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Evaluating the Coherence of Kazakhstan's Rural Water Supply Programs within the Framework of Sustainable Development

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Abstract. Objective – to assess the degree of coherence between the Republic of Kazakhstan's national strategies and program documents on rural water supply and the priorities of the Sustainable Development Goals (SDGs), identify existing gaps, and propose measures to improve policy effectiveness. Methods – a mixed-methods approach was employed, including content analysis of over 20 strategic documents (2002-2025), comparative analysis of goals and indicators, and a SWOT analysis of the Concept for Housing and Utility Infrastructure Development (2023-2029). Quantitative analysis and visualization of regional disparities based on Key National Indicators (KNI 13 and KNI 36) were performed using the R programming language. Results – the analysis revealed substantive alignment in thematic areas such as digitalization and sustainable water use. Quantitatively, while the national average for rural water access (KNI 13) reached 97.8% in 2024, the analysis showed substantial regional underperformance in the implementation of water-saving technologies (KNI 36) in several regions, primarily due to insufficient funding and a lack of Design and Estimate Documentation. Conclusions – the study confirms the hypothesis that insufficient policy coherence, combined with territorial imbalances, limits the achievement of sustainable rural water supply targets, underscoring the necessity for reinforced interagency coordination and the establishment of unified, SDG-aligned monitoring systems.

Keywords: water supply, rural areas, sustainable development, public planning, alignment, government programs, Kazakhstan

Introduction

Rational management of water resources in rural areas of the Republic of Kazakhstan has become strategically important in the context of climate change, increasing water consumption, and the need to ensure sustainable development. Rural territories face numerous challenges,

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including outdated infrastructure, inefficient use of budgetary resources, and limited access to quality water supply services. Despite the existence of strategic and program documents aimed at improving the water sector, the issue of coherence and integration among them remains unresolved.

Previous efforts – such as the "Ak Bulak" and "Nurly Zher" programs, as well as various sectoral development concepts –demonstrate the government's commitment to infrastructure modernization. However, institutional fragmentation, duplicated objectives, and the absence of unified performance indicators continue to hinder effective public policy implementation. Moreover, academic literature lacks in-depth studies on the alignment of strategic and programmatic frameworks, especially regarding regional indicators and the use of digital tools for monitoring.

The object of this research is the government policy on water supply in Kazakhstan's rural areas.

The subject is the coherence between the goals, objectives, and indicators of planning documents and the Sustainable Development Goals (SDGs).

The aim is to assess the degree of coherence between national water supply strategies and SDG priorities, identify gaps, and propose measures to improve policy effectiveness.

The study sets the following objectives:

– conduct content analysis of strategic and program documents;

– identify overlapping or contradictory goals and performance indicators;

– assess regional performance based on Key National Indicators (KNI 13 and KNI 36);

– visualize disparities using the R programming language;

– develop policy recommendations to enhance coherence and efficiency.

The hypothesis of the study is that insufficient alignment among strategic and programmatic documents limits the achievement of sustainable rural water supply targets.

The methodology includes:

– content analysis of documents adopted between 2002 and 2025;

– comparative analysis of objectives and indicators across planning levels;

– SWOT analysis of the Concept for the Development of Housing and Utility Infrastructure (2023–2029);

– visualization of regional disparities using RStudio software.

The research materials include more than 20 strategic, national, and sectoral programs, as well as regional implementation data on KNI 13 and KNI 36 for all 17 regions of Kazakhstan. A combination of qualitative and quantitative analysis was applied to assess both structural inconsistencies and territorial imbalances. The novelty of the approach lies in simultaneously evaluating programmatic coherence and visualizing regional performance in alignment with sustainable development priorities.

Literature Review

Globally, integrated water governance frameworks have become central to achieving the Sustainable Development Goals (SDGs). The United Nations emphasizes that successful implementation demands policy coherence across economic, social, and environmental dimensions (United Nations Statistics Division, 2023). The OECD proposes a structured approach to enhancing coherence at the national level by defining eight "building blocks" and

reviewing SDG implementation across countries (OECD, 2018). Its Toolkit for Water Policies and Governance contains practical guidelines for cross-sectoral water governance (OECD, 2021), while the OECD Principles on Water Governance highlight stakeholder engagement, effectiveness, and sustainable financing as crucial factors (OECD, 2015).

The concept of policy coherence itself has been further elaborated by Nilsson M. et al., who describe it as the systemic alignment of goals and policy tools across sectors necessary to achieve SDGs (Nilsson et al. 2012). This aligns with broader research on policy and functional incoherence, which examines how misalignments across sectors impair inter-agency collaboration and outcomes (Dombrowsky et al. 2022).

Turning to Kazakhstan, recent studies provide valuable empirical insights into rural water access and governance. Tussupova K. examines water and sanitation provision in rural Kazakhstan, offering recommendations for establishing effective management systems (Tussupova et al. 2016). Similarly, Bolatova Z. et al. assess rural access to safe drinking water and sanitation in the Atyrau region, emphasizing user satisfaction and discrepancies between official data and household experiences (Bolatova et al. 2025). Another key study by Karatayev M. applies a SWOT analysis to identify critical factors affecting sustainable water resource management in Kazakhstan (Karatayev et al. 2017). These works indicate the growing academic interest within Kazakhstan in integrating governance, infrastructure, and user-facing perspectives.

International evidence and national case studies together suggest strong potential for applying coherence-focused frameworks – like those recommended by the OECD and UN – in Kazakhstan's rural water governance context.

Research methods

This research applies a mixed-methods approach, combining qualitative and quantitative analyses to evaluate the coherence of Kazakhstan's rural water supply programs with the Sustainable Development Goals (SDGs). The methodology consists of four interconnected components: formulation of the research question and hypothesis, description of research material, research stages, and detailed explanation of applied methods.

