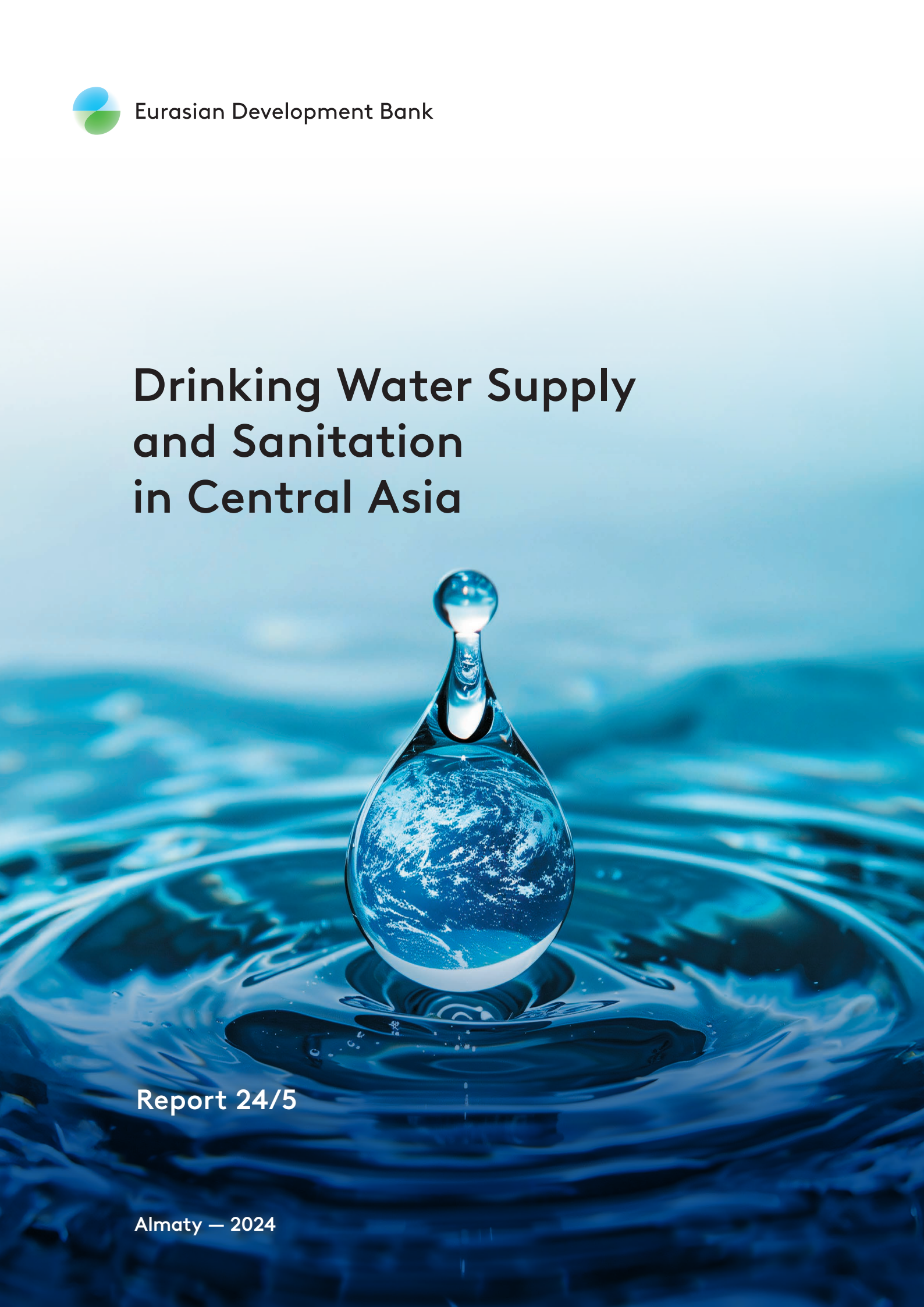
Eurasian Development Bank

Drinking Water Supply and Sanitation in Central Asia



Report 24/5

Almaty — 2024

DRINKING WATER SUPPLY AND SANITATION IN CENTRAL ASIA

KEY CONCLUSIONS

ANALYTICAL REPORT'24

DRINKING WATER IS THE BASIS OF WELL-BEING AND PROSPERITY

CHALLENGES IN CENTRAL ASIA

7%
of water intake goes to meet household and utility needs

2x
increase in drinking water consumption in 1994–2020

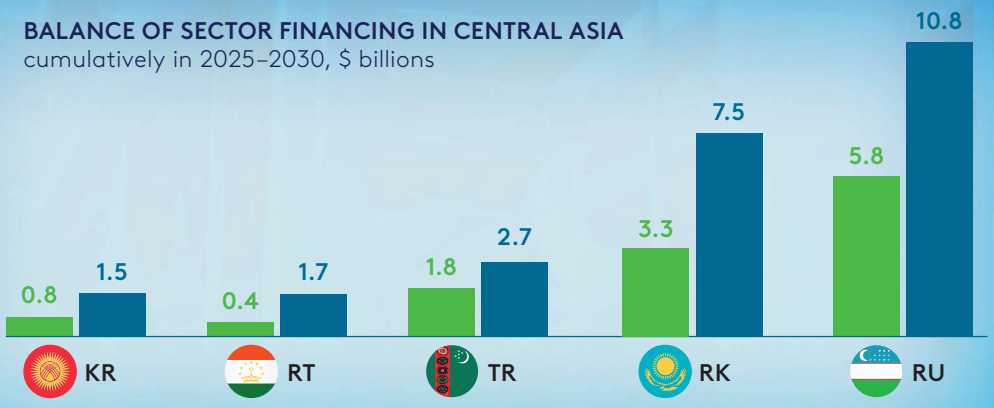
9.9
million people have no access to safe drinking water

up to 80%
wear and tear of water and sanitation networks

up to 55%
water loss in distribution networks

THE REGION NEEDS TO CLOSE THE FINANCING GAP

BALANCE OF SECTOR FINANCING IN CENTRAL ASIA
cumulatively in 2025–2030, $ billions



Source: EDB expert calculations

$12.1 billion

REGIONAL SHORTFALL of financing required to achieve SDG 6 in 2025–2030

AN INTEGRATED APPROACH IS RECOMMENDED TO DEAL WITH THESE CHALLENGES

1 Regulatory Solutions

- **INTERSECTORAL COORDINATION** mechanism *(government bodies, local authorities, water utility companies)*
- Restoration of the **R&D POTENTIAL** *(including by creation of a design company)*
- Training of **ENGINEERING AND TECHNICAL PERSONNEL** *(including within the IFAS ASBP-4 framework)*
- Prioritization of **PROTECTION OF SURFACE AND GROUND WATERS** in national strategies

2 Financial Solutions

- Adaptation and expansion of **PUBLIC-PRIVATE PARTNERSHIP** institutions
- Engagement of large **OPERATING COMPANIES**
- **INVOLVEMENT OF IFIs** in sovereign and non-sovereign financing
- Improvement of **TARIFF PRACTICES** with preservation of the existing state support mechanisms (subsidies, soft loans, provision of assistance to socially disadvantaged groups of the population)

3 Technical Solutions

RURAL AREAS
- Focus on protection of small rivers
- Transition of intake facilities to underground water sources
- Deployment of local water treatment, decontamination, and conditioning systems
- Shared water supply systems

CITIES
- Focus on construction of water treatment facilities
- Use of long-lasting materials
- Digital monitoring and reporting
- Localisation of equipment manufacturing

Eurasian Development Bank

Vinokurov, E. (ed.), Akhunbaev, A., Chuyev, S., Adakhayev, A., Sarsembekov, T. (2024). *Drinking Water Supply and Sanitation in Central Asia*. Report 24/5. Almaty: Eurasian Development Bank.

Abstract

Drinking water accounts for merely 7% of total water consumption in Central Asia, but its supply plays a special priority role in sustainable development. Drinking water is a critical health factor. However, the poor technical condition of water supply and treatment facilities in all countries of Central Asia (*depreciation: up to 80%*) prevents their proper operation, making it impossible to produce drinking water of high quality. The sector suffers from high water loss (*up to 55%*), with 9.9 million people (*13.5% of total population*) having no access to safe drinking water. Achievement of SDG 6 in Central Asia is possible if a $2 billion infrastructure financing gap is closed every year in 2025–2030. International financial institutions, multilateral development banks, and development agencies can contribute to reducing the investment deficit in the water supply and sanitation sector. One of the possible solutions is to mobilise private capital and management expertise of major players (*including through public-private partnerships*). It is advisable to enforce balanced investment planning strategies and policies, review tariffs, increase the R&D and educational potential of the water sector, etc.

Keywords: Central Asia, water resources, water security, agriculture, water supply, sanitation, water conservation.

JEL: F15, L66, N55, Q53, L95, Q25.

The electronic version of the report is available at the Eurasian Development Bank website at https://eabr.org/analytics/special-reports/

CONTENTS

INTRODUCTORY REMARKS BY NIKOLAI PODGUZOV 5

SUMMARY 6

INTRODUCTION 12

1. DRINKING WATER SUPPLY ON THE GLOBAL AGENDA 14

1.1. Fresh Water as an Indispensable Component of Social and Economic Well-Being 14

1.2. Global Background 15

1.3. Water on the International SDG Agenda 18

1.4. Global Water Market 19

2. CHALLENGES FACED BY THE WATER AND SANITATION SECTOR IN CENTRAL ASIA 21

2.1. Key Metrics of the Water and Sanitation Sector in Central Asia 21

2.2. Outdated Water and Sanitation Infrastructure in Central Asia 23

2.3. Water Quality and National Security 26

2.4. "Bad Management Practices" in the Water and Sanitation Sector of Central Asia 29

2.5. Rapid Urbanisation in Central Asia 30

3. REGULATION OF THE WATER AND SANITATION SECTOR, ECONOMIC POLICY MEASURES, AND THE FINANCIAL NEEDS OF CENTRAL ASIA 33

3.1. Republic of Kazakhstan 33

3.2. Kyrgyz Republic 35

3.3. Republic of Tajikistan 37

3.4. Turkmenistan 39

3.5. Republic of Uzbekistan 41

3.6. Financial Needs of Central Asia for Achievement of SDG 6 46

4. INVESTMENTS IN THE WATER AND SANITATION SECTOR OF CENTRAL ASIA 48

4.1. Untapped Potential of International Financial Institutions 48

4.2. Water and Sanitation Sector Financing: International Best Practices 50

4.3. Positive Impact of Investing in the Water and Sanitation Sector 55

5. PRACTICAL RECOMMENDATIONS 60

5.1. Adoption of Modified Regulatory Approaches to Managing the Water and Sanitation Sector 60

5.2. Identification of Priority Strategic Goals and Objectives in the Water and Sanitation Sector 62
5.3. Sustainability of Water Supply and Sanitation in Rural Areas Should Be a Political and Economic Priority 63
5.4. New Technologies Should Increase the Operational Reliability of Water and Sanitation Systems 64
5.5. Water and Sanitation Investments Should Be Attracted on the Basis of Integrated Planning and Modern Management 65
5.6. Regional Co-operation Will Improve Access of the Populations of the Countries of Central Asia to Quality Drinking Water 67

ANNEXES 68

REFERENCES 74

ABBREVIATIONS 77

INTRODUCTORY REMARKS BY NIKOLAI PODGUZOV

Nikolai Podguzov,
Chairman of the
Management Board,
Eurasian Development Bank

The world remains off track to achieve its water-related Sustainable Development Goal (SDG) targets. Water security is under threat in many regions and that includes Central Asia.

In Central Asia, the climate crisis is fundamentally a water crisis. It is driven by a combination of a changing hydrological regime, increased water demand due to population growth and rapid urbanisation, ageing infrastructure, declining water quality, inadequate management practices, and insufficient financial resources. It is evident that investment in the water sector, particularly in the water, sanitation and hygiene (WASH) segment, is of paramount importance in Central Asia, given the significant challenges the region faces. In order to achieve SDG 6, the region requires an additional $2 billion annually invested in the WASH sector. A pivotal question in this respect is from where will this funding come?

To date, all Central Asian countries have been implementing strategies that integrate national development plans with SDG 6. The aim is to ensure the availability and sustainable management of water and sanitation for all. Despite these efforts, almost 10 million people in Central Asia still lack access to safe drinking water. To address the region's water needs, it is essential to adopt a sustainable and efficient approach to the use of available water resources, maintain water infrastructure in a satisfactory condition, and attract the necessary investments for these purposes.

Globally, around $165 billion is invested annually in the water sector, with 76% of this investment directed towards WASH. Of this total, 85% is provided by governments, 7% comes from official development assistance (ODA), 6% is provided by state-owned enterprises, but less than 2% comes from the private sector. The water sector is capital-intensive, with substantial fixed capital costs and long payback periods. Furthermore, the absence of clear property rights, coupled with the common-pool nature of water, gives rise to a situation where unchecked overuse occurs. Consequently, in view of the distinctive public value and features of water, the state will maintain its dominant role in the sector.

Nevertheless, international best practices indicate that, within the framework of well-adapted institutional and regulatory reforms, there is potential for international financial institutions to make a significant contribution. The challenge is to engage in initiatives that support regulatory reforms and facilitate greater private financial flows into the water sector in Central Asia. In this context, IFIs could play a crucial role in advancing sustainable WASH initiatives. Through strategic investments, capacity-building programs, and policy dialogues, these institutions could act as catalysts for positive changes in the region.

SUMMARY

Access to high-quality drinking water and sanitation is an internationally recognised basic and **fundamental human right**. The share of drinking water supply in total water intake is rather modest, with utility and drinking water accounting for a mere 7% of total water consumption in Central Asia (*Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, collectively "CA"*), and 13% of global water consumption. Still, it plays a special and **priority role** compared with the other types of water use. The quality of drinking water is a critical health factor. According to the WHO, 90% of diseases in developing countries are caused by consumption of poor-quality drinking water or a failure to comply with sanitary and hygienic rules and standards during the operation of utility water supply systems. Access to quality drinking water has significant economic returns, as high as 7 to 1 in developing countries. For the CA region, this indicator is estimated at 3 to 1 and **this value is explained, compared to other developing countries**, by the presence of more developed infrastructure and high rates of access to safe drinking water in cities, etc.

However, water security in many regions of the world is currently **under threat**. According to the UN, about two billion people have no access to safe drinking water, and 3.6 billion people have no access to safe sanitation. More than 40% of people in the world live in regions with a critical shortage of water. More than 80% of domestic wastewater in developing countries is dumped into rivers and seas without treatment. Water pollution undermines the security of global water supply. It is projected that by 2050 about 33% of the world's river sub-basins will be affected by water scarcity caused primarily by water pollution, as well as by hydrologic and climatic factors. Economic activity in these regions (which occupy 32% of the global land surface, and are home to 80% of the world's population) is accompanied by intensive pollution of both surface and ground water sources. Another important issue is joint management of water resources in transboundary river basins.

