Research article

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Organisational and Economic Model of Innovation and Resource Potential Management of a Water Supply Enterprise in the Context of Sustainable Development

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Abstract

This paper is devoted to the problems of managing the innovation and resource potential of water supply enterprises for the purpose of their sustainable development. The study develops an organisational and economic model of innovation and resource potential management of water supply enterprises, tests the model within the activities of a particular enterprise, and, consequently, forms recommendations to improve the management of the innovation and resource potential of the water supply enterprise. The creation of the model is based on the results of earlier studies in which we proved the necessity of using the term "innovation and resource potential of an enterprise" in scientific and practical vocabulary. We previously substantiated the significance of considering innovation and resource potential, studying its essence and structure in relation to water supply enterprises as economic entities that implement the most important goal of sustainable development associated with providing the population with high-quality drinking water. Our previous methodology assessed the innovation and resource potential of a water supply enterprise. The present study applies various methods of analysis, synthesis, structuring, and generalisation, as well as regression analysis. In the proposed model, the external and internal environments and input and output parameters specific to water supply enterprises are reflected in their interrelations. The model is tested on the example of the State Unitary Enterprise "Vodokanal of St. Petersburg". In particular, the influence of the introduction of an intelligent automated system of management in Saint Petersburg's water supply system on the value of the innovation and resource potential (in terms of its sub-potentials) and on the resultant indices of the enterprise performance is evaluated. We propose guidelines for managing each structural element of innovation and resource potential.

Keywords: sustainable development; innovation and resource potential; water supply enterprise; drinking water production; management; model

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Организационно-Экономическая Модель Управления Инновационно-Ресурсным Потенциалом Предприятия Водоснабжения

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Аннотация

Статья посвящена проблемам управления инновационно-ресурсным потенциалом предприятий водоснабжения в целях их устойчивого развития. Основной посыл исследования связан с необходимостью разработки организационно-экономической модели управления инновационно-ресурсным потенциалом предприятий водоснабжения, ее апробацией в деятельности конкретного предприятия и на основе этого формирования рекомендаций по совершенствованию управления инновационно-ресурсным потенциалом предприятия водоснабжения. Построение модели базируется на следующих результатах ранее проведенных авторских исследований. Во-первых, доказавших необходимость использования в научно-практическом обороте термина «инновационно-ресурсный потенциал предприятия». Во-вторых, обосновавших значимость рассмотрения инновационно-ресурсного потенциала, изучения его сущности и структуры применительно к предприятиям водоснабжения, как экономическим субъектам, реализующим важнейшую цель устойчивого развития, связанную с обеспечением населения качественной питьевой водой. В-третьих, реализовавших методику оценки инновационно-ресурсного потенциала предприятия водоснабжения. В исследовании применены методы анализа и синтеза, структурирования и обобщения, регрессионного анализа. В предлагаемой модели во взаимосвязи отражены специфические для предприятий отрасли водоснабжения внешняя и внутренняя среда, входные и выходные параметры. Модель апробирована на примере ГУП «Водоканал Санкт-Петербурга». В частности, оценено влияние от внедрения автоматизированной системы интеллектуального управления водоснабжением Санкт-Петербурга на величину инновационно-ресурсного потенциала (в разрезе его субпотенциалов) и на результирующие показатели деятельности предприятия. Предложены рекомендации по управлению каждым структурным элементом инновационно-ресурсного потенциала.

Ключевые слова: управление, модель, инновационно-ресурсный потенциал, предприятие водоснабжения, устойчивое развитие, прогнозирование

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1. Introduction

Given the technological transformations affecting all social relations today, the need to consider economic objects and phenomena in the state of their movement and constant variability has become crucial (Barykin et al., 2020). These innovations accompany the naturally inevitable progressive nature of the progressive development of economic systems. Therefore, as an economic object and part of the economic system, an enterprise should seek innovative technological solutions to improve the efficiency of its activities, taking into consideration the rational use of available resources. Thus, there is a need to study the innovation potential of enterprises together with their resource potential, which requires theoretical and science-to-practice approaches to the representation of the total innovation and resource potential, identifying their essence and structure, and proposing methods for managing such a potential. Solving such problems is important for enterprises in any industry. This is especially relevant for enterprises in resource-intensive industries, which, in particular, include water supply enterprises. With regard to the activities of such enterprises, accounting, rational use of water resources (due to their qualitative and quantitative instability), and applied and innovative technologies are required.

Identifying, evaluating, and managing the potential of enterprises in the water supply industry is also of high priority in the framework of Sustainable Development Goal 6—"Ensure availability and sustainable management of water and sanitation for all"—of the 2030 Agenda for Sustainable Development. According to the UN annual reports, the global challenge for states by 2030 is "to achieve universal and equitable access to safe and affordable drinking water for all". The solution to this task is the main objective of the functioning of resource-supplying organisations in the water supply industry. Water supply enterprises are obliged to provide consumers with drinking water of guaranteed quality to maintain decent standards of living for the population and ensure the sustainable development of their activities through the application of innovative technologies in the industry. This requires improving the management of enterprise activities, including the management of innovation and resource potential, which is also confirmed by the literature.

2. Literature review

Numerous studies conducted by scientists around the world have been devoted to the study of such a phenomenon as potential, its characteristics and properties, determination methods, and management models. In the socio-economic aspect, the purpose of potential management is to ensure the sustainable development of a country, industry, or enterprise (Rudskaia and Rodionov, 2018, Rodionov et al., 2018, Tereshko et al., 2021). Depending on the territorial, economic, political, cultural, and other features of economic objects, researchers analyse potential, categorising it into components or considering its integrated essence (Tashenova et al., 2020), using a variety of tools for managing potential (Niewöhner et al., 2021). To manage this potential, it is necessary to correctly assess it, as tackled by a number of studies for various purposes.

According to Yashin et al. (2021), innovation potential is considered a combination of production, financial, labour, and other resources, assessment, and management that contributes to successful development of the region. Rakhmeeva (2020) emphasised that the key role in improving the economic efficiency of enterprises under the conditions of transformation of economic relations and institutional changes is innovation potential. The study of company performance management through innovation potential examines the issue of innovation management in a highly competitive environment, rapid technological change, and market uncertainty. Today, it is extremely important for enterprises to introduce advanced innovative technologies into their production processes and manage their innovation potential to survive (Ahmed et al., 2020). Thus, Cansi (2021) presented an assessment of the country's innovation potential (using the example of the United States) over the past few decades. The author proves that there is a connection between the innovation potential of enterprises and the general state of the state economy.

