IMPORTANCE OF PPP IN WATER SUPPLY SECTOR IN DEVELOPING COUNTRIES: THE CASE OF GEORGIA

Rusudan Sulakadze
Ivane Javakhishvili Tbilisi State University, Tbilisi, Georgia

ABSTRACT

This article presents an empirical study on the effectiveness of Public-Private Partnerships (PPPs) in the water supply industry in Georgia. The study identifies vital and causal problems within the industry, including outdated infrastructure, lack of technical and financial resources in rural areas, absence of consolidated state policy, and insufficient state subsidies. Through a comprehensive assessment that considers economic, social, and environmental sustainability, as well as stakeholder perspectives, the study evaluates the relative importance of different PPP models. Findings indicate that the Build-Operate-Transfer (BOT) model is highly prioritized due to its reliance on private capital and the preservation of state control. The results contribute to evidence-based decision-making, enabling policymakers to design effective PPP frameworks that address the specific needs and characteristics of the water supply industry in Georgia.

Keywords: Public-Private Partnerships (PPT); Georgia; water supply; Public-Private Partnerships models; effectiveness; Build-Operate-Transfer (BOT) model

DOI: http://dx.doi.org/10.15549/jeecar.v10i5.1458

INTRODUCTION

Access to clean and reliable water is a pressing global concern, and Georgia is no exception. With a population of over 3.7 million people, the country faces significant challenges in ensuring a sustainable and efficient water supply system (Javakhadze, 2021). Even though it is believed that 2/3 of the population has access to clean drinking water, many cities are still characterized by the complete absence of a water supply system and management companies (Turner & Kekenadze, 2022). And such characteristic conditions as deteriorating water infrastructure, limited financial resources, and the need for technological advancements pose hurdles to delivering safe drinking water to all citizens and achieving the sustainable development goals by 2030 (UNICEF, 2023).

In its pursuit of aligning with international standards and fostering sustainable development, Georgia has set its sights on approximating the European Union (EU) directives concerning water quality and resource management, including the marine environment. 2016 the EU-Georgia Association Agreement (European Union, 2023a) entered into force. Georgia undertook to bring its national water management legislation in line with European standards by 2026 (European Parliament, 2000). Georgia also launched a new EU program, "EU for the Environment – Water and Environmental Data" (European Union, 2023b).

In Georgia, the water sector has witnessed

remarkable progress in recent times and around 83% of Georgia's urban population had access to improved water sources. However, this figure drops to only 48% in rural areas, highlighting the disparities that exist within the country (OECD, 2018). Additionally, while improvements have been made, the aging infrastructure and inadequate service delivery in some regions continue to hamper progress. In the country the lack of modern and sufficient treatment facilities poses a significant challenge, with only 26% of wastewater currently being treated (OECD, 2018).

The inadequate treatment of wastewater in Georgia poses a threat to water resources and public health. Pollutants and contaminants present in untreated wastewater can seep into rivers, lakes, and groundwater, compromising their quality and posing risks to ecosystems and human well-being. Moreover, the insufficient treatment capacity limits Georgia's ability to meet the demands of a growing population and address the environmental challenges associated with urbanization and industrialization. This shortfall not only jeopardizes water quality but also hampers the country's efforts to meet international standards and align with best practices in wastewater management. To address this critical issue, Georgia recognizes the potential of Public-Private Partnerships (PPPs) as a transformative model to enhance wastewater treatment infrastructure and bridge the gap towards sustainable development (Javakhadze, 2021).

Many countries have sought the involvement of the private sector to upgrade and develop their water and sanitation infrastructure and improve the efficiency of water systems. PPP s are successfully introduced and implemented in the water supply sector. In the example of “UWSCG,” it is necessary to improve the level and quality of service; achieve financial sustainability of the company; reduce unaccounted water volume; increase the productivity of personnel; Share knowledge, and develop skills that will facilitate the introduction of new technologies (United Water Supply Company of Georgia, 2021).

Recognizing the need for innovative solutions, the Georgian government has taken proactive measures to promote PPPs in the water sector. In 2017, the Law on Public-Private Partnerships was adopted, providing a comprehensive legal framework for facilitating partnerships between the public and private sectors (Legislative Herald of Georgia, 2018). This legislation aimed to attract private investment, harness expertise, and improve service quality and infrastructure development in the water supply industry.

Since the introduction of the PPP framework, Georgia has witnessed a notable shift in the trend of water supply management. The government, in collaboration with private entities, has embarked on ambitious projects to modernize and expand the water infrastructure. For instance, the construction of water treatment plants, rehabilitation of distribution networks, and implementation of advanced monitoring systems have been initiated to enhance efficiency, reduce water loss, and ensure the provision of clean water to underserved areas according to the strategy "Economy-2030" (European Union, 2022).

These efforts reflect a growing recognition of the potential of PPPs to bring about transformative change in the water supply industry. By leveraging the expertise, resources, and innovative approaches of both the public and private sectors, Georgia aims to tackle the existing challenges and achieve sustainable development goals related to water access, quality, and infrastructure (Javakhadze, 2021).

Investing in PPPs for wastewater treatment not only addresses the infrastructure deficit but also brings about numerous benefits. Private sector participation can mobilize additional financial resources, improve operational efficiency, and foster innovation in treatment technologies (Devidze, 2020). Furthermore, PPPs can ensure long-term sustainability by incorporating performance-based contracts, stringent monitoring mechanisms, and comprehensive maintenance and operation plans (Javakhadze, 2021).

