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FINANCIAL AND ECONOMIC ASPECTS OF CREATING SOURCES OF SHARED WATER USE IN RURAL COMMUNITIES

ABSTRACT

The purpose of the article is to study the financial and economic aspects of creating sources of shared water use in rural communities, substantiating their feasibility, importance for providing the population with high-quality drinking water and sustainable economic growth.

The article states the fact of deterioration of water supply in rural areas both in quantitative and qualitative aspects. The way out can be seen in the solution of issues regarding the use of underground water, which is better protected than surface water resources, by increasing the number of sources of shared water supply. It has been substantiated that as a result of free water use, rural communities can receive such advantages as the improvement of the quality of drinking water, the efficiency of water resources, use the reliability, security and stability of the water supply source. The measures of financial and economic regulation of the use of groundwater, among which the diversification of funding sources for the renewal of water management infrastructure facilities, the attraction of credit and grant funds to renew the technical and technological base of water management enterprises, and to improve monitoring procedure for the extraction of groundwater from deep wells, have been systematized.

The article reflects the results of a survey conducted in order to find out the opinion of the respondents regarding the sources of water intake, the presence of interruptions in the water supply of populated areas of Chernihiv Oblast, the need to create shared water use facilities in the community and the sources of funding for their creation. The vast majority of respondents have reported that in their communities they use wells, their own boreholes and there are interruptions in water supply, there are problems with wells drying up.

Keywords: financial and economic regulation, sources of shared water use, ecological and economic security, sustainable development, envirionmental awareness, human capital

JEL Classification: Q20, Q25

INTRODUCTION

Climate changes caused by temperature fluctuations, changes in the amount of precipitation and a significant anthropogenic load on water resources have led to the fact that in Ukraine in many settlements there is a decrease or even disappearance of water in rivers, lakes, and wells, a decrease in pressure in water supply networks, significant lowering of the groundwater level.

The war in Ukraine has caused significant damage to water supply systems, water supply and drainage facilities, and led to the contamination of water bodies with oil, chemicals, metal impurities, remnants of military equipment, and projectile fragments. Compliance with the principles of sustainable development requires focusing attention on forms and methods of reducing the level of pollution of water bodies to maintain the conditions for the existence of biodiversity, fish breeding, providing drinking water to the population, maintaining health, increasing life expectancy, meeting communal and household needs, agricultural water supply and recreation, and will contribute to the

development of business and increase the level of its social responsibility in rural communities [6].

The lack of stable sources of water supply leads to the deterioration of the sanitary and hygienic condition of drinking water supply. Residents of rural territorial communities feel this most acutely. Such a situation requires an immediate solution, since the rational use of water resources and the provision of high-quality drinking water to the population are the first priorities of economic development. Therefore, it is necessary to thoroughly study the state of water supply in communities, assess the possibilities of building sources of shared water use in order to provide the population with drinking water in settlements that have insufficient water supplies. This requires unifying the efforts of local authorities and self-government, as well as enterprises (institutions, organizations) that are owners or users of centralized or decentralized drinking water supply facilities [19].

The situation has worsened as a result of the wartime events, since providing the population with water for drinking and household needs is extremely important, and therefore, in order to guarantee the sustainable functioning of the social and critical infrastructure of communities, it is necessary to consider the possibility of using alternative sources of water supply from reliably protected groundwater. The relevance of the issue is also determined by current forecasts of the impact of global climate changes and anthropogenic activity on the water resource potential of Ukraine in general and the state of surface waters, in particular.

LITERATURE REVIEW

The theoretical and methodological basis of the research are the works of national scientists who study the feasibility of creating sources of shared water use to provide the population with high-quality drinking water, investigate the financial and economic aspects of regulating the use of groundwater, and also justify the feasibility of using various sources of financing these measures. O. Bondar, A. Kavun, Yu. Kirsanova, V. Kozak, A. Kopytin, and V. Sorokovskyi devoted their works to the study of rural drinking water supply issues [2]. M. Khvesyk is engaged in the development of the water strategy of Ukraine, as well as scientific approaches to the formation of a financial and economic mechanism for managing rational water use in order to ensure the livelihood of the population and the development of territorial communities [15]. L. Levkovska, V. Mandzyk emphasize the importance of developing an effective water policy strategy of Ukraine and the financial and economic aspects of creating shared water supply sources in the context of effective water use and providing the population with high-quality drinking water [15].