1. Research Question and Hypothesis

The central research question is: To what extent are Kazakhstan's strategic and program documents in the field of rural water supply aligned with the Sustainable Development Goals (SDGs), and what gaps or overlaps hinder policy coherence?

The working hypothesis assumes that insufficient alignment among strategic and programmatic documents, combined with the absence of unified indicators and weak interagency coordination, limits the achievement of sustainable rural water supply targets.

2. Research Material and Its Characteristics

The research material comprises:

Documentary sources: more than 20 national, strategic, and sectoral programs and concepts adopted between 2002 and 2025, including "Ak Bulak," "Nurly Zher," the National Development Plan until 2029, and the Concept for Water Resources Management for 2024–2030.

Statistical data: official 2024 regional performance indicators for KNI 13 ("Access to quality drinking water in rural areas") and KNI 36 ("Implementation of water-saving technologies on irrigated lands") for all 17 regions of Kazakhstan.

Quantitative scope: coverage of all administrative regions, analysis of over 300 water supply projects in rural areas, with aggregated financial allocation of 218 billion KZT in 2024.

Qualitative scope: assessment of institutional frameworks, interagency coordination mechanisms, and integration of SDG-related indicators.

The dataset's comprehensiveness ensures representativeness and strengthens the reliability of the conclusions.

3. Research Stages

• Formulation of objectives and selection of evaluation criteria based on SDG alignment principles and policy coherence frameworks (OECD, INTOSAI).

• Collection and systematization of strategic, programmatic, and legislative documents in the rural water supply sector (2002-2025).

• Content analysis to identify thematic overlaps, contradictions, and gaps across documents.

• Comparative analysis of objectives and indicators to assess vertical (between national and regional levels) and horizontal (between sectors) coherence.

• SWOT analysis of the Concept for Housing and Utility Infrastructure Development (2023-2029) to reveal strengths, weaknesses, opportunities, and threats.

• Quantitative evaluation and visualization of regional disparities in KNI 13 and KNI 36 using the R programming language (bar charts, heatmaps).

• Formulation of recommendations for strengthening interagency coordination, monitoring, and evaluation systems.

4. Research Methods and Tools

Content Analysis: applied to identify recurring goals, inconsistencies, and the presence of interlinked performance indicators. Comparative Analysis: used to measure the degree of alignment between different planning documents and with SDG targets. SWOT Analysis: conducted to assess the strategic viability of key sectoral concepts. Statistical Visualization: Software: RStudio (version 2024.09) with ggplot2 and reshape2 packages.

Outputs: bar charts for comparative achievement of KNI 13 and KNI 36; heatmaps to visualize regional imbalances; time-series graphs for 2019–2024 dynamics.

Novelty of Approach: simultaneous assessment of policy coherence and spatial disparities in rural water supply performance, integrating qualitative policy review with quantitative indicator mapping.

5. Limitations and Ethical Considerations

The study is limited to officially published documents and open-source statistical data, which may not fully capture informal implementation practices or unpublished project evaluations. No confidential data were used. There is no conflict of interest between the authors and institutions cited in this research.

Results and discussion

In the context of sustainable development of rural areas in Kazakhstan, assessing the alignment of goals, objectives, and measures in state planning documents on water supply is essential to ensure the rational use of water resources, prevent environmental risks, and create favorable conditions for economic growth in rural settlements.

Despite the efforts undertaken by the government in the area of water provision, the analysis of coherence and effectiveness of strategic and program documents targeting rural areas

remains highly relevant. It enables the identification of potential bottlenecks and contributes to enhancing the effectiveness of public policy implementation.

The Water Code of the Republic of Kazakhstan, signed on April 9, 2025, and set to enter into force on June 10, 2025, introduces significant changes in water resource management, encompassing five key directions. The innovations include the implementation of water-saving mechanisms and the protection of water bodies through the introduction of the concept of "water security"; a revision of management approaches with an emphasis on conservation, public participation, and basin-level governance; strengthening measures for the prevention and elimination of harmful water impacts; tightening state regulation and oversight; and ensuring the safety of hydraulic structures. Overall, the code aims to comprehensively improve water resource governance in Kazakhstan .

An analysis of the coherence of key provisions related to water supply across goal-setting documents, the state planning system, and other documents outside the formal planning system is presented in Table 1.

Table 1 – Analysis of State Planning System Documents of the Republic of Kazakhstan on Rural Water Supply

Document Title	Year of Adoption	Key Provisions on Water Supply
Goal-setting Documents		
Kazakhstan-2050 Strategy: A New Political Course for the Established State	December 14, 2012	Sustainable management of water resources, study of best practices in addressing water supply issues, introduction of water-saving technologies, shifting public mindset toward water conservation, international cooperation on transboundary waters
Strategy for Achieving Carbon Neutrality of the Republic of Kazakhstan by 2060	February 2, 2023	Adaptation of water infrastructure to climate change, improvement of water use efficiency, restoration of aquatic ecosystems
Documents of the State Planning System		
National Development Plan of the Republic of Kazakhstan until 2029	July 30, 2024	Increase in the use of water-saving technologies, establishment of domestic production of irrigation systems, use of smart automated irrigation management systems, tariff regulation
National Security Strategy of the Republic of Kazakhstan	January 6, 2012	Ensuring water security, preventing conflicts over water use, protection of water bodies from pollution and depletion
Other Documents Outside the State Planning System		
Concept for the Development of the Agro-industrial Complex of the Republic of Kazakhstan for 2021–2030	December 30, 2021	Expansion of land area using water-saving technologies (drip and sprinkler irrigation)