Public-Private Partnerships (PPPs) have gained prominence as a model to address the challenges in the water supply industry in Georgia (Delmon, 2023). However, it is essential to critically assess the effectiveness of existing PPPs in order to identify their limitations and refine the approach for optimal outcomes. Performance evaluation is a critical component of PPP models in the water supply sector. By assessing various performance indicators and employing appropriate methodologies, stakeholders can gain insights into the effectiveness and impacts of PPP projects. The article aims to conduct an

econometric analysis to substantiate the most effective PPP model, taking into account the current state and development potential of the water supply industry in Georgia. By examining the data, evaluating the performance of existing PPPs, and considering relevant factors such as infrastructure, financing, and governance, we seek to inform policymakers, stakeholders, and investors about the best approach to enhance water supply services and ensure sustainable development.

LITERATURE REVIEW

The water supply is a crucial industry because access to water and sanitation ensures a quality of life. Such scholars as Tang, Liu and Zhang (2021), Li et al. (2020) have highlighted the benefits of PPP models in the water supply industry. These benefits include increased efficiency in service delivery, improved infrastructure quality, access to private sector expertise and technology, financial sustainability, risk-sharing between public and private partners, and enhanced accountability. PPPs enable the mobilization of private investment, innovative approaches to infrastructure development, and the integration of long-term operation and maintenance plans. Given the particular importance of the industry for the population, some notable entities actively research this field for developing countries. The World Bank Group identifies best practices, assesses the impact of PPPs, and guides policy and regulatory frameworks. Justifying that the factor for the effectiveness of PPPs in the water supply industry of developing countries is the commitment of the government to reform the industry (World Bank Group, 2014). United Nations Development Programme (UNDP) assesses the socio-economic benefits, environmental sustainability, and capacity building to implement PPPs successfully. International Water Association (IWA) researches various aspects of water supply, including PPPs, and provides platforms for knowledge sharing and collaboration among experts in the field. International Finance Corporation (IFC) investigates risk management and private sector participation in developing countries (Javakhadze, 2021; International Finance Corporation, 2023). They identify several crucial challenges and risks associated with PPPs in the water supply industry in developing countries. These include complex contractual arrangements, risk allocation, regulatory frameworks, affordability, and equity concerns, potential conflicts of interest, and political and public acceptance (Javakhadze, 2021). The same result was obtained by Tang, Liu and Zhang (2021), Nizkorodov (2021).

Numerous studies explore various PPP models employed in the water supply sector. These include: Concession Contracts (involve granting a private entity the right to operate and manage a water supply system for a specified period), Build-Operate-Transfer (BOT) (involves private entities designing, financing, constructing, operating, and eventually transferring a water supply facility to the government after a specified period), Design-Build-Operate (DBO) (private entities are responsible for the design, construction, and operation of a water supply system), Management Contracts (involve outsourcing the management and operation of a water supply system to a private company) and Hybrid Models (combine elements of different PPP models to suit specific contexts and objectives) (Asian Development Bank, 2022). Each model has its characteristics, benefits, and challenges, which must be considered when selecting the most appropriate model for a particular context. The literature identifies several factors influencing the successful implementation of PPP models in the water supply industry. These factors include clear project objectives, practical risk assessment and management, stakeholder engagement and public participation, capacity building and regulatory frameworks, financial viability, and governance mechanisms (Javakhadze, 2021; Tang, Liu & Zhang, 2021). Understanding these factors and their interdependencies is essential for maximizing the benefits of PPPs and ensuring long-term sustainability. Additionally, legal frameworks and regulatory mechanisms need to be in place to ensure transparency, accountability, and the protection of public interests in PPP projects (Javakhadze, 2021). Research indicates that well-designed and properly implemented PPP models can improve the water supply sector's service quality, operational efficiency, infrastructure development, and financial sustainability.

It should be noted that the factors, efficiency, and design of PPPs in developed and developing countries significantly differ. Highlighted PPP

projects in developing countries may involve larger-scale infrastructure development or expansion compared to developed countries. Also, developing countries focus on building basic water supply systems, while developed countries may prioritize upgrading and modernizing existing infrastructure (Leigland, 2018).

Wang et al. (2019) analyzed the experience using the PPPs in water supply and concluded the differences in financing options in developed and developing countries. Most of PPP designs in developing countries include innovative financing mechanisms, such as concessional loans, blended finance, or subsidies, to ensure the financial viability of projects. In contrast, developed countries have more developed financial markets and easier access to capital, allowing for a greater emphasis on market-driven financing models (Sahiti et al., 2022).

Scholars Darko et al. (2023) focused on the legal framework of the PPP. Developing countries must establish or strengthen regulatory frameworks to attract private sector participation and protect public interests. This may involve creating clear rules and procedures for project selection, tendering, contract management, and dispute resolution. Developed countries have enought established regulatory frameworks and institutional capacity, enabling a more streamlined PPP process.

Surachman, Perwitasari and Suhendra (2022) attached the importance of stakeholder engagement and capacity to the success of PPP projects. Developing countries must invest more in stakeholder engagement processes, including public consultations, to ensure transparency, address community concerns, and build public trust. Additionally, capacity-building efforts may be necessary to enhance the capabilities of local government agencies and institutions responsible for PPP implementation. In developed countries, stakeholders and institutions have greater familiarity and experience with PPP processes, leading to more streamlined stakeholder engagement and capacity-building efforts.

Digitalization of the economy provoked the importance of such a factor as technology and Innovation (Martínez et al., 2022). Technological advancement and Innovation levels can vary between developing and developed countries. PPP designs in developed countries are based on advanced technologies, digital systems, and intelligent infrastructure to improve efficiency, sustainability, and service delivery. In contrast, developing countries focus on introducing appropriate and affordable technologies that address their specific water supply challenges, considering factors such as affordability, availability of resources, and local conditions.

Therefore, it can be stated that the level of economic development dictates the possibility of using one or another PPPs model in the water supply.

