retail prices for water usage.

Water losses (leakages), low quality of network and the price for its repair are reflected in final tariffs set for consumers, because companies strive to compensate the costs of maintenance works [Martínez-Espiñeira R. et al., 2009; Chong E. et al., 2006].

**Hypothesis 2:** A lower quality of network should lead to higher costs and, therefore, higher prices.

In the water industry, economies of density mean that unit costs decrease with greater population density or water provided per kilometer of mains. According to the researches, increasing the number of consumers for 1 kilometer of network, making the network denser, can allow companies:

- To take advantage of the economies of scale.
- To reduce costs and prices [Chong E. et al., 2006; Ruester S. and Zschille M., 2010].

**Hypothesis 3:** The higher the network density in the company, the lower the retail price should be.

## Summary

The first chapter is devoted to the theoretical analysis of water supply service provision. Still the main volume of production and provision of water supply and sanitation services in Russia is provided by municipal enterprises (86%). The top three private companies account for 80% of all private companies share, and 11% of the overall market. Also, there are 26 PPP contracts for managing water utilities.

However, the deterioration in the state of infrastructure is rather high: 44% of water supply networks and 35% of sewerage networks need to be replaced. The share of leaks and unaccounted consumption of water in the last years was 18-20% without any tendency for reduction and the quality of services of water supply and sanitation remains low.

State policy in the industry provides the preservation of tariff regulation for utilities and the gradual elimination of the monopoly position of the state in this market and the development of competition. Tariff policy consists of legally established three-level system of tariff regulation (the Federal Tariff Service - Tariff Regulatory Authorities of the Subject of the Russian Federation - Local Self-Government Bodies) and Tariff regulation methods:

1. By the method of economically justified expenses.
2. The indexing tariff rates method.
3. The return on invested capital.
4. By comparing the analogs (benchmarking).

Concerning the private sector participation analysis, the mostly used mechanisms in the sector of communal infrastructure in the Russia Federation are: Lease, Concession and Privatization. At the moment, the state is aimed at increasing the number of concession agreements in the sphere of water supply and sanitation.

The analysis of privatization processes in Russian water and sanitation sector reveals the following distinctive features:

- The long-term nature of the contract (25-49 years).
- Private operators mainly operate under long-term lease agreements with investment obligations.
- The lack of public discussions in bidding and determining the terms of the agreement.
- Large interregional companies affiliated with business in other industries are represented as renters.
- Renters are usually interested in large utility objects of large cities.

The conducted literature review revealed the contradictive result in studies and allowed to formulate three research hypotheses for this paper.

## CHAPTER 2. EMPIRICAL STUDY

### 2.1. Research methodology

This chapter is dedicated to the empirical research. The literature review in the previous chapter has reflected a research gap in the studies devoted to the research of impact of ownership type of communal enterprises on the results of the tariff policy in the industry in the Russian Federation.

#### 2.1.1 Purpose of the research

The research question of the work is to identify: How the ownership structure (public or private) of the water supply services providers affects final water tariffs for consumers? The nature of the research question can be considered as both exploratory and explanatory, therefore, it implies that this study will be organized as the quantitative research.

The paper will be devoted to the examination of the relationship between different ownership regimes and other external factors, which will serve as determinants for changes in the price which consumers should pay for water delivery.

The aim of this work is to answer the research question and to give several significant policy implications. This will be done by testing the hypotheses set in the previous chapter, on the basis of the conducted empirical research, in which the impact of different factors on the level of urban water prices for residential use will be examined.

Research design of this study will be based on collection of secondary data and include analysis of quantitative and qualitative data. A more detailed description of the methodology will be introduced further in this chapter.

#### Research steps

##### 1. Secondary data analysis

This study will be focused on the analysis of documentary secondary data (written materials) and data obtained from statistics. For the study, such materials will be used: scientific articles, legal documents, newspaper articles, data from companies' reports published on their websites and statistics from Rosstat.

##### 2. Sample selection

All the data for the sample will be collected from the official websites of the companies, which will be observed in the research, and the national statistics websites - Rosstat. For each company information on several characteristics for 2012-2016 years will be collected.

##### 3. Reliability, validity and generalizability

In this paper all the data used is obtained from main open sources that are proven to be correct, the same factors and the same years for each company will be analyzed and, moreover, the empirical research, which will be conducted in the next part will include all the necessary

data to estimate a model, which will be able to answer the research question. The results of the sample, on average, can be applied to all providers of water supply services in Russia.