Concept for the Development of Housing and Public Utilities Infrastructure for 2023–2029	September 23, 2022	Improving the quality of utilities through sectoral development, including population access to water supply services, reduction of wear and tear in water, heating and wastewater networks, and maintaining high standards for wastewater treatment in major cities
Concept for the Development of the Water Resources Management System of the Republic of Kazakhstan for 2024–2030	February 5, 2024	Rational use of water resources, implementation of water-saving irrigation technologies, increased use of treated wastewater, development of a hydrogeological and reclamation monitoring system, implementation of digital technologies, regulation of transboundary water use, and enhancement of interstate water cooperation
National Infrastructure Plan of the Republic of Kazakhstan until 2029	July 25, 2024	Construction and modernization of water supply and wastewater infrastructure, flood protection
National Plan for the Modernization of the Energy and Utility Sectors	December 25, 2024	Modernization and replacement of outdated water supply and wastewater networks, attracting investment to update infrastructure, introduction of modern digital and energy-efficient technologies for optimizing water resource management

Note: compiled by the authors

As shown in the table above, strategic documents (such as the Kazakhstan-2050 Strategy, the Strategy for Achieving Carbon Neutrality by 2060, and the National Development Plan through 2029) emphasize the introduction of water-saving technologies, adaptation to climate change, and the development of sustainable water infrastructure. At the same time, a number of sectoral programs (e.g., Ak Bulak, Nurly Zher) formulate their goals in a narrow scope, often without taking intersectoral coordination into account.

The comparative analysis reveals the following findings:

• There is substantive alignment between strategies and programs, particularly regarding digitalization, sustainable water use, and water quality monitoring;

• However, the absence of a unified set of indicators hampers cross-program monitoring and the assessment of overall effectiveness;

• Duplication of objectives without clearly defined institutional responsibility is observed in the concepts related to housing and utilities as well as in the agro-industrial sector.

A key strategic document that defines the long-term vision and main directions for the development of the water resources management system in the Republic of Kazakhstan is the Concept for the Development of the Water Resources Management System of the Republic of Kazakhstan for 2024-2030 [9-----18]. This document includes an analysis of the current situation, the formulation of goals and objectives, the definition of principles and approaches

to water resources management, as well as the establishment of target indicators and an action plan for the implementation of the Concept.

The role of this Concept within the state planning system lies in setting the strategic direction for the development of the water sector. It serves as a foundation for the development and implementation of more specific programs and action plans aimed at achieving long-term objectives in water resources management, including the provision of water supply to rural areas.

A SWOT analysis of the Concept for the Development of Housing and Utility Infrastructure for 2023-2029, which defines the strategic direction for the development of the housing and utilities sector, is presented below in Figure 1.

Figure 1 – SWOT Analysis of the Concept for the Development of Housing and Utility Infrastructure of the Republic of Kazakhstan for 2023-2029

Note: compiled by the authors

The conducted SWOT analysis of the Concept for the Development of Housing and Utility Infrastructure for 2023-2029 reveals both the strengths of the document and the potential risks associated with its implementation. Among the strengths are the clearly defined time frame, distribution of responsibilities, and the presence of monitoring mechanisms.

However, one of the main weaknesses is the general nature of the resolution and its dependence on the quality of implementation at the local level. The implementation of the Concept offers opportunities for infrastructure modernization, attraction of investments, improvement of quality of life, and the introduction of innovations.

Nevertheless, threats such as insufficient funding, inefficient management, and external economic factors may significantly affect the achievement of the stated goals. This analysis makes it possible to consider the Concept as a potential object for performance audit in the future.

To ensure the effective use of budgetary resources, the state must clearly understand how, where, and for what specific purposes public financing should be primarily allocated. This challenge has been addressed through the development of the institution of government programs, within which budgetary funds are concentrated in one focal area with clearly defined goals, and financial resources are distributed according to specific objectives.

In Kazakhstan, a targeted policy in the field of water supply has been implemented since the early 2000s. Over the course of 25 years, a number of programs have been carried out, as presented in Table 2.

In the past two to three years, Kazakhstan has transitioned to a project management approach, signifying a shift from traditional program-based planning and governance to methods based on national projects.

Table 2 – Summary Analysis of State, National, and Sectoral Programs on Rural Water Supply in the Republic of Kazakhstan

Programs / Projects	Goal	Objectives
Sectoral Program "Drinking Water" for 2002–2010	Sustainable provision of the population with drinking water of guaranteed quality and in sufficient quantity	- Increase the population's access to centralized water supply systems; - Improve reliability of water sources and water supply systems by ensuring compliance with sanitary rules and quality standards; - Maximize use of local potable groundwater sources; - Eliminate decentralized use of surface water for drinking purposes; - Reduce water-related disease incidence; - Establish an operational monitoring system for drinking water quality by region and river basin; - Reduce the cost of 1 m^3 of water supplied through introduction of new technologies and materials in construction and treatment systems.
Program "Ak Bulak" for 2011–2020	Provision of the population with quality drinking water and sanitation services	- Apply a systematic approach to constructing new water supply and sanitation facilities and reconstructing existing ones; - Construct and reconstruct centralized water supply and local sanitation systems (septic tanks) in rural areas; - Improve regulatory framework in the water supply and sanitation sector; - Ensure efficient and cost-effective operation of water and wastewater systems;