The situation will be **getting worse** over the long term. By 2050, drinking water consumption will increase by 50–63%. The key driver is the growth of the population, especially urban population: by 2050, 70% of people in the world will be living in cities. Water supply, in turn, will be affected by the adverse impact of climate change, ageing infrastructure, and declining water quality. That is why water security and sustainable sanitation are the key areas covered by Sustainable Development Goal (SDG) 6.

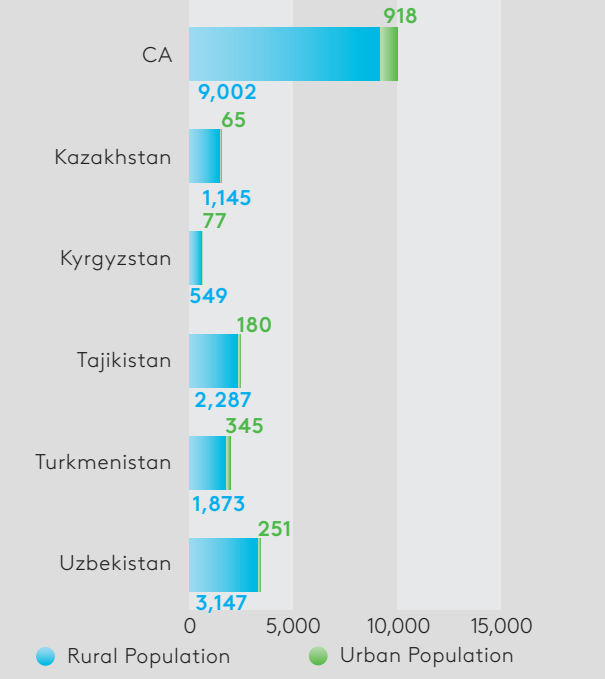
In CA, the challenges involving drinking water access and purification are **even more formidable**. The region is situated in an area of mounting water stress. By 2028, it will have reached the stage of chronic water shortage. The consequences of that will impact all sectors of the economy: agriculture, industry, public utilities, and drinking water supply. The water supply and sanitation sector is critically affected by:

- climate change;
- anticipated population growth and rapid urbanisation;
- ageing infrastructure;
- deteriorating water quality;
- outdated water management practices, etc.

Today, **9.9 million people, or 13%** of the CA population, have no access to safe drinking water (see Figure A). In 1994–2020, intake of water for utility and household purposes

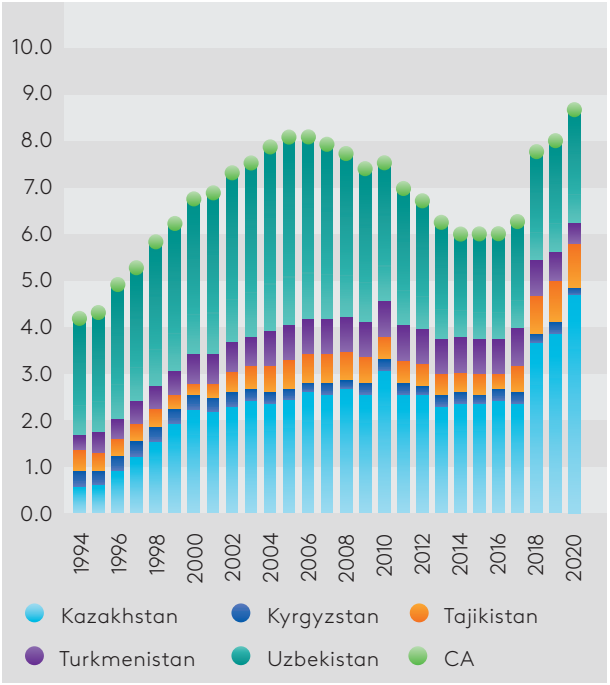
increased twofold to reach 8.6 km³ (see Figure B), while investments in drinking water supply infrastructure failed to cover that consumption growth. As a result, water supply infrastructure and sanitation equipment wear and tear is extremely high. Wear and tear of water supply and sanitation networks in Central Asia is estimated at up to 80%. Physical and commercial water losses in distribution networks can be as high as 55%. In all CA countries, the poor state of repair of water supply and sanitation infrastructure facilities impedes their proper operation, making it more difficult to produce high-quality drinking water.

↓ **Figure A. Number of People Without Access to Safe Drinking Water in CA, 2020, thousand people**



Source: compiled by EDB experts using data provided by AQUASTAT, 2024.

↓ **Figure B. Water Intake by the Utility and Household Sector in CA, km³/year, 1994–2020**

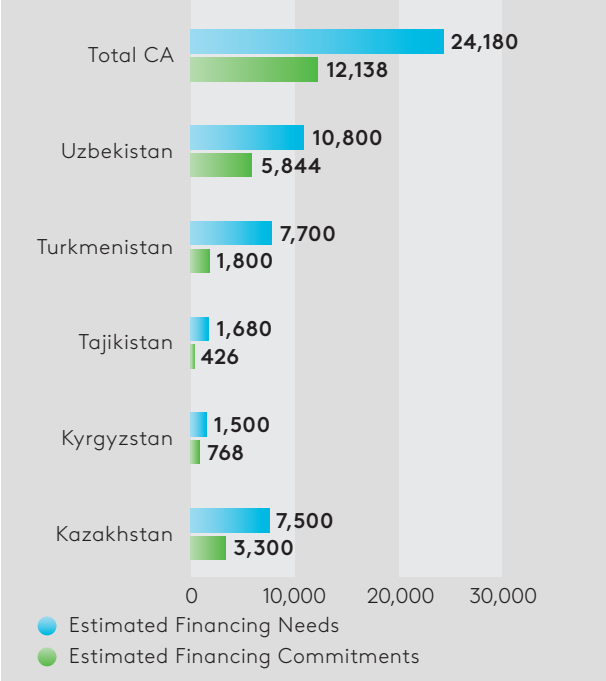


Source: compiled by EDB experts using data provided by AQUASTAT, 2024.

Many problems that the CA countries are facing in the water supply and sanitation sector have persisted for quite a long time. With the formation of independent Central Asian states, decentralisation of management of water supply and sewerage systems intensified with their transfer to local municipal ownership and transition to market conditions of economic management. That gave rise to major organisational, economic, financial, institutional, and legal challenges. Due to the impact of objective political, social, and economic factors that are typical for emerging economies, the CA countries experienced difficulties with the implementation of water supply improvement programmes, with four to six such programmes being approved in each of those countries over the last 30 years.

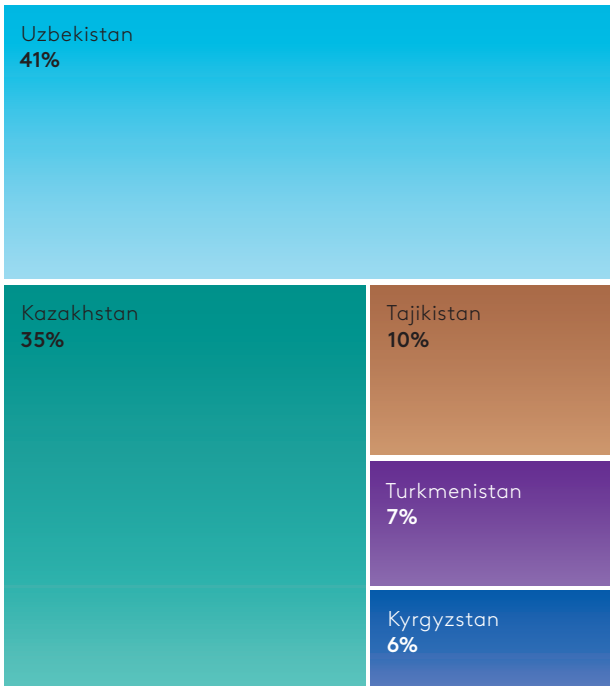
An analysis of water supply and sanitation sector development plans and programmes adopted in CA shows that the proposed scope of their **financial support** is clearly **insufficient to ensure achievement of SDG 6** by 2030. A comparison of planned (anticipated) and projected 2025–2030 funding commitments leads to the conclusion that the region is facing a deficit of more than $12 billion for the entire period, or about $2 billion per year (see Figure C). The largest financing shortfall among the countries of the region is expected to occur in Uzbekistan: $826 million per year, or almost $5 billion in 2025–2030 (see Figure D). A major financing shortfall is projected for Kazakhstan at $700 million per year, or $4.2 billion in 2025–2030. In Tajikistan, the financing shortfall will be rather significant given the size of the country's economy, reaching $209 million per year, or more than $1.2 billion in 2025–2030.

↓ **Figure C. Estimated CA Financing Shortfall, 2025–2030, $ million**



Source: compiled by EDB experts using data provided by the UN and government agencies.

↓ **Figure D. CA Financing Shortfall Structure, 2025–2030**



Source: compiled by EDB experts using data provided by AQUASTAT, 2024.

The main challenges faced by the CA water supply and sanitation sector are in the following domains: **institutional and legal (governance-related); financial and economic; and technical**. Accordingly, any viable solution requires an integrated approach. The proposed measures, when taken together, form a **general conceptual framework** that can be used to deal with the problems of the CA water supply and sanitation sector.

At the **institutional and legal level**, we suggest that the regulators take the following nationwide steps:

- **Create a mechanism to enable intersectoral coordination** among authorised central and local government bodies and the sector's companies. The new body may design infrastructure facilities, supervise their construction, and introduce modern management methods. Its most important tasks will be to implement international financial and human resources management standards, as well as boost the effectiveness of tariff and investment policy tools in order to gradually increase the profitability of water supply and sanitation companies.

- **Boost the R&D potential** of the water supply and sanitation sector. With higher quality at all project stages, from feasibility studies to detailed design, as well as effective supervision of construction sites, the countries can slash corruption while reducing budget expenditures and water facility construction and operating costs.

- **Train more specialists** in all technical and chemical engineering fields, taking into consideration the urgent need to protect water resources from pollution and improve the quality of drinking water. Those specialists should have extensive knowledge of industry-specific water preparation and wastewater treatment issues. An important prerequisite of safe provision of water supply and sanitation services is the availability

of qualified personnel capable of mastering advanced management, financing, operating, and maintenance methods.

- **Protect surface and ground water sources,** as well as river basins. These matters should be prioritised by all national strategies. The proposed solution is to use economic tools to combat water pollution (for example, by penalising polluters with additional taxes and fines), find ways to effectively promote clean technologies and innovations, and provide financial support to projects envisaging purification of water and restoration of water resources.

Several action plans proposed at the **regional level** could be implemented within the framework of the International Fund for Saving the Aral Sea (IFAS).

- Considering the compelling need of the CA countries for Official Development Assistance (ODA), the IFAS should occupy an increasingly prominent place on the regional agenda. **Coordination of efforts aimed at achieving SDG 6** should become one of its primary objectives. To deal with international water use issues, it will be necessary to find new co-operation mechanisms and tools to be employed in transboundary river basins.

- To resolve critical HR issues, it is necessary to strengthen regional co-operation in the area of personnel training. A **special HR program**, complete with all requisite financing and implementation mechanisms, can be adopted under the aegis of the IFAS as part of the Aral Sea Basin Programmes package (**ASBP-4**).

- It is necessary for the IFAS, in co-operation with the UNESCAP and the UNECE, to develop a **Water Supply and Sanitation Programme** that will benefit the **residents of the Aral region** who have suffered from the Aral catastrophe, and set up a consortium of international banks. When creating the consortium for the construction of large-scale water supply and sanitation facilities, it is necessary to rely on international best practices as well as experience accumulated by the CA countries in the course of their co-operation in the IFAS format.

- It would be advisable to establish a PPP-based **head organisation for the provision of design and consulting services** to the CA water supply and sanitation sector. That organisation could coordinate design activities across CA, pursue uniform scientific and technological policies in that sphere, and interact with donor countries and MDBs by providing them with up-to-date information on water supply and sanitation projects together with related feasibility studies.

The CA countries are facing a major challenge: they **need to raise financing** for the water supply and disposal sector. We suggest that the following practical steps be taken at the **financial and economic level** taking into account existing international experience and our assessment findings.

- The financing gap can be reduced by **actively attracting funds from international financial organisations**, multilateral development banks, development agencies, etc. (IFIs). These institutions wield significant potential to finance the CA water supply and sanitation sector. At this time, the sector accounts for only 6% of total IFI-approved sovereign financing provided to the CA countries, with 147 projects costing $4 billion (out of a total of $67.5 billion) completed in 2008–2023. However, as the sector's investment appeal improves, IFIs may seek more active engagement in its financing. Besides, great potential is also available in the **non-sovereign financing** segment.

- The CA water supply and sanitation sector needs private investments and large players. To attract those, it will be necessary not only to modify the existing ownership and governance structure, but also to create conditions conducive to effective development of market relations in that area. It is becoming increasingly important to **strengthen the public-private partnership (PPP) institutions**. With PPPs playing a more active role in the water sector, state and private structures will be able to co-operate in a more productive fashion. Expansion of the water services market will boost competitiveness and improve operating efficiency of individual companies. The availability of strong PPP institutions is likely to encourage private operators to join water sector projects. The advent of private players, including transnational corporations (TNCs), will help the CA countries to gain access to innovations, technologies, and experience required to modernise the sector.

- The CA countries should **improve their tariff systems**. With current water tariffs in the region being extremely low, the CA countries can partially hike them to improve the financial sustainability of their water supply and sanitation companies. This will stimulate investments in the development of infrastructure and improve the quality of services. The CA countries can also delegate their tariff approval and review functions to the companies operating in the sector, with control functions vested in local governments or independent regulators. International best practices indicate that it is important for water supply and sanitation companies to keep state support in the form of subsidies and soft loans, and preserve targeted subsidies for low-income and socially disadvantaged groups of the population.

The implementation of investment projects in the water supply and sanitation sector can produce a significant economic impact. **Investments are vital for human health, education, and social well-being.** They also have a multiplier effect. For CA, it is estimated at **$3 per $1** of investments. Adequate water supply, water disposal (sanitation), and wastewater treatment have a beneficial effect on people's health, the economy, and the natural environment. Access to clean drinking water supply and sanitation reduces health risks, frees up time for education and other productive activities, and increases the productivity of the labour force.

At the **technical level**, it would be advisable for the CA countries to carry out certain priority activities in their villages and cities.

First and foremost, considering the urgency of the matter, it is necessary to ensure reliable **supply of drinking water to people living in rural areas**, as the share of the rural population is likely to remain significant throughout the region. In many situations where there is a need to provide primary access to clean water supply and sanitation, the following simple and proven solutions may be employed:

- **Monitor the sanitary status of small rivers**, and protect them from pollution and depletion;

- **Switch from open water bodies to ground water sources**. This will improve the quality of drinking water and reduce the risk of pollution. It is important to deploy monitoring systems to control the quality and amount of ground water;

- **Switch to local systems** to purify, decontaminate, and condition drinking water in places where its users are located. This will ensure safe water access without lengthy transportation and storage. It is necessary to install desalination plants of various types and designs in areas experiencing a shortage of fresh ground water;

- **Create shared water supply systems** with an economically optimal range of operation. This will improve access to water for agricultural needs.

