

Monitoring of design models of ongoing water supply and drainage projects in the Kyrgyz Republic

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Abstract: Monitoring of water supply and drainage design models is an important task in the context of sustainable development of cities and regions. With increasing population and climate change, effective management of water resources becomes critical. Monitoring of design models helps identify the effectiveness and shortcomings of projects and ensures they adapt to changing conditions. Existing water supply and drainage design models may face a number of problems, such as insufficient efficiency, instability to changing conditions and technological limitations. It is important to investigate these problems and develop monitoring methods and tools that will improve the quality of design and implementation of such projects. The purpose of the study is to develop a system for monitoring of design models of ongoing water supply and drainage projects in order to increase their efficiency and sustainability. The main objectives of the study include: Analysis of existing design models and identification of their main characteristics. Determination of criteria for the effectiveness and sustainability of water supply and drainage projects. Review of monitoring methods and tools that allow to evaluate the compliance of design models with specified criteria. Conducting an analysis of the effectiveness and sustainability of existing projects and identifying areas for improvement.

1 Introduction

In the Kyrgyz Republic, currently about 1 million people have problems with access to clean drinking water [1]. And this despite the fact that Kyrgyzstan is one of the richest countries in post-Soviet Central Asia in water resources.

Most of the water supply networks were built back in Soviet times, in the last century, and have now fallen into almost complete disrepair.

After the collapse of the USSR, the water supply system was abandoned for 10 years, which led to an intensive deterioration in its technical condition. Due to the lack of sources of funding

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from local self-government bodies and the lack of funds in local budgets, the previously existing system of their operation, maintenance and repair ceased to function, as a result of which many water supply networks fell into disrepair.

On a national scale, these problems have become threatening, especially in rural areas.

Taking into account the current situation, in 2000 the Government of the Kyrgyz Republic signed a loan agreement with the Asian Development Bank to allocate funds for the restoration and new construction of rural drinking water supply systems, and 2 years later - a loan agreement with the World Bank. The main goal of which was to improve the living and health conditions of the rural population, reduce poverty in rural areas through the provision of clean drinking water and appropriate sanitation. The Asian Development Bank project entitled "Provision of infrastructure services at the community level", worth \$45 million, including a loan from the Asian Development Bank - \$36 million, and co-financing from the Government of the Kyrgyz Republic and the local community - \$9 million, which covered 860 villages of Chui, Osh, Jalal-Abad and Batken provinces and a World Bank project entitled "Rural water supply and sanitation", with a total cost of \$24.5 million, of which \$15 million was a World Bank loan of \$6.25 million and the Department for International Development (UK) and \$3.5 million co-financing from our government and the local community, which covered 270 villages in the Issyk-Kul, Naryn and Talas provinces. Having united, both projects received the name "Taza Suu" program. Within the framework of this project, one of the main requirements of the Asian Development Bank, according to the Agreement signed by both parties, was that the owners of water supply systems should be the drinking water consumers themselves.

As a result, amendments and additions were made to the Law "On drinking water" and in rural settlements, with the exception of district centers, rural public drinking water consumers unions (RPDWCU) were created and the Decree of the Government of the Kyrgyz Republic "On the transfer of rural water supply systems (except for district centers) into the ownership of rural public drinking water unions and their subsequent operation" was adopted, according to which rural water supply systems were transferred free of charge from the balance of local self-government bodies to the balance of the RPDWCU. The same decree provided for the State committee for state property management and attraction of direct investments, as well as the Ministry of Agriculture to develop and approve a procedure for securing ownership of accepted rural water supply facilities. It should be noted that not only water supply facilities, but also loans for restoration, major repairs and construction of water supply systems were provided to the RPDWCU. An important factor was that the RPDWCU had the right to set tariffs for consumed drinking water in the order established by the Law of the Kyrgyz Republic "On drinking water". And in order to monitor the water supply and sanitation program at the national level, the Government of the Kyrgyz Republic in 2000 created the Department of rural water supply under the Ministry of agriculture, water resources and processing industry of the Kyrgyz Republic (DRWS), whose territorial offices are represented by chief specialists in each district of the republic. The department of rural water supply, according to its status, was supposed to develop and implement mechanisms and procedures for developing programs for rural water supply, strengthen the activities of territorial offices, rural public drinking water consumers unions and coordinate work on rural water supply with a group of international specialists.