The branch specificity of the assessment and management of innovation potential has been emphasised in a few studies. For example, in the agricultural sector, a special role is played by issues related to

the management of the innovation potential in the industry. Somkuwar et al. (2022) associated this type of potential with the application of various kinds of innovation in agro-industrial enterprises. The existing problems of large-scale physical and chemical pollution in soils threaten food security as the population increases. Thus, agro-industrial enterprises require the introduction of environmentally sustainable innovative technologies to avoid huge losses in agricultural production. Fallah-Alipour et al. (2018) demonstrated the potential of agricultural enterprises. Their methodology for assessing the potential of agricultural areas was based on a system of environmental, social, economic, and other indicators. The obtained results allowed for the formulation of recommendations for the effective use of land to ensure the sustainable development of the country.

Dzikuć et al.'s (2021) study on the prospects of low-carbon development in Poland and switching to renewable energy sources raises one of the most important problems of the need to assess and manage innovation potential through the effective implementation of energy production technologies based on low-carbon fuels. Martins et al. (2018) studied the issues of research into the fuel and energy complex enterprise, proposing a model for assessing the innovation potential of power generation companies in Portugal. The essence of the model was to develop areas of effective management mechanisms for such enterprises to achieve environmental sustainability in the form of reducing greenhouse gas emissions through the introduction of innovative "green" technologies. The potential of electric power companies was also considered in the example of Pakistan, where the created model of enterprise management justified the feasibility of power generation using wind power plants (Hulio et al., 2017).

Summarising the above efforts, problems affecting the innovation potential of an enterprise are relevant and up-to-date. The present study focuses on the question of the importance of such problems in the sphere of water supply, which has been underscored by recent studies. Kydyrbekova et al. (2022) used the example of Kazakhstan and a number of other countries to systematise potential problems associated with water resources, which require improvement of the innovation activities of water supply enterprises. Based on a survey of related companies, the authors substantiated the potential impact of the COVID-19 pandemic on the formation of innovations in the water supply and sanitation sectors. Such crises have been shown to have a negative impact on large water supply enterprises. Other researchers have come to a similar conclusion. For example, Maryati and Azizah (2022) considered six informal settlements in Indonesia. The main innovations during the COVID-19 pandemic were described as arrangements for the use of common facilities and the provision of hand-washing devices, which can hardly be called breakthrough innovations for the water supply sector. The authors' recommendations are related to the need for the transformation of the institutional environment.

The connection between innovations in water supply and the sustainable development of territories can be traced in the literature. The technological innovation "biofarm", which enables the rational use of rain and storm water for domestic needs and the creation of a surface water reservoir, was proposed by Rybicki et al. (2022). Such a design is aimed at improving the quality of life of the population and the ecological conditions of the environment. Puppim de Oliveira et al. (2022) proposed innovations in urban green and blue infrastructure, including progressive technological solutions in the use of water resources, to implement the goals of sustainable development. According to the authors, such an approach is relevant to the concepts of a closed-loop economy, urban transformation, and smart cities. This conclusion was reinforced by Wuijts et al. (2022), who analysed the impact of water sources on urban development in terms of climate change and socio-economic transformations (tourism, urbanisation, and increasing social inequality). In their study of five European cities (Amsterdam, Barcelona, Plymouth, Tallinn, and Thessaloniki), the authors showed the importance of considering the characteristics and state of local water sources when making managerial decisions regarding sustainable urban development.

These previous studies clearly substantiated the importance of innovations in the sphere of water supply and sanitation for the sustainable development of territories. However, the problem of improving the management of water supply enterprises in the context of innovation potential is equally significant. This problem has not drawn sufficient attention in scientific research. Therefore, the purpose of the pres-

ent study is to construct an organisational-economic model of the management of the innovation and resource potential of water supply enterprises, testing its performance in the activities of a case enterprise to determine the areas of sustainable development.

3. Materials and methods

The proposed study systematises the authors' earlier developments of the theoretical and methodological nature of the issues of the innovation and resource potential of water supply enterprises (Furtatova and Viktorova, 2020) to obtain new scientific and practical results, which are implemented in the following logical sequence:

1. Development of an organisational and economic model of managing the innovation and resource potential of a water supply enterprise with an allowance for the specifics of its activities for sustainable development. The object of management, its structural parts, external and internal environments, input and output parameters, methodological tools, and the relationship between all elements of the model are identified.

2. Testing of the organisational and economic model of managing the innovation and resource potential on the example of State Unitary Enterprise (SUE) "Vodokanal of St. Petersburg" during the adoption of an innovative technological solution—an intelligent automation system of water supply management in St. Petersburg

3. Proposal of recommendations for each sub-potential to improve the management of the innovation and resource potential of the water supply enterprise.

To develop the elements of the organisational and economic model, we used general scientific methods of analysis and synthesis, structuring, and generalisation. We determined the specific external and internal environments of the water supply enterprise, formulated the notion and content of the category "innovation and resource potential of a water supply enterprise", and identified the aggregated elements of such a potential (sub-potential). We also applied economic and mathematical methods of regression analysis (Song and Li, 2021) in developing this potential resource for assessing innovation. To assess the impact of introducing an innovative technology on innovation and resource potential and the resultant performance indicators of the enterprise, we used mathematical calculations to predict changes in the value of the innovation and resource potential up to 2025. The innovation and resource potential were considered in terms of the following sub-potentials: educational and personnel, scientific, and research, production and technological, information technology, socio-environmental, financial and economic, and organisational and managerial (Furtatova and Viktorova, 2020). The resultant indicators were represented by the following set: water loss during transportation, total water loss, revenue, profit, costs, and volume of the water consumed.

As the initial information, we used the data from annual reports of St. Petersburg water supply enterprise – State Unitary Enterprise "Vodokanal of St. Petersburg" for 2011–2020 (hereafter, the water supply enterprise).

4. Results

A summary of our previous work on the organisational and economic model for managing the innovation and resource potential of the water supply enterprise is presented in Figure 1. We describe this model, emphasising the results obtained earlier (elements of the model) in their interrelation and interdependence.