The financial and economic tools for regulating nature management processes are structured in the works of O.V. Sakal [23], Y. Ziabina et al. [25-27].

G. Hutton and M. Varughese examine the necessary costs for achieving the objectives of the Sustainable Development Goals by 2030 in terms of the availability of drinking water, sanitation and hygiene [9]. James C. Winter, Gary L. Darmstadt, Jennifer Davis studies the role of water supply in improving health, economic development and gender equality in rural communities [10]. G. Alaerts examines the financial aspects of water security through a review of past and current policies and practices, as well as new needs due to the increasing instability of water resources (ie, droughts and floods) and climate change [1]. S. Cardascia emphasizes the risks associated with water, as they affect health and the deterioration of ecosystems and are exacerbated by the unsatisfactory state of water bodies, moreover, these problems are complicated by climate change and irrational land use, the increase in the number of extreme weather events, crisis situations related to water resources, and related natural disasters. Water risks affect not only livelihoods and ecosystems, but also the economy. When water risks are not properly managed, the economic consequences are significant [4]. K. Dominique and W. Bartz-Zuccala assess the possibilities of mixed financing for investments in water management, note that they are a necessary condition for sustainable development, declared by SDG 6 "Ensuring the availability and sustainable management of water resources and sanitation for all ", which affects food security, sustainable consumption and production, as well as on marine and river resources [7]. Mabel Gómez, Jordi Perdiguero, Alex Sanz is engaged in the study of socio-economic factors affecting access to water in rural areas in low- and middle-income countries [8].

Groundwater is an underestimated resource and requires finding ways and mechanisms for its effective use for drinking water supply to the population. For this, it is necessary to conduct a retrospective analysis of the expediency and effectiveness of their use in each of the communities experiencing a water shortage, as well as the development of recommendations for the formation of an ecological and economic mechanism for the exploitation of underground aquifers.

However, there are certain problems associated with the use of underground water resources: uneven territorial location of enterprises with high water capacity; regional differences in the state of water supply; disproportions in the use of surface and underground water; an increase in the depth of the underground as a result of climate change and increased

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anthropogenic load; non-compliance of the quality of groundwater with regulatory requirements for its use as a source of water supply.

This requires the development and implementation of measures for the financial and economic regulation of the use of underground water in the conditions of modern challenges and environmental restrictions, which will also require a review of the existing system of payments and fees for the use of underground water resources in terms of water users. It is also possible to create a specialized advisory body from among representatives of interested parties both at the industry level and in territorial communities, as well as environmental organizations, foundations, the scientific community, public organizations, and international experts [21].

AIMS AND OBJECTIVES

Study of the financial and economic aspects of creating sources of shared water use in rural communities, considering their feasibility, importance for providing the population with high-quality drinking water and sustainable economic growth.

Objectives include:

- to reveal the content of measures of financial and economic regulation of the use of underground water;
- to investigate the main priorities of the Concept of the Nationwide targeted social program "Drinking water of Ukraine" for 2022-2026;
- justify the benefits of creating shared water supply sources in rural communities;
- to structure existing sources of water intake in settlements of Chernihiv region;
- consider possible components of the cost of construction of deep wells in rural communities;

to investigate the impact of shared water, use on providing the population with high-quality drinking water, maintaining health, life expectancy, forming environmental awareness, and developing business in communities.

METHODS

When writing the article, both general scientific and specific scientific methods were used to collect information, process it and analyze the results of the research in the context of financial and economic regulation of the use of groundwater, substantiating the feasibility of creating sources of shared water use in communities, which will contribute to business development. General scientific methods were used in part, in particular observation, comparison in the evaluation of alternative sources of shared water supply in rural communities; advantages of creating water intake wells in rural communities; components of the cost of construction of deep wells.

When determining the impact of water use safety on providing the population with quality drinking water, maintaining health, life expectancy, forming environmental awareness, and developing business in communities, such general scientific methods as idealization, formalization, abstraction, the method of statistical analysis, graphic, logical methods were used. The use of the mentioned methods made it possible to substantiate the peculiarities, possibilities and prospects of the impact of creating sources of shared water use and the state of health, life expectancy, strengthening of business social responsibility. Questionary water users of the Chernihiv region made it possible to determine the current state of water intake sources in settlements, the presence of interruptions in the water supply of communities of the Chernihiv region, to assess the feasibility and necessity of creating joint water use facilities in communities and possible sources of funding for their creation.