Over a period of time, practice has shown that the RPDWCU, being a public organization, was unable to properly collect money from the population for the drinking water they consumed, as well as interest on the loan provided, be responsible to the population for the results of its activities and for the safety of the transferred property, many disbanded due to approaching bankruptcy or for the inability to further carry out their functions. In addition, the functions of rural public unions on providing drinking water to the population contradicted the basic Law "On local self-government and local state administration" (Article 12), according to

which the powers of local self-government bodies cannot be transferred to organizations not included in the system of local self-government bodies.

The transfer of water supply facilities from municipal property to the ownership of RPDWCU was a violation of the constitutional principle of inviolability of property, since in the Kyrgyz Republic private, state and municipal property are equally recognized and protected. Therefore, today the responsibility for providing the population with high-quality drinking water remains with local self-government bodies.

In order to ensure proper operation and maintenance of drinking water supply systems in rural areas, municipal enterprises have been established in 23 district centers of the republic for maintenance and operation.

Currently, in order to improve the quality of services for providing the population with drinking water, drainage and wastewater treatment, as well as the effective operation and maintenance of centralized drinking water supply and drainage systems, Gosstroy has begun work on the creation of a State enterprise for technical support to providers of drinking water supply and drainage services and further operation of systems.

Despite the fact that at all levels of government various attempts are being made to resolve problems of providing the population with safe drinking water, such as, for example, the adoption of the Strategy for the development of drinking water supply and drainage systems in populated areas of the Kyrgyz Republic until 2026 [2], the Government of the Kyrgyz Republic does not allocate sufficient financial resources to resolve issues of water supply to the population with safe drinking water.

In accordance with this Program, it is planned to carry out work on the construction of drinking water supply systems in 715 villages and by 2026, the rehabilitation of drinking water supply systems in 448 villages of the republic for a total amount of 2 billion from the republican budget and 48 billion 247.6 million soms from funds of international development partners, as well as drainage systems - in 26 district centers with village status, in the amount of 4 billion 048 million soms.

The total amount of necessary financial resources for the implementation of the Program is about 70.21 billion soms, of which: 68215.4 billion soms of external investments, 2000.0 billion soms - funds from the republican budget.

Today, in order to implement the activities mentioned in the Program, donor partners, such as the World Bank (WB), the European Union (EU), the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB), State Secretariat for Economic Relations of the Swiss Confederation (SECO), Asian Development Bank (ADB), Islamic Development Bank (IDB), Saudi Development Fund (SDF) and Eurasian Fund for Stabilization and Development (EFSD) are actively involved.

In addition, Gosstroy has begun work to attract credit funds from the Eurasian Fund for Stabilization and Development. The Eurasian Fund for Stabilization and Development will attract 60.0 million US dollars, taking into account co-financing from the Cabinet of Ministers of the Kyrgyz Republic. The project covers 32 villages of Osh province. Sewage treatment and construction of sewage treatment facilities were planned for Phase II of the long-term program for Issyk-Kul and on December 28, 2018, a new Agreement with the ADB for the project "Wastewater management in Issyk-Kul" was signed and ratified by the Law of the Kyrgyz Republic as of July 16, 2019 No. 84.

This project is aimed at improving and expanding access to reliable, uninterrupted and affordable sewerage services in Balykchy and Karakol cities, located on the shores of Issyk-Kul lake. The total amount of the project is 41.87 million US dollars. These projects will be completed in 2025. Also, ADB plans to construct and rehabilitate sewage treatment facilities in Cholpon-Ata city in the amount of 65.2 million US dollars. In accordance with the feasibility study and the project implementation plan, it is planned to carry out the construction of a sewage treatment facility, a sewage pumping station and sewers with a length of more than 45

km, and about 95 km of an intra-block sewage network, tourism facilities (museum, parks, sanitary facilities at the location of petroglyphs and etc.).

The component for the construction of sewage pumping stations and sewers, including intra-block sewage networks, will cover the villages of Bosteri, Baktuu-Dolonotu and Kara-Oi.