The proposed model identifies the external environment factors that are significant for water supply enterprises: economic, environmental, infrastructural, political, and technological. The input parameter is water from a water source. It passes through the stages of water treatment, transportation, and water consumption. The output is drinking water and water supply services. Business processes are implemented with the use of innovation and resource potential, which is the object of management for en-

terprise administration. The described elements are compactly reflected in organisational and economic models. The core of the organisational and management model is the innovation and resource potential of the water supply enterprise. We define such potential as "a set of structural elements (sub-potentials), with the help of which a water supply enterprise is able to use available resources in the best way, taking into consideration the application of progressive achievements of science and technology, to implement its statutory activities—providing consumers with high-quality water supply services—and to develop the innovative activities of these enterprises" (Furtatova and Viktorova, 2020).

The innovation and resource potential in the model is considered in terms of its seven sub-potentials. The selection of these sub-potentials is conditioned by the following circumstance. The components of the innovation and resource potential adopted for enterprises in other spheres of activity (financial, labour, production, and innovation sub-potentials), as well as specific ones, are characteristic of water supply enterprises. Taking this into consideration, the present study examined the following sub-potentials: financial and economic, educational, and personnel, organisational, and managerial, information technology, production and technological, scientific and research, socio-environmental. The choice of such varieties of sub-potentials is substantiated in detail in the authors' publication (Furtatova and Viktorova, 2020). Innovation and resource potential, as reflected in the model, directly affect the results of innovation activity (output parameters). We propose assessing this potential and analysing its impact on the resultant performance indicators of the enterprise in accordance with the algorithm in Figure 2, which is described in detail in our previous study (Furtatova et al., 2021).

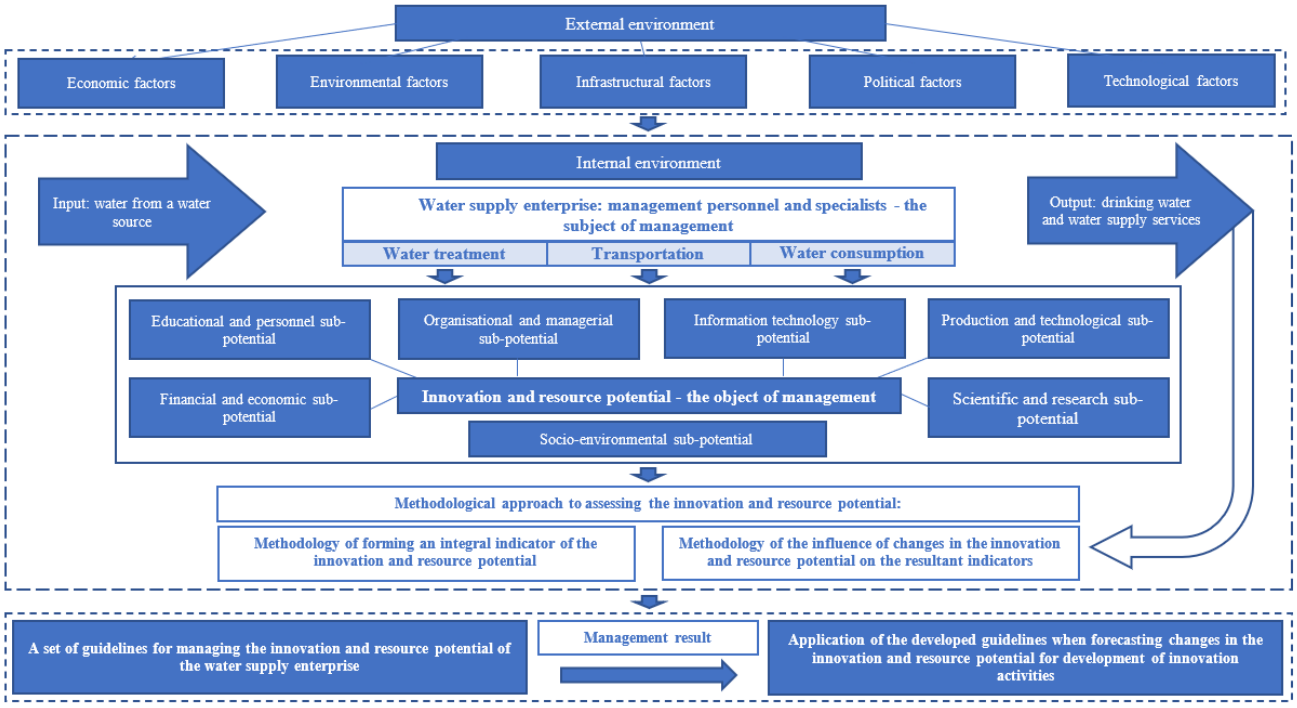

Figure 1. Organisational and economic model of management of the innovation and resource potential of water supply enterprises

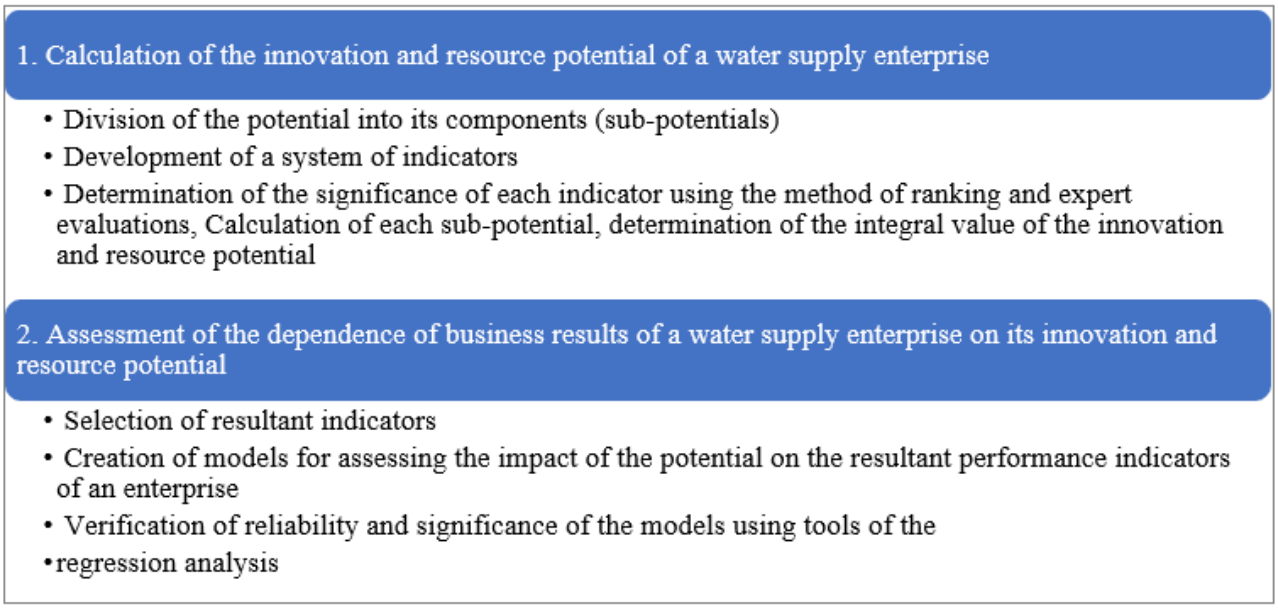

Figure 2. Algorithm for assessing the innovation and resource potential of a water supply enterprise