RESULTS

According to the main provisions of the Water Code of Ukraine, water use is the use of water (water bodies) to meet the needs of the population, industry, agriculture, transport and other sectors of the economy, including the right to take water, discharge wastewater and other types of water use (water bodies) [24]. The main source of water supply in Ukraine is surface water, however, their reserves are very limited, in addition, they are polluted and do not always meet sanitary requirements. The use of groundwater has advantages, because it is better protected and the water from it is of better quality [15].

The use of high-quality groundwater requires the activation of investment processes for the implementation of water management projects, which will contribute to the development of the market for water management services and the regulation of the system of rent relations in the field of water use. It is also important to implement successful practices of integrated water resources management, which will allow for faster response to existing risks, timely implementation of water conservation measures, and monitoring of the state of water resources in territorial communities, which will contribute to strengthening water, food and energy security. The exploitation of natural resources is accelerating in the face of dwindling resources, while humanity creates ever greater waste streams and pollutes the environment. Global resource use per capita is much higher than resource recovery per capita [12].

Among the measures of financial and economic regulation of the use of underground water, the following are priorities: diversification of funding sources for the renewal of water infrastructure facilities; revision of rent rates for special water use; attraction of credit and grant funds for updating the technical and technological base of water management enterprises; improvement of monitoring of groundwater production from deep wells (Figure 1).

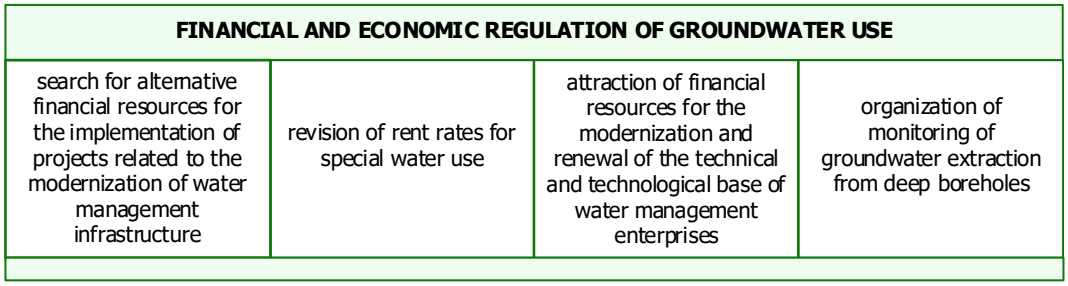

Figure 1. Measures of financial and economic regulation of underground water use. *(Source: formed by the authors based on [21; 15])*

According to the concept of the National Targeted Social Program "Drinking Water of Ukraine" for 2022-2026, more than 1,700 projects are planned to be implemented (Figure 2).

UAH 28 billion is needed to finance these measures, and the key priority is to provide 7,414,000 people with quality drinking water over the next five years [20].