The population of the region's **cities** is growing, and their urban infrastructure is evolving. However, old systems are becoming obsolescent and incapable of meeting the needs of a modern society. Stable operation of urban and rural water supply and sanitation systems depends on reliability and a good state of repair of pipelines — their most capital-intensive and vulnerable component. It is necessary to do the following:

- **Upgrade the existing water pipelines, distribution networks, and treatment facilities**: in particular, replace worn-out pipes and obsolescent equipment, build modern integrated treatment facilities, etc. This will increase the efficiency and reliability of the water supply;

- **Use state-of-the-art technologies and long-lasting materials**, such as spheroidal graphite cast iron (ductile iron) and PE100 polyethylene. This will reduce maintenance costs and prolong system service lives. When restoring the throughput capacity of corroded water conduits, it is possible to prevent further degradation and extend their service lives by applying sand/cement lining;

- With the deployment of information technologies, **create a system for integrated continuous network control and rapid monitoring** of nationwide metering of water consumption and water losses, including prompt detection and elimination of leaks. This will reduce energy consumption and commercial water losses to an economically viable level;

- **Upgrade the existing industrial production base** by incorporating relevant projects in investment programmes to strengthen the region's science and research potential, and organise local production of modern equipment for the water supply and sanitation sector.

INTRODUCTION

Access to quality drinking water and sanitation is an internationally recognised human right. It is a critical indicator of social well-being of the population and economic development of a country (UN, 2017). The right to water is a prerequisite for securing all other human rights. The main responsibility for providing access to safe and clean drinking water and sanitation is borne by the state (UN, 2003).

Box 1. Definition of "Water and Sanitation"

We use "water and sanitation" as a synonym for the widespread international term "WASH" (water, sanitation, and hygiene). It is broadly used by non-governmental organisations and aid agencies operating in developing countries. The purposes of providing access to WASH services include achieving public health gains, improving human dignity in the case of sanitation, implementing the human right to water and sanitation, reducing the burden of collecting drinking water for women, reducing risks of violence against women, improving education and health outcomes at schools and health facilities, and reducing water pollution. Another phrase used in this report is "water and sanitation sector". In this case, *water* refers to water supply defined as the set of measures (and utility networks) designed to extract, store, prepare, deliver, and distribute water among consumers through water supply systems. *Sanitation* is the set of measures (and utility networks) designed to collect, transport, purify, and remove wastewater through sanitation systems (including sewerage systems) to water bodies and/or land. The term is used to denote the infrastructure that needs to be developed to support WASH services.

Water security in many regions of the world is currently under threat due to major water supply issues. More than 40% of people in the world live in regions characterised by critical shortage of water. More than 80% of household wastewater in developing countries is dumped into rivers and seas without preliminary treatment. Water pollution undermines global water supply security. It is projected that by 2025, about 33% of the world's river sub-basins will be affected by water scarcity caused primarily by water pollution and hydrologic and climatic factors. These regions, which occupy 32% of the world's land area, are home to about 80% of the world's population, and economic activities are accompanied by intensive pollution of water resources, both surface and underground (Wang et al., 2024). Another important issue is joint management of water resources in transboundary river basins.

Central Asia is in the high-risk zone due to water scarcity and water pollution. Water stress is increasing (Vinokurov et al., 2022), and the region is on the verge of a chronic shortage of water (Vinokurov et al., 2023). The countries of the region share water resources of two transboundary river basins (the Amu Darya and the Syr Darya), which are also exposed to pollution risks. Accordingly, water quality is a major challenge faced by the whole region. Its water supply and sanitation infrastructure are characterised by strong physical wear and tear, and is rather low-tech. It has a very limited modern water-metering capacity. In this regard, to secure reliable access to drinking water, the countries of the region should concentrate their efforts on boosting the technical and engineering capabilities of their water and sanitation systems.

For the countries of Central Asia, attracting investment in the development of water supply and sanitation is an urgent issue. There is a huge gap between the region's investment

needs in that area and real funding opportunities. Therefore, the authors of this report seek to identify effective ways to manage the water and sanitation sector of Central Asia in line with global best practices, and to find possible investment solutions. Therefore, the report is structured as follows.

Water security and sustainable sanitation are the key matters covered by Sustainable Development Goal (SDG) 6, which has to be achieved by all countries in the world. **Chapter 1** describes global challenges related to drinking water supply and sanitation. Many countries may be affected by water shortages, and the market for water-saving equipment, water treatment and filtration equipment, etc., is expanding from year to year, becoming an increasingly attractive target for global investors.

Chapter 2 presents the findings of a diagnostic assessment of the water and sanitation sector of Central Asia. With so many common historical, institutional, geographic, and climatic factors, the countries of the region are facing largely identical challenges: outdated infrastructure, poor quality of water, governance crises, rapid urbanisation, lack of funding, etc. Even though the results reported in many areas are reasonably good, a substantial part of the region's population has no access to clean drinking water and basic sanitation.

Despite the similarity of challenges, approaches to regulation and development of the water and sanitation sector adopted by various countries of Central Asia are different. **Chapter 3** reviews the regulatory environment in the water and sanitation sector of each country, with special emphasis on economic policy measures, and features a detailed assessment of SDG 6-related investment needs of all countries of the region.

Urgent action is required to deal with the widening gap between needs and financing capacities for water supply and sanitation infrastructure in Central Asia. **Chapter 4** looks at possible ways to attract investors to the sector. The key role can be played by international financial institutions (IFIs), multilateral development banks (MDBs), development agencies, and other players which have already established a presence in the region. International experience also points to potential involvement of private capital. Correct prioritisation means more effective investments. It is also important to understand the possible beneficial impact of investments on the economies of the countries of Central Asia.

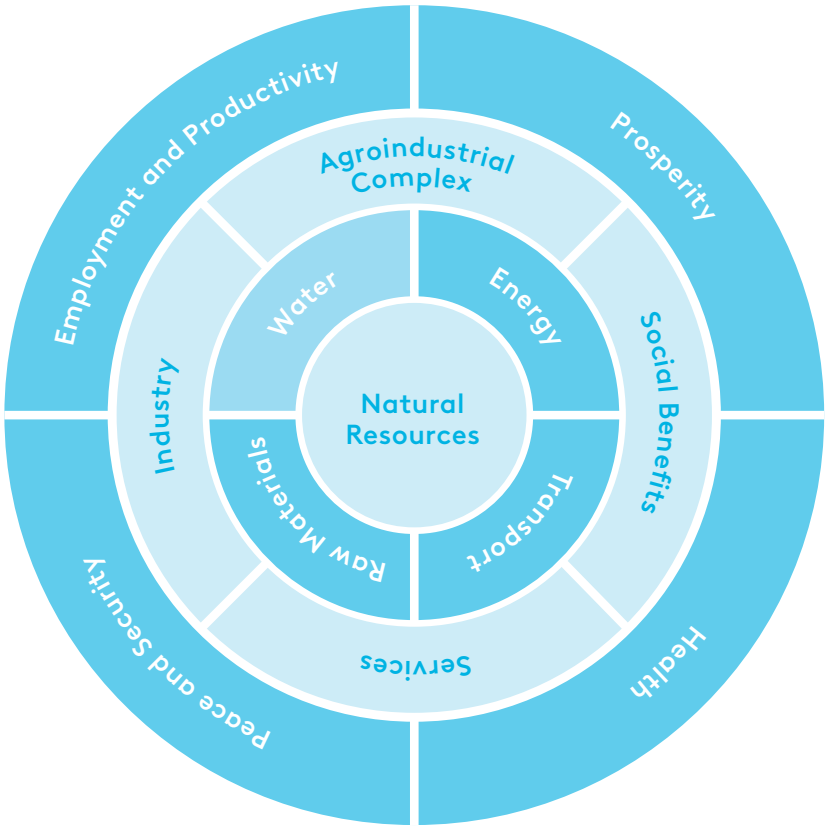
In **Chapter 5**, the authors, based on their analysis, offer their vision of more effective governance of the water and sanitation sector, and provide a list of practical recommendations grouped into three large economic policy blocks covering institutional/legal (managerial), technical, and financial/economic aspects of the sector's operations.

1. DRINKING WATER SUPPLY ON THE GLOBAL AGENDA

1.1. Fresh Water as an Indispensable Component of Social and Economic Well-Being

Access to quality drinking water and sanitation is an internationally recognised **human right**, and a critical indicator of social well-being of the population and economic development of a country (UN, 2017). The right to water is a prerequisite for ensuring all other human rights. Water is an indispensable component of the social and economic **well-being of society** and the environment. It is involved in all vital areas of modern society. Drinking water and especially its quality characteristics as well as sanitation have a huge impact on human health (Elpiner, 2013).

↓ **Figure 1. Water as the Foundation for Peace, Security, Well-Being, and Prosperity**



Source: IHLPWIA, 2023.

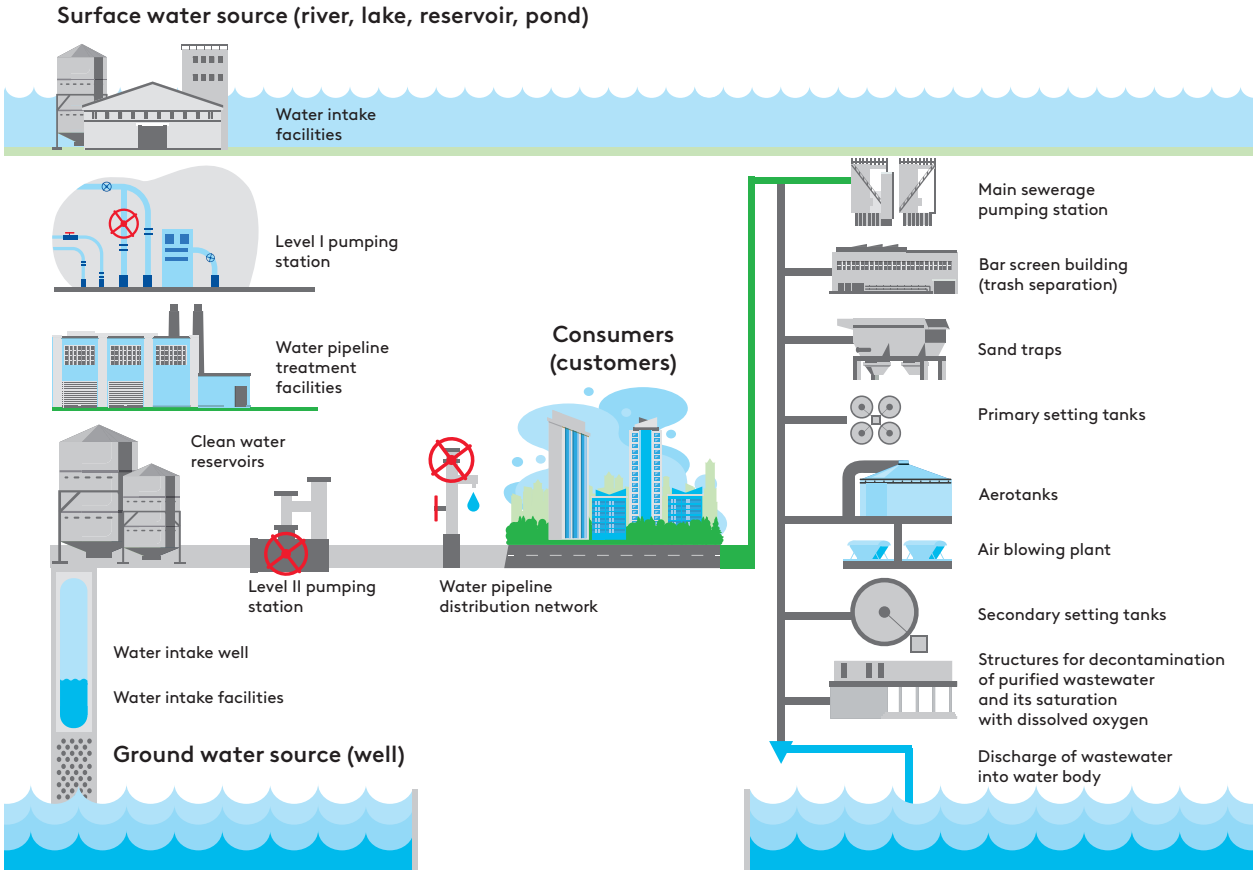
Fresh water is the source of drinking water supply. It is a limited and **exhaustible resource**, and its availability and accessibility are a critical component of national security of **the state**. Water security promotes food security, increases productivity in agriculture, stimulates industrial growth, improves public healthcare, and facilitates achievement of gender equality. In addition, water security provides access to renewable energy sources. Proper development, utilisation, and management of water resources accelerates growth, and creates significant employment opportunities.

Lack of access to improved water and sanitation services gives rise to huge societal costs, particularly for the disadvantaged strata of the population. Along with insufficiency and

irrational use of water resources and the growing share of degraded soils, such lack of access translates into a low Human Development Index (HDI). That is typical for developing and poor countries which have no sustainable sources of financing to support development of the water and sanitation sector and its infrastructure.

The main **responsibility** for providing access to safe and clean drinking water and sanitation is borne by the state (UN, 2003). It also has a duty to ensure proper operation of water and sanitation systems. Standards and regulations with respect to drinking water stipulate, first and foremost, sanitary and hygienic requirements to ensure its safety, and reliability of access to the water supply.

↓ Figure 2. Main Components of the Water and Sanitation System



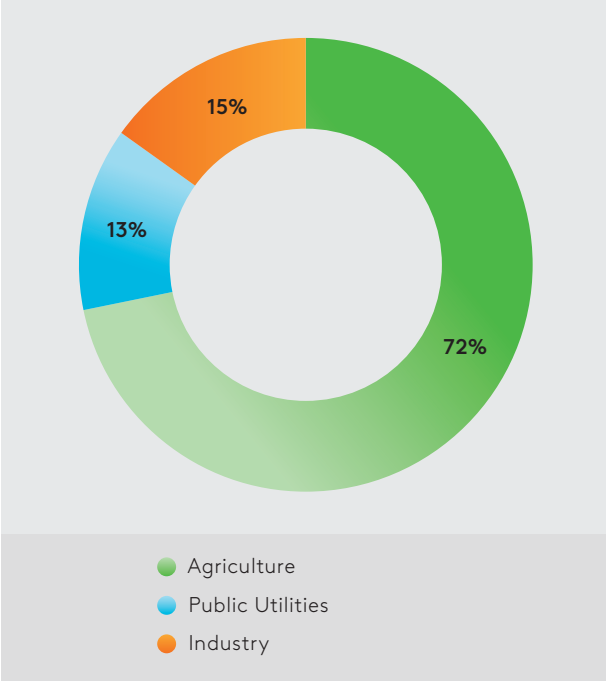
Source: eduprofi.com.