Therefore, subject to the above-mentioned conditions, the future results of this study may be estimated as reliable, valid and generalizable.

### 2.1.2. Research approach and method

In order to study the impact of the utility company management forms on the level and the dynamics of tariffs for water supply, the public and private companies, which are situated in cities with two major characteristics – size and the territory of its presence.

Firstly, the territorial limitation is set: the cities located in the European part of Russia will be selected due to close geography position and similar relief for water provision. European part of Russia includes the Central, Southern, North-Western, North-Caucasian federal districts, as well as part of the Volga Federal District (with the exception of the Ural regions, partially located in Asia - Bashkortostan, the Orenburg region and the Perm region).

Secondly, the companies located in the large and largest (with population of over 200 thousand people) cities of Russia will be selected. This size characteristic of cities was obtained from “Set of rules on urban and rural planning and development” issued by Ministry of Regional Development of the Russian Federation.<sup>28</sup> At the moment the leading producers of water and sanitation services in these largest cities are the country's largest water utilities.

For the empirical research panel data will be used, and the model for the research was obtained from previously published international studies:

$$\mathbf{Tariff}_{it} = \beta_0 + \beta_1 \mathbf{Private}_{it} + \beta_2 \mathbf{Leakage}_{it} + \beta_3 \mathbf{Replacement}_{it} + \beta_4 \mathbf{Density}_{it} + \beta_5 \mathbf{logIncome}_{it} + \beta_6 \mathbf{Crisis}_{it} + \varepsilon_{it},$$

where

$$i = 1, \dots, n; t = 1, \dots, T,$$

$\beta_i$  – vectors of the unknown coefficients,

$\varepsilon_{it}$  – a random variable that characterizes other factors not included in the model.

Variables include one dependent, four independent and two control variables. The dependent variable is the price for cold water supply in rubles per 1m<sup>3</sup>. Independent variables include company characteristics (type of ownership and number of consumers), water supply network characteristics (length of network in kilometers and network leakage rate in percentage) and the share of network that needs to be replaced in the city in percentage. Control variables are

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<sup>28</sup> Ministry of Regional Development of the Russian Federation. Set of rules "Urban development. Urban and rural planning and development". JSC Codex. Accessed May 10, 2017. Retrieved from <http://docs.cntd.ru/document/1200084712>. (In Russian).

included in the model for completeness of the study. In this case, as the control variables average per capita income and financial crisis characteristics were chosen.

Moreover, one variable is included in the model as the logarithm due to high difference between their values and values of other variables. The description of the variables for the regression is shown in the Table 1.

*Table 1. Variables' description.*

Group	Variable	Description
Dependent variable		
Price for cold water usage	Tariff	The price for cold water usage per 1m <sup>3</sup> set by the provider (Rubles)
Independent variables		
Company characteristics	Private	Binary variable: 1 if water infrastructure is managed by a private company or the ownership is mixed, 0 – if by a local authority
Water supply characteristics	Density	Density of distribution network, (consumers/km)
	Leakage	Network leakage rate (%)
Characteristics of the city where the provider is present	Replacement	Share of network that needs to be replaced in the city (%)
	Control variables	
	LogIncome	Logarithm of average monthly income per capita in the city
Crisis characteristic	Crisis	Binary variable: 1 if financial crisis took place in the year, 0 if not

*Source: created by the author.*

The research includes several assumptions on the expected signs of the variables that will be included in the model, based on the literature review and previous international studies (see Table 2).

*Table 2. Expected signs.*

Variable	Expected sign
Private	-
Density	-
Leakage	+
Replacement	+
LogIncome	+
Crisis	+

*Source: created by the author.*



According to research Hypothesis 1, the expected sign for *Private* is negative due to higher efficiency and better quality of service provided by a private company [García-Valiñas M.A. et al., 2013].

According to Hypothesis 2, the expected sign for *Leakage* and *Replacement* is positive. The reason for this is that lost water, low quality of network and the price for its repair are reflected in final tariffs set for consumers [Martínez-Espiñeira R. et al., 2009].

According to Hypothesis 3, the expected sign for *Density* is also negative because of the economies of scale [Chong E. et al., 2006].

The sign for *logIncome* could be positive, because it could be expected that large operators tend to gravitate towards areas where revenue is more stable and household income is higher [Martínez-Espiñeira R. et al. 2009].