Therefore, we see the need to develop an effective design model for managing projects to provide the population with drinking water, the needs of the population and the financial capacity of the state.

2. Materials and methods

All projects implemented on water supply and drainage by donors and banks are implemented according to their design. Therefore, each donor has its own design for project implementation and funding requirements accordingly.

In order to monitor the water supply and sanitation program at the national level, the Government of the Kyrgyz Republic in 2000 created the Department of rural water supply (DRWS) under the Ministry of agriculture, water resources and processing industry of the Kyrgyz Republic, whose territorial offices are represented by chief specialists in each district of the republic. DRWS, in accordance with its status, develops and implements mechanisms and procedures for developing programs for rural water supply, strengthens the activities of territorial offices, rural public drinking water consumers unions, coordinates work on rural water supply with a group of international specialists.

Due to the lack of a unified model of state management of water resources, in the implementation of projects, approaches proposed by banks and donors were used.

Considering this situation, the department proposed that donors develop a unified design model for project implementation, followed by implementation, but donors and banks did not agree to this, arguing that they have their own approved model for the implementation of projects on which they work throughout the world.

Therefore, for each project, the implementation design and its execution turned out to be different, the department, from its side, could not introduce its own design and comments. Accordingly, this influenced the implementation process itself, which did not depend on the department, whose functions included only participation and assistance as observers. In addition, there are other points that affect the efficiency of project implementation - the process of passing project approval, for example, ratification of projects takes a very long and complicated process that takes time. For this purpose, DRWS developed a special criterion for selecting priority villages. At the beginning, a list of priority villages is formed where it is necessary to implement the project, at the first stage, a list of priority villages is formed by joint-stock companies, then it is approved at the district level and then at the regional level, it is then transferred to the DRWS, on the DRWS side, the list of priority villages is provided to donors.

The selection criteria for villages for the project are considered according to the following criteria:

Group 1 no rural water supply system.

Group 2 villages where the system was built in 1950-70.

Group 3 villages where the system was built in the period of 1970-1990.

Group 4 villages where the system was built in 2000.

According to the state program, priority is given to group 1 and group 2.

And also, in order to avoid duplication and carry out coordinated work, a mechanism for the work of donors in the implementation of water supply and drainage projects has been developed by the department, where donors are distributed among the regions of the country:

1) The European Bank for Reconstruction and Development (EBRD) – works in cities, small towns, district and regional centers.

- 2) Asian Development Bank (ADB) -works in Naryn province.
- 3) The World Development Bank (WB) - works in Osh, Issyk-Kul and Chui provinces.
- 4) Islamic Development Bank (IDB) and Saudi Development Fund (SDF) – work in Jalal-Abad, Batken and Talas provinces.

3. Results

1. Through the *European Bank for Reconstruction and Development*, the European Union and the State Secretariat for Economic Relations of the Swiss Confederation (SECO), investments in the total amount of 192.12 million Euros were attracted. Out of the 31 cities existing in the republic, projects on the construction, rehabilitation and reconstruction of drinking water supply and sewerage systems are being implemented in 20 cities and 8 villages. Of them:

- in 2018 - 2023, projects were implemented in cities (Bishkek 1-phase, Osh 1-phase, Jalal-Abad 1-phase, Naryn 1-phase, Kant 1-phase, Talas 1-phase);
- in 2021, the main works on the project in Osh city phase 2 and Batken city has been completed and preparations are underway to put into operation;
- construction works are underway in 9 cities (Bishkek 2-phase, Kara-Suu, Kyzyl-Kiya, Cholpon-Ata, Balykchy, Toktogul, Uzgen, Mailuu-Suu and Tokmok. These projects were implemented in the period of 2021-2023;
- projects in Nookat and Kerben cities were ratified by the Jogorku Kenesh of the Kyrgyz Republic on September 22, 2021; internal procedures are carried out for the signing of Sub-grant and sub-loan agreements between the city mayor's offices and the Ministry of Finance.

- In addition, through the EBRD, projects in Tash-Kumyr, Kok-Jangak, Kadamjai, Aidarken, Kemin, Shopokov and Kant cities (phase 2) were approved by the decision of the Government of the Kyrgyz Republic on fiscal and investment policy as of August 28, 2020. Currently, the Bank has selected consultants for these projects and works on the development of a feasibility study are in process.