Water and sanitation systems are **complex engineering facilities**. Their reliable operation has great social and economic significance, and is a national security matter. The key requirement that applies to water supply systems in cities and other settlements is their strict compliance with stringent sanitary standards of drinking water quality. To ensure such compliance, it is necessary to preserve natural water sources (both surface and ground) and protect them from pollution, as well as to properly purify water at water treatment facilities. Another crucial aspect of organisation of utility and drinking water supply is uninterrupted delivery of water, subject to strict observance of approved quantity limits.

1.2. Global Background

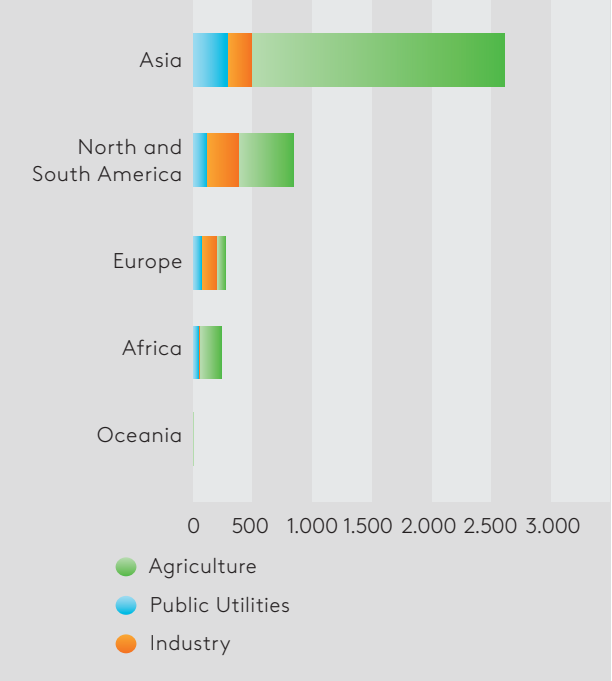
Drinking water supply has a special significance among all types of water use, even though it has a relatively small share in total global water consumption, with utility and drinking water accounting for **13%** (526 mln km^3) of total global water intake, industry for 15% (608 mln km^3), and agriculture for 72% (2,889 mln km^3). In terms of geographical distribution, Asia accounts for 56% of utility and drinking water intake. Total global water intake reaches 4,000 km^3.

↓ Figure 3. Sectoral Structure of Global Water Intake in 2020, %



Source: AQUASTAT, 2024.

↓ Figure 4. Geographical Structure of Global Water Intake in 2020, km³



Source: AQUASTAT, 2024.

Surface water is the main source of water used by people and the economy, with 73.4% of total water use. Globally, in agriculture, energy/industry, and drinking water supply, surface water accounts for 71.6%, 87.3%, and 48.2% of total consumption, respectively. Renewable ground water is the most pollution-protected and reliable source of drinking water. It accounts for 45.69% of global human consumption. Non-renewable ground water accounts for 2.54% of drinking water, with 3.55% of that water produced by desalination plants (Borisova et al., 2021).

By 2050, global water consumption may increase from 4,000 km³ today to over 5,000 km³ (UN, 2023). According to various estimates, the increase could be even greater — from 25% relative to its current level (to 5,500 km³ according to OECD, 2012) to 70% (to 8,400 km³ according to Hejazi et al., 2014), with the increase in water consumption for utility and household purposes during the same period ranging from 50% (790 km³) to 63% (859 km³), respectively.

The key driver of global water consumption is the growth of population, primarily urban population: by 2050, 70% of people in the world will be living in cities (2020: 56%) (UN, 2022). This will boost incomes and change the scale and structure of consumption, nutrition, and energy production. With incomes rising, per capita water consumption standards in the developing and developed countries will be converging.

Higher national incomes will also boost industrial water consumption. Industrial production in the cities requires more water, and depends on the level of sophistication of the water and sanitation system. In many production facilities, water consumption exceeds the weight of output by one or two orders of magnitude. The increase in water consumption by industrial users can be attributed not only to rapid industrial development, but also to higher consumption of water per unit of the final product. On the average, consumption of water for technical purposes by industrial facilities reaches up to 40% (in some cities, up to 51–67%) of total water fed into the distribution system by utility water pipelines. The rising living standards and ongoing industrialisation in the emerging markets increase the pressure on global distribution of water resources.

Water resources, in turn, will be affected by the adverse impact of climate change and ageing infrastructure. The problem of wear and tear of the infrastructure is also relevant for the developed countries. Projected temperature rise may change precipitation patterns, affect accumulation and melting of snow, and transform the hydrologic system, because it increases total evaporation and builds up the volume of water on the surface. Climate change affects water accessibility in many regions. With increasingly higher frequency and intensity of extreme weather events (storms, floods, droughts), water may become even more scarce in countries suffering from critical water shortages — countries that are home to more than 40% of the world's population. Similar problems may emerge in other regions which were not severely affected in the past (UNESCO, 2020).

Climate change impacts all water cycle elements: cities and adjacent areas are exposed to higher risks of floods, quantitative and qualitative water shortage during droughts, and poor operation of sewerage and drainage systems. In many cities, consumption of ecosystem services exceeds the available resource potential, with ecosystems forced to bear an additional elevated burden as a result of water and air pollution and growing household and industrial waste (WWF, 2011). Water resources management for urbanised areas requires clear principles for regulating water reserves for domestic and industrial needs, wastewater disposal, and prevention of pollution of water sources beyond administrative boundaries.

In rapidly growing megalopolises, infrastructure development rates are often slower than population growth rates and, as a result, drinking water and sanitation are not always fully accessible to those who need them. Cities and urbanised areas actively pollute water sources: according to available estimates, more than 80% of wastewater globally is not collected and treated. Most pollution point sources are concentrated in cities (WWAP, 2012).

To eliminate the growing water shortage, it is necessary to improve water infrastructure and implement water-saving policy measures, i.e., to streamline water use. These urgent measures require significant long-term investments and effective co-operation mechanisms based on international legal standards. Almost 80% of the 94 countries where an assessment of water and sanitation systems was conducted listed insufficient financing as the key problem, with 70% noting that the existing tariffs do not fully cover water and sanitation system operation and maintenance costs (WHO, 2014).

The global water crisis and other concurrent crises will be steadily worsening over the long term. This is a critical risk for the world community. The decreasing quality and quantity of fresh water will escalate competition in such fundamental sectors of the economy as utility water supply, agriculture, hydro power generation, water transport, fisheries, and recreation.

As utilisation of natural resources intensifies, water, land, and air become more and more polluted. This problem has reached a global scale: pollution produces an adverse impact on the quality of the environment and water resources. Deterioration of water quality is regarded as the gravest challenge, with many countries and regions already affected. The number of new chemicals used by industrial and agricultural enterprises and households is growing at a fast pace, with about 700 such chemicals commercially released each year in the USA alone. As a rule, the existing technologies fail to completely remove such chemicals from wastewater, with reclaimed water remaining unsuitable for reuse or discharge into river systems (UNEP, 2010). Each day, 2 million tonnes of industrial and agricultural effluents are discharged into water bodies around the world.

In many regions, the current climate crisis is primarily a water crisis provoked by a governance crisis (OECD, 2016) caused not only by the deteriorating hydrologic status of the region, but also by insufficient funding, severe wear and tear on infrastructure facilities, and generally maladapted public policies. This is particularly urgent for the drinking water segment, which accounts for the smallest share of total water consumption. Essentially, it is least exposed to the water shortage problem. And this problem does have a solution. The countries affected need to adopt sound policy measures, implement robust governance mechanisms, and adapt their financing and regional co-operation systems, especially in transboundary river basins.

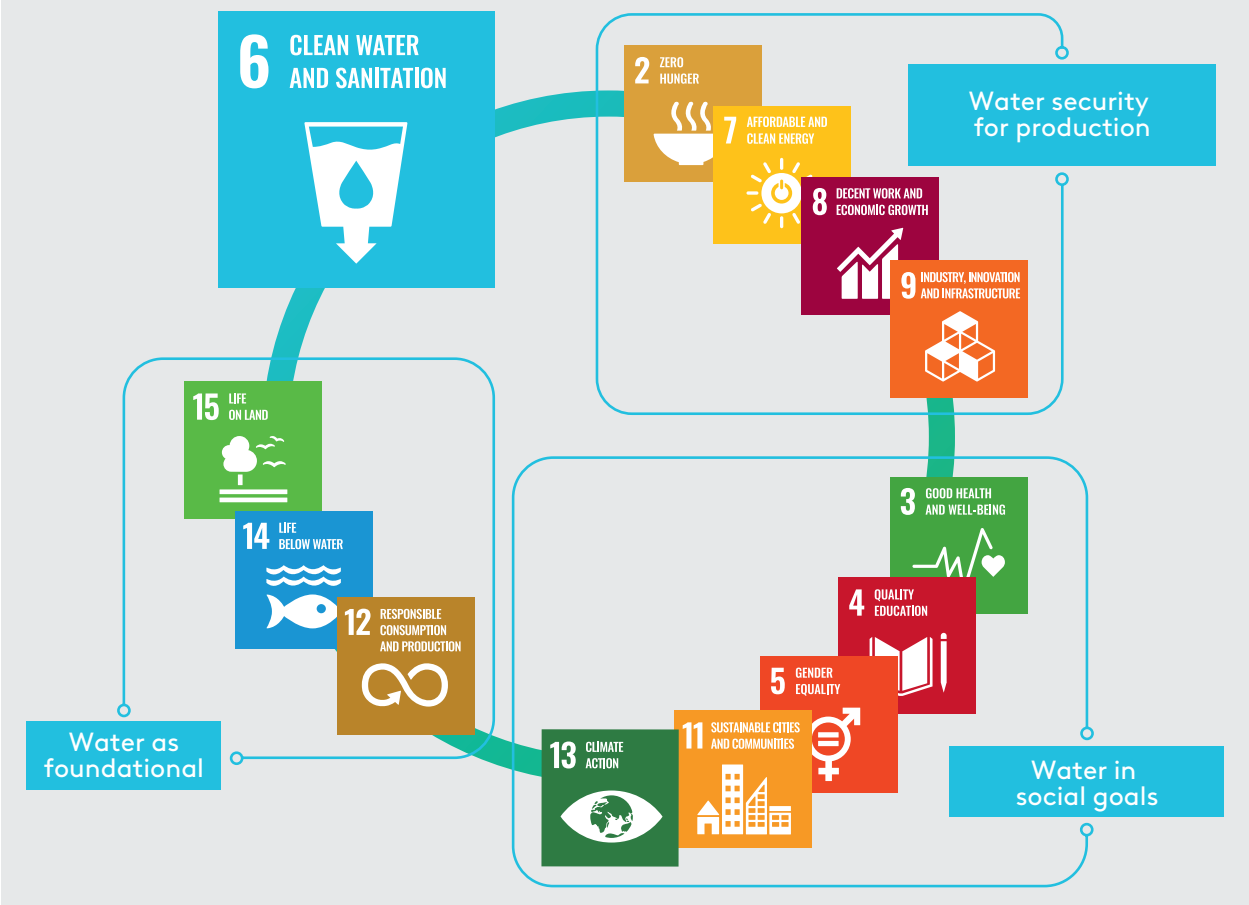
1.3. Water on the International SDG Agenda

As of now, almost 30% of the world's population has limited access to water and sanitation. About 2 billion people have no access to safe drinking water, and 3.6 billion people have no access to safe sanitation (UNICEF/WHO, 2023). According to the WHO, about 90% of diseases in the developing countries are caused by consumption of poor-quality drinking water and failure to comply with sanitary and hygienic rules and standards during the operation of utility water supply systems.

Access to quality drinking water and sanitation is an indicator of the quality of life and social and economic well-being of a country. Drinking water, its qualitative properties, and sanitation produce a huge impact on human health. Accordingly, water security and sustainable sanitation are the key matters covered by Sustainable Development Goal (SDG) 6. That goal is linked to most other SDGs.

In December 2016, the United Nations General Assembly declared 2018–2028 the International Decade for Action "Water for Sustainable Development" (UN, 2016). This is the main platform to accelerate the achievement of SDG 6. All activities of the Decade are coordinated by the unique "UN–Water" mechanism. It supports interaction among all UN agencies, departments, and programmes dealing with water supply issues. The countries of Central Asia could also engage in co-operation using that model. The Global Water Security and Sanitation Partnership (GWSP) was established in 2017 to achieve water supply and sanitation goals. The Global Partnership is a multilateral special-purpose fund managed by the World Bank, with the support of international development agencies and institutions from multiple countries, including Austria, Denmark, the Netherlands, Sweden, Switzerland, and the USA.

↓ **Figure 5. Fundamental Role of SDG 6**



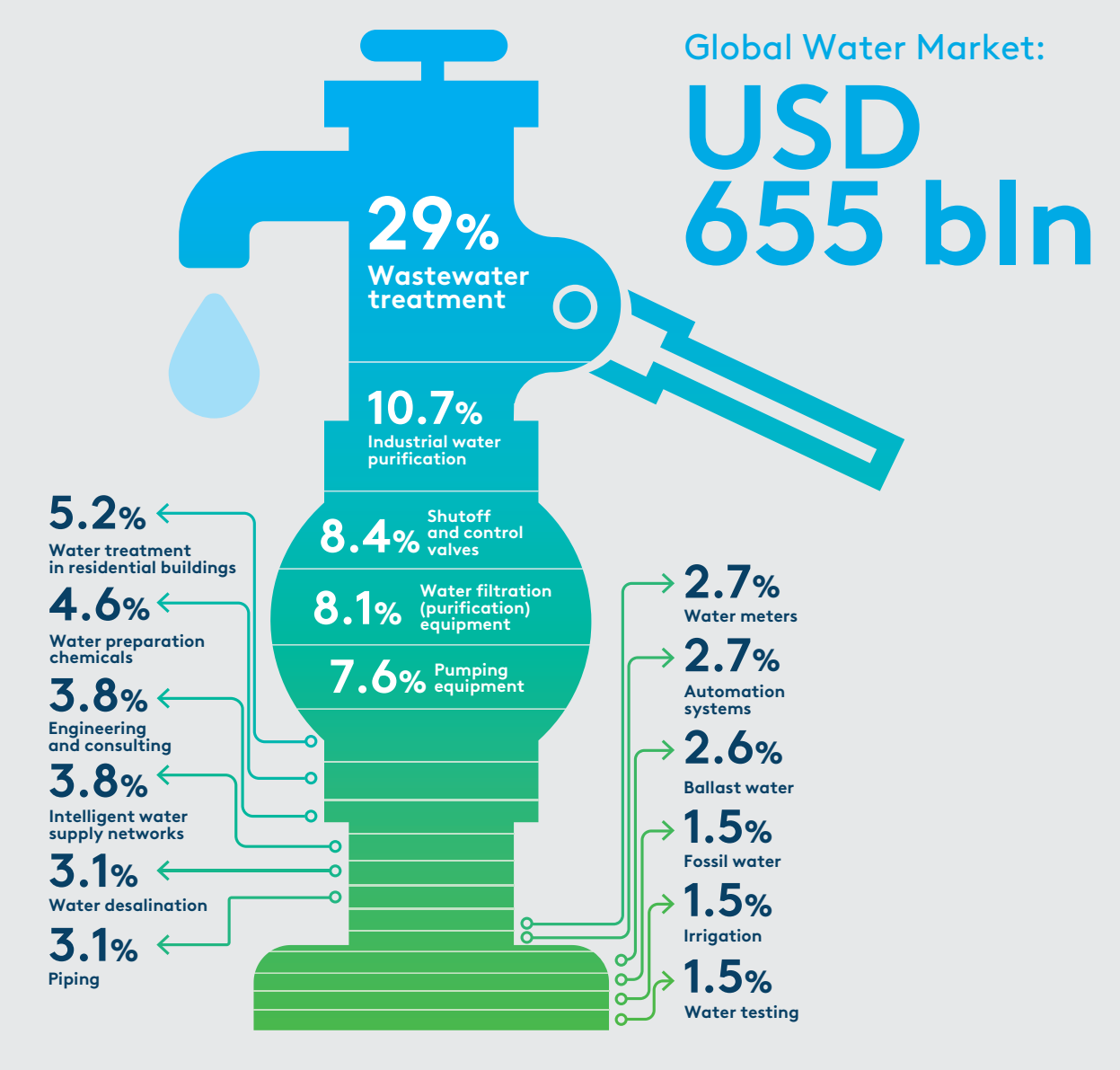
Source: UN-Water, 2024.