For modelling, we chose the indicators that characterise the sustainability of development of a water supply enterprise: 1) group of environmental indicators (water loss during transportation and total water loss); 2) group of economic indicators (profit, costs, and revenue); 3) social indicator – drinking water supply to consumers (volume of the water consumed). As shown in the organisational and economic model of innovation and resource potential management (Figure 1), problem areas are highlighted, and recommendations for improving each of the sub-potentials are formed for predicting the development of activities of a water supply enterprise, taking into consideration the use of various kinds of innovations. The model (its methodological part) was tested on the example of the data on SUE "Vodokanal of St. Petersburg".

We determined the values of the integral indicator of the innovation and resource potential (Table 1) by calculating the integral values for each sub-potential according to the following formula (1):

$$I_p = \sum_{i=1}^{m} w_i \times k_i \quad (1)$$

where:

I_p is the value of the integral indicator by a sub-potential;

k_i is the value of the indicator describing the sub-potential;

w_i is the weighting factor obtained by applying the ranking method and expert evaluations (Furtatova et al., 2021).

We calculated the integral value of the innovation and resource potential of the water supply enterprise using Formula (2), where $I_{\text{IRP...EPS}}$ represents the integral values of the corresponding sub-potential (potential).

$$I_{\text{IRP}} = I_{\text{EPS}} + I_{\text{SRS}} + I_{\text{ITS}} + I_{\text{PTS}} + I_{\text{SES}} + I_{\text{FES}} + I_{\text{OMS}} \quad (2)$$

Table 1. Value of the innovation and resource potential of SUE "Vodokanal of St. Petersburg" in 2010-2020

Sub-potential / Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Educational and personnel	0.268	0.294	0.293	0.298	0.303	0.309	0.302	0.300	0.296	0.289	0.291
Scientific and research	0.312	0.316	0.323	0.320	0.319	0.316	0.311	0.314	0.315	0.319	0.321
Information technology	0.472	0.485	0.517	0.529	0.539	0.532	0.543	0.556	0.563	0.569	0.575
Production and technological	0.365	0.367	0.389	0.383	0.379	0.386	0.385	0.386	0.379	0.378	0.380
Socio-environmental	0.611	0.612	0.617	0.613	0.630	0.629	0.623	0.640	0.644	0.642	0.651
Financial and economic	0.284	0.284	0.288	0.285	0.275	0.276	0.259	0.279	0.299	0.311	0.328
Organisational and managerial	0.299	0.292	0.306	0.328	0.329	0.322	0.336	0.339	0.337	0.337	0.331
TOTAL, integral indicator	2.610	2.651	2.733	2.756	2.775	2.769	2.761	2.814	2.834	2.844	2.876

We assessed the impact of the innovation and resource potential on resultant indicators of an enterprise (Georgiev et al., 2018). The results are summarised in Table 2.

Table 2. Summary of the results of regression models

Model	Assessing the impact of the innovation and resource potential on:	Regression equation and coefficient of determination	Elasticity coefficient
1	Water loss during transportation	$y = -218976x + 681908$ $R^2 = 0.896$	-7.9%
2	Total water loss	$y = -417828x + 1E+06$ $R^2 = 0.8975$	-5.5%
3	Service revenue	$y = 3E+07x - 6E+07$ $R^2 = 0.6901$	6.1%
4	Profit	$y = 2E+08x^2 - 8E+08x + 1E+09$ $R^2 = 0.8605$	6.5%
5	Costs	$y = 1E+07x - 3E+07$ $R^2 = 0.6389$	4.7%
6	Volume of the water consumed	$y = -512903x + 2E+06$ $R^2 = 0.835$	-2.6%

Based on the calculated the elasticity coefficients, the following conclusions are drawn:

1. Environmental indicators (water loss during transportation, total water loss): To a great extent, the rise of the innovation and resource potential by 1% will cause a decrease in the indicator of "water loss during transportation" by almost 8%. This will have a positive impact on the decrease in water loss during transportation, that is, the difference between the volume of the water consumed and the water supplied after water treatment. Thus, the higher the innovation and resource potential that the water supply enterprise has through changes in indicators by sub-potentials, the less water the enterprise will lose

during transportation. A 1% increase in the innovation and resource potential will result in reducing the indicator of "total water loss" by 5.5%, which is lower than the value of the previous indicator by 2.4%. This is explained by the fact that this indicator includes water loss during production, and the reduction of this indicator requires large-scale measures to modernise capacities and water treatment facilities.

2. Social indicator (the volume of the water consumed). With a 1% increase in the innovation and resource potential, the lowest change is the decrease in water consumption by 2.6%. This situation is regular, as the strategic goal of a water supply enterprise is the rational use of resources, which ensures sustainable growth for the good of future generations. The water supply enterprise adopts resource-saving technologies that reduce the amount of initial water from the water source. The hydraulic operation of the water piping system and its regular checks can contribute to cutting water loss.es Additionally, mutual cooperation with customers aimed at raising awareness of environmentally friendly water consumption can ensure a decrease in the indicator of "the volume of the water consumed".

3. Economic indicators (service revenue, profit, costs): The rise of the innovation and resource potential by 1% will lead to the increase of all financial and economic resultant indicators considered in the given model. The rise of costs is determined by the necessity to fund activities for maintaining innovation and resource potential through the system of sub-potentials, which are mandatory for the sustainable development of a water supply enterprise. However, the increase in the profit and service revenue of the water supply enterprise is much higher than the increase in costs, which ensures the efficiency of the water supply enterprise's performance.

Based on these conclusions, we affirm that, primarily, the change in the innovation and resource potential of the water supply enterprise by 1% will cause a decrease in the percentage of the environmental indicators, namely, *water loss (total and during transportation).*

Next, we identified several efficiency potentials for the use of water resources based on the water supply stages (business processes).