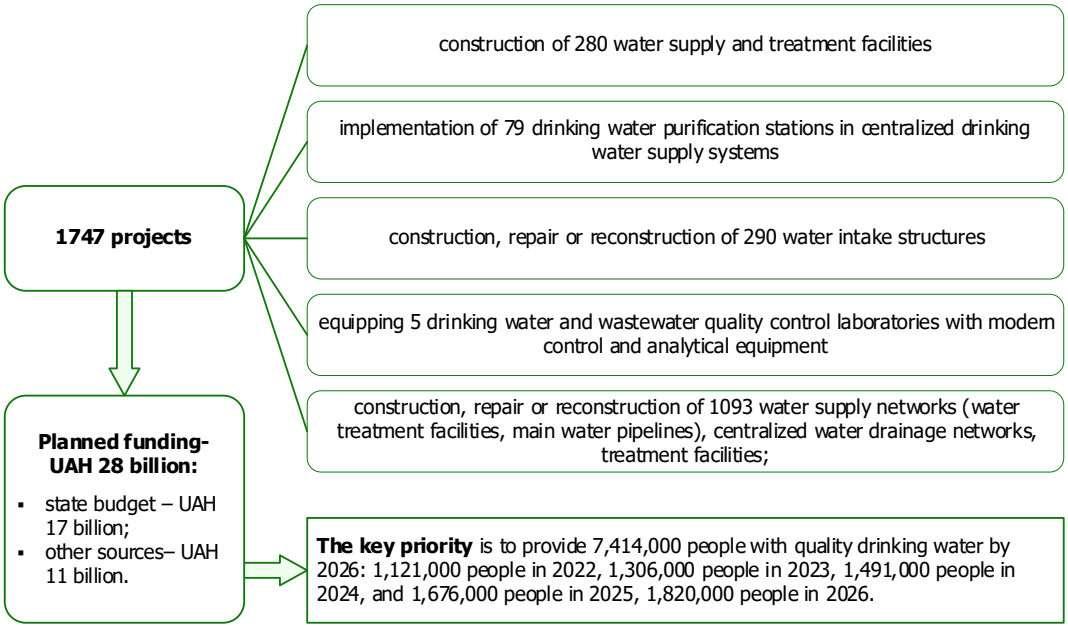

Figure 2. Main financial and economic priorities of the Concept of the Nation Targeted Social Program "Drinking water of Ukraine" for 2022-2026. *(Source: developed on the basis of [20])*

It is especially urgent to resolve issues related to the creation of shared water supply sources in rural areas, since only about 30% of the population is provided with centralized water supply.

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The problem of access to a sustainable water supply has worsened since the beginning of the large-scale invasion, when residents, especially in rural areas, began to use streams, shallow wells, and wells as sources of water. For the period of rapid response, these sources were indeed the only ones available to the population. However, their further use actualizes the risks of environmental pollution, worse health condition of the population, while the organization of water purification and drainage requires significant funds, which communities do not always allocate to these types of work.

Accordingly, it is promising for communities to organize shared water supply through the use of centralized water supply systems connected to deep boreholes with access to the lower aquifers. Observance of the principle of sustainability is important when organizing a shared water supply. As a result, rural communities can receive such advantages as the improvement of the quality of drinking water, the efficiency of the use of water resources, the reliability, security and stability of the source of water supply, etc. (Figure 3).

ADVANTAGES OF CREATING SHARED WATER SUPPLY SOURCES IN RURAL COMMUNITIES				
Increasing the efficiency of the use of water resources	Improving the quality of drinking water	Optimization of costs for the construction and maintenance of water supply facilities	Higher reliability, security and stability of the water source	Better social interaction of community residents in support of shared information structure

Figure 3. Advantages of creating shared water supply sources in rural communities.

Creating shared sources of drinking water in rural areas can be critical to providing the local population with clean and safe water. When choosing the type of water supply source, it is necessary to be guided by available financial resources of territorial communities and the possibility of their diversification, and the conclusions of territorial geological administrations, bodies that regulate the use of water and are responsible for its protection, research by the sanitation service, and environmental protection bodies.

In June 2023, a survey of representatives of territorial communities of Chernihiv region was conducted. The survey was conducted in order to find out the opinion regarding: sources of water intake in settlements, the presence of interruptions in the water supply of communities of the Chernihiv region, the feasibility and necessity of creating facilities for shared water use in the community and sources of financing their creation. The sample covered 1% of the settlements of the Chernihiv region.

Regarding the issue of sources of water intake in settlements, 64% of respondents reported that in their communities they use wells and their own boreholes, and only 34.1% said that they use centralized water supply (Figure 4). Also, 68.1% of respondents reported the presence of interruptions in water supply, the presence of problems with wells drying up.