1.4. Global Water Market

The global market plays a key role in ensuring accessibility of clean and safe water. It consists of several industry sectors and subsectors, and comprises such major segments as water treatment and distribution and wastewater management, including equipment, chemicals, services, etc. The equipment segment covers diverse types of hardware, including filtration, biological treatment, demineralisation, decontamination, sediment processing, and other equipment.

In 2021, the global water market, as defined above, was estimated at $655 billion (UBS, 2022). The largest segment, with 29%, or $190 billion, is wastewater treatment, represented primarily by large water supply and sanitation enterprises. Manufacture of water exploration, distribution, and treatment equipment accounts for about 71%, or $465 billion. Notably, the share of the irrigation equipment segment is low, at 1.5%, or $9.8 billion. Utility, household, and industrial consumption accounts for about 28% of global water intake, with agriculture using the remaining 72%. To a large extent, the water market evolves around wastewater treatment and manufacturing of household and industrial water supply equipment.

↓ Figure 6. Global Water Market Structure in 2021, %



Source: UBS, 2022.

A significant share of the market is occupied by the filtration equipment segment. Going forward, supply and demand in the disinfection equipment segment are projected to grow at the highest rate due to sizeable public investments in the efforts to stem the spread of infectious diseases through drinking water. There is a powerful drive to design and deploy innovative water treatment methods using cutting-edge technologies, such as artificial intelligence and nanotechnologies. That research will open up new opportunities for expansion of the market for wastewater treatment services.

The modern water supply market offers a broad range of services related to the maintenance of water supply and sewerage (sanitation) systems with the participation of private and municipal operators, as well as project management services. Recent technological advances in the manufacturing sector resulted in massive production of wastewater. Wastewater from enterprises processing chemicals, pesticides, rare metals, and other harmful chemicals and materials is dangerous for the environment, and should go through mandatory purification. Stringent water treatment rules force industrial enterprises to build and regularly service water treatment facilities. These factors will be driving the market in the coming years.

It is expected that the equipment maintenance segment will be growing at a high rate, as companies are building new treatment facilities and retain existing facilities that will require modernisation as the segment is evolving. It is projected that this trend will be quite persistent.

The water and sanitation sector is one of the fastest growing markets. The increasing global water shortage will primarily affect local water monopolies and industrial enterprises manufacturing equipment for the water market (UBS, 2022).

The water market has significant business appeal. Over the long term, its key players can be expected to see higher revenues. Accordingly, the global water market can be extremely interesting for large investors many of whom have clear-cut investment strategies for that market.

2. CHALLENGES FACED BY THE WATER AND SANITATION SECTOR IN CENTRAL ASIA

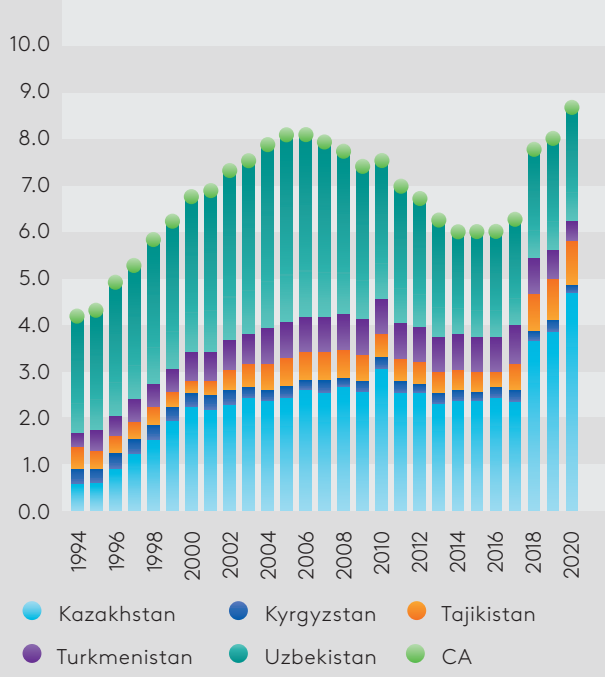
Water supply and sanitation are among the most important aspects of water management in Central Asia. They support the operation of a complex of interrelated structures and facilities used for water intake from natural surface or ground sources, as well as for water treatment, transportation, distribution, and delivery to the end user. The ultimate goal of those activities is to supply quality utility and drinking water, and then dispose of it after it has been used, in quantities consistent with the needs of the population and the economy.

The current and future state of the water and sanitation sector is determined by several factors. Central Asia is situated in an area of mounting water stress (Vinokurov et al., 2022), and over the next five years (i.e., by 2028) it will have reached the stage of chronic water shortage (Vinokurov et al., 2023). The sector is critically affected by climate change, elevated demand for water caused by population growth and rapid urbanisation, obsolescent infrastructure, water quality and monitoring, outdated governance practices, etc. Considerable challenges facing the sector testify to the need to invest in Water, Sanitation, and Hygiene in Central Asia (*WASH*).

2.1. Key Metrics of the Water and Sanitation Sector in Central Asia

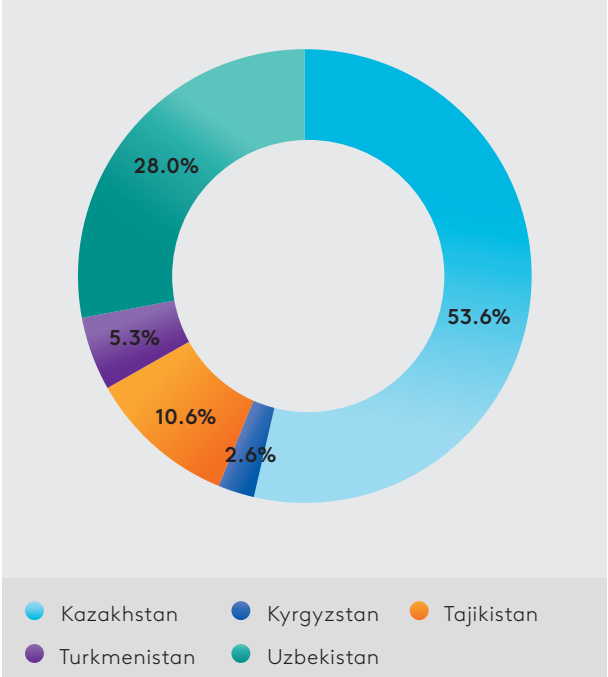
Water consumption in the utility and household sector of the countries of Central Asia is steadily growing. In 1994–2020, it more than doubled from 4.2 km³ to 8.6 km³. Accordingly, its share in total water intake went up from 3.1% to 6.8%.

↓ **Figure 7. Water Intake by the Utility and Household Sector in Central Asia, km³/year, 1994–2020**



Source: compiled by the EDB experts using data provided by AQUASTAT, 2024.

↓ **Figure 8. Structure of Water Intake by the Utility and Household Sector in Central Asia, 2020**



Source: compiled by the EDB experts using data provided by AQUASTAT, 2024.

A significant water consumption increase was recorded in Kazakhstan and Tajikistan. Due to the high share of total water consumption by the utility and household sector in Central Asia, the largest consumption growth was in Kazakhstan (53.6%). Consumption also increased in Turkmenistan, but decreased in Kyrgyzstan and Uzbekistan. In the water consumption rating, Kazakhstan was followed by Uzbekistan (28%), Tajikistan (10.6%), Turkmenistan (5.3%), and Kyrgyzstan (2.6%).

Since 1990, the urban population and the size of populated areas in Central Asia have increased in both relative and absolute terms. Industry is developing at a brisk pace. Industrial enterprises gain access to water through shared distribution systems, which increases water consumption by the utility and household sector.

↓ **Table 1. Utility and Drinking Water Supply in the Countries of Central Asia**

	Access to Safe Drinking Water, % (2020)	*Rural Areas, %*	*Cities, %*	Water Consumption, m^3/year per capita (2020)	Water Loss, %* (2016)	Tariff, $/$m^3$ (2016)
Kazakhstan	92.9	*85.6*	*99.4*	246	30	0.10 — 0.58
Kyrgyzstan	90.0	*86.2*	*96.7*	36	50	0.07–0.11
Tajikistan	73.8	*66.7*	*93.1*	96	45	0.4–0.8
Turkmenistan	60.4	*34.6*	*89.1*	75	55	0.5
Uzbekistan	87.3	*80.9*	*98.5*	73	45	0.11–0.25

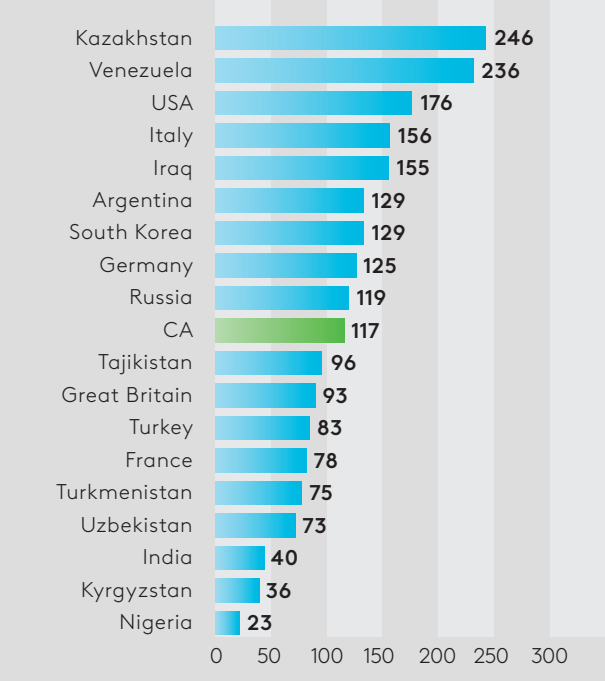
Note: * Water loss includes both technological losses (leaks from distribution networks and unavoidable losses) and commercial losses (unauthorised use, etc.).
Source: EDB expert calculations based on OECD, 2020; AQUASTAT, 2024.

In 2020, annual per capita water consumption by the utility and household sector of Central Asia amounted to 116.8 m^3, including 246 m^3 in Kazakhstan, 36 m^3 in Kyrgyzstan, 96 m^3 in Tajikistan, 75 m^3 in Turkmenistan, and 73 m^3 in Uzbekistan. Since 1994, that indicator in Central Asia had increased by 42.6%. In Kazakhstan, per capita water consumption increased almost seven-fold. In Tajikistan, the increase stood at 41%. In all other countries of Central Asia, consumption decreased (by 46% in Kyrgyzstan, by 19% in Turkmenistan, and by 39% in Uzbekistan). Per capita water consumption by the utility and household sector of Central Asia is lower by a factor of 1.4 than in high-income countries (163 m^3 per capita). However, it is comparable with per capita water consumption in Russia, and higher than in the UK and France.

In 2020, the average share of the population with access to safe drinking water in Central Asia was 87%: 92.9% in Kazakhstan, 90% in Kyrgyzstan, 73.8% in Tajikistan, 60.4% in Turkmenistan, and 87.3% in Uzbekistan. Because of the well-developed urban water supply infrastructure, in cities that indicator ranges from 89.1% to 99.4%. The main water and sanitation services available in the cities of Central Asia are of relatively high quality. Only 918,000 urban residents in Central Asia have no access to safe drinking water. Most difficulties in the cities are related to direct connection to water supply networks and sewerage systems.

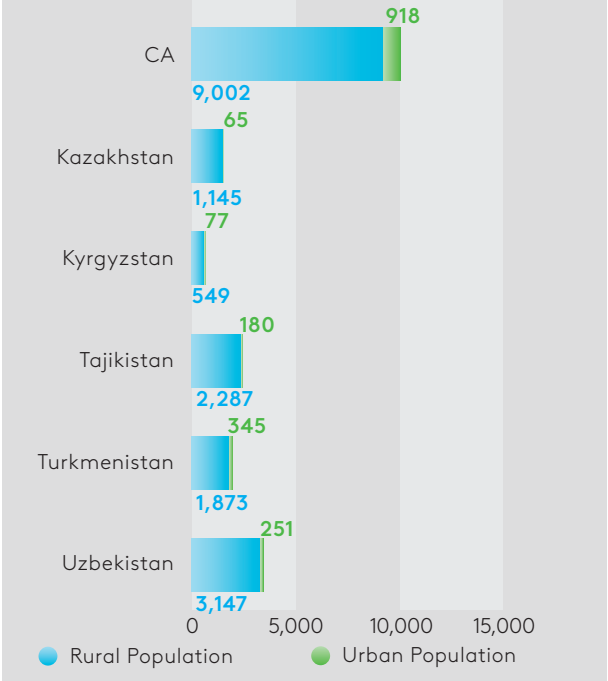
Most problems with access to safe drinking water in Central Asia are experienced by people living in rural areas. In absolute terms, 9 million rural residents in Central Asia have no such access: 3.1 million people in Uzbekistan, 2.2 million people in Tajikistan, 1.8 million people in Turkmenistan, 1.1 million people in Kazakhstan, and 0.5 million people in Kyrgyzstan. In 2020, a total of 9.9 million people living in urban and rural areas of Central Asia (13.5% of total population) had no access to safe drinking water.