Concerning *Crisis*, the expected sign is positive as in crisis years government tends to increase prices for utilities.

## **2.2. Sample description**

The study sample includes Russian companies, which provide water supply services with two types of ownership regimes: public and private ones. The period for the study is 2012 to 2016 years, time is measured half-yearly. The study used data from 21 companies, and the final number of observations was 210. Among private companies such players are presented: “Russian communal systems”, “Eurasian”, “Rosvodokanal” and several other companies. These companies operate in cities: Voronezh, Krasnodar, Kirov, Tolyatti, Samara, Tambov, Sochi, Novorossiysk, Rostov-on-Don, Nizhny Novgorod.

Among public companies are municipal and state unitary enterprises of different cities: Saint Petersburg, Ufa, Kazan, Volgograd, Moscow, Astrakhan, Vologda, Izhevsk, Podolsk, Yoshkar-Ola.

The data on tariffs, consumers, network length and quality were collected using companies reports from their websites, data on network quality in cities and municipalities, average income and population was obtained from Federal State Statistics Service “Rosstat”.

The distribution of companies in the sample according to their current ownership regime is revealed on the Figure 4. The share of public and private ownership in the sample is relatively equal: 46% and 54%, respectively. Privately owned companies are divided according to the type of PPP mechanism used: 29% of companies are owned under lease contracts and 25% of companies – under concession agreements.

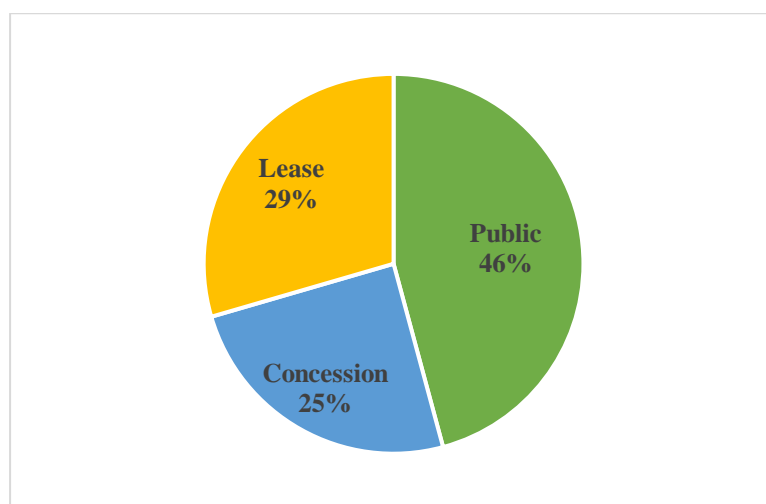


Figure 4. Ownership structure of companies in the sample.  
Source: created by the author.

Below is the descriptive statistics of the variables, which are considered in this study (see Table 3). The table shows the mean values of the variables, the standard deviation and the minimum and maximum values of each variable in the sample. The estimation result output from Stata is presented in Appendix 1.

Table 3. Descriptive statistics.

Variable	Mean	Std. deviation	Minimum	Maximum
Tariff	20,692	8,117	8,65	48,25
Private	0,543	0,499	0	1
Consumers	1415484	2790597	81000	13000000
Length	1959,135	2727,148	187,14	12822
Density	615,851	326,613	104,554	1923,693
Leakage	0,254	0,137	0,015	0,605
Replacement	0,514	0,183	0,065	0,922
Lowquality	0,004	0,009	0	0,035
Income	33883,31	11569,01	17330,1	87615,1
LogIncome	10,387	0,278	9,760	11,381
Crisis	0,4	0,491	0	1

Source: created by the author.

According to the results, the average value of the tariff set for cold water supply by the companies for the period from 2012 to 2016 in the sample is approximately 20,6 rubles per 1 cubic meter with the lowest tariff being set by Izhevsk municipal enterprise in 2012 - 8,65 rubles, and the highest one – by “Yugvodokanal” in Taman’ region in 2016 – 48,25 rubles.

Yugvodokanal is a private operator, therefore the highest tariff for water among public companies should also be mentioned. The highest tariff was in “MUE Vodokanal Vologda” in 2016 – 33,09 rubles.