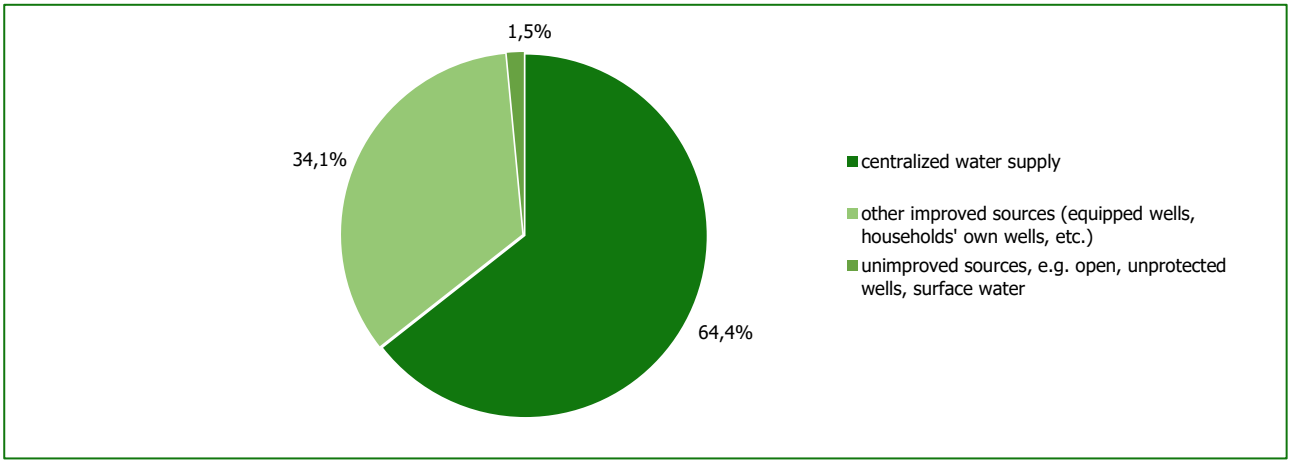

Figure 4. Sources of water intake in settlements of Chernihiv region.

Regarding the need for shared water use facilities in the community, 67% of respondents confirmed the appropriateness of their creation, 16% consider their construction inappropriate, and 17% confirmed the existence of shared water use facilities in their community already.

Insufficient funding at all levels remains a significant deterrent to the development of the real sector of the economy in general and its individual areas [11].

Funding the construction of wells in rural areas may have specifics depending on the region, available sources of financing, as well as the financial capabilities of the community.

Among the possible options for financing the sphere of water supply can be the following: at the expense of the community's own funds; creation of a shared fund or cooperative on the basis of a share contribution; attraction of grants for the financing of infrastructure projects, including the construction of wells; funds for humanitarian response and recovery projects; use of bank credit; partnership with private companies; cooperation with international organizations and donors; participation in state support programs aimed at infrastructure development in rural communities; microfinancing; charitable or voluntary donations, etc.

As for the sources of financing for the construction of shared water supply facilities in rural areas, during the survey, the opinions of the respondents varied. The vast majority of respondents (71%) believe that these should be community funds, 63% - investors' funds, 32% - community members' donations, 51.1% - grant funds (Figure 5).

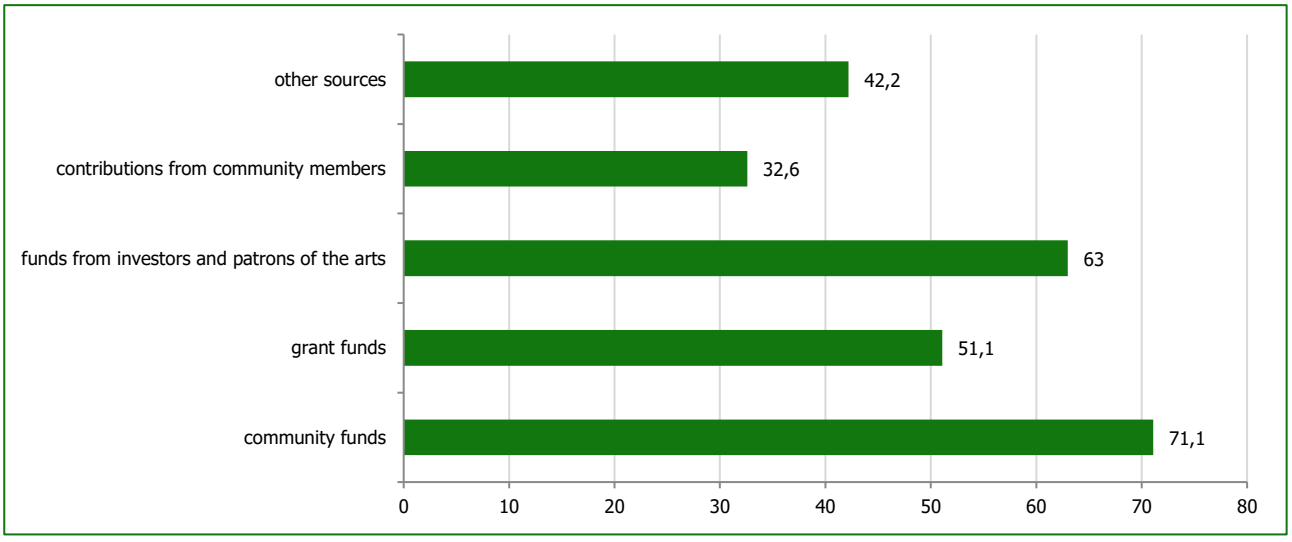

Figure 5. Sources of financing for the construction of shared water supply facilities in rural areas, %.