↓ **Figure 9. Global Per Capita Water Consumption for Utility and Household Purposes, 2020, m^3 per capita**



Source: compiled by the EDB experts using data provided by AQUASTAT, 2024.

↓ **Figure 10. Number of People Without Access to Safe Drinking Water in Central Asia, 2020, thousand people**



Source: compiled by the EDB experts using data provided by AQUASTAT, 2024.

Drinking water tariffs in the cities of Central Asia are among the lowest in the world, and often do not cover production costs. Tariffs differ significantly from country to country (OECD, 2020). In Kazakhstan, drinking water supply tariffs in urban areas at the end of 2019 ranged from KZT 41.5 (10¢) per 1 m^3 in Astana to KZT 223.9 (58¢) per 1 m^3 in Aktau. The tariff in Almaty was KZT 50 (12¢) per 1 m^3. In Kyrgyzstan, drinking water tariffs are set significantly below estimated cost. Thus, in 2018 the average drinking water tariff in the country was KGS 22.61 (33¢) per capita, while the estimated cost amounted to 54¢. Before 15 November 2019, the tariff per 1 m^3 of drinking water in Bishkek was KGS 5.38 (7¢), while its actual production cost amounted to KGS 7.7 (11¢). In November 2019, it went up to KGS 8.1 (12¢). In Tajikistan, drinking water tariffs range from TJS 3 (40¢) to TJS 6 (80¢), depending on the region and the type of connection to the water source. In Uzbekistan, the highest water tariffs are in southern Karakalpakstan (25¢), and the lowest in one of the districts of Fergana Region (11¢). In Tashkent, the tariff is 21¢.

For comparison, the drinking water tariff in Mumbai (India) is 7¢ — one of the lowest in the world. Other cities with low tariffs are Bangalore (India) with 8.8¢, Hyderabad (India) with 23¢, and Incheon (South Korea) with 53¢. In the cities of the developed European countries, tariffs range from $3.6 per 1 m^3 to $4.8 per 1 m^3.

2.2. Outdated Water and Sanitation Infrastructure in Central Asia

With the formation of independent Central Asian states, decentralisation of management of water supply and sewerage systems intensified with their transfer to local municipal ownership and transition to market conditions of economic management. That gave rise to major organisational, economic, financial, institutional, and legal challenges. These processes are characterised by strong inertia and insufficient municipal (local) funding. In addition, the countries of Central Asia lack financial resources for modernisation and capital repair of water and sanitation systems, which resulted in degradation of the water supply

infrastructure and failure to replace antiquated equipment. This impedes proper operation, making it more difficult to produce drinking water of high quality. Water loss in the utility and household sector of Central Asia amounts to 30% in Kazakhstan, and is as high as 55% in Turkmenistan.

Box 2. Water Loss in Water Supply Systems in the World

Most industrially developed countries built their water pipeline networks and water supply infrastructure facilities at the beginning of the 20th century, without substantial follow-up investment in their modernisation. The average useful life of water pipes is 50–100 years. Because of the outdated infrastructure, utility companies lose, on the average, 10–30% of water in the developed countries, and up to 40% in the developing countries. In certain extreme cases, water loss in the developing countries may reach 70%.

Source: OECD, 2016.

In **Kazakhstan**, the total length of water supply networks is 93,500 km, of which 22,400 km (24%) needed to be replaced at the end of 2022, including 8,400 km (28%) of water mains. It is necessary to urgently replace 21% of street networks. An upgrade of district networks is also long overdue, but little, if any, replacement works are currently under way. The utility infrastructure is characterised by severe wear and tear of networks, and poor state of repair of sewage treatment plants (STPs). STPs need to be built, modernised, or refurbished in 68 out of 89 cities (MoJ RK, 2023). The total length of sanitation networks is 17,700 km, of which 7,200 km (40%) require replacement (National statistics office RK, 2023). Network replacement rates are extremely low: network upgrade alone may take from 35 to 45 years, despite the urgency of the matter. The total deterioration of water supply and wastewater networks in Kazakhstan is 51% in 2022 (MoJ RK, 2023).

Accordingly, the number of network accidents increases, on the average, by 4–5% every year, with leak volume on the rise, and aggregate loss of water in pipeline networks due to damaged pipes reaching or exceeding 30% of total supplied water. Pipeline leaks, shutdowns, and accidents result not only in water loss and supply interruptions, but also in breach of sanitary rules governing the quality of drinking water. In rural areas, the state of repair of water supply systems is classified as critical when their physical wear and tear exceeds 50%. If that indicator increases any further, it will increase the accident rate, with the resultant damage well in excess of standard water supply system maintenance costs. In addition to poor drinking water quality, many regional centres, small cities, and rural settlements have to deal with situations where the water supply is interrupted or rationed.

Many rural settlements have no water and sanitation system maintenance units. If such units are available, they mostly focus on accident response and elimination of pipeline ruptures. Local executive bodies do not pay proper attention to construction and reconstruction of water and sanitation facilities. Water supply matters usually take precedence, while sanitation matters are put on the back burner. That gives rise to serious sanitary and ecological problems, and creates risks to the safety of people and the environment. It takes a long time to create maintenance units to support new water and sanitation systems built in rural areas because of the scarcity of qualified personnel.

In **Kyrgyzstan**, with the physical wear and tear of most urban water supply systems built before the 1980s in excess of 70%, the network requires urgent restoration and repair. As regards rural water pipelines, wear and tear exceeds 40%, with most networks having been

in operation for more than 30 years. In 262 villages, drinking water supply systems were built before 1970, and in 567 villages — before 1990 (MoJ KR, 2020). Less than 29.1% of the country's population has access to central sanitation, and the problem has still not been solved. In the cities, that indicator is 64.1%, while in rural areas it does not exceed 10% (MoJ KR, 2020). In some settlements there are existing wastewater disposal systems, but due to excessive life expectancy and lack of capital investment, they are in a condition requiring rehabilitation or new construction. In Bishkek and Osh cities, 23% of the population does not have access to wastewater disposal networks, and in five large cities and all small towns and district centres they are absent (MoJ KR, 2020). The population in rural areas is actually provided with sewerage nine times less than in urban areas.

Another major problem is the maintenance of drinking water supply systems whose construction was financed by external donors. Such pipelines quickly go out of service, as they have no permanent operation units to monitor their state of repair, and no funding is allocated to finance their maintenance. Many drinking water supply systems with water intake from surface sources produce water of poor quality. Most water treatment facilities do not operate in a proper fashion.

In **Tajikistan**, the total length of urban water supply and distribution networks is 3,000 km. About 95% of pipelines were laid before 1980. Their physical wear and tear ranges from 60% to 70% (UNECE, 2013). Almost two thirds of the existing water supply systems do not meet applicable sanitary requirements because of the absence of water treatment and decontamination/chlorination plants and protective sanitary zones.

The existing urban utility lines (networks and structures) cannot support normal functioning of housing and utility facilities due to insufficient operating capacity (MoJ RT, 2022). In most cities, the number of accidents per year per 1 km of pipes ranges from 2.8 to 3.7. The number of water supply system accidents in the country every year is about 7,400 (2.9 accidents per 1 km of pipes). In Dushanbe, it is 1,890 accidents, or 3.7 accidents per 1 km of pipes per year, while the value considered acceptable is 0.2–0.3 accidents per 1 km of pipes per year (UNECE, 2013). Upon completion of large-scale privatisation of housing, related operation and maintenance responsibilities passed from the state to the new owners (residents), most of whom were not ready for it. In addition, the problem of uninterrupted and reliable supply of drinking water to consumers remains unsolved. None of the country's settlements, with the exception of the cities of Dushanbe and Khujand, has 24x7 drinking water (World Bank, 2017).

Rural water infrastructure is in a critical condition. Utility infrastructure facilities in rural areas are characterised by severe wear and tear, high accident rates, and low efficiency. The wear and tear on utility infrastructure fixed assets exceeds 70%, and they urgently need restoration. Some rural settlements are experiencing local power and drinking water supply crises. There is a newly emerged shortage of sanitation and wastewater treatment capacity. Merely 5% of rural households have access to tap water inside their homes. Despite the efforts by the government and international donors, the population has extremely limited access to quality drinking water and sanitation services because of the failure to complete previously approved water supply improvement programmes. In rural areas, about 30% of the population draws water directly from rivers, reservoirs, lakes, ponds, creeks, courses, or irrigation canals. Such water use is not considered improved or safe from the sanitary perspective (World Bank, 2017).

In **Turkmenistan**, most water and sanitation systems were built in the 1950s–1980s. The length of the urban water supply system and the sanitation system is 16,800 km and 2,800 km, respectively. Water and sanitation networks have been in operation for more than 50 years, i.e., much longer than permitted by the existing norms. This reduces the quality of drinking water, and results in its high loss during transportation (up to 45% and more). Approximately 70% of the urban population receives water 24x7 from central water supply systems, while for

others supply is interrupted for 6–8 hours per day. In rural areas, the average water supply period does not exceed six hours per day. Sewerage systems operate only in the largest cities, with only 35% of water provided by central water supply systems going into the sanitation networks (Commission for Regional Processes, 2011). In all regional and district centres, with the exception of the city of Mary, wastewater is transported beyond city boundaries and discharged into natural depressions, creating environmental and health hazards.

Water supply development programmes were designed to enable addition of new water sources, increase the capacity of pumping stations and water treatment facilities, boost the throughput capacity of water mains, etc. People living in rural areas receive water mostly from decentralised systems using ground sources (drill holes, wells) or surface sources (reservoirs, canals, regulated rivers in foothill areas) (Dukhovny, Sokolov, 2016).

In **Uzbekistan**, the water and sanitation sector consists of 60,200 km of water conduits and pipeline networks. There are central water supply systems in all cities, 93.5% of urban settlements, and 80.2% of rural settlements. The country's current utility infrastructure was built mostly during the Soviet era. Since Uzbekistan declared its independence in 1991, its infrastructure has been evolving in a transitional economy, concurrently with reform of the housing and utility sector. Most infrastructure facilities have exceeded their useful lives, and need large-scale restoration or upgrade. Thus, 14,300 km out of 44.400 km (32.3%) of water distribution network pipes are worn out, as are 5,800 km out of 18,600 km of water mains (UNECE, 2015). Water loss in distribution networks can be as high as 40%. Due to the uneven distribution of fresh groundwater reserves and their depletion, some regions such as the Republic of Karakalpakstan, Khorezm and Bukhara provinces, as well as the western provinces of Samarkand, Kashkadarya, Jizzak and Surkhandarya, are experiencing a shortage of drinking water (Usmanov et al., 2019).

The length of sewerage networks and header lines is 6,700 km. Only 79 out of 119 cities have utility sewerage systems (66.4%). In 2020, about 3.7 million people (12% of the population) had access to central sewerage systems, but mostly in large cities. Only 38% of urban residents and less than 5% of rural residents have access to local sewerage systems. Most treatment facilities need reconstruction. In rural areas, only 10% of households have access to sewerage systems, while most households build dry pit latrines or install septic tanks (with indoor toilets). One of the reasons for poor access to sewerage systems in rural areas is the shortage of water, with water-stressed regions being affected the most. Inasmuch as installation of standard (gravity) sewerage leads to higher water consumption, the use of such systems in rural areas may be problematic due to the widespread scarcity of water resources.

2.3. Water Quality and National Security

In Central Asia, 87% of the population has access to safe drinking water — a relatively high average. It reflects, first and foremost, the physical connection of people to water supply infrastructure facilities. However, it is in fact not the same as guaranteed constant access to safe drinking water. The indicator does not reflect the quality of supplied water, nor does it assess its guaranteed reliable and uninterrupted delivery to consumers. For example, a central water supply system may have low productivity: water supply may be rationed or limited, forcing people to use trucked water or lower-quality water from local sources.

For example, in Kazakhstan the main sources of domestic drinking water supply for the urban population of the country are underground water resources; they account for about 65 per cent of the total balance of municipal water use. Surface sources are partially or fully supplied to 46 cities of the republic. More than 50 per cent of water treatment and pumping stations are more than 70 per cent worn out. At the same time, it should be noted that all surface water sources are subject to varying degrees of pollution as a result of industrial, agricultural

and domestic wastewater discharged into them. Water quality in many of them does not meet regulatory requirements (MoJ RK, 2011). Due to the high pollution of surface water sources, the barrier role of water treatment plants is sharply reduced, which in conditions of their high wear and tear and failure of network facilities does not allow to maintain quality standards of household and drinking water supply.

Kyrgyzstan lacks specialists and laboratory equipment, and there is virtually no centralised control of water quality and safety in many urban, municipal, and rural water supply systems. More than 30,000 cases of acute intestinal infections are registered every year, with parasitic diseases accounting for 24–27% of the total (MoJ KR, 2020).

Tajikistan has no water treatment or decontamination/chlorination plants or protective sanitary zones. As a result, almost two thirds of water supply systems do not meet sanitary requirements (World Bank, 2017). About 80% of treatment facilities are in a poor state of repair, and wastewater in urban areas undergoes only partial biological or mechanical treatment before it is discharged into water bodies.

The quality of water in Uzbekistan's large cities is generally consistent with the national standards. In rural areas, however, the compliance ratio is merely 30%. About two thirds of the country's population consumes drinking water that does not meet government standards (Usmanov et al., 2019).

Water quality in Central Asia is controlled by several agencies. Surface water quality is monitored by hydrometeorological services (in all countries except Turkmenistan). Ground water quality is controlled by geological agencies. Sanitary and epidemiological services supervise drinking water quality. The quality of recycled water (agricultural wastewater) is controlled by water management entities. Overall pollution monitoring is the responsibility of government nature conservation bodies. National water quality standards generally stipulate all components necessary to conduct proper monitoring.