		- Increase investment attractiveness and promote private capital involvement in financing water and sanitation projects; - Maximize the use of groundwater for drinking water provision;
		- Improve design quality of water and sanitation systems; - Establish a monitoring system for the condition of the water and sanitation sector; - Develop a monitoring system for surface and groundwater quality; - Introduce tariffs to ensure profitability of water organizations; - Set long-term and profitable tariffs to guarantee investment return; - Reduce non-productive water losses during transport to scientifically justified levels; - Promote domestic content in water and sanitation project implementation.
State Water Resources Management Program (2014)	Ensure water security of the Republic of Kazakhstan through improved water resource management efficiency	- Guaranteed provision of water resources to the population, environment, and economy through water saving and increased availability; - Enhance efficiency in water resource management; - Preserve aquatic ecosystems.
State Program for the Development of the Agro-Industrial Complex (2017–2021)	Ensure sustainable and efficient use of water resources for agro-industrial development and improve rural well-being	- Expand irrigated land area and implement water-saving irrigation technologies; - Ensure rational use of water resources; - Modernize existing and develop new water-related infrastructure; - Reduce the agro-industrial sector's vulnerability to water-related risks.
State Program for Regional Development until 2020	Increase regional competitiveness through managed urbanization and improved quality of life	- Develop rural settlements, including border areas, outside functional urban zones; - Provide rational access to quality drinking water and sanitation services; - Modernize housing and utilities infrastructure.
State Program for Housing and Utility Development "Nurly Zher" (2020–2025)	Improve housing accessibility and comfort and develop residential infrastructure	- Provide rational access to quality drinking water and sanitation services; - Modernize and develop the housing and utilities sector.
National Project "Modernization of the Energy and Utility Sectors"	Modernize energy and utility infrastructure (networks and facilities) in Kazakhstan to ensure reliable and high-quality public services	- Upgrade and construct infrastructure (networks and facilities) in energy and utility sectors; - Develop and implement a comprehensive digitalization program; - Create mechanisms for sustainable and

	and promote sustainable economic development	affordable financing; - Maximize use of domestic goods and materials; - Mitigate the impact of tariff burdens on household expenditures.

Note: compiled by the authors

The analysis of the goals and objectives presented in Table 2 demonstrates a comprehensive approach to the development of water resource management and rural water supply systems. However, several points warrant critical consideration:

• The programs address a broad spectrum of issues, including the adoption of a systematic approach to the construction of new water supply and sanitation facilities and the reconstruction of existing ones; the development of centralized water supply systems and local sanitation systems (e.g., septic tanks) in rural settlements; improvement of the regulatory and legal framework in the field of water supply and sanitation; ensuring the efficient and cost-effective operation of water supply systems; enhancing th...

• The importance of efficient water resource management and minimizing environmental impacts is strongly emphasized.

• The relevance of digitalization in the sector is acknowledged.

• Some goals and objectives – such as the creation of an operational monitoring system for drinking water quality across regions and river basins, or the reduction of the cost per cubic meter of water through the introduction of new technologies and materials in water treatment infrastructure – may appear overly ambitious or unrealistic in practice.

• It is crucial not only to define strategic goals and objectives but also to develop specific, measurable mechanisms for their implementation, as well as robust systems for monitoring and evaluating policy effectiveness.

• The achievement of program objectives may be constrained by the availability of financial, human, and infrastructure resources, as well as by the efficiency of their allocation.

The chronology presented in the table demonstrates that the successive implementation of programs has not achieved the primary objective – ensuring the country's water security.

To provide a visual representation of the substantive structure and evolution of government programs on rural water supply, a comparative matrix was developed (Figure 2). The evaluation was conducted based on five key criteria: presence of a stated goal, presence of specific objectives, emphasis on digitalization, presence of a monitoring system, and presence of intersectoral coordination.

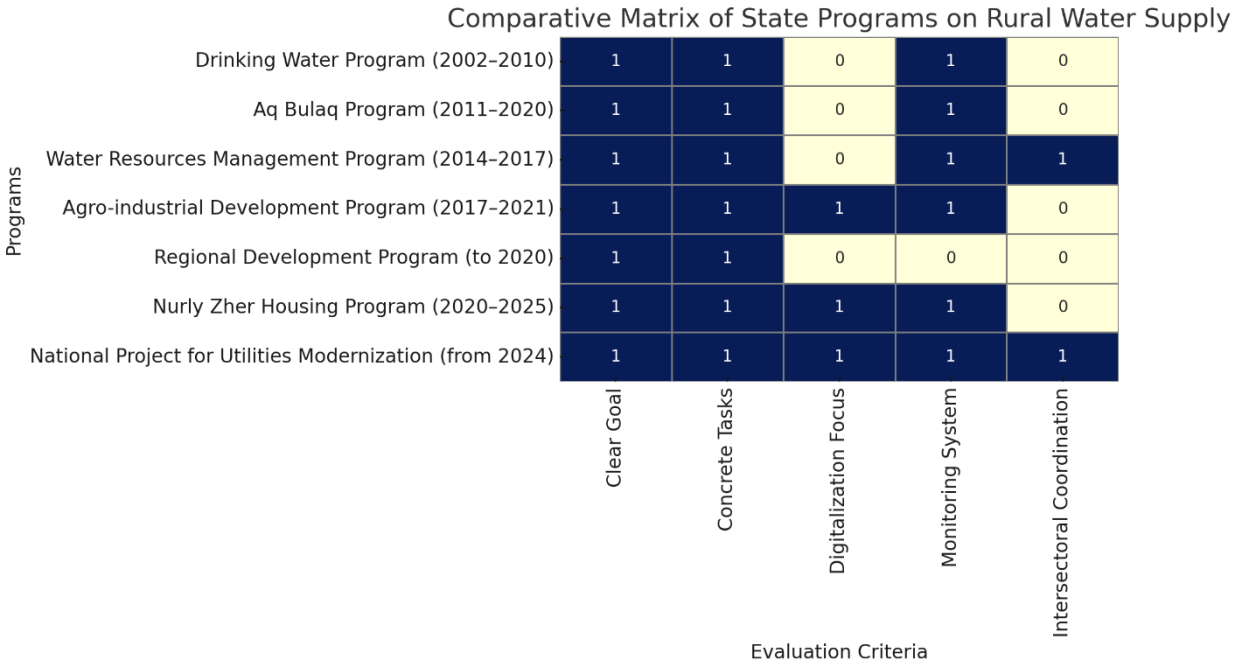


Figure 2 – Comparative Matrix of Government Programs on Rural Water Supply
Note: compiled by the authors

As shown in Figure 2, nearly all programs contain clearly defined goals and objectives. However, digitalization and intersectoral coordination are reflected only in select initiatives, primarily in more recent ones – for example, in the National Project for the Modernization of the Utility Sector. The absence of systematic monitoring in earlier programs hindered effective oversight and adjustment.