Indeed, selecting a specific Public-Private Partnership model in the water supply sector depends on the problems and challenges being addressed. The crucial fitches to using the PPP in water supply in the developing country last decade became a better understanding of PPPs advantages and how it could be used more efficiently (Delmon, 2023).

Because the water supply sector in developed countries is characterized by well-established industry infrastructure, scholars have many debatable issues regarding setting up practical and appropriate PPP models in emerging market countries (Surachman, Perwitasari & Suhendra, 2022).

Since inadequate PPPs model in the water supply can cause several dangerous risks for society: environmental (pollution, etc.) and economic costs (drop up GPD, etc.), social losses (mortality, etc.) (Javakhadze, 2021; Lima, Brochado & Marques, 2021). Each country's specific context, institutional capacity, and project requirements will influence the design of PPPs in the water supply sector.

Nowadays, the development of PPPs in water supply has become very country-specific and needs to be scientifically studied in each case. In this study, we will determine the critical destructive factors of Georgia's current development water supply and use the econometric approach to prove appropriate and the most effective PPPs model for the industry.

METHODOLOGY

The study involved assessing the current challenges and long-term opportunities for developing the water supply industry in Georgia through the introduction of PPP models. The questionnaire method was used to obtain estimates.

For a comprehensive study of the water supply sector development in Georgia, an expert group has been formed consisting of (Table 1):

- workers of housing and communal services (fitters, engineers, process engineers), whose task was to assess the technical characteristics of the water supply system in Georgia: the availability and suitability of fixed assets, the term of operation, capacity;
- employees of the National Center for Disease Control and Public Health - to assess the physical, chemical, and microbiological parameters of water, its suitability for industrial and domestic use;
- environmentalists - to assess damage to the environment from water production, water supply, and sanitation;
- economists of housing and communal services (HCS), external auditors - to assess the economic efficiency of the water supply industry, its financial stability, and solvency;
- potential private investors - to assess the investment attractiveness in the industry;
- representatives of local governments - to assess the feasibility and prospects of PPP in terms of achieving state goals in the field of water supply, social policy, and national security;
- population of Georgia (consumers of industry services) - to assess the degree of satisfaction with water quality, infrastructure, and quality of wastewater treatment.

Table 1: Composition of the Expert Group to Assess Current Challenges and Long-Term Opportunities for the Development of the Water Supply in Georgia

Respondents	Number, pers.	Stakeholders
Staff housing and communal services	195	State
National Center for Disease Control and Public Health staff	172	Society
Ecologists	164	Society
Economists of housing and communal services	168	State
External auditors	101	State
Potential private investors	395	Private business
Local authorities	181	State
Population	337	Society
Total number of respondents	1713	State, society, private business

The expert group formed in this way requires the representativeness of the survey results due to:

- sufficient size (Taherdoost, 2017) of the sample;
- competence (all experiments assessed the direction in which they worked for at least five years);
- identifying the identity of the identified party (experts are representatives of all identified parties: crime, private business, society);
- the general assessment of the scope of development everywhere (economic, social, and environmental efficiency was assessed);
- diversity (all detection categories are found in all regions of Georgia).

The survey was voluntary and anonymous, ensuring the grades' objectivity. The coefficient of variation was used to assess the consistency of expert opinions. At the same time, the level of consistency of each category of experts was assessed separately, except for housing and communal services economists and external auditors, who evaluated one area and represented one interested party (the state). Potential private investors also assessed economic efficiency, but from the standpoint of the possibility of obtaining benefits for themselves, so the degree of consistency was assessed autonomously for this category of experts. The calculated coefficients of variation did not exceed 5%, indicating expert opinions' consistency.

Different regions of Georgia were characterized by further development of the

water supply, so the purpose of the survey was to assess the problems of the industry and the prospects for PPP in general, without reference to the region of residence. When processing data and forming conclusions, the t-test was used. This criterion became possible due to the normal distribution of the obtained estimates. The results showed the absence of statistically significant differences in the grades given, depending on the regions represented by the respondents.

The survey was conducted during January-March and July-September 2022, January-March 2023, in person and remotely (via e-mails). The survey was conducted in two stages:

1. Generation by members of the expert group to determine current problems and opportunities for the development of the water supply industry in Georgia, their assessment by experts on a 7-point Likert scale, where "1" is the least significant problem/opportunity being assessed, and "7" is the highest significance. Based on the estimates obtained using the t-criterion, a group to determine priority problems and opportunities for industry development was identified (statistically significant at p=0.05). Causal relationships were identified between priority problems and opportunities, for which the survey results were also used for 2022 and the Granger causality test in the EViews 10 program. This test was made possible due to the data stationarity.

2. Using the graph method, the fundamental problems of the industry development that satisfy equation (1) were determined based on the identified cause-and-effect relationships (Kühn et al., 2017). These problems are fundamental and give rise to others. At the second iteration, the problems that formed the 1st level of the hierarchy were excluded, and the satisfaction of equation (1) was re-checked. The iterations continued until all the problems were categorized into hierarchy levels. When constructing the graph, causal relationships are reflected, with statistical significance - 0.05. Such links between PPP opportunities have not been established. Therefore, when determining an effective PPP model, all possibilities were considered.

$$[S(z_i) \cap P(z_i)] = [P(z_i)] \quad (1)$$

where $S(z_i)$ –industry problems caused by the i-th problem;

$P(z_i)$ – industry problems that cause the i-th problem.