The average length of the water supply network in considered companies is about 1960 kilometers, with the shortest one in “Yugvodokanal” in Taman’ region – 187 kilometers in 2016, and the longest one in municipal unitary enterprise of Moscow “Mosvodokanal” – 12 822 kilometers in 2016.

The average number of consumers is 1,400 million people. The smallest company in terms of consumers is “Yugvodokanal”, presented in the city Novorossiysk – 81 000 consumers, and the biggest one – “Mosvodokanal” – 13 million consumers.

The average density of distribution network of companies in the sample is 615 people for 1 km. The lowest density with 104 people for 1 km of network is presented in “Yugvodokanal”, presented in the city Novorossiysk, and the highest one with 1923 people for 1 km of network – in “MUE Mosvodokanal”.

Average leakage ratio is 25,4%. The company with the least leakages amount is “Yugvodokanal”, presented in the city Novorossiysk – only 1,5% in 2012, and with the greatest – “Sochivodokanal”, the leak ratio of which was 60,5% in 2014.

Average rate of network that needs replacement in the city is 51,4%. The network of the best quality is located in Tambov (where the company “Tambov communal systems” operates) in 2016 - only 6,5%, and the worst – in Ufa (the municipal unitary enterprise “MUE Ufavodokanal” operates there) – 92% share of replacement need in 2016.

Average share of water samples with the low quality is 0,004. The “cleanest” water with the zero share of such samples is presented in several companies: “Sochivodokanal Ltd.”, “Yugvodokanal”, “Vodokanal Rostov-on-Don”, “MUE Ufavodokanal” and “MUE Mosvodokanal”. The worst water in terms of quality is provided by the company «MUE Vodokanal Podolsk” and the share of the wrong samples there is 0,035.

Average income 33 883 rubles, the lowest income was in the city Novorossiysk in 2012 (the company “Yugvodokanal” operates there) - 17 300 rubles, and the highest one – in Moscow – 87 615 in 2016.

### **2.3. Regression analysis results**

In this part of the paper the relationship between prices for cold water for residential use and type of company owner is investigated. Among other independent variables are present: water supply network quality revealed in rate of leakages and repairs, number of consumers, network length and crisis years’ presence.

The STATA13 program was used for regression analysis. The study is based on panel data and the model with random effects was chosen to be used in the study.

### 2.3.1. Model estimation results

The model includes six factors, which describe company ownership characteristics, network quality, water quality, income per capita and crisis characteristic. The results of regression analysis are presented below:

$$\begin{aligned} \mathbf{Tariff}_{it} = & -57,27 + 1,57\mathbf{Private}_{it} + 14,52\mathbf{Leakage}_{it} + 4,75\mathbf{Replacement}_{it} \\ & + 0,01\mathbf{Density}_{it} + 7,00\mathbf{logIncome}_{it} + 2,62\mathbf{Crisis}_{it} \end{aligned}$$

The model overall is statistically significant, as the p-value equals 0 (is less than 0,01). Factors included in the model account for 58,53% of the Tariff variation, according to the results of regression analysis ( $R^2=0,5853$ ). The estimation result output from Stata is presented in Appendix 2.

All six factors are statistically significant; therefore, their coefficients and signs can be commented. There is a positive relationship between a binary variable *Private* and *Tariff*, which leads to the rejection of Hypothesis 1. This means that, on average, prices for cold water supply set by private companies are higher than the same prices set by municipal enterprises, for approximately 2 rubles per 1m<sup>3</sup>. The same result was found by authors [Martinez-Espineira R. et al., 2009; Ruester S. and Zschille M. (2010); J. Capentier et al. (2006)] who conducted studies on Spanish, German and French markets, respectively. There could be several reasons for such relationship. Firstly, private firms just could exploit their dominant position on the market and, therefore, increase tariffs. Secondly, the costs for implemented investment programs aiming at improving water supply quality and network replacement could influence the prices.

A positive relationship was discovered between rate of leakages (*Leakage*) at water supply and the *Tariff*. So, if the leakage rate increases by 1%, the price for water increases for about 15 rubles per 1m<sup>3</sup>. The same result concerns the replacement rate, which means the relation of water supply network that needs to be replaced (in kilometers) to the length of all network in the city where the company is present (in kilometers). So, if *Replacement* increases by 1%, the *Tariff* increases by approximately 5 rubles per 1m<sup>3</sup>.