The comparative analysis illustrates the evolution of policy approaches – from fragmented solutions to more comprehensive strategies that incorporate digital technologies and the integration of various sectors.

In addition to national-level documents, regional development plans also form part of the state planning system. Based on the Development Plans of 17 regions and the Reports on their implementation, an assessment was conducted on the achievement of Key National and Target Indicators for 2024.

We focus on KNI 13: "Level of provision of social benefits and services in accordance with the Regional Standards System (%)", including rural settlements. The goal is to create a comfortable living environment for residents of both rural and urban areas. The analysis of progress toward Key National Indicators (KNIs), as defined in the National Development Plan of the Republic of Kazakhstan until 2029, is presented in Figure 3.

In 2024, a total of 218 billion KZT was allocated across the country for the implementation of 324 water supply projects, including 112 billion KZT for 202 projects in rural settlements. The share of the rural population with access to quality drinking water reached 97.8% in 2024, which represents a 1.2% increase compared to the previous year.

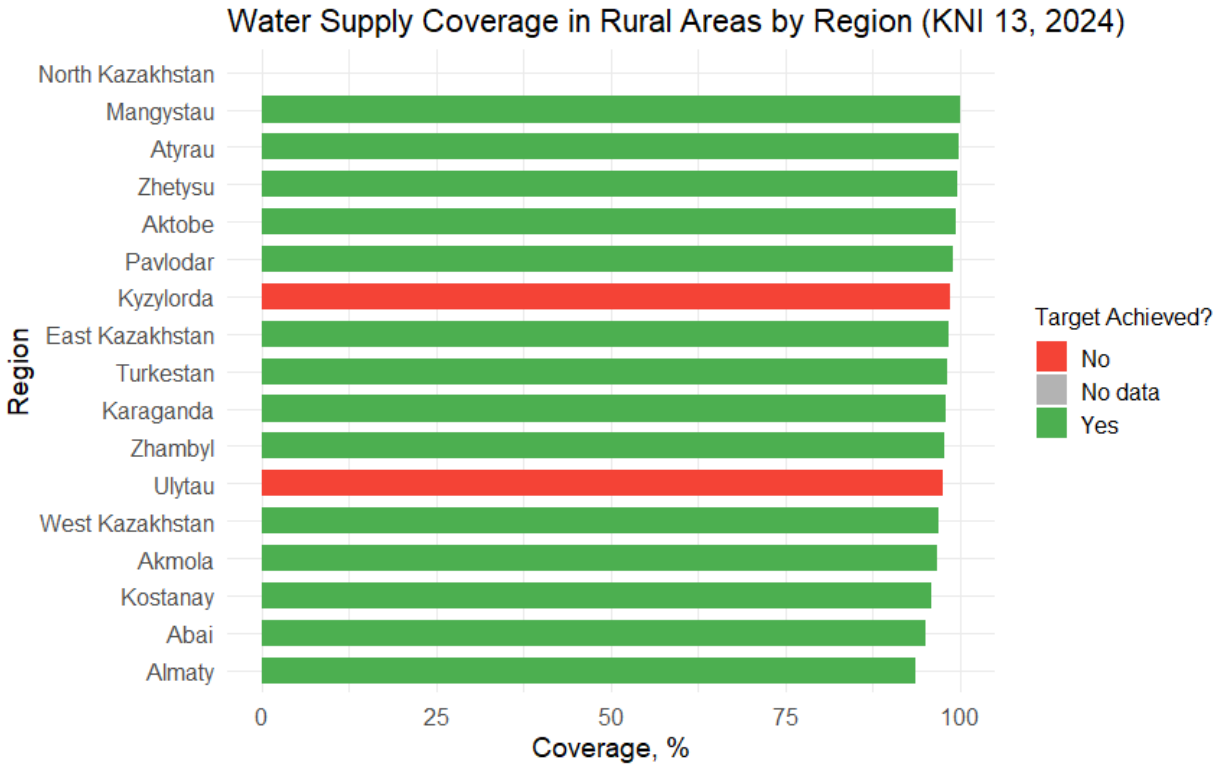
The target indicator was not achieved in only two regions: Kyzylorda Region (98.6%) and Ulytau Region (97.5%). In Ulytau Region, the installation of 10 modular block stations (MBS)

was planned for 2024 (4 in Zhanaarka District and 6 in Ulytau District). In Zhanaarka District, design and estimate documentation (DED) was prepared for water pipeline networks in two rural settlements, with a positive state environmental expert review conclusion. In the remaining eight rural settlements, community meetings were held, and residents officially declined the installation of MBS, as recorded in meeting protocols.

Next, we consider KNI 36: "Savings of irrigation water through the implementation of water-saving technologies in irrigated agriculture (national level)."

Objective 1: Implementation of water-saving technologies on irrigated land.

Measure 1: Implementation of water-saving technologies covering up to 150,000 hectares per year nationwide.



Note: compiled based on data from regional development plans

Figure 3 – Level of Access to Drinking Water in Rural Areas by Region of Kazakhstan (%), KNI 13, 2024

Note: compiled based on data from regional development plans

The above figure – an analysis of the achievement of KNI 13 (level of water supply coverage) and KNI 36 (implementation of water-saving technologies) by region of Kazakhstan in 2024 – shows that:

• The majority of regions have met their planned targets;

• Underperformance in certain regions (Ulytau, Zhambyl, Kostanay, among others) is attributed to limited financing and the absence of design and estimate documentation (DED);

• The overall level of rural access to water reached 97.8%, which reflects progress but still falls short of achieving sustainable water security.