3. It assessed the PPP models' effectiveness in solving industry problems and providing development. Using a 7-point Likert scale, experts assessed the potential of PPP models to address the underlying industry challenges and development opportunities identified in Stage 1. According to the problem-oriented approach (Liu & Xiong, 2021), The development of the economic system is possible first of all by solving problems, then by using opportunities. Based on this theory, using the method of analysis of hierarchies (Kudláč, Štefancová & Majerčák, 2017), an effective PPP model in the short term (providing a solution to current problems) and an effective model in the long term (ensuring the development) (formulas 2-3).

$$GP = \begin{vmatrix} wp_{11} & wp_{12} & \dots & wp_{1j} \\ wp_{21} & wp_{22} & \dots & wp_{2j} \\ \dots & \dots & \dots & \dots \\ wp_{i1} & wp_{i2} & \dots & wp_{ij} \end{vmatrix} \times \begin{vmatrix} ws_1 \\ ws_2 \\ \dots \\ ws_j \end{vmatrix}, \quad (2)$$

$$GM = \begin{vmatrix} wm_{11} & wm_{12} & \dots & wm_{1i} \\ wm_{21} & wm_{22} & \dots & wm_{2i} \\ \dots & \dots & \dots & \dots \\ wm_{k1} & wm_{k2} & \dots & wm_{ki} \end{vmatrix} \times |GP|, \quad (3)$$

where GP – global priority of problems/opportunities of the industry, taking into account the significance and opinions of stakeholders;

GM – global priority of PPP models, taking into account the priority of problems/opportunities and the significance of models for solving problems or create opportunities;

wp_{ij} – relative priority of the i-th problem/opportunity according to the j-th stakeholder group. $wp_{ij} = p_{ij} / \sum_{i=1}^{n} p_{ij}$, n – number of problems/opportunities, p is the average score for the j-th stakeholder group of the i-th problem/opportunity, $p = [1; 7]$;

ws_j - relative priority of the opinions of the j-th group of stakeholders ($ws_j=1/l$, where l – number of stakeholder groups);

wm_{ki} - relative priority of the k-th PPP model to solving the i-th problem/opportunity.

$\mathrm{wm}_{ki} = \mathrm{m}_{ki}/\sum_{k=1}^{r} \mathrm{m}_{ki}$, r – number of PPP models, m – the average score of the significance of the k-th PPP model for solving the i-th problem/opportunity, $m = [1; 7]$.

The application of the hierarchy analysis method made it possible to determine effective PPP models based on the balance of benefits of stakeholders: the private sector, the state, and society.

The research methodology is shown in Fig. 1.

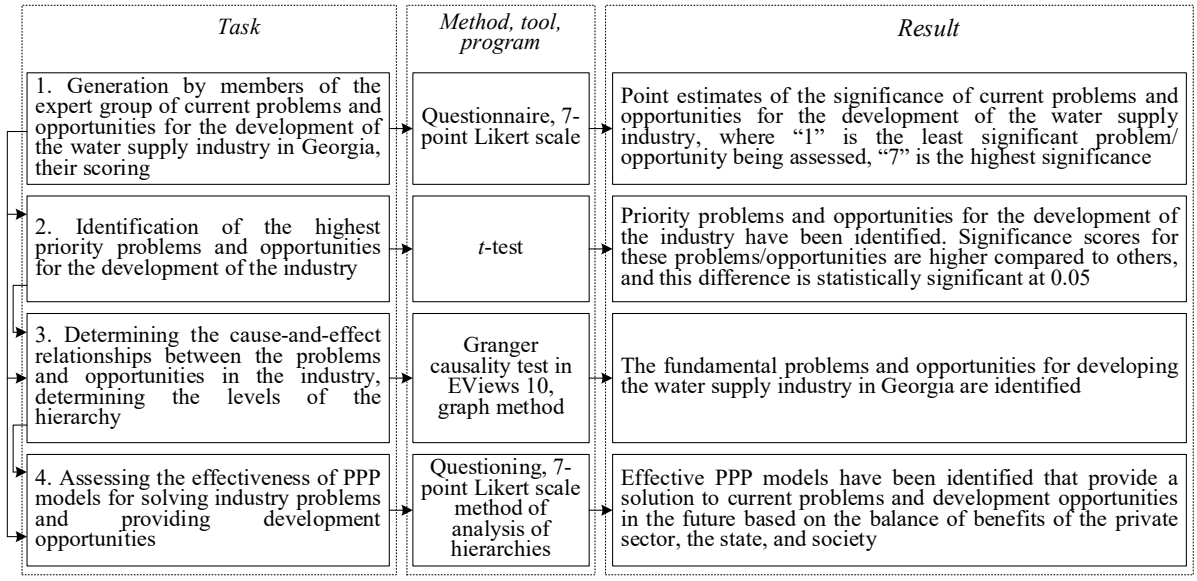


Figure 1: Methodology for determining an effective PPP model in the water sector in Georgia

Among the PPP models studied were Concession Contracts, Management Contracts, Build-Operate-Transfer (BOT), and Design-Build-Operate (DBO), the most common in the literature and used in the water supply industry in Georgia (Asian Development Bank, 2022).

RESULTS

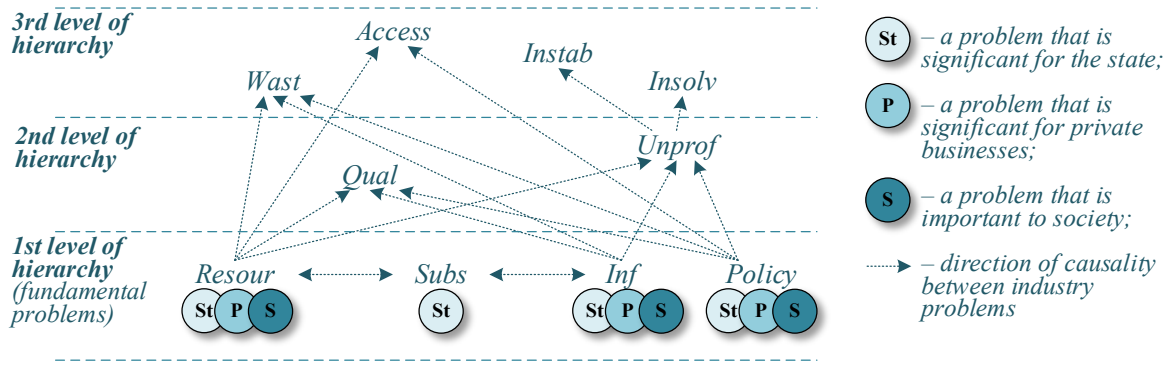
According to the results of the survey, it was determined that the current priority problems of the water supply in Georgia are:

- uneven access to clean drinking water by region (primarily in rural areas) due to different levels of natural resource endowment and lack of technical and financial resources of the industry in rural areas. According to WHO and UNICEF, 1/3 of the population of Georgia does not have access to clean drinking water, which is the highest indicator in the region (Turner & Kekenadze, 2022);
- outdated infrastructure. Old and worn-out water supply systems (Javakhadze, 2021) lead to leaks, losses, and malfunctions, which negatively affect the quality of drinking water, wastewater treatment, and the reliability of the water supply system;
- inefficient state policy in the water supply and sanitation sector: the lack of a consolidated state policy for sectoral planning, development, and monitoring, which adversely affects the quality of water, the quality of wastewater treatment, leads to the loss of the industry, its financial instability, and insolvency. Ineffective state policy also hinders the development of PPPs as a result of the risk of losing state control over tariffs in the industry, losing property rights over strategic facilities;
- the need to improve the quality of wastewater treatment. Among the sustainable development goals (Sustainable Development Report, 2023), Georgia has the

lowest indicators of ecosystem development and combating climate change. The negative dynamics of implementing these sustainable development goals aggravate the situation. The problem makes a destructive contribution to their implementation of wastewater treatment as a result of the physical and obsolescence of fixed assets of the industry;

- the financial instability of the industry, unprofitability, and problems with solvency, which are problems for the state and reduce investment attractiveness for private business (Ismawati, Neskorodieva & Pustovhar, 2023);
- shortage of financial and technical resources of the industry, unprofitability, financial instability, and impaired solvency necessitate state subsidies to the industry, which is a problem for the state, especially in the context of the restore the economy after the humanitarian crisis caused by the COVID-19 pandemic.

The hierarchy of current problems in the water supply in Georgia was defined by formula (1), and their significance for stakeholders is shown in Fig. 2.



Access - uneven access to water by region; *Wast* - the need to improve the quality of wastewater treatment ; *Instab* - the financial instability of companies engaged in water supply; *Insolv* - problems with the solvency of companies in the industry; *Qual* - the need to improve water quality; *Unprof* - unprofitable companies in the industry; *Resour* - lack of technical and financial resources of the industry in rural areas; *Subs* - the need for state subsidies for the industry; *Inf* - the outdated infrastructure of the water supply and sanitation system; *Policy* - lack of a consolidated state policy for sectoral planning, development, monitoring

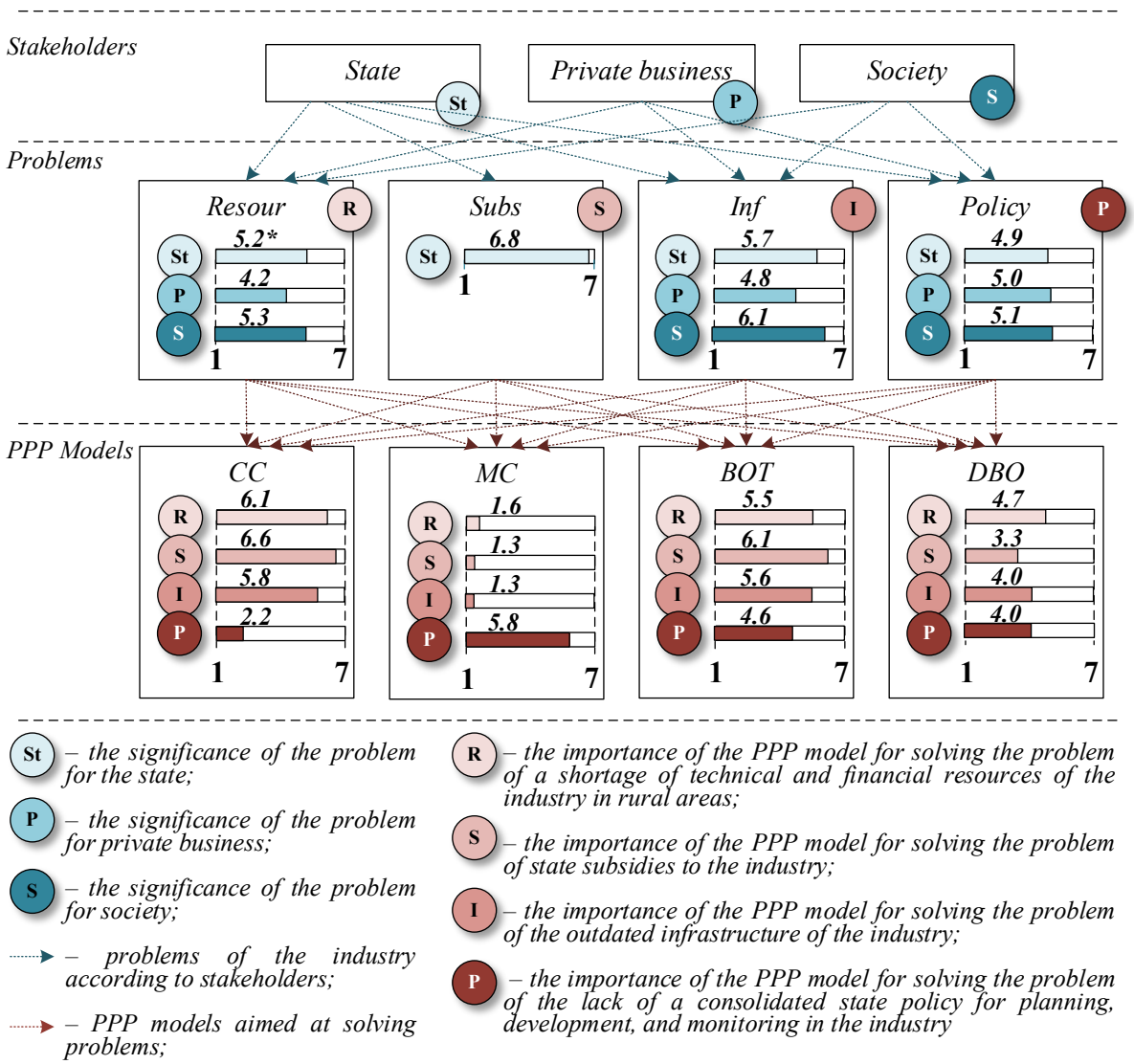
Figure 2: Hierarchy of current problems in the water supply in Georgia and their significance for stakeholders