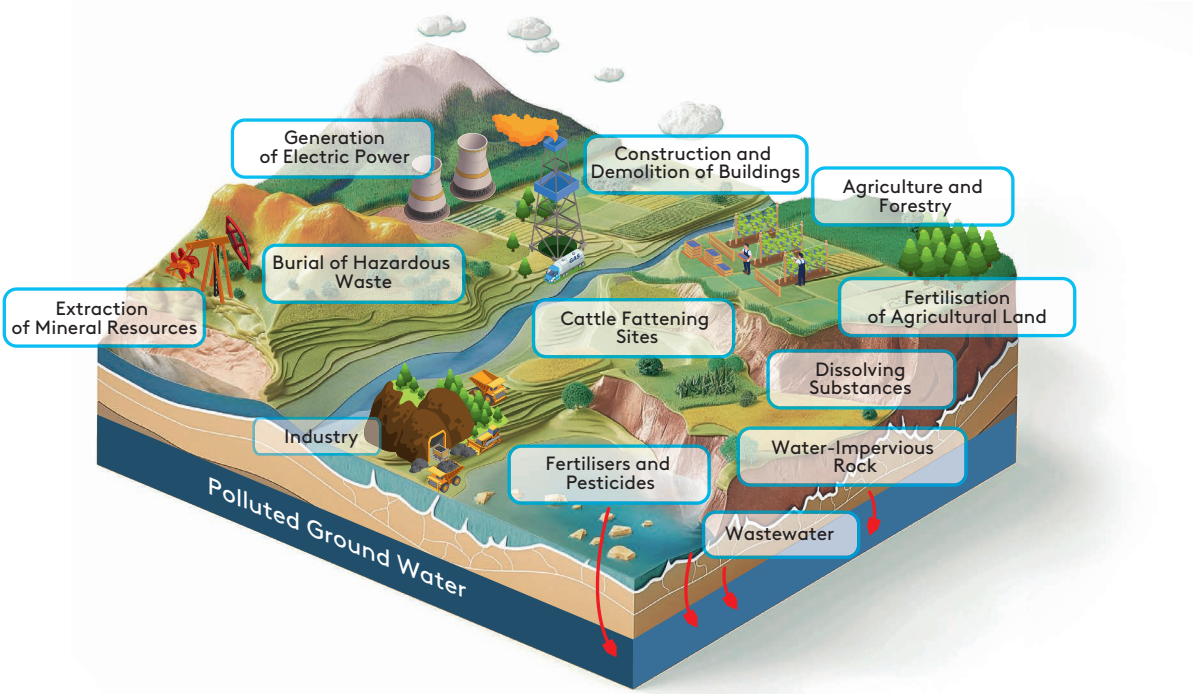
Problems in the sector arise because of insufficient interagency coordination, lack of unified water quality data formats, and delayed exchange of monitoring data. The monitoring of water quality in rivers flowing through several countries is inadequate, with merely one observation station per 200–800 km. Water sampling frequency is also low, while the number of monitored water quality parameters is limited. In Kazakhstan, monitoring is conducted in all major cross-border water courses: there are 12 active stations taking up to 36 samples per day. In Kyrgyzstan, water quality is monitored only in the Chu basin. In Tajikistan, the water quality monitoring system covers all major international water courses, but observation intensity has decreased noticeably. In Turkmenistan, three monitoring stations provide information on water quality along the Amu Darya River. In Uzbekistan, water quality monitoring is conducted in the two major water courses (Amu Darya and Syr Darya), as well as along the Surkhan Darya and the Kara Darya (OECD, 2020).

Non-compliance with drinking water with sanitary and epidemiological quality standards is a direct threat to national security. Low quality of drinking water is a material morbidity factor. The main reasons for unsatisfactory quality of supplied water are: (a) poor quality of water in the natural source itself; (b) pollution of natural sources by non-purified wastewater, e.g., as a result of widespread application of chemical fertilisers in agriculture, or direct discharge of wastewater in cities and by industrial enterprises; (c) low quality of water processing at water treatment plants (obsolescent and physically worn out equipment, and use of outdated reagents); (d) worn pipeline networks where water is contaminated during transportation with a huge loss of treated water, electricity, and other material resources (Danilov-Danilyan, Gelfan, 2015).

As water intake from a river or other source increases, so does discharge of non-purified or insufficiently purified wastewater. This diminishes the self-cleaning capacity of river

water, making it all but unusable for drinking and other utility purposes. In many cases, social tensions in developing countries are caused by pollution of drinking water sources, unsatisfactory sanitary conditions, and shortage of water resources for agriculture. In many such countries, improvement of the water supply and sanitation and development of irrigation reduce social and economic inequality.

↓ **Figure 11. Possible Sources of Pollution of Drinking Water**



Source: EDB.

Fresh water intake and utilisation increase with every passing year. Accordingly, more contaminated water makes its way back to river systems. As a result, renewable resource potential of such fresh water may become critically low, provoking economic recession in certain regions that are already water-stressed. Taking into consideration the uneven territorial and seasonal distribution of water and its strong exposure to technogenic and anthropogenic pollution, any solution of the water scarcity problem primarily implies the need to control pollution of rivers.

The potential to supply people with water is degraded by expansion of water-intensive industries (chemical, oil, mining, etc.), urban growth, and increased consumption of water for crop production, especially when combined with intensive water use and pollution of water resources. Water management should focus on projecting the consequences, preventing and mitigating an adverse impact on safe water use and the environment. The problem of quality of water sources will not just go away when wastewater is no longer discharged into rivers and water bodies. Wastewater should be reused for diverse purposes after purification, making sure that it bypasses rivers and water bodies during its processing cycle.

Quantitative criteria of water sufficiency in river basins should also reflect water quality, which is an important component of drinking water safety. The quality of surface water deteriorates as industrial and utility enterprises and households discharge poorly purified wastewater into water bodies. This inflicts significant social, economic, and environmental damage, impairs the barrier function of drinking water treatment facilities, and gives rise to high sanitary and hygienic risks to safe water use and people's health. This is a global problem, and its solution requires close co-operation, especially in the basins of the transboundary rivers of Central Asia.

Because of the intensive pollution and exhaustion of surface water sources used for water supply in Central Asia, the strategic importance of ground water for utility and household water supply is growing rapidly. However, unauthorised construction of water intake facilities has considerably depleted ground water reservoirs and aquifers. The problem is further exacerbated by unregulated intake of ground water by industrial and agricultural enterprises. The operation of those factors decreased the reserves of fresh ground water in the region.

↓ **Table 2. Ground Water Reserves and Their Use in the Countries of Central Asia**

Countries	Ground Water Reserves, mln m^3/year						Actual Water Intake, mln m^3/year	
	estimated		approved		total		drinking water supply	
	2000	2018	2000	2018	2000	2018	2000	2018
Kazakhstan	1,845	8,410	1,270	1,052	963	859	200	367.6
Kyrgyzstan	1,595	14,212	632	622	548	545	304	340
Tajikistan	18,700	N/A	6,020	2,965	2,294	2,300	485	461
Turkmenistan	3,360	69,000	1,220	1,270	457	1,200	210	558
Uzbekistan	18,455	N/A	7,796	6,336	7,749	5,577	3,369	1,825
Total	43,956	91,622	16,938	12,245	12,011	10,481	4,568	3,552

Source: OECD, 2020.

Commercial reserves have declined because of impairment of subsurface aquifers. For example, in 2018, the Aral Sea basin's reserves (400 ground water reservoirs) decreased relative to 1998. In Uzbekistan alone, annual intake from approved ground water reserves went down by 25–30%. The region's ground water monitoring system is not capable of promptly and reliably assessing the adverse factors causing pollution of aquifers, exhaustion of ground water reserves, and flooding of settlements. At the same time, the overstatement of the region's reserves can be attributed to the fact that the boundaries of aquifers and the "connection" of their sources to those boundaries were determined in a very approximate fashion. Taking into consideration the current state of monitoring of locations, sources of replenishment, and reserves of water in aquifers, assessing that process is extremely difficult.

2.4. "Bad Management Practices" in the Water and Sanitation Sector of Central Asia

The fact that the urban and rural populations in Central Asia lack adequate access to water can be attributed primarily to insufficient organisational, legal, economic, and financial development of the sector, and the absence of integrated water and sanitation management on the sectoral, territorial, and local levels. The state of repair of water and sanitation systems does not comply with applicable standards. The situation is exacerbated by their poor maintenance and servicing. This is the result of a protracted management crisis in the water and sanitation sector, which reduced the reliability of quality water supply to the population, and caused social and economic losses.

As urban and rural water and sanitation systems were being reformed and decentralised, only the physical structures and facilities were transferred to local authorities without any previous scientific, technical, engineering, material, or financial support. Upon completion of large-scale privatisation of housing, related operation and maintenance responsibilities passed from the state to the new owners (residents), most of whom were not ready for it.

There was a dramatic decline in the quality of planning and preparation of design documents, construction, capital repair and maintenance of water and sanitation facilities. There is almost no coordination among authorised government bodies, local executive bodies, and water supply and sanitation enterprises.

Box 3. Water Security in Central Asia

The definitions of "water security", a notion closely correlated with water supply and sanitation, range from concise (e.g., "acceptable level of water-related risk to society") to much more complex. In any event, all such definitions reflect the multidimensional nature of water security. Its assessment is based on numerous indicators whose number may be as high as 80. Since 2013, the Asian Development Bank (ADB) has been publishing the findings of its assessments of water security in the UNESCAP member states in its Asian Water Development Outlook (AWDO) annual reports. The ADB uses more than 50 indicators and sub-indicators grouped into five "key dimensions" of national water security, and then ranks all countries of the region by their aggregate scores (MacAlister et al., 2023).

According to ADB estimates, national water security in the countries of Central Asia is acceptable relative to other countries of the subregion. Access of rural households to water has improved, but the water supply situation in the economy and the water security status of the region's cities remain largely unchanged and require urgent attention. The ADB concludes that "*the main reason for unreliable access to water resources is* ***poor governance*** *rather than water scarcity*". Total economic losses resulting from inadequate water and sanitation sector governance may be as high as 6–10% of the GDP in each country of the region (ADB, 2020).

Routine maintenance of water and sanitation networks and equipment is universally superseded by emergency recovery work. One-off costs associated with such work exceed scheduled repair costs by a factor of 2.5–3.0. As a result, water systems are operated in emergency mode, and water and sanitation enterprises are rendered incapable of mid-term and long-term operational planning.

This problem needs a comprehensive solution based primarily on integrated management and interaction among government agencies and private sector players. Such interaction should aim to curb the increasing pollution of drinking water sources, renovate and modernise water pipelines and distribution networks, build new water and sanitation systems and treatment facilities, expand material and technical capabilities of operating companies, train qualified mid- and base-level specialists in various fields, improve business planning, and improve water and sanitation tariff policies.

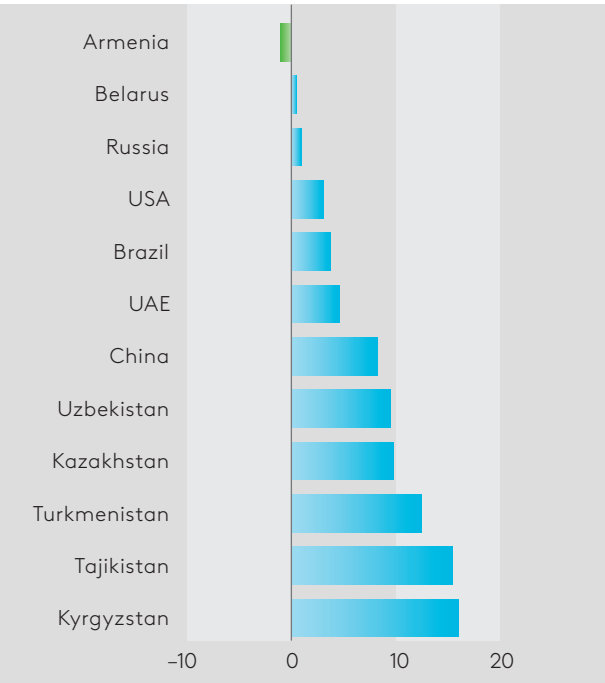
2.5. Rapid Urbanisation in Central Asia

Demographic factors determine the present and the future of the water sector in Central Asia. The structure of the population (urban vs. rural), its growth rate and density, are the key indicators that are considered in the development of water and sanitation systems and assessment of capital and current costs related to their construction and operation.

Demand for water resources in Central Asia will keep increasing along with population growth and the fast-paced urbanisation of the region. Growth will affect all types of water

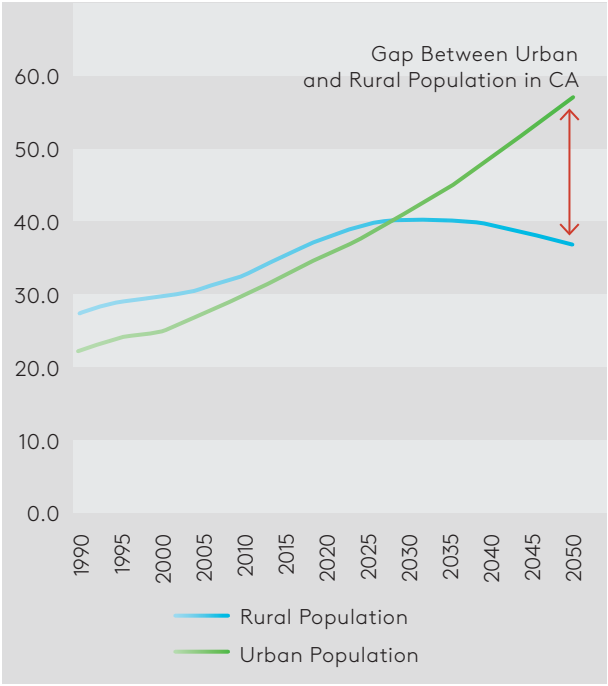
consumption (utility and household sector, industry, and agriculture). In 2018–2023, the urban population increased by 9.5–16%. This indicator is higher than in the other countries of the Eurasian region and in many developing countries (Vinokurov et al., 2024). The main reasons are high birth rates and internal migration, with surplus labour moving to the cities driven by low incomes in rural areas. According to UN estimates, by 2050 the population of Central Asia will increase by 18% relative to 2023, from 79.8 million in 2023 to 94.4 million in 2050. Notably, the urban population of Central Asia will increase by 46% from 39 million to 57 million. Accordingly, the level of urbanisation will increase from 49% to 61% (global average: 57%). In 2030, the urban population is projected to exceed rural population, and by 2050 the gap is expected to widen even further.

↓ Figure 12. Urban Population Increase in 2018–2023, %



Note: * 2023 — estimate.
Source: EDB expert estimates based on WB (2024) and UN (2022) data.

↓ Figure 13. Urbanisation in Central Asia, 1990–2050, mln people



Source: EDB expert estimates based on WB (2024) and UN (2022) data.

The population and area of cities in Central Asia are growing. This growth is not accompanied by improvement of engineering or social infrastructure, including effective water and sanitation systems, steady energy and heat supply, waste disposal, transport, including public transport, etc. The same is true for residential properties. Moreover, new territories in large cities of Central Asia are often developed in an uncontrolled fashion (CER, 2013). Such urbanisation increases pressure on city labour markets, degrades utility infrastructure, limits access to social infrastructure, and makes cities more vulnerable to climate change, natural disasters, and environmental risks. As a result, Astana, Almaty, Bishkek, Dushanbe, and Tashkent regularly top global winter air pollution rankings.

Drinking water supply in rural areas remains a problem in Central Asia. Unfortunately, not enough attention is paid to ensuring that the rural population and agricultural enterprises have reliable access to water. This affects the health of the population and its labour productivity. According to the WHO classification, rural water supply systems in Central Asia are characterised as "small-scale". Inasmuch as small-scale systems are scattered across vast areas, and are often situated far from regional centres, authorised bodies cannot exercise independent control over their activities, and operating companies cannot establish professional communication networks, and have no access to information, expert assistance, or technical support.