In Kazakhstan, approximately 60% of all water resources are used in agriculture, as irrigation plays a key role. Crop production in the country requires efficient irrigation methods. In this

regard, the implementation of water-saving technologies continued, and the area of irrigated land increased from 312.2 thousand hectares to 462.2 thousand hectares in 2024. Particular attention was given to the adoption of drip and sprinkler irrigation systems.

However, as shown in Table 4, the target indicators were not achieved in the following regions: Aktobe (93.6%), Almaty (91.8%), Atyrau (76.4%), Zhambyl (69.9%), Zhetysu (84.9%), and Kostanay (69.4%). The failure to meet the targets was primarily due to a lack of funding.

Table 3. Analysis of Measure 1 of KNI 36 "Implementation of Water-Saving Technologies on Irrigated Lands Covering up to 150 Thousand Hectares per Year (Nationwide)"

Abai	-	-		5,487	6,159	6,63	7,296	13,1/ 13,8	105,3 Achieved
Akmola	-	28,550	29,550	31,334	37,094	43,102	57,110	-	No data
Aktobe	-	21,572	26,463	33,308	36,284	40,372	41,822	29,5/ 27,6	93,6% – Not achieved
Almaty	17,049	19,158	21,042	26,719	31,790	34,356	36,999	42,6/ 39,1	91,8% – Not achieved
Atyrau	3,702	-	4,107	4,311	4,759	5,138	5,635	6,8/ 5,2	76,4% Not achieved
West Kazakhstan	-	-	3,789	4,004	4,218	4,598	5,169	9/ 9,3	103,3% Achieved
Zhambyl	-	-	40,458	41,814	44,740	51,400	58,865	79,2/ 55,4	69,9% Not achieved
Zhetysu	-	-		8,0	10,2	11,5	12,7	31,2/ 26,5	84,9% Not achieved
Karaganda	-	-	35,037	38,85	41,573	44,246	49,427	-	No data
Kostanay	-	-	5,776	6,411	9,523	13,837	17,02	12,1/ 8,4	69,4% Not achieved
Kyzylorda	-	-	0,810	1,910	7,966	11,025	17,182	4,2/ 4,4	104,8 Achieved
Mangystau	-	0,790	0,810	0,863	0,920	0,981	1,046	-	No data
Pavlodar	45,1	54,85	64,555	77,717	82,728	88,482	93,253	3,2/ 3,2	100% Achieved
North Kazakhstan	2,261	2,267	3,511	4,531	4,781	5,167	5,451	-	No data
Turkistan	-	20,197	24,243	28,663	33,123	37,813	42,639	54,3/ 54,3	100% Achieved
Ulytau	-	-		0,2	1,2	4,0	4,1	-	No data
East Kazakhstan	9,9	9,8	9,9	5,487	6,159	6,63	7,296	1,027/ 1,027	100% Achieved

Note: compiled by the authors based on regional development plans and implementation reports of the Republic of Kazakhstan

Analysis of the data in Table 3 shows that despite the overall increase in areas with the implementation of water-saving technologies, not all regions meet the planned targets.

The lowest levels of implementation were recorded in Kostanay (69.4%), Zhambyl (69.9%), and Atyrau (76.4%) regions. The main reasons for these shortfalls include insufficient funding, weak technical and material infrastructure, and limited access to modern technologies.

At the same time, several regions – such as Abai, Turkistan, and Pavlodar – achieved 100% or more of the target, indicating the presence of successful regional practices. Scaling up these approaches further requires stronger coordination at the level of agricultural sector competence centers.

To enable a comprehensive comparison of the degree of achievement of key national indicators across the regions of Kazakhstan in 2024, Figure 4 presents a heat map. The visualization simultaneously reflects two indicators: the provision of rural populations with access to quality drinking water (KNI 13) and the implementation of water-saving technologies on irrigated land (KNI 36). This approach helps to identify imbalances between the social and technological components of state water policy.