Summing up, these two factors characterize the quality of the network in the city and they both account for the Hypothesis 2, which is accepted. So, the worse the network quality is, the higher is the price. The same results were found by [Martínez-Espiñeira R. et al., 2009] in Spanish water supply market and [Chong E. et al., 2006] in French water supply market. The reason for such relationship is that water losses and the price for the needed network repair are reflected in final tariffs set for consumers.

The relationship between *Tariff* and *Density* is negative, and this result allows to accept Hypothesis 3. The explanation for this result is that increasing the number of consumers for existing network length can allow companies to take advantage of the economies of scale and,

therefore, reduce their costs and prices [Chong E. et al., 2006; Ruester S. and Zschille M., 2010]. If the number of consumers per 1 kilometer of network in the company increases by 1, the price for 1m<sup>3</sup> of cold water set by this company decreases, on average, by 0,01 rubles.

Also, the relationship between *logIncome* and *Tariff* is positive. If average income per capita increases by 1%, *Tariff* for 1m<sup>3</sup> of cold water increases by 0,07 rubles. The expectation of the sign is confirmed, so the higher the income in the city, the more consumers pay for cold water supply [Martínez-Espiñeira R. et al. 2009].

Moreover, there is a positive relationship between a binary variable *Crisis* and *Tariff*, as it was expected. This may happen because in tough financial condition in the country, the state tends to increase prices for utilities.

### 2.3.2. Empirical results for private companies

The model described above have shown that private companies are associated with higher prices. Therefore, it seems reasonable to check, whether private companies really have better infrastructure and the water of higher quality than public companies.

In order to do this another model will be built. The dependent variable is the binary variable *Private* and the independent variables are: *Leakage*, *Replacement* and *Lowquality*. The variable *Lowquality* describes the percentage of water samples that do not comply with sanitary rules and regulations. The lower the percentage is, the cleaner the water is.

The expected signs for all three factors are negative due to the assumption and research results, that private companies provide services of better quality. The probit model was used and its estimation results are presented below:

$$\begin{aligned} \mathbf{Private}_{it} = & \mathbf{21,92} - \mathbf{20,35Leakage}_{it} - \mathbf{25,89Replacement}_{it} \\ & - \mathbf{459,93Lowquality}_{it} \end{aligned}$$

All three factors in the model are statistically significant and the model overall is also statistically significant. The estimation result output from Stata is presented in Appendix 3.

According to the estimation results all three factors have the expected sign. Thus, there is difference in the share of leakages, network quality and water quality between public and private companies. Private companies do have lower leakage and replacement rates, and lower percentage of water samples that do not comply with sanitary rules and regulations according to the estimated model.

## Summary

This part of work is dedicated to the empirical study. Research methodology is presented, the process and peculiarities of sample formation were described. Twenty-one Russian water

supply companies from large cities located in European part of Russia were chosen for the study. After obtaining all the necessary data from companies' websites and Federal State Statistics Service, the regression analysis on panel data was conducted.

The obtained model is overall statistically significant with all the factors statistically significant as well, and it describes approximately 58% of Tariff variation, which is a rather high result. With the help of the estimated model, the conclusion on the hypotheses put in the study were done.

Hypothesis 1 is rejected and the result is that prices set by private companies, on average, are higher than prices set by public ones (the same result was in articles of [Chong E. et al., 2006, Martínez-Espiñeira R. et al., 2009]). The reason for this result is that the costs for implemented investment and innovation programs aiming at improving water supply quality influence the prices. The second model showed that private companies really have less water losses, better network and higher water quality.

Hypothesis 2 is accepted: the lower the quality of the network, the higher the price (the same result was found in the work of Martínez-Espiñeira R. et al., 2009). The reason for this result is that water losses and the price for the needed network repair are reflected in final tariffs set for consumers.

Hypothesis 3 is accepted: the higher the network density in the company, the lower the price [Martínez-Espiñeira R. et al., 2009]. The explanation for this result is that increasing the number of consumers for 1 kilometer of network can allow companies to take advantage of the economies of scale and, therefore, reduce their costs and prices [Chong E. et al., 2006; Ruester S. and Zschille M., 2010].

The table, summing the results of the model and comparing them with the expected ones is presented below (see Table 4).