2. Through the *Asian Development Bank (ADB)*, funds in the amount of 32.9 million US dollars were attracted, covering 43 villages of Naryn province, which were ratified. Today, works are underway to develop design and estimate documentation. For the first lot, covering 13 villages, a contract was signed with the winning company and work on developing design and estimate documentation has started. For the second lot, covering 15 villages, work is being carried out to study drinking water supply systems. Construction works will be carried out in the period of 2021-2026.

For the implementation of the above mentioned project, the Implementing agency is the Department for the development of drinking water supply and drainage, and the implementing organization is the Community development and investment agency of the Kyrgyz Republic. Through the Asian Development Bank, within the "Wastewater management in Issyk-Kul" project worth 41.82 million US dollars it is planned to modernize and expand existing wastewater treatment systems, strengthen institutional capacity and increase the sustainability of water supply and drainage services in Balykchy and Karakol cities.

Today, for these cities, tender procedures are in process for the purchase of 3 pumping units for irrigation pumping stations at the choice of companies.

Project "Small support for multi-sectoral activities - Small expenditure financing facility for the Kyrgyz Republic (SEFF)" in the amount of 10 million US dollars, within the framework of the First sub-grant activity, works were successfully completed on the supply of chlorine neutralization equipment for the Ozgur drinking water treatment plant at the Osh dam water treatment plant, which has been installed and put into operation.

At the same time, in order to provide drinking water to Osh city and lay 2.4 km in 2 lines and build a dam, 3.0 million US dollars are provided and 2.0 million US dollars are provided

for the construction of 1.1 km of water pipeline in 2 lines that were approved by the Coordination Kenesh of the Kyrgyz Republic.

3. Through the *World Bank*, the “Taza Suu Program” is being implemented in 95 villages of Osh, Chui and Issyk-Kul provinces in the amount of 71.2 million US dollars. To date, since the beginning of the project, implementation has been completed in 49 villages; construction and installation works and preparation of design and estimate documentation continue for the remaining facilities.

The World Bank implemented a water supply project in Kerben and Sulukta cities for 8.0 million US dollars, which was completed and put into operation.

3. Through the *Islamic Development Bank* (phase I), it is planned to provide 25 villages of Jalal-Abad province with clean drinking water for a total amount of 23.0 million US dollars. To date, the development of design and estimate documentation has been fully completed, and construction and installation works have been completed in 10 villages. Construction and installation works continue on the remaining facilities. Construction works were completed in the period of 2019-2023.

Through the Islamic Development Bank and the Saudi Development Fund in the amount of 50.0 million US dollars, 61 villages of Batken and Talas provinces were included, of which 44 villages in Batken province, 17 villages in Talas province. These projects were ratified at the end of 2019, today in the villages of Batken province the preparation of design and estimate documentation is at the completion stage, construction and installation works have started in 2 villages, and in the villages of Talas province, works on developing design and estimate documentation are underway. Construction works will be carried out from 2021-2023.

4. Through the *Eurasian Fund for Stabilization and Development* (EFSD), a Memorandum for a total amount of 200.0 million US dollars was signed within the framework of the donor conference on November 19, 2019 and the Concept was sent to the EFSD.

For this project, 36 villages of Osh province are included as pilot villages, for which 48.22 million US dollars is expected to be allocated. The project was approved by the Council of the Government of the Kyrgyz Republic on fiscal and investment policy as of August 28, 2020 and the draft concept was sent for consideration by the EFSD Board of Directors.

5. The republican budget is distributed throughout the provinces of Kyrgyzstan, from the republican budget under the item “Capital investments” for water supply facilities, in the period from 2014-2020, 1441.1 million soms were allocated, construction and rehabilitation in 109 villages were completed with the allocated funds.

For 2023, 500.0 million soms were planned from the republican budget under the item “Capital investments”, of which:

- 240.0 million soms for the continuation of work in 25 transitional facilities (35 villages), today 240.0 million soms have been transferred and by the end of 2023, 2 facilities (3 villages) have been completed and works on the remaining facilities are carried out by the Department of Housing and Civil Construction.