For the state, the main problem is the need for state subsidies for the industry, rated at an average of 6.8 points for 2023 out of 7 maximum. Other problems were rated in the 4.9-5.7 points (Fig. 3).

Among the problems of the water supply industry, private businesses singled out the lack of a consolidated state policy for sectoral planning, development, and monitoring (5 points). The lack of a consolidated policy leads to disagreements and conflicts, hinders practical cooperation between the state and private business, and creates uncertainty for the private sector in the industry's long-term prospects. The problem of outdated infrastructure was rated at 4.8 points, and the industry's lack of technical and financial resources in rural areas - at 4.2 points. Outdated and underdeveloped infrastructure, insufficient government funding requires businesses to make significant capital investments and a more extended period to implement PPP projects.

For society, the main problems are outdated infrastructure (6.1 points), lack of technical and financial resources for the industry in rural areas (5.3 points), and lack of a consolidated state policy for sectoral planning, development, and monitoring (5.1 points). These problems lead to poor water quality, limited access to it, poor

quality of wastewater treatment, and uncontrolled growth of water tariffs.



* - ehe average for 2023 scoring of the significance of industry problems, set on a 7-point Likert scale; *Resour* - shortage of technical and financial resources of the industry in rural areas; *Subs* - the need for state subsidies for the industry; *Inf* - the outdated infrastructure of the water supply and sanitation system; *Policy* - lack of a consolidated state policy for sectoral planning, development, and monitoring; *CC* - concession contracts; *MC* - management contracts; *BOT* - build-operate-transfer; *DBO* - design-build-operate

Figure 3: Priority of PPP models in the water supply in Georgia

To determine an effective PPP model, according to formula (3), the global priority is calculated by taking into account the assessments of the current problems of each stakeholder. This study does not prioritize any stakeholders to achieve a balance of interests. To determine an effective PPP model in the future, average assessments of problems for all stakeholders were taken. The application of the Granger test did not allow us to determine the presence of statistically significant causal relationships between the possibilities of PPP; therefore, in the future, all possibilities were evaluated (without dividing them into basic and resulting ones).

The distribution of the priority of PPP models, depending on how much a particular model contributes to implementing these opportunities, was given in Table. 2.

Table 2: Priority of PPP Models for Prospective Development of the Water Supply in Georgia

	In	*Opt*	*Risk*	*Ec.dev*	*Proj*	*Sust*	*Plan*	*Cons*	*Budg*
Point assessment of the significance of models for PPP opportunities, points									
CC	5.7	4.5	1.3	5.5	6.7	4.1	4.4	5.6	6.3
MC	2.4	4.6	3.6	4.2	4.1	3.8	4.8	4.9	3.1
BOT	5.1	4.2	4	5.2	6.2	5.3	4.2	6	6
DBO	4.8	4.2	4.1	4.6	5.8	5	4	5.5	4.9
Relative priority of models for the PPP opportunities, %									
	In	*Opt*	*Risk*	*Ec.dev*	*Proj*	*Sust*	*Plan*	*Cons*	*Budg*
CC	31.7%	25.7%	10.0%	28.2%	29.4%	22.5%	25.3%	25.5%	31.0%
MC	13.3%	26.3%	27.7%	21.5%	18.0%	20.9%	27.6%	22.3%	15.3%
BOT	28.3%	24.0%	30.8%	26.7%	27.2%	29.1%	24.1%	27.3%	29.6%
DBO	26.7%	24.0%	31.5%	23.6%	25.4%	27.5%	23.0%	25.0%	24.1%

Notes: *In* - introduction of innovations and know-how at the micro, meso, and macro levels; *Opt* - optimization of business processes in the industry; *Risk* - reduction of risks associated with the implementation of projects; *Ec.dev* - stimulation of economic development in the country; *Proj* - implementation of large-scale infrastructure projects in the industry; *Sust* - sustainable operation of water supply systems; *Plan* - strengthening the capacity of companies in the field of strategic and operational planning; *Cons* - increasing consumer satisfaction with water quality and water supply and sanitation services; *Budg* - reduction of the budget deficit; *CC* - concession contracts model; *MC* - management contracts; *BOT* - build-operate-transfer; *DBO* - design-build-operate

DISCUSSION AND CONCLUSION

Based on the conducted empirical study, several vital and causal problems have been identified in the development of the water supply industry in Georgia. These include:

- outdated infrastructure: aging and deteriorating infrastructure can lead to water loss, inefficiencies, and service disruptions);
- lack of technical and financial resources in rural areas: this issue requires targeted investments, capacity building, and tailored solutions for rural water supply;
- lack of consolidated state policy for sectoral planning and development: can lead to fragmented efforts, inconsistent regulations, and limited coordination among stakeholders;
- monitoring and evaluation deficiencies: strengthening monitoring and evaluation practices can enhance transparency, accountability, and evidence-based decision-making;
- insufficient state subsidies: can hinder investments in infrastructure development, particularly in underserved areas and for vulnerable populations and increased state subsidies can incentivize private sector participation, promote affordability, and facilitate universal access to clean and safe water.