*Table 4. Comparison of expected signs for factors and model results.*

Variable	Expected sign	Result
Private	-	+
LogConsumers	-	-
Length	-	-
Leakage	+	+
Replacement	+	+
LogIncome	+	+
Crisis	+	+

*Source: created by the author.*

## **2.4. Policy implications**

### **Recommendation 1. Increasing private companies' presence in the water industry.**

One of the findings of the work is that prices for cold water supply set by private companies are higher than the same prices set by municipal enterprises (by approximately 2 rubles per 1m<sup>3</sup>).

The research has also proved the fact that private companies have lower leak ratio, higher quality of water and higher network quality in the cities with their presence than the public companies. Therefore, the reason for increased prices can be the implementation of investment and innovation programs aiming at improving water supply and network quality, the costs for which are covered from the tariff.

Moreover, according to the assessment of Ministry of Construction of Russia and the Ministry of Economic Development 30% of all municipal unitary enterprises are officially admitted to be unprofitable and inefficient in their performance.

Summing up these two facts, widening of private companies' presence in the industry seems reasonable.

### **Recommendation 2. Finding incentive mechanisms for increasing the attraction of the water industry for private operators.**

It is necessary for the state to find incentive mechanisms for private companies to come to the industry or to expand the activity of already existing companies in the industry and work with the enterprises that were declared to be inefficient. The possible incentive mechanism from the government can be:

- Additional subsidizing of small cities, where it is difficult to attract large investors due to the absence of economy of scale.
- Stopping financing from the budget the unprofitable enterprises, to allow them to implement the plan of measures for increasing their performance (i.e. by bringing water quality in line with standards, improve infrastructure). In case they do not show any progress in improving their activity, such companies may be transferred to more perspective private companies, which have proved their efficiency in other cities by improved infrastructure, qualifies water supply and satisfied customers.

### **Recommendation 3. Tightening fines for non-payments.**

According to the legislation the fines for non-payments and late payments for utility services are rather low at the moment, which does not give motives for consumers to pay all the

rent for housing and communal services in time. However, the tariff is the main source of income for companies in the water industry, though it is sharply undervalued. Amending the current legislation, increasing the liability for non-payments and late payments for utility services and providing the possibility to charge fines from the first month of delay would decrease the level of debts and allow companies to better cover the costs for maintenance

#### **Recommendation 4. Federal targeted program development.**

Federal targeted program in the sphere of water supply and sanitation may serve as a mechanism for creating of an effective business environment and conditions for attracting private investment in the water supply and sanitation sector on the basis of a transparent system of state regulation. Moreover, the program may solve the problem of the insufficient information transparency and create a single information analytical base that will provide all the stakeholders with objective information on the state of the water sphere, including the financial and technical status of water sector organizations, the characteristics of water consumers and other useful indicators.

One of the significant objectives of the program may be co-financing of large, capital-intensive projects that cannot be covered by private investments fully and facilitating access of private operators to the borrowing market and reducing the cost of attracting funds.

Also, the program can stimulate the production of innovative equipment and development of technologies for water supply and sanitation systems. What is more, the opportunity on federal level to create a new model of citizens' behavior in terms of water consumption increasing the efficiency of water use and resource saving would favor and sustainable development of the country.

### **2.5. Research limitations**

This research is characterized by several limitations that could constrain the study. They are:

1. Absence of total transparency and full disclosure by the companies operating in the industry. The research could not be done for the whole country due to this reason and was limited to a part of the country in order to obtain more relevant results.
2. Absence of the unified database with the information on performance of companies in the water supply sector.
3. The list of variables for the model can be extended for future studies to cover other factors that can be associated with tariffs changes and private sector participation in the industry.



## Conclusion

The analysis of water industry in Russia revealed that main volume of production and provision of water supply and sanitation services in Russia is provided by municipal enterprises (86%). The infrastructure in water supply and sanitation in the country on average is characterized by a very high level of deterioration (about 40%), which leads also to large water losses (20%), so the overall quality of services of water supply and sanitation remains low. Moreover, 30% of all municipal unitary enterprises in the sphere of water supply were admitted to be inefficient and unprofitable by the assessment system established by the government.

In order to solve this problem, since 2000s the policy of attracting private companies to the water industry is being implemented, therefore the gradual increase in private companies' involvement takes place, but still the presence of private companies in the industry is very limited (14%).

Concerning the private sector participation in the water industry in the Russia Federation, the mostly used models here are: Lease, Concession and Privatization. As of 2017, there are 26 PPP contracts for managing water utilities. The most widely used type of contracts is lease and the duration of the contract – long-term. At the moment, the state aims at increasing the number of concession agreements in the sphere of water supply and sanitation.