A capital construction department was created under the Department for the development of drinking water supply and drainage. For this purpose, 260.0 million soms are to be allocated from the republican budget under the item “Capital investments” for 2023, of which 260.0 million soms have been allocated, works are underway at 73 facilities (111 villages)[3].

4 Discussion

As for Donors procedures in the field of drinking water provision, each Donor has its own policies and procedures that they work with around the world. This especially applies to conducting tenders and selecting contractor organizations, which requires certain skills, conditions and time. In this regard, the implementation of some projects is delayed for a long time.

If you look at the example of Banks, then the design of the EBRD project, their procedure is very complicated, and they work mainly in cities, since city residents are considered to be able to pay the loan, in addition, their process for passing and approving the project is coordinated with their central office, where it is written that the repayment is made by the municipality and the agreement is signed with the city water utilities where the city mayor's offices are the guarantors. If you look at the tender procedures, the EBRD tender and procurement is carried out through the mayor's offices.

Other donors and banks work with the republican budget, where the guarantor of repayment is the Government of the Kyrgyz Republic. In the example of the World Bank, the tender and procurement procedure should be carried out by Aiyl Aimaks (AA), because Aiyl Aimaks are responsible, but due to the fact that there are no procurement specialists in Aiyl Aimaks, this procedure is carried out by the Community Development and Investment Agency (ARIS) on behalf of the AA, but as a result, it is not ARIS but AA that is responsible.

On the other hand, why it is carried out by the ARIS and not Aiyl okmotu, this is due to the fact that the WB contractual agreements state that the implementing agency should be ARIS, and the Government should be represented by the Department for the development of drinking water supply and drainage, as there are no other similar bodies in this sphere yet.

In the banking environment, there are very high requirements for selecting contractors. Despite the fact that Kyrgyzstan has a Law "On public procurement", donors still conduct tenders according to their design and procedures for selecting suppliers and contractors, choose contractors themselves, but in the case of poor quality work and an unscrupulous contractor, in the end the Government of Kyrgyzstan is responsible for this including all comments on failures, which is not correct.

An open question arises, if ultimately our state bears responsibility for the success of the implemented project, then it is necessary for the Government (Department) to develop and lobby their own design of the "Procedure policy" for the implementation of projects, starting with the coordination of the projects being implemented, for the selection and approval of contractors, which will allow to ensure successful coordinated joint work that will be more tailored for us and successful for donors, this is the only way to achieve our goals.

To do this, it is necessary to solve the problem related to the structures that work on water supply, these are again rural public drinking water consumers unions (RPDWCU), which were created at the request of Donors and are considered unsustainable, and municipal enterprises that will not be able to fully define their structures with very low unreasonable tariff that cannot cover the simple existence of water supply structures.

Tariffs set by local authorities vary in different villages and are usually significantly lower than the cost of services. Raising tariffs turned to be difficult and the process is often politicized, and representatives of local councils are opposed to price increases. This dooms the sector with unclear tariff setting provisions and politicization of tariffs. In most cases, the willingness to pay among the population is higher than the actual tariff rates, subject to the provision of quality water supply services.

Tariff policy reform is one of the most important elements of the strategy and this policy. Local service providers will be incentivized to gradually increase tariffs to a level sufficient to cover the costs of proper operation and maintenance, while respecting the ability of consumers to pay such tariffs.

At the moment, a draft Law "On drinking water supply and drainage" has been prepared with the water supply department with the support of the WB. This draft Law prohibits the approval of a tariff below cost price, it says that if a tariff is approved at cost price, then the local authority must compensate it from other sources. It should be noted that this draft Law provides not only for water supply but also for drainage, since before this there was no Law on drainage.

In order to eliminate collisions and gaps in regulatory legal acts regulating relations in the field of household and drinking water supply to the population and ensuring the quality of drinking water, the State Agency for Architecture, Construction and Housing and Communal Services under the Cabinet of Ministers of the Kyrgyz Republic (hereinafter referred to as Gosstroy), with the support of the World bank, a new draft Law of the Kyrgyz Republic “On drinking water supply and drainage” has been prepared, which provides, among other things, for the approval of tariffs not lower than cost price, the responsibility of local authorities for approving tariffs at the level of expenses cost price, as well as taking into account the costs of professional technical development of the drinking water supply and drainage sector’s human resources potential, which is at the approval stage.