The results of an expert assessment of the priority of PPP models showed that to solve problems caused by a lack of public funding, unsuitability of fixed assets, and underdeveloped infrastructure, the Concession Contracts model is more effective. This model transfers the right to develop, finance, build, operate, maintain infrastructure, and provide services to private businesses. The possibility of solving the problem of the shortage of technical and financial resources of the industry in the implementation of this model was assessed at 6.1 points out of 7 maximum possible, the

problem of the need for state subsidies - at 6.6 points, and outdated infrastructure - at 5.8 points. Such projects do not need government funding. But the model is accompanied by the risk of losing state control over critical infrastructure facilities over tariff restrictions on public utilities.

The problem of the absence of a consolidated state policy for sectoral planning, development, and monitoring is minimized with the Management Contracts model, according to which the state hires a private company to manage the existing infrastructure. The private company is responsible for effective management, quality improvement, and operational activities. The right of ownership and the right to regulate tariffs remain with the state.

The most effective PPP model for solving the industry's current problems is Build-Operate-Transfer (relative priority 31.2%). The priority of Concession Contracts is estimated at 28.6%, Design-Build-Operate - at 24.2%. The least effective is the Management Contracts model (relative priority 16%), which does not solve the problems of the need to raise capital for the modernization and expansion of infrastructure.

Among the main most essential opportunities for the implementation of PPP projects:

- stimulation of economic development in the country (rated by experts as 7 points). Achieving economic development is possible by attracting investments for the implementation of expensive projects, increasing the competitiveness of the industry, creating new jobs, paying taxes to the budget;
- increasing consumer satisfaction with water quality and water supply and sanitation services (7 points) by attracting funds for the modernization and development of infrastructure and innovative water purification technologies. This will make it possible to upgrade and improve water treatment, supply, and distribution systems, expand consumer access to water supply and sanitation services;
- the introduction of innovations and know-how at the micro, meso, and macro levels (6.3 points) is possible due to additional funding from private businesses. Under PPP, the state can take advantage of access to innovations developed and implemented by private companies. This allows you to use the best practices and technologies in the industry;
- implementing large-scale infrastructure projects in the industry (6.3 points) involves using private capital to implement expensive projects that the state cannot finance. When implementing large-scale PPP projects (worth more than 100 million US dollars), the project costs are about 1-3% of the total project cost. When implementing smaller projects - 3-4% (Javakhadze, 2021);
- reduction of the budget deficit (6.1 points). Achieved by reducing government spending and funding projects (total or partial) at the expense of private companies. Perhaps through the growth of the revenue side due to tax revenues from the implementation of PPP projects;
- sustainable operation of water supply systems (4.8 points). Modernization and renewal of infrastructure through private sector investment contributes to better drinking water treatment and sanitation, wastewater treatment;
- reduction of risks associated with the implementation of projects (4.7 points) due to the distribution of risks between the state and private businesses;
- optimization of business processes in the industry (4.3 points). PPP introduces innovative management methods, technologies, and effective monitoring systems, which contribute to improving water supply quality and business entities' economic efficiency.
- strengthening the potential of companies in strategic and operational planning (4.2 points). The participation of private businesses in projects increases the efficiency of company management and strategic and operational planning for a more rational use of companies' financial, material, and labor resources.

The study findings indicate that the Build-Operate-Transfer (BOT) model is deemed effective for the long-term and short-term development of the water supply industry, with a relative importance of 27.5%. This model is considered a high priority due to its reliance on private capital for financing, providing opportunities for state control while

safeguarding against the loss of control over the strategically important water supply sector.

Compared to other PPP models, the study suggests that concession contracts (26.1%), design-build-operate (25.6%), and management contracts (20.8%) have relatively lower priority in addressing the problems of the water supply industry. These findings are valuable as they provide a deeper understanding of the industry's challenges and prospects for implementing PPP projects. The assessment considers not only the economic aspects but also the social and environmental sustainability of the industry, taking into account the perspectives of various stakeholders, including the state, private businesses, and society.

By incorporating stakeholder views and considering the broader implications of PPP projects, the study contributes to a more comprehensive understanding of the potential benefits and limitations of different PPP models. This holistic approach enables policymakers and stakeholders to make informed decisions and design effective PPP frameworks that align with the specific needs and characteristics of the water supply industry in Georgia.

It is worth noting that these findings provide specific insights for the context of the water supply industry in Georgia and may not be directly applicable to other regions. However, they contribute to the existing body of knowledge and can guide future discussions and decision-making processes related to PPP project implementation in the water supply sector.