In modern conditions of increased risks of anthropogenic impact, preference should be given to the use of underground water: artesian, spring or hyporheic.

Before the development of the construction project, the body of the territorial geological management and the sanitary-epidemiological service must confirm the operational reserves of groundwater and their quality.

Groundwater extraction, depending on the type of terrain, can be carried out using such water intake facilities as water intake wells, mine wells, water towers, pumps and pumping stations, etc. (Table 1).

It is also advisable to investigate the possibility of creating filtration systems for water purification, to consider options for maintenance and repair of water supply and system purification, in the event of a power outage, it is advisable to evaluate the advantages of installing solar power stations. In addition, it is worth considering the possibility of using modern technologies for monitoring water quality, which will allow timely detection of problems and making operational decisions.

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Table 1. Evaluation of alternative sources of shared water supply in rural communities and financial aspects for their creation. *(Source: systematized by the authors according to [2])*

Shared water supply sources	Source advantages	Disadvantages	Prerequisites for construction
Water intake wells (tube wells)	High quality water High debits	The high cost of drilling and installation Moderate operating costs	Aquifers lie at a depth of more than 10 m
Mine wells	Low water quality Relatively low cost of installation Can be used for local water supply systems	Low debits	Aquifers lie at a depth of more than 10 m Low construction costs
Creation of pure water tanks from polymeric materials	Can provide access to potable water during emergency situations. Modern design Do not require constant care (hermetic) Easy to install	High cost Limited water supplies	Used for water storage. Can be installed above ground, underground, integrated into the building, performing the functions of fire tanks
Catchment sources	High quality water Low cost of installation Used for local water supply systems	Debits are low	Availability of an underground water source reaching the earth's surface
Pumps and pumping stations	A wide range of pumps High reliability Repairable Low price	Moderate financial burden on the community budget	The relief of the area does not make it possible to ensure the gravity flow of water from the water intake
Water towers with plastic tanks	Modern design Hermetic and hygienic Does not require permanent staining Higher than metal towers	Requires significant investment in construction Moderate operating costs	Suitable for water supply systems in villages and small towns

For rural communities, the organization of shared wells may be the best option. The advantages of creating water intake wells in rural communities are shown in Figure 6.

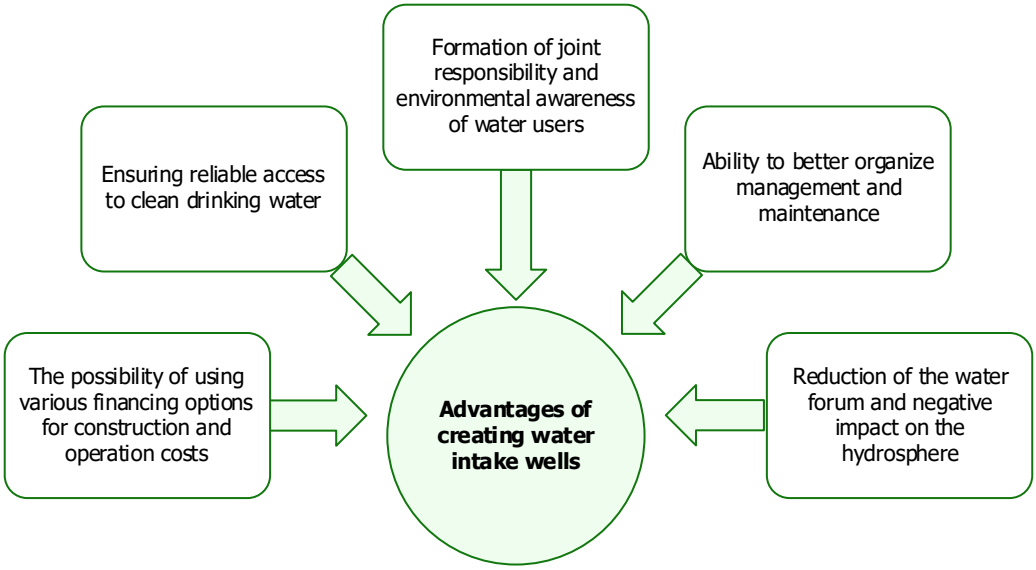

Figure 6. Financial, economic and environmental advantages of creating water intake wells in rural communities.