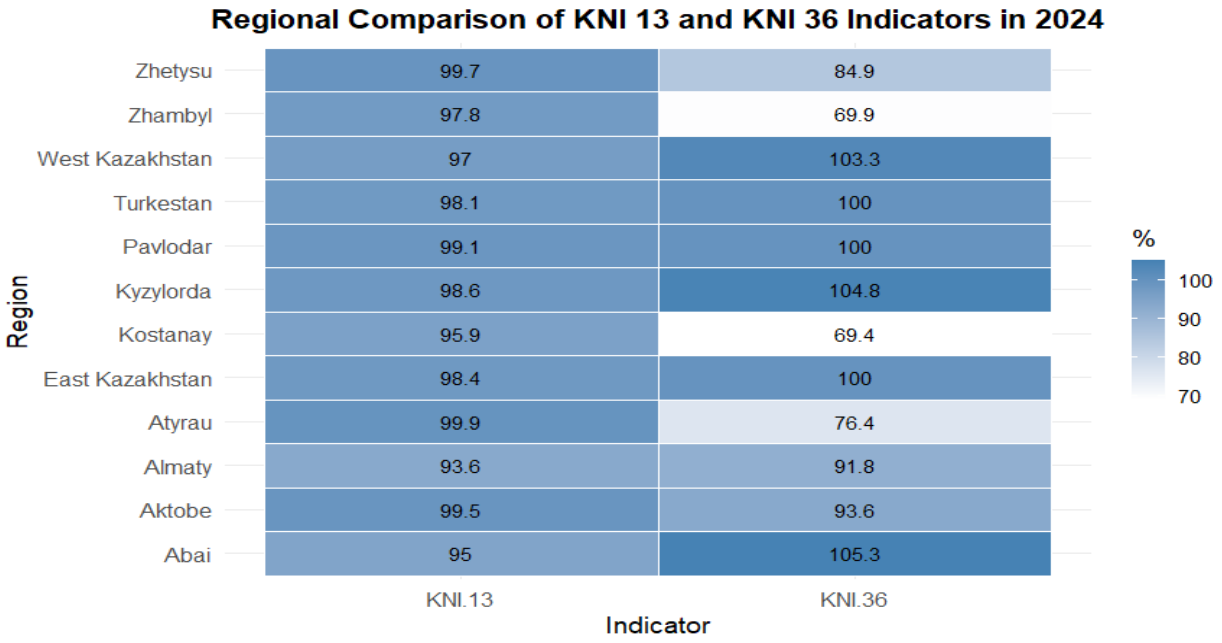


Figure 4 – Regional Comparison of Indicators KNI 13 and KNI 36 in 2024

Note: compiled based on regional programmatic documents

As shown in Figure 4, not all regions that have achieved high values for KNI 13 demonstrate similar progress in relation to KNI 36. This is particularly evident in Atyrau, Zhambyl, and Kostanay regions, where the level of implementation of water-saving technologies significantly lags behind normative targets. In contrast, regions with consistently strong results across both indicators – such as Kyzylorda and East Kazakhstan – demonstrate the effectiveness of an integrated approach. These disparities highlight the need to balance state policy between social and environmental priorities and to strengthen interagency coordination at the regional level.

To assess the progress in implementing public policy in the areas of water supply and agrotechnology, it is advisable to analyze long-term trends. Figure 5 presents the growth of

key national indicators – KNI 13 (provision of rural populations with drinking water) and KNI 36 (implementation of water-saving technologies) – over the period from 2019 to 2024. This approach makes it possible to evaluate the sustainability of progress and to identify areas requiring additional support.

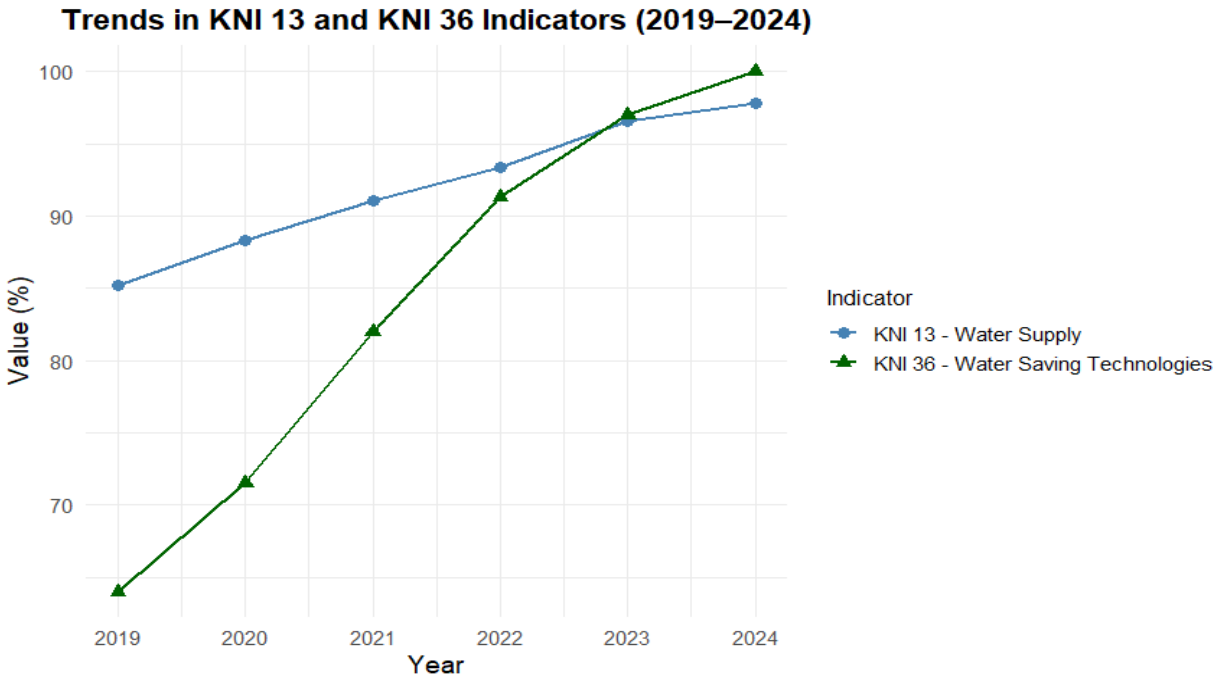


Figure 5 – Dynamics of Indicators KNI 13 and KNI 36 in 2019-2024

Note: compiled based on regional programmatic documents

As shown in Figure 5, both indicators exhibit steady growth, particularly over the past three years.

The increase in access to drinking water (KNI 13) reflects the effectiveness of ongoing infrastructure programs. However, the even sharper rise in KNI 36 may indicate large-scale efforts toward the modernization of agriculture. It is important to note that such high values require continuous monitoring to avoid statistical inflation or reporting without tangible impact. Taken together, these trends point to a generally positive – but uneven – dynamic in achieving the Sustainable Development Goals.

Conclusions

Thus, despite the existence of numerous programs and policy documents, target benchmarks are often formulated without clearly defined implementation mechanisms. Key challenges include:

- the absence of a unified platform for monitoring program implementation;
- decentralized responsibilities and weak interagency coordination;
- limited resource base and institutional mechanisms.