At the water treatment stage, a considerable amount of water (about 20%) is spent on washing filter facilities to ensure a smooth technological process. The process of washing filter facilities at the water supply enterprise requires pure water, which undergoes technological purification with the use of the following: chemicals, electricity, materials, and other economic resources. This approach shows the wasteful and irrational use of the complex of resources (water and economics). After washing the filter facilities, the polluted wash water is sent untreated to nearby water bodies, causing a negative environmental impact on them. For a complex solution to the problems (economic and environmental), it is essential to introduce a closed-cycle technology aimed at purifying and recycling the wash water.

At the transportation stage, to cut water loss, it is necessary to ensure timely maintenance and renovation of water pipelines and utilities (to reduce the risk of emergencies), as well as additional scheduled checks and surveys of water pipelines (to detect defected and broken sections of water supply systems). To reduce water consumption (during emergency and scheduled work), innovative technologies should be adopted to optimise maintenance work for water pipelines in the process of eliminating leaks with an allowance for minimum water consumption for washing. At the production stage, the emphasis is on the competence of maintenance teams who do emergency and scheduled work for water pipelines. Consequently, water supply enterprises should organise regular trainings, tests, and exams for workers in order to increase productivity while maintaining water pipeline systems.

At the water consumption stage, we identified high water losses due to unauthorised consumers who intervene illegally in the centralised drinking water supply system. To reduce these water losses, it is necessary to increase the number of regular checks and control tests of water metre readings, automatic entry of information into the centralised database of water consumption. This will become part of the organisational and managerial information systems of the water supply enterprise. Further, consumers (residents, industrial enterprises, institutions, social objects, etc.) should be educated to raise awareness of water consumption, and rational use of water resources should be emphasised through seminars, ex-

hibitions, conferences, and other events. Based on the example of a group of environmental indicators of water loss, we demonstrated the necessity to undertake measures aimed at increasing the efficiency of using the innovation and resource potential of water supply enterprises at each stage of the production process and by each sub-potential.

Further, we assessed the impact of implementing a promising innovative project for automation of the water supply management system on the innovation and resource potential and resultant performance indicators of an enterprise. The choice of this particular project is due to the current programme of innovative development of SUE "Vodokanal of St. Petersburg for the period of up to 2025".

The implementation of the project, which is aimed at introducing the intelligent automation system for water supply management in St. Petersburg, will help obtain the following results.

1. Increase the ratio of drinking water samples in the water distribution network in compliance with the current legislation of the Russian Federation (on average, by 1.5%).

2. Increase customer satisfaction with water supply services by improving the quality of drinking water and eliminating accidents in water supply networks promptly (on average by 30%).

3. Cut production costs at the expense of ensuring control over the performance of the water supply system and regular maintenance and repair of the equipment (on average by 15%).

4. Cut energy costs at the expense of introducing energy-saving equipment and frequency regulations (on average by 30%).

5. Reduce water loss during production and water loss during transportation (on average, 20%).

To test the proposed model of managing the innovation and resource potential of SUE "Vodokanal of St. Petersburg", we forecast the change in the value of the innovation and resource potential of the enterprise, with allowance for the implementation of the project of introducing the intelligent automation system of water supply management of St. Petersburg, for the period of up to 2025" (Figure 3).

Thus, the forecast shows the growth of the considered potential by 5.5%, compared to the value of 2020. The forecast was made on the basis of the analysis of the effects of the results of the project, aimed at introducing the intelligent automation system of water supply management in St. Petersburg, upon the indicators of the innovation and resource potential, taking into account specifics of sub-potentials. Generally, all the sub-potentials expect growth within 1–8% up to 2025, depending on the impact of the project results on a particular sub-potential:

The educational and personnel sub-potential will rise via recruiting experts with top professional knowledge and competencies to support the management system's functioning.

The scientific research sub-potential will increase due to using intellectual property in enterprise performance, organising cooperation with research and commercial institutions to exchange experience;

The information technology sub-potential of the enterprise will grow as a result of automation and digitalisation of the enterprise's business processes at the expense of introducing innovative software into the management system (Furtatova and Viktorova, 2020).

The production and technological sub-potential will increase due to intensifying the work on renovation, modernisation, and construction of new water supply facilities.

The socio-environmental sub-potential will grow as a result of an increase in customer satisfaction with water supply services and employee satisfaction with working conditions; the implementation of the project will also help protect the environment.

The financial and economic sub-potential, primarily related to the enterprise's property and its funding sources, will rise due to the necessity of long-term funding of the project via various sources.

The organisational and managerial sub-potential will grow as a result of optimising the management structure of the enterprise and encouraging senior managers to gain additional educational qualifications in the area of digital technologies.