The cost of well construction may vary depending on the characteristics of the region, the depth of the well, the quality and type of soil, and the construction option. Therefore, the cost of construction will depend on such components (Figure 7)

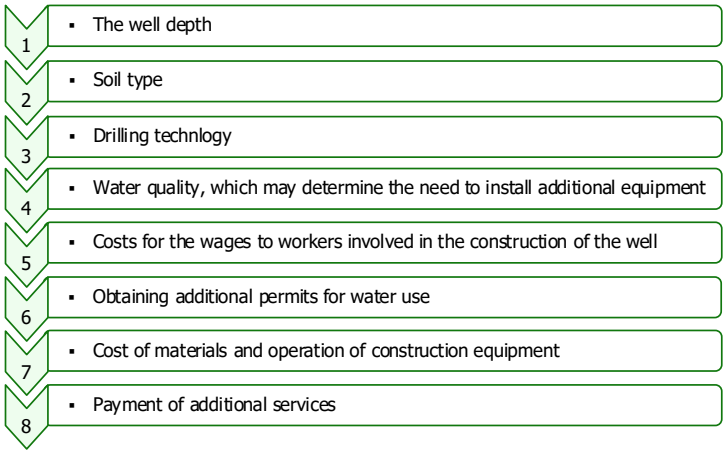

Figure 7. Components of the construction costs for deep boreholes in rural communities.

Reliable functioning and long-term operation of the water supply and water treatment infrastructure can be ensured due to the organization of joint maintenance and repair of water supply sources, saving water on the basis of cleaning and reuse [3].

To do this, it is advisable to identify persons or organizations that will be responsible for the maintenance and repair of the water supply source, find sources of funding for these activities, develop a maintenance and repair plan, if necessary, teach water users the basic rules for using the water source, as well as train specialists who will maintain it and repair, document management, organize cooperation with the community, use the water quality monitoring system, etc. [15].

Shared water use can be defined as a specific system consisting of subsystems with defined principles and mechanisms of interaction. The main elements of the system are the following blocks: ensuring the efficiency and sustainability of water supply sources; water resources management; efficient water use; digitalization of water supply and water use management processes.

Based on the results of the analysis of international experience, it is possible to single out tools that are effective and will contribute to sustainable water use: interaction of basin managements, local self-government bodies, communal enterprises with the aim of making joint decisions regarding water management activities; use of water bodies under lease conditions; rationalization of the taxation system at the level of communities to reimburse the costs of measures to preserve water resources; shared investment in the modernization of water management facilities; the use of information technologies and the creation of information systems for the rationalization of water management activities.

We believe that the organization of shared water use should be based on certain principles: all water users should pay for the service or benefit received; diversification of sources of investment resources for water management activities; flexibility of the system of payments for water use. Thus, shared water use based on defined principles will provide the population with high-quality drinking water and will have a significant impact on the economic development of the community (Table 2)

Table 2. The impact of shared water uses on providing the population with high-quality drinking water and on the economic development of the community. *(Source: systematized by the authors using [7; 9; 15])*

Impact factors	Expediency
Improving the health and life expectancy of the population	High-quality drinking water is an important factor in preserving the health of the population, and therefore the use of such water will reduce the level of morbidity, reduce treatment costs, as well as payments by employers and the state for temporary incapacity for work, improve the use of working time, and therefore increase the productivity of employees
Saving household and community funds	Access to clean potable water reduces household and community costs and the purchase of bottled or bottled drinking water.
Stimulation of business development, social responsibility of business	Access to potable water of appropriate quality can be stimulated by the creation of businesses in communities, in particular as public catering establishments, hospitality and tourism, agricultural production, etc.
Water supply for agricultural businesses and farmers	The availability of water allows to increase the development of crop production, animal husbandry, fish breeding, the number of projects focused on society, etc.
Environmental support	Due to access to quality water, it is expected to reduce the use of plastic bottles and disposable packaging for potable water, which will reduce the amount of waste and contribute to the preservation of the environment.