The thesis is devoted to identifying the relation between type of the company in terms of ownership and prices for cold water supply. This goal was achieved. As a result, private companies are associated with higher tariffs for cold water supply. At the same time, it was proved that private companies do have less water losses, better network and higher water quality.

Moreover, it was revealed that the lower quality of the network and water losses lead to the higher price for water, as the companies strive to compensate these costs by consumers.

Also, the increase of network density may allow companies to take advantage of the economies of scale and, therefore, reduce their costs and prices.

On the basis of the industry and regulatory framework analysis and estimated regression analysis several policy implications were developed. They include:

- Increasing private companies' presence in the water industry.
- Finding incentive mechanisms for increasing the attraction of the water industry for private operators.
- Tightening fines for non-payments.
- Federal targeted program development.

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# Appendices

## Appendix 1

```
. sum tariff private concession lease consumers logconsumers length density leakage replacemen
> t lowquality logincome crisis
```

Variable	Obs	Mean	Std. Dev.	Min	Max
tariff	210	20.69151	8.117454	8.65	48.25
private	210	.5428571	.4993502	0	1
concession	210	.247619	.4326607	0	1
lease	210	.2952381	.4572397	0	1
consumers	210	1415484	2790597	81000	1.30e+07
logconsumers	210	13.37052	1.081385	11.3022	16.38046
length	210	1959.135	2727.148	187.14	12822
density	210	615.8513	326.6127	104.5539	1923.693
leakage	210	.2541324	.1366396	.015	.605
replacement	210	.5140525	.1827435	.0653981	.9223301
lowquality	190	.0044972	.0088502	0	.03474
logincome	210	10.38732	.2784266	9.7602	11.38071
crisis	210	.4	.4910686	0	1

Figure 5. Descriptive statistics.

Source: created by the author.

## Appendix 2

```
. xtreg tariff private leakage replacement density logincome crisis, re

Random-effects GLS regression              Number of obs   =       210
Group variable: comp                       Number of groups =        21

R-sq:  within = 0.5853                     Obs per group:  min =       10
        between = 0.4755                    avg           =      10.0
        overall = 0.4723                    max           =       10

Wald chi2(6)                               =      268.87
corr(u_i, X) = 0 (assumed)                  Prob > chi2     =      0.0000
```

tariff	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
private	1.556878	1.140379	1.37	0.172	-.6782244 3.791981
leakage	14.52143	2.638192	5.50	0.000	9.350666 19.69219
replacement	4.745125	1.484978	3.20	0.001	1.834621 7.655629
density	-.0044584	.0026594	-1.68	0.094	-.0096708 .0007541
logincome	6.997164	1.714471	4.08	0.000	3.636863 10.35746
crisis	2.617975	.4006387	6.53	0.000	1.832738 3.403212
_cons	-57.26651	18.08961	-3.17	0.002	-92.72149 -21.81153
sigma_u	5.2058589				
sigma_e	1.8997403				
rho	.88248078	(fraction of variance due to u_i)			

Figure 6. Random effects model estimation result.

Source: created by the author.



## Appendix 3

```

. xtprobit private leakage replacement lowquality, re nolog

Random-effects probit regression          Number of obs   =    190
Group variable: comp                     Number of groups =    19

Random effects u_i ~ Gaussian            Obs per group: min =    10
                                           avg =    10.0
                                           max =    10

Integration method: mvaghermite          Integration points =    12

Log likelihood = -18.364027               Wald chi2(3)     =    40.99
                                           Prob > chi2      =    0.0000

```

private	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
leakage	-20.34551	6.030073	-3.37	0.001	-32.16424	-8.526788
replacement	-25.89385	5.118919	-5.06	0.000	-35.92675	-15.86095
lowquality	-459.929	139.3164	-3.30	0.001	-732.9841	-186.874
_cons	21.91715	3.403406	6.44	0.000	15.24659	28.5877
/lnsig2u	5.831598	.6201847			4.616059	7.047138
sigma_u	18.46356	5.725409			10.05459	33.90522
rho	.9970752	.0018086			.9902052	.9991309

Likelihood-ratio test of rho=0: **chibar2(01) = 183.87** Prob >= chibar2 = **0.000**

*Figure 7. Probit-model estimation results.  
Source: created by the author.*