The following recommendations are proposed:

- Establishment of an integrated information system to track all programs and indicators related to water supply;

• Development of a composite index to assess the coherence of program documents with sustainable development priorities;

• Introduction of regular interagency audits to evaluate the alignment of goals and indicators;

• Creation of an evaluation system that accounts for the social, economic, and environmental impacts of programs.

The assessment of policy coherence in the area of rural water supply revealed that, despite the presence of multiple programs, issues such as duplication of objectives, fragmented implementation, and insufficient coordination across planning levels persist. Achieving the Sustainable Development Goals will require a systemic transformation of planning, monitoring, and interagency cooperation mechanisms.

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Authors' Contributions

All authors confirm that they meet the authorship criteria and take full responsibility for all aspects of the work. **A.O. Zhupysheva** and **A.Zh. Mashayeva** made substantial contributions to data collection, analysis, interpretation of results, and drafting of the manuscript. **A.M. Petrov** was responsible for literature data collection and synthesis, conducting the literature review, formulating the research conclusions, and approving the final version of the article for publication. All authors equally agree to be accountable for all aspects of the work and to ensure that any issues related to the accuracy or integrity of any part of the manuscript are appropriately investigated and resolved.

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Тұрақты даму контекстінде Қазақстанның ауылдық аумақтарын сумен қамтамасыз етудің мемлекеттік бағдарламаларының үйлесімділігін бағалау

Аңдатпа. Ұсынылған ғылыми мақаланың мақсаты – Қазақстан Республикасының ауылдық аумақтарды сумен қамтамасыз ету саласындағы ұлттық стратегиялары мен бағдарламалық құжаттарының Орнықты даму мақсаттарының (ОДМ) басымдықтарымен үйлесімділік (когеренттілік) деңгейін бағалау, қолданыстағы алшақтықтарды анықтау және саясаттың тиімділігін арттыру бойынша шаралар ұсыну. Әдістері – аралас әдістер қолданылды, оның ішінде 20-дан астам стратегиялық құжаттарға (2002–2025 жж.) контент-талдау, мақсаттар мен индикаторларға салыстырмалы талдау, сондай-ақ Тұрғын үй-коммуналдық инфрақұрылымды дамыту тұжырымдамасына (2023–2029 жж.) SWOT-талдау жүргізілді. Өңірлік сәйкессіздіктерді негізгі ұлттық индикаторлар (КҰИ 13 және КҰИ 36) бойынша сандық бағалау және көрнекілеу үшін R бағдарламалау тілі қолданылды. Нәтижелері – талдау цифрландыру және суды тұрақты пайдалану сияқты тақырыптық бағыттарда мазмұнды үйлесімділікті көрсетті, бірақ сонымен қатар, бағдарламалық құжаттар арасында бірыңғай индикаторлар жиынтығының жоқтығы, мақсаттардың қайталануы және институционалдық бытыраңқылық сияқты айтарлықтай үйлесімсіздіктер анықталды. 2024 жылы ауылдық жерлерде суға қол жеткізудің орташа көрсеткіші 97,8%-ға жеткенімен, сандық талдау қаржыландырудың жетіспеушілігі мен жобалық-сметалық құжаттаманың (ЖСҚ) жоқтығына байланысты бірқатар өңірлерде су үнемдеу технологияларын енгізу бойынша (КҰИ 36) нысаналы көрсеткіштердің айтарлықтай орындалмағанын көрсетті. Қорытындылар – зерттеу стратегиялық және бағдарламалық құжаттардың жеткіліксіз үйлесімділігі, аумақтық диспропорциялармен ұштасып, ауылдық жерлерді сумен қамтамасыз ету саласындағы тұрақты мақсаттарға жетуді шектейтінін растайды және ведомствоаралық үйлестіруді күшейтуді, сондай-ақ бірыңғай, ОДМ-ға сәйкестендірілген мониторинг жүйелерін енгізу қажеттілігін көрсетеді.

Түйін сөздер: сумен қамтамасыз ету, ауылдық аумақтар, тұрақты даму, мемлекеттік жоспалау, келісімділік, мемлекеттік бағдарламалар, Қазақстан

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Оценка согласованности государственных программ водообеспечения сельских территорий Казахстана в контексте устойчивого развития

Аннотация. Цель – оценить степень согласованности (когерентности) национальных стратегий и программных документов Республики Казахстан в области водоснабжения сельских территорий с приоритетами Целей устойчивого развития (ЦУР), выявить существующие пробелы и предложить меры по повышению эффективности политики. Методы – применен смешанный подход, включающий контент-анализ более 20 стратегических и программных документов (2002-2025 гг.), сравнительный анализ целей и показателей, а также SWOT-анализ Концепции развития жилищно-коммунальной инфраструктуры (2023-2029 гг.). Для количественной оценки и визуализации региональных диспропорций по Ключевым национальным индикаторам (КНИ 13 и КНИ 36) использовалось программное обеспечение R. Результаты – анализ выявил содержательную согласованность по таким направлениям, как цифровизация и устойчивое водопользование, однако установлены значительные пробелы в когерентности, включая отсутствие унифицированного набора индикаторов, дублирование целей и институциональную фрагментацию между программными документами. На региональном уровне, несмотря на достижение среднего показателя доступа к воде в 97,8% в 2024 году, количественный анализ показал существенное невыполнение целевых показателей по внедрению водосберегающих технологий (КНИ 36) в ряде регионов из-за недостаточного финансирования и отсутствия проектно-сметной документации (ПСД). Выводы – исследование подтверждает гипотезу о том, что недостаточная согласованность стратегических и программных документов, в сочетании с территориальными диспропорциями, ограничивает достижение устойчивых целей в области водоснабжения сельских территорий и требует усиления межведомственной координации и внедрения унифицированных систем мониторинга.

Ключевые слова: водообеспечение, сельские территории, устойчивое развитие, государственное планирование, согласованность, государственные программы, Казахстан

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