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DISCUSSION

In contrast to the existing results obtained in the process of researching the possibilities, necessity and prospects of providing the population of villages with quality water, there are reasons to assert that the organization of shared water supply through the use of centralized water supply systems connected to deep boreholes with access to lower aquifers is promising for communities. At the same time, it is important to observe the principles of sustainability and diversification of sources of financing of shared water use facilities. Issues of the terms of providing the rural population with high-quality drinking water, the possibility of bringing to justice the main polluters of water resources, monitoring the quality of drinking water of existing sources of water use in rural areas remain debatable.

Thus, M. A. Khvesyk and V. A. Golian consider it expedient to carry out institutional transformations in the field of water management [14, p. 275]. In our opinion, privatization, corporatization, liquidation of unpromising state enterprises in the field of water use, especially in rural areas and during the period of martial law, is inappropriate, as it affects the interests and life processes of the local population, negatively affects the processes of settlement in territories, the demographic component of economic development.

Regarding the issue of financial support in the context of water use, it is advisable to use a wider range of financial sources, including rent and investment, and not only self-financing, lending, external financing [18; 1].

CONCLUSIONS

Diversification of sources of funding for the renewal of water infrastructure facilities is an important tool for financial and economic regulation of the use of water resources in rural areas. Optimizing rent rates for special water use will allow solving the issues of territorial communities and promote more careful use of resources.

The generalization of the main provisions of the Concept of the National Targeted Social Program "Drinking Water of Ukraine" for 2022-2026 made it possible to detail the key priorities for financing water projects, to identify the number, types and sources of their financing. Among the priority sources of funding for water supply and sanitation in rural areas during the war and post-war economic recovery in Ukraine, it is advisable to give preference to communities' own funds, grants for financing infrastructure projects, including the construction of wells, funds from humanitarian response and recovery projects, public funds; microfinance; charitable or voluntary contributions, etc.

The survey structured the existing sources of water intake in Chernihiv Oblast settlements, including centralized water supply, improved and unimproved sources. The use of various sources of funding for joint water supply in rural communities makes it more affordable to create water intake wells, which will contribute to the economic development of communities, provide the population with quality drinking water, maintain health, life expectancy, form environmental awareness, and develop business in communities.

Prospects for further research consist in evaluating alternative sources of common water supply for rural communities, the advantages of creating water intake wells in rural areas.

ADDITIONAL INFORMATION

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ФІНАНСОВО-ЕКОНОМІЧНІ АСПЕКТИ СТВОРЕННЯ ДЖЕРЕЛ СПІЛЬНОГО ВОДОКОРИСТУВАННЯ В СІЛЬСЬКИХ ГРОМАДАХ

Метою дослідження є вивчення фінансово-економічних аспектів створення джерел спільного водокористування в сільських громадах, обґрунтування їх доцільності, важливості для забезпечення населення якісною питною водою й сталого економічного зростання.

У статті констатовано факт погіршення водозабезпечення в сільській місцевості й у кількісному, і в якісному аспекті. Вихід проглядається в розв'язанні проблем використання підземних вод, які краще захищені, ніж наземні водні ресурси, шляхом збільшення кількості джерел спільного водопостачання. Аргументовано, що в результаті використання джерел спільного водокористування сільські громади можуть отримати такі переваги як підвищення якості питної води, ефективності використання водних ресурсів, надійності, захищеності й стабільності джерела водопостачання. Систематизовано заходи фінансово-економічного регулювання використання підземних вод, серед яких виділено диверсифікацію джерел фінансування для оновлення об'єктів водогосподарської інфраструктури, залучення кредитних, грантових коштів на оновлення техніко-технологічної бази водогосподарських підприємств, удосконалення процедури моніторингу видобутку підземних вод із глибоких свердловин.

У статті відображено результати опитування, проведеного з метою з'ясування думки респондентів щодо джерел водозабору, наявності перебоїв у водопостачанні населених пунктів Чернігівщини, необхідності створення об'єктів

спільного водокористування в громаді та джерел фінансування їх створення. Установлено таке. Переважна більшість респондентів повідомила, що в їхніх громадах користуються колодязями, власними свердловинами та існують перебої з водопостачанням, наявні проблеми з пересиханням колодязів.

Ключові слова: фінансово-економічне регулювання, джерела спільного водокористування, еколого-економічна безпека, сталий розвиток, екологічна свідомість, людський капітал

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