Since in the neighboring country Uzbekistan the tariff is approved by the Ministry of Housing and Communal Services, and in our country tariffs are approved by Deputies of the Local Kenesh and City Kenesh who, in turn, do not take responsibility and remain unpunished, due to which they accept economically unjustified tariffs, as a result of which the structures that work on water supply will not be able to achieve profitability. If this draft Law is adopted, it will make water supply structures more efficient and achieve profitability. There is a requirement in the WB conditions that in order to ensure sustainability, it is necessary to adopt an economically justified tariff.

It should also be noted that today the system of state management of water resources is in an extremely difficult condition.

The state body responsible for drinking water supply and the main body of projects being implemented in the Kyrgyz Republic was the Department for the development of drinking water supply and drainage, and was under the State Agency for Architecture, Construction and Housing and Communal Services under the Cabinet of Ministers of the Kyrgyz Republic. This body has undergone many structural and functional changes, which have led to insufficient implementation, monitoring of projects and coordination with donors on water resources management.

In 2023, under the instruction of the Administration of the President of the Kyrgyz Republic, the Ministry of Agriculture of the Kyrgyz Republic initiated the draft Water Code of the Kyrgyz Republic in a new edition, which considered the issues of establishing general requirements for the design and construction of external water supply systems and providing the population with safe drinking water, drafts of regulatory technical acts (RTA) in the field of drinking water supply and drainage (Constructing norms and rules (CNR (SNiP).

But the data presented confirm the need to strengthen coordination of the actions of government bodies, local management of organizations and enterprises responsible for managing water resources, water supply, drainage, sanitation systems and protection of water supply sources.

It is necessary to strengthen human resources potential in the field of drinking water supply and drainage, develop and approve, together with the Ministry of Education and Science of the Kyrgyz Republic and the Ministry of Labor, Social Welfare and Migration of the Kyrgyz Republic, a Program for the professional and technical development of the sector, as a fundamental document defining the goals, objectives and main directions of professional and technical development of the sector, as well as a Roadmap for its implementation until 2026. Currently, Gosstroy is working with the World Bank and ARIS to resolve the issue of financing the further implementation of the Program and the roadmap for its implementation.

The government must decide how to include national planning processes, policies and strategies into project implementation and set its own objectives, taking into account local conditions.

Create partnerships on the PPP Platform - with the participation of all stakeholders and strengthen for joint use, accessibility and development of solutions to achieve sustainable development in the field of water supply. Carry out integrated management of water supply

activities, integration of the water sector and the water use sector as a whole, policy formation (with the participation of all stakeholders).

Finance water supply based on a new project implementation design, where there is increased efficiency of existing financial resources and the mobilization of additional and innovative forms of internal and international financing.

Ensure public participation: public participation in decision-making process brings many benefits, but better methods of measuring the quality and effectiveness of such participation are needed rather than relying on the number of public members involved.

Develop the institutional capacity of organizations that work in the field of water supply and drainage.

Use smart technologies: smart technologies can improve all aspects of management of water supply, as well as sanitary and hygienic activities.

5 Conclusion

At the moment, the water supply sector of the Kyrgyz Republic is experiencing insufficient financial resources to operate and ensure uninterrupted operation of water supply systems, it is necessary to raise awareness among the population about the need to pay for the provision of water supply services and establish tariffs that cover the costs of providing water supply and drainage services.

Institutional issues are hampering the sector at the national and local levels. There is unclear distribution of roles among stakeholders, and there are also gaps in coordination and accountability. Shortcomings include, among other things, management capacity, uncompetitive salaries, insufficient number of professionals with sector expertise, gaps in responsibility and asset ownership, etc.

Currently, the state budget does not have sufficient funds for capital investments in this sector, as a result of which the support of international donors is needed in the future. According to independent external and national experts' assessment, the amount of investments required to improve the rural population's access to water supply services is more than 26 billion 420 million soms.

In order to improve the database of the drinking water supply and drainage sector proposed by the World Bank, the new information system for piloting and implementation, data collection "SIASAR" requires certain time and finances.

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