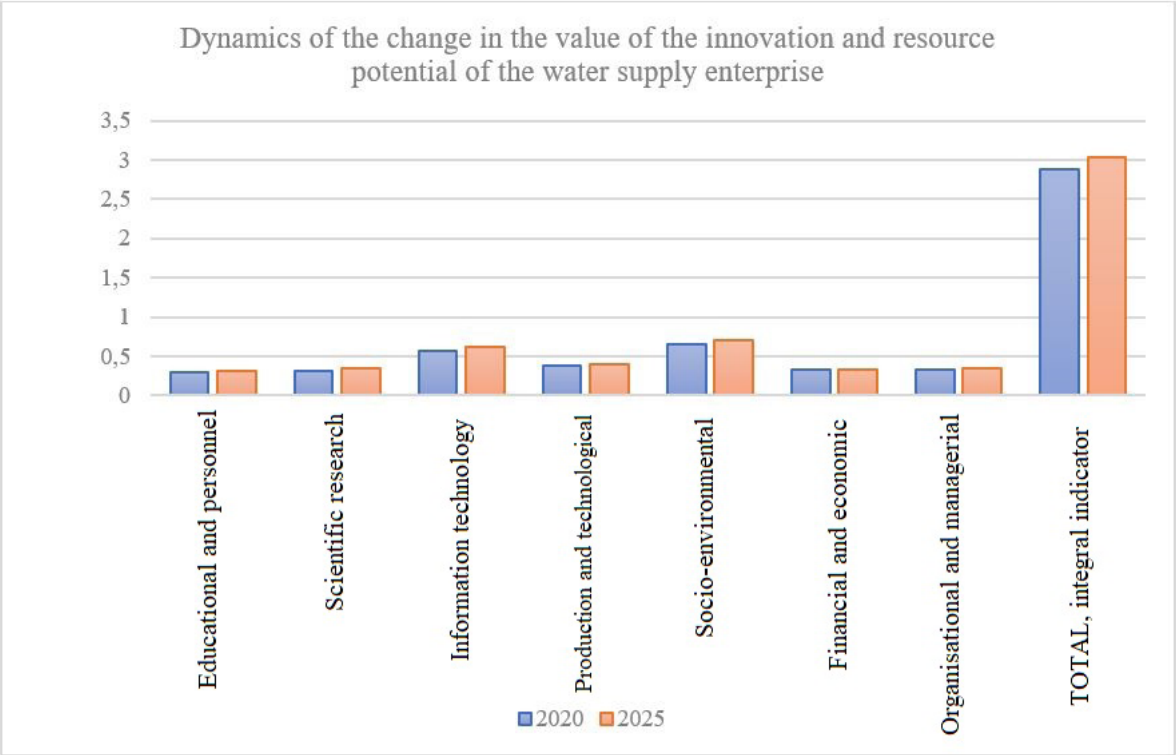

Figure 3. Forecast of changes in the integral value of the innovation and resource potential of the water supply enterprise

The next step in testing the organisational and economic model is to apply the proposed methodology in calculating the forecast values of the resultant indicators for 2025 (the scheduled completion of the project). The calculation results are shown in Figures 4–6.

The introduction of the intelligent automation system of water supply management in St. Petersburg will increase the innovation and resource potential of the water supply enterprise by 5.5%, which will lead to a decrease in these indicators: water loss during transportation (by 70%), total water loss (by 38%), volume of the water consumed (by 20%), profit growth (by 18%), revenue (by 15%), and costs (by 13%) by 2025.

In summary, the organisational and economic model of the innovation and resource potential management for water supply enterprises, which takes into account internal and external environments and input and output parameters, allows the managerial staff to make reasonable recommendations for innovative development of water supply companies. In the general view, and in the view of sub-potentials, such recommendations can be applied to the performance of SUE "Vodokanal of St. Petersburg". These are shown in Figure 7.