REFERENCES

Asian Development Bank. (2022). *A Governance Approach to Urban Water Public–Private Partnerships*. https://goo.su/9doNV6

Darko, D., Zhu, D., Quayson, M., Hossin, M.A., Omoruyi, O., & Bediako, A.K. (2023). A multicriteria decision framework for governance of PPP projects towards sustainable development. *Socio-Economic Planning Sciences, 87*, Part B, 101580. https://doi.org/10.1016/j.seps.2023.101580

Delmon, V. (2023). 5 Trends in Public-Private Partnerships in Water Supply and Sanitation. The World Bank Group. https://goo.su/IlUpk

Devidze, N. (2020). *Public–Private Partnerships in Georgia and Impact Assessment of Infrastructure*. Asian Development Bank Institute. https://www.adb.org/sites/default/files/publication/623256/adbi-wp1162.pdf

European Parliament. (2000). Directive 2000/60/EC of the European Parliament and of the Council. Establishing a framework for Community action in the field of water policy. https://goo.su/XIsLgo

European Union. (2022). *Final NDC Financing Strategy and Investment Plan*. https://goo.su/dUrik

European Union. (2023a). The European Union and Georgia. https://www.eeas.europa.eu/georgia/european-union-and-georgia_en?s=221

European Union. (2023b). EU4Environment – Water Resources and Environmental Data. https://eu4georgia.eu/projects/eu-project-page/?id=1719

International Finance Corporation. (2023). https://goo.su/7VTHl3

Ismawati, L., Neskorodieva, I., & Pustovhar, S. (2023). Influence of economic factors on the share's value through the concepts of the life cycle: The case of Indonesia. *Journal of Eastern European and Central Asian Research (JEECAR), 10*(1), 114-124. https://doi.org/10.15549/jeecar.v10i1.1049

Javakhadze, N. (2021). *Recommendations to Support Public-Private Partnerships at the Local Level*. UNDP. https://goo.su/19duB1M

Kudláč, Š., Štefancová, V., & Majerčák, J. (2017). Using the Saaty Method and the FMEA Method for Evaluation of Constraints in Logistics Chain. *Procedia Engineering*, *187*, 749-755.

Kühn, D., Osthus, D., Townsend, T., & Zhao, Yi. (2017). On the structure of oriented graphs and digraphs with forbidden tournaments or cycles. *Journal of Combinatorial Theory*, *124*, 88-127

Legislative Herald of Georgia. (2018). On public-private partnerships. Law of Georgia No 2273-IIს. https://faolex.fao.org/docs/pdf/geo181474ENG.pdf

Leigland, J. (2018). Public-Private Partnerships in Developing Countries: The Emerging Evidence-based Critique. *The World Bank*

Research Observer, *33*, 1, 103–134. https://doi.org/10.1093/wbro/lkx008

Li, H., Lv, L., Zuo, J., Bartsch, K., Wang, L., & Xia, Q. (2020). Determinants of public satisfaction with an Urban Water environment treatment PPP project in Xuchang, China. *Sustainable Cities and Society, 60*, 102244. https://doi.org/10.1016/j.scs.2020.102244

Lima, S., Brochado, A., & Marques, R. C. (2021). Public-private partnerships in the water sector: A review. *Utilities Policy, 69*, 101182. https://doi.org/10.1016/j.jup.2021.101182

Liu, S., & Xiong, X. (2021). Problem-oriented approach to political economy. *China Economic Review, 69*, 101674. https://doi.org/10.1016/j.chieco.2021.101674

Martínez, J., Puertas, R., Martín, J., & Ribeiro-Soriano, D. (2022). Digitalization, innovation and environmental policies aimed at achieving sustainable production. *Sustainable Production and Consumption, 32*, 92-100. https://doi.org/10.1016/j.spc.2022.03.035

Nizkorodov, E. (2021). Evaluating risk allocation and project impacts of sustainability-oriented water public–private partnerships in Southern California: A comparative case analysis. *World Development, 140*, 105232. https://doi.org/10.1016/j.worlddev.2020.105232

OECD. (2018). *Facilitating the Reform of Economic Instruments for Water Management in Georgia*. https://goo.su/YIgoT

Sahiti, A., Alshiqi, S., Neskorodieva, I., Sahiti, A., & Bekteshi, X. (2022). Managing Credit Risk Strategies for Commercial Banks: The Case of Kosovo. *Journal of Eastern European and Central Asian Research (JEECAR)*, *9*(2), 309-318. https://doi.org/10.15549/jeecar.v9i2.847

Surachman, E.N., Perwitasari, S.W., & Suhendra, M. (2022). Stakeholder management mapping to improve public-private partnership success in emerging country water projects: Indonesia's experience. *Utilities Policy, 78*, 101411. https://doi.org/10.1016/j.jup.2022.101411

Sustainable Development Report. (2023). https://dashboards.sdgindex.org/rankings

Taherdoost, H. (2017). Determining Sample Size; How to Calculate Survey Sample Size. *International Journal of Economics and Management Systems*, *2*, 237-239

Tang, Y., Liu, M., & Zhang, B. (2021). Can public-private partnerships (PPPs) improve the environmental performance of urban sewage treatment? *Journal of Environmental Management, 291*, 112660. https://doi.org/10.1016/j.jenvman.2021.112660

Turner, B., & Kekenadze, D. (2022). Georgians face lack of clean domestic water due to decaying infrastructure. Euronews. https://goo.su/SCdU4g

UNICEF. (2023). The Sustainable Development Goals. https://www.unicef.org/georgia/sustainable-development-goals

United Water Supply Company of Georgia. (2021). *Social Monitoring Report. Georgia: Urban Services Improvement Investment Program - Tranche 1*. https://goo.su/M7zmFlb

Wang, H., Liu, Y., Xiong, W., & Song, J. (2019). The moderating role of governance environment on the relationship between risk allocation and private investment in PPP markets: Evidence from developing countries. *International Journal of Project Management, 37*, 1, 117-130. https://doi.org/10.1016/j.ijproman.2018.10.008

World Bank Group. (2014). *World Bank Group Support to Public-Private Partnerships*. https://goo.su/U6fPKB

ABOUT THE AUTHOR

Rusudan Sulakadze, email: rusudan.sulakadze443@eab.tsu.edu.ge

Rusudan Sulakadze, Ph.D candidate, Ivane Javakhishvili Tbilisi State University, Georgia.