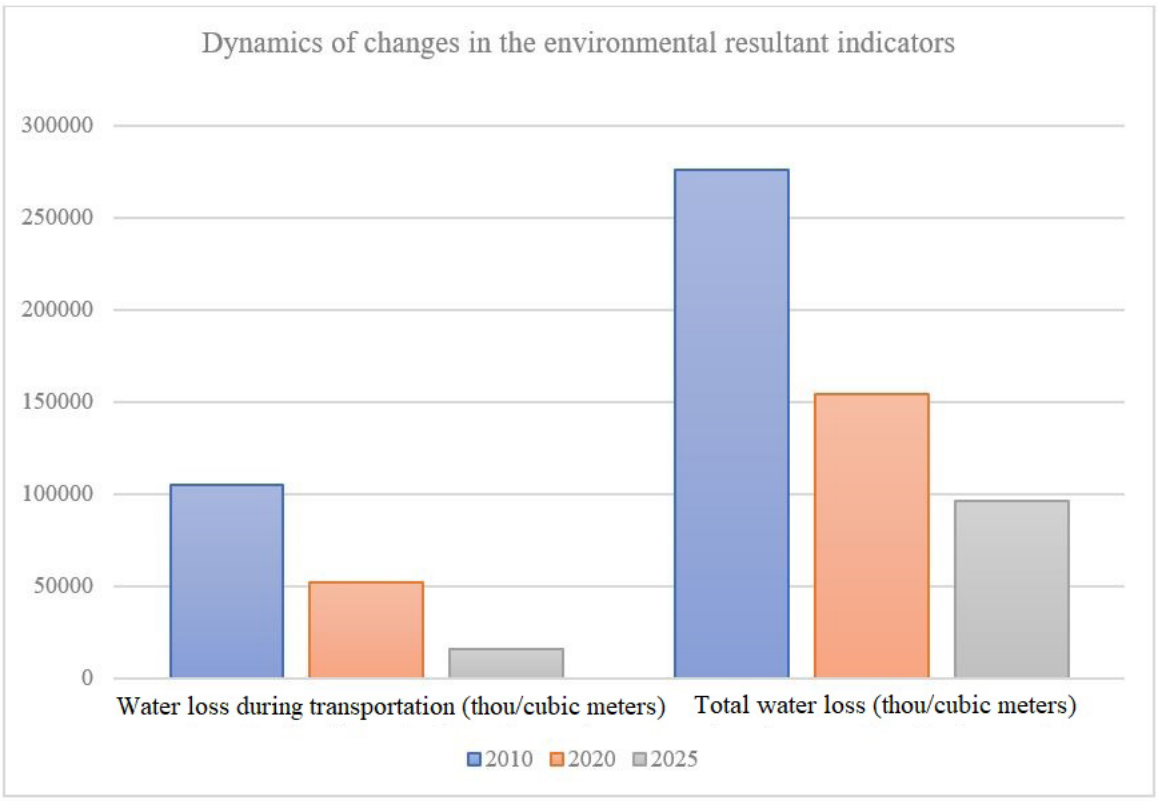

Figure 4. Dynamics of changes in the resultant environmental indicators

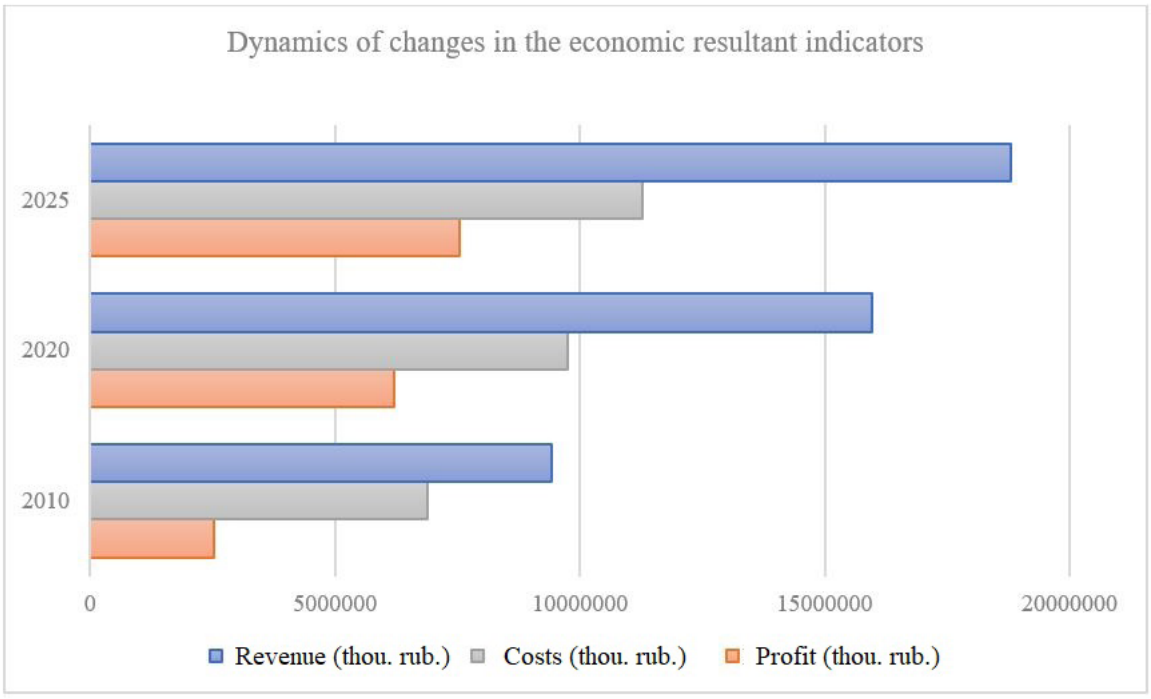

Figure 5. Dynamics of changes in the resultant economic indicators

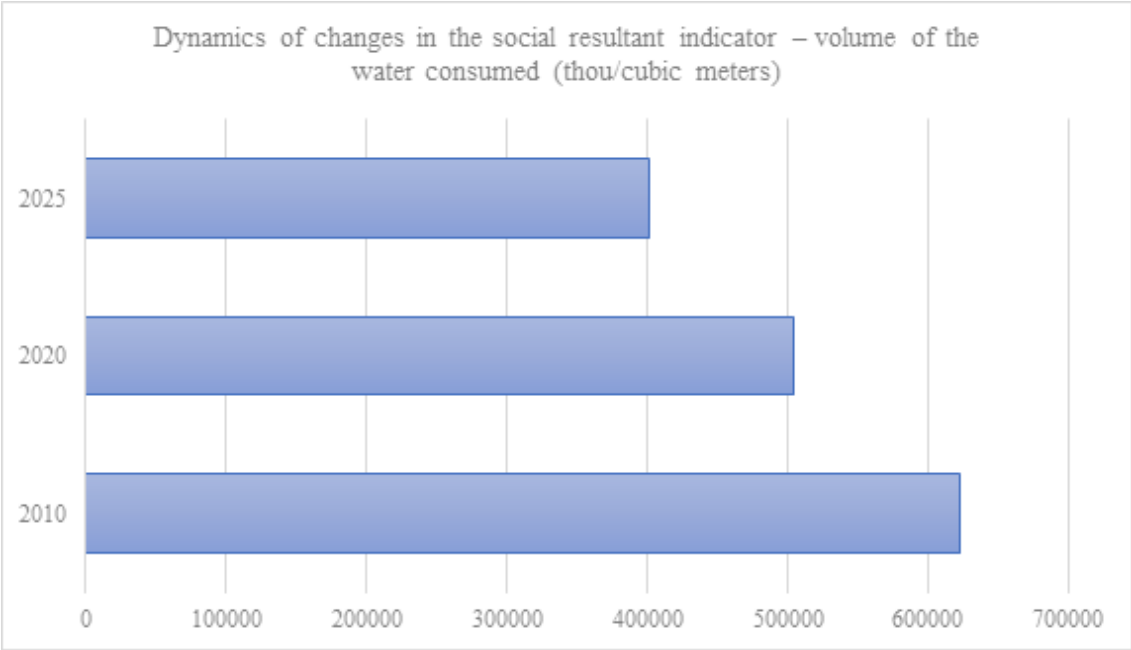

Figure 6. Dynamics of changes in the resultant social indicator

In summary, the organisational and economic model of the innovation and resource potential management for water supply enterprises, which takes into account internal and external environments and input and output parameters, allows the managerial staff to make reasonable recommendations for innovative development of water supply companies. In the general view, and in the view of sub-potentials, such recommendations can be applied to the performance of SUE "Vodokanal of St. Petersburg". These are shown in Figure 7.

5. Discussion

The findings of this study are relevant and coherent. For instance, they can logically explain the significance and specificity of the socio-environmental sub-potential as part of the innovation and resource potential of the water supply enterprise. The indicators of this sub-potential inform recommendations for increasing it, with the focus on two directions: providing the staff of the water supply enterprise with decent working conditions, and monitoring the state of water bodies and the environmental quality.

Regarding the first direction, we recommend that stakeholders:

1. Create a social environment that is favourable for enterprise development enhances the efficiency of managing social programmes and projects.

2. Ensure safe and comfortable working conditions via continuous improvement of labour protection and industrial safety.

3. Change employees' wages depending on the rate of inflation and financial capacity of the water supply enterprise, launching a system of additional tangible and intangible incentives for employees.

4. Develop a system of awards and remuneration for employees who are diligent in performing their duties, excellent work, improvement of the quality of water supply services provided by the water supply enterprise, and other professional achievements.

5. Maintain an effective system of general remuneration and a set of additional benefits to attract, retain, and motivate the staff.

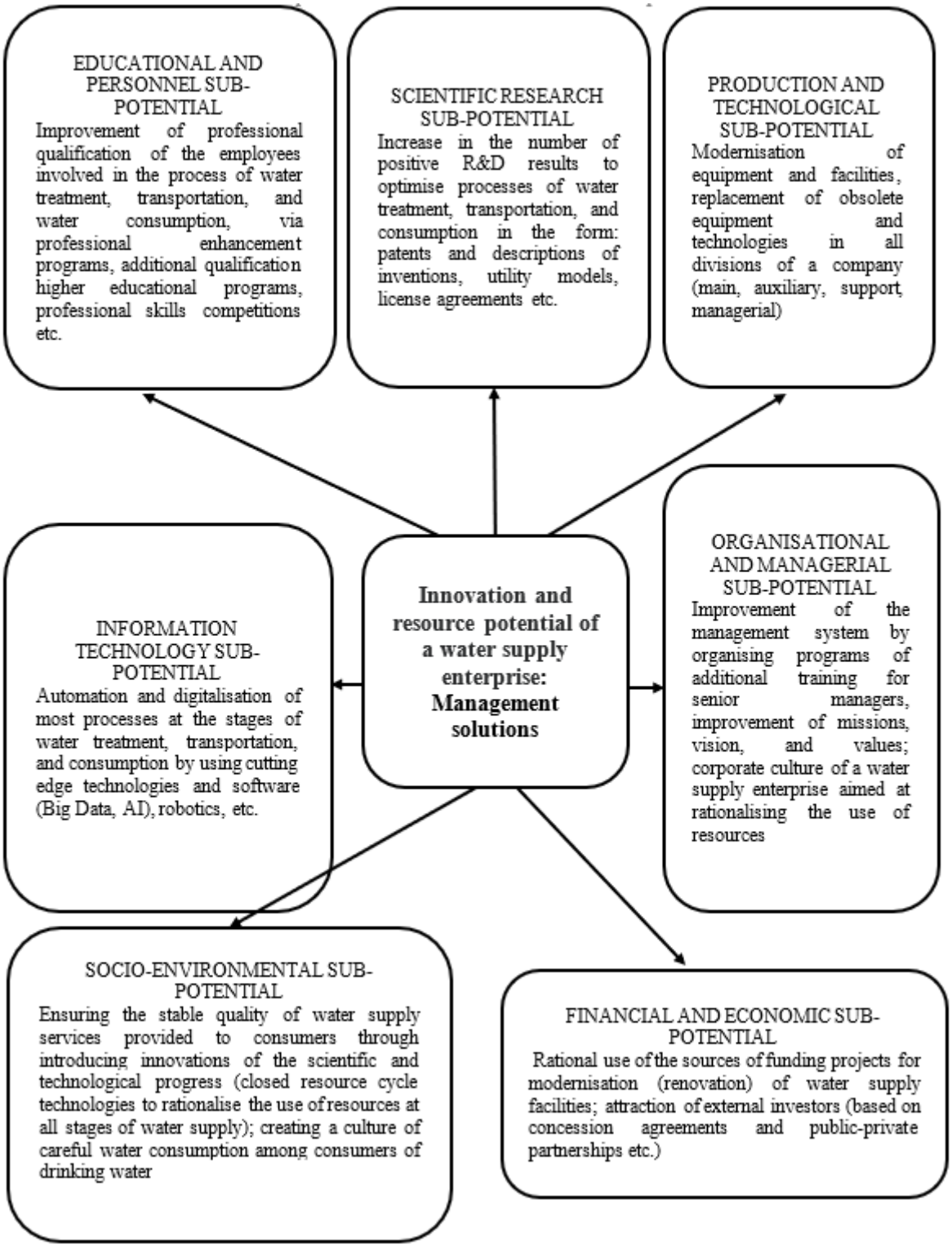

Figure 7. Recommendations for improving management of the innovation and resource potential of a water supply company in view of its sub-potentials

To drive the second direction, we recommend that stakeholders:

1. Increase the environmental friendliness of production efficiency of using resources by the water supply enterprise.

2. Reduce the release of pollutants generated by the water supply enterprise during production into water bodies.

3. Introduce the best accessible technologies into water supply systems that have a negative impact

on the environment.

4. Reduce water consumption and loss during production and transportation.

5. Adopt environmentally efficient waste management technologies at water supply enterprises.

The outcome of the research is the organisational and economic model of the innovation and resource potential management of the water supply enterprise, with content that is typical for such contexts. The specific features of this model that distinguish it from previous models are discussed below.

First, the focus of our model is on the complex category of the innovation and resource potential. A number of modern studies by other authors are devoted to the innovation and resource potential of the agro-industrial sector (Somkuwar et al., 2022; Fallah-Alipour et al., 2018), the fuel and energy sector (Dzikuć et al., 2021; Martins et al., 2018; Gutman and Brazovskaya, 2022; Hulio et al., 2017), and the chemical sector (Vasilieva et al., 2020). Fewer works dwell on resource potential. However, we must assume that there are no works devoted to innovation and resource potential. Overall, turning to the new category requires further in-depth methodological elaboration and substantiation to make scientific debates on this matter positive.

Second, the model considers a water supply enterprise as an economic research object and includes parameters unique to the enterprise. Such approaches to enterprise management, including the management of its potential, can be considered universal. For instance, the study, which is devoted to fundamentals of the enterprise's innovation potential management and to building a management model (Niewöhner et al., 2021), affirms that apart from developing products and services on a regular basis to remain competitive in the long run, companies should take advantage of the innovation potential of digital technologies. These technologies are the driving forces of innovation. The standard model of managing an enterprise's innovation potential is comprised of the innovative processes of an enterprise, innovation strategy, and culture.

The uniqueness of the model for managing the innovation and resource potential of a water supply company consists of the economic specifics of such companies and their core function, which is to provide the population with quality water. Therefore, the resultant indicators of this company's performance include not only conventional financial indicators but also indicators of water loss and consumption. This is correlated with Goal 6 of Sustainable Development Goals[1]. This aspect should be regularly updated, and the resultant management indicators should be constantly improved.

Further, the important role of taking measures to achieve sustainable development goals is the responsibility of financial institutions (Chen et al., 2022) as the source of tangible resources for the support of enterprises committed to green innovations, and offering such enterprises sustainable funding in the form of concessional loan programmes, subsidies, etc. (Wang et al., 2022). Through green funding, water supply companies can introduce innovative technologies –product and process innovations (Dhanora et al., 2018) – to provide customers with quality and safe drinking water supply services (Furtatova and Kamenik, 2020).

A debatable issue requiring further study is the analysis of a water supply enterprise, for example, SUE "Vodokanal of St. Petersburg" and similar companies, only in terms of water supply, without taking into account another component—sewerage. Both processes are closely linked, and they laid the ground for Goal 6 from the Sustainable Development Goals Report "Water and Sanitation". Considering water supply and sewerage in connection with the management of the enterprise's innovation and resource potential is a relevant further study.

6. Conclusion

This study constructed an organisational and economic model of managing innovation and resource potential, proposed by the authors, using classical laws. The model has specific features that characterise only water supply enterprises and the management specifics of such enterprises. Model testing

demonstrated the applicability of the model. The methodological part of the model enables assessment of the integral indicator of the innovation and resource potential of a water supply enterprise with an allowance for seven types of sub-potentials. It also enables the analysis of the links between innovation and resource potential and the resultant indicators of enterprise performance. This will help managers make reasonable decisions for managing innovation and resource potential. Testing the organisational and economic model on other water supply enterprises of the Russian Federation is of particular scientific interest. The given research focused on only one water supply enterprise, albeit a large one, targeted at innovative development.

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