In rural areas that have no central water supply systems, people draw drinking water directly from rivers, reservoirs, lakes, ponds, creeks, springs, courses, irrigation ditches and channels, and underground sources, which exposes them to serious health hazards.

Therefore, it is advisable for Central Asia's governments to ensure protection of small rivers used as sources of drinking water. However, none of the countries of Central Asia monitors the sanitary status of small rivers on a permanent basis, or protects them from pollution or depletion.

Small rivers are included in hydro-reclamation systems, and intensively used for irrigation of crops. They take in wastewater and rainwater, and may potentially have significant impact on the quality of water in larger water bodies. The topography of the hydrographic network in the catchment areas of small rivers facilitates inflow of surface runoff from cities, other settlements, livestock breeding complexes, farms, poultry factories, farming lands, industrial enterprises, etc.

Small rivers are the first link in the river network. They affect the whole hydrographic network whose sections are used as drinking water sources. The consequences of economic activity have a more pronounced effect on small rivers than on large ones, exposing the rural population to high water security risks and hazards. Therefore, it is necessary to conduct continuous hygienic evaluation, and monitor the sanitary status of small rivers.

Demand for water resources increases due to population growth and urbanisation. This represents a significant challenge for Central Asia. Internal migration, as well as reduction of the rural population and rapid growth of the urban population after 2030, may have a critical impact on social infrastructure, including water and sanitation facilities, especially considering their inadequate capacity and the deterioration of network equipment (OECD, 2019).

3. REGULATION OF THE WATER AND SANITATION SECTOR, ECONOMIC POLICY MEASURES, AND THE FINANCIAL NEEDS OF CENTRAL ASIA

At the UN General Assembly session held on 25 September 2015, all countries of Central Asia signed UN summit final documents, and resolved to develop strategies linking their national development plans to SDG 6, "Ensure availability and sustainable management of water and sanitation for all". The countries of the region made certain SDG 6 commitments. This may become a part of a unified roadmap for national strategies in the water and sanitation sector. Such a roadmap will help to strengthen regional economic co-operation and integration.

Future water needs of the countries of Central Asia may be met only through rational and economic utilisation of available water resources, maintenance of the water infrastructure in a good state of repair, and attraction of investments required to attain those objectives. It is also necessary to support, at the national level, climate change adaptation efforts, and strengthen regional co-operation in the joint use and protection of transboundary river basins.

In that connection, all countries of Central Asia are introducing measures to regulate the water and sanitation sector, and are implementing various programmes and projects designed to ensure its restoration and development. The sources of funding include service fees, national and local budgets, loans, grants, and technical assistance provided by the developed countries and international financial institutions. The countries of Central Asia are interested in attracting external investments because of their weak infrastructure (which in some regions needs to be created from scratch).

3.1. Republic of Kazakhstan

Regulation of the Water and Sanitation Sector

Pursuant to Article 33 of the Water Code, public administration duties in the area of water supply and sanitation in the Republic of Kazakhstan are "carried out by the President of the Republic of Kazakhstan, the Government of the Republic of Kazakhstan, the authorised body and agency in the area of public utilities management, local representative and executive bodies of regions (cities of national subordination, the capital)" (Annex 1).

The Ministry of Construction and Industry is the authorised public utilities management body. It is responsible for government regulation of water supply and sanitation inside the boundaries of settlements (Article 37-1, 1 of the Water Code). The key duties are performed by the Republican Government Agency "Construction, Housing and Public Utilities Committee". Joint Stock Company "KazTsentr ZhKKh" is the national operator responsible for reforms in the housing and utilities sector. It is wholly owned by the Construction Committee, and it prepares and approves drafts for the Ministry.

The Ministry of Water Resources and Irrigation of the Republic of Kazakhstan is the authorised body for water supply and sanitation outside the boundaries of settlements (Article 37, 1-1 of

the Water Code). The Water Management Committee and the National Hydrological Service of the Ministry of Water Resources and Irrigation of the Republic of Kazakhstan are the authorised agencies responsible for policy-making, regulation, implementation, and control functions in the area of utilisation and protection of water resources, including ground water.

The Sanitary and Epidemiological Control Committee operates under the Ministry of Health Care of the Republic of Kazakhstan. It is responsible for the management and implementation of government policy for the sanitary and epidemiological well-being of the population, supervision of relevant products, including food products, and control of compliance with the requirements stipulated by technical rules and regulations. The Committee performs regulation, implementation, control and supervision functions within its scope of authority, including the drinking water supply.

The Ministry of Ecology and Natural Resources of the Republic of Kazakhstan is represented by the Environmental Regulation and Control Committee. It exercises government control over compliance with the environmental legislation of the Republic of Kazakhstan. The Committee organises and conducts government ecological assessments and evaluations. Its tasks include issuing comprehensive ecological permits and reports on government ecological assessment of projects that involve Category I facilities, control of compliance with contractual licence terms related to environmental protection and water quality standards, and supervision of the activities of local executive bodies related to public services in the area of environmental protection.

Local (regional and district) executive bodies resolve, among other things, issues related to ownership of housing and utility facilities, including water and sanitation facilities in the cities and other settlements. Government functions and duties related to hydrogeological aspects of utilisation and protection of ground water are delegated to local executive bodies.

The country has no single body that would be responsible for the development and regulation of the urban and rural water supply. There is no drinking water supply and sanitation law that is supposed to regulate legal relations in that area. Authorised government bodies do not interact on a continuous basis: the Ministry of Industry and Construction and the Ministry of Water Resources and Irrigation are not engaged in intersectoral coordination and long-term water and sanitation development planning together with local executive bodies. Therefore, urban and rural water supply problems and tasks are not being resolved at the central government level.

Water utilities are natural monopolies. Their operations are regulated by antimonopoly, water management, and other laws. The legislation of the Republic of Kazakhstan does not in any way restrict the right of ownership of public water and sanitation facilities. They can be owned both by the state and by private companies. In most cities, water utility companies are state-owned. There are also several limited liability partnerships (LLPs). Besides, some water and sanitation facilities, e.g., in Shymkent and Pavlodar, are wholly owned by private companies. Water utility companies with non-state participation are being established in some regional centres. The share of such companies in Shymkent is 78%, while in Karaganda it is 49%, and in Pavlodar 20%. In most cities with a population of less than 20,000 and in rural district centres, water and sanitation systems are operated by private water utility companies. In some cases, privately owned water utility companies failed to discharge their obligations, and water and sanitation facilities reverted to municipal ownership.

Government Programmes

Over the last 25 years, the Republic of Kazakhstan approved several state and sectoral programmes designed to supply the population with quality drinking water. Such programmes envisaged allocation of significant investment funding:

- Sectoral Programme "Drinking Water" for 2022–2010 (2002);
- Programme "Ak bulak" for 2011–2020 (2010);
- Regional Development Programme until 2020 (2014);
- State Programme for the Management of Water Resources of Kazakhstan (2014);
- State Programme for the Development of the Agricultural Complex of the Republic of Kazakhstan for 2017–2021 (2017);
- State Programme "Nurly Zher for 2020–2025" (2019) with a budget of up to $2 billion for the water and sanitation sector.

The programmes listed above provided for the modernisation (reconstruction and construction) of water and sanitation systems. It was expected that they would be funded with budget allocations, loans extended by financial institutions, cash provided by natural monopolies, and financing from other sources.

The current effective policy document is the Concept for the Development of Housing and Utility Infrastructure for 2023–2029, as amended by Decree of the Government of the Republic of Kazakhstan No. 265 dated 28 March 2023 (approved by Decree of the Government of the Republic of Kazakhstan No. 736 dated 23 September 2022). Pursuant to that Concept, by 2030 the Republic of Kazakhstan intends to make water supply services more accessible to the population both in the cities (100% in 2025–2029) and in rural areas (100% in 2025–2029); to reduce the physical wear and tear on water and sanitation networks (by 49% in 2024, by 48% in 2025, by 46% in 2026, by 44% in 2027, by 42% in 2028, and by 40% in 2029); and to increase the efficacy of wastewater treatment in the cities of republican and regional subordination (79% in 2024, 84% in 2025, 85% in 2026, 92% in 2027, 97% in 2028, and 98.1% in 2029).

To do that, the state intends to implement 43 group water conduit construction and reconstruction projects, build 9,000 km of water networks in urban and rural areas, and upgrade 14,000 km of heat supply/water and sanitation networks and 1,225 km of stormwater and rainwater drainage networks. There is a plan to implement 68 infrastructure projects for construction and reconstruction of sewerage and treatment facilities. It is expected that various sources of funding will be used to finance such projects, including loans extended by international financial institutions, and bonds issued by national institutions against government guarantees. Accordingly, it is also necessary to design a new mechanism to subsidise the servicing and repayment of loans received from external sources.

3.2. Kyrgyz Republic

Regulation of the Water and Sanitation Sector

The public administration reform in the Kyrgyz Republic clarified delimitation of functions, decentralised the powers vested in government bodies and delegated most of them to local self-government bodies. For example, the state demonopolized the country's housing and utility complex, and delegated 19 functions to the local level. One of those functions is provision of drinking water and sanitation services to the population. Some of the functions were redistributed to the entities operating at the local self-government level (associations of water users, drinking water consumers, etc.). In the Kyrgyz Republic, local communities are authorised to independently deal with local issues. That institution is vested with the right to manage municipal assets. It is the best developed institution of that type among the countries of Central Asia.

Historically, central water supply and sanitation in cities and district centres were regulated by the government body (ministry) in charge of housing and public utilities. Provision of drinking water in rural areas was regulated by the ministries responsible for agriculture, water management, and melioration. All those ministries were performing similar tasks related to the provision of drinking water, but their activities were not coordinated. They did not interact with each other, and their operations lacked intersectoral unity. This prevented them from carrying out an aligned water supply policy, particularly in rural areas.

There were 524 water intake and release companies in the country, including 459 rural public associations of drinking water consumers (RPADWCs). Insufficient funding and low drinking water tariffs made RPADWCs unsustainable and insolvent. Their number is decreasing with every passing year. One in three RPADWCs is economically insolvent. Drinking water supply costs exceed the existing tariffs by a factor of 1.5, which puts RPADWCs in a financial quandary.

In 2023, the government renewed its efforts to improve the water and sanitation system. To enable centralised implementation of the required measures, it reinstated the Drinking Water Supply and Sanitation Development Department (Annex 2) of the State Agency for Architecture, Construction, Housing and Public Utilities (Gosstroy) under the Cabinet of Ministers of the Kyrgyz Republic (Decree of the Government of the Kyrgyz Republic No. 84 dated 17 February 2023). The Department is authorised to develop drinking water supply and sanitation in settlements, and engage in construction, reconstruction, capital repair, and operation of water and sanitation facilities. It is also responsible for coordinating its work with other government bodies.

The Department develops republican and regional strategies, programmes, action plans, and projects related to the development of drinking water supply and sanitation systems; improvement, jointly with local self-government bodies, of the operation of drinking water supply and sanitation systems; coordination of international donor assistance and foreign investments in that area; and monitoring, coordination, and facilitation of implementation of long- and mid-term programmes for the development of drinking water supply and sanitation in settlements. The Head of the Department (Director) is appointed/dismissed by the Chairman of the Cabinet of Ministers of the Kyrgyz Republic at the recommendation of the Director of the Gosstroy of the Kyrgyz Republic.

Government Programmes

The main government programmes in the area of development of drinking water supply and sanitation are:

- Draft State Programme for the Development of Drinking Water Supply and Sanitation in Settlements of the Kyrgyz Republic for 2014–2024 (2014);
- Strategy for the Development of Drinking Water Supply and Sanitation Systems in Settlements of the Kyrgyz Republic until 2026 (2016);
- Programme for the Development of Drinking Water Supply and Sanitation Systems in Settlements of the Kyrgyz Republic until 2026 (2020);
- National Development Programme of the Kyrgyz Republic until 2026 (2021);
- National Water Strategy of the Kyrgyz Republic until 2040 (2023).

The current policy document is the Programme for the Development of Drinking Water Supply and Sanitation Systems in Settlements of the Kyrgyz Republic until 2026 approved by Decree

No. 330 of the Government of the Kyrgyz Republic dated 12 June 2020. The Programme establishes the principles of sustainable governance of drinking water supply and sanitation systems. It suggests an amalgamation and aggregation of the key functions related to potential development of drinking water supply and sanitation systems. The Programme also envisages a uniform technical, financial, economic, and investment policy for drinking water supply and sanitation.

The National Development Strategy of the Kyrgyz Republic for 2018–2040 was approved by Decree of the President of the Kyrgyz Republic No. UP-221 dated 31 October 2018. The Programme is based on that Strategy. The President, by Decree No. UP-23 dated 10 February 2023, also adopted the National Water Strategy of the Kyrgyz Republic until 2040. It will facilitate protection and defence of surface and ground water, including water supply sources, as the main drinking water safety condition.

The Programme determines the vector of future development of the water and sanitation sector, and prioritises the activities of government and local bodies and operating companies. The Programme is designed to ensure that 95% of the urban population and more than 2 million rural residents have access to a safe central drinking water supply, and that 70% of residents of district centres with village status have access to sanitation services. Other tasks set by the Programme are to ensure compliance with sanitary and hygienic standards in school and pre-school institutions, and improve the laws and regulations governing the operation of the water and sanitation sector. The amount of funding required to implement the Programme is about $616.92 million. The programme envisages construction and restoration of drinking water supply systems in 24 cities and 715 villages, restoration of water pipelines in 448 villages, and restoration of water treatment facilities and sewerage networks in the cities of Issyk-Kul Region (Karakol, Balykchy, Cholpon-Ata), Osh Region, and Jalal-Abad Region.

To ensure that the entire population of the country has access to drinking water and sanitation systems, it is necessary to attract investments. The amount of long-term investments is projected by experts at about $917 million, of which only 2.8% will be covered from the republican and local budgets. The bulk (about $890 million) will come from external sources. That funding will be used to finance construction of infrastructure, institutional development, capacity building, and improvement of the quality of services provided by operating companies. The country intends to approach MDBs, and to file a series of requests for the provision of international government assistance (World Bank, IsDB, Saudi Fund for Development, ADB, Government of the PRC, Government of the Republic of Korea, etc.).

The aims and objectives formulated by the Programme are supported by the National Council for Water and Land Resources under the President of the Kyrgyz Republic established by Decree of the President of the Kyrgyz Republic No. 532 dated 24 November 2021. The Council is chaired by the President of the Kyrgyz Republic, and his deputies are the Chairman of the Cabinet of Ministers of the Kyrgyz Republic and the Minister of Natural Resources, Ecology, and Technical Supervision of the Kyrgyz Republic. The functions of the secretariat of the National Council are assigned to the authorised body in the area of natural resources of the Kyrgyz Republic. Moreover, during the second People's Assembly (Kurultai) on 15 December 2023, the President of the Kyrgyz Republic stated the need to upgrade the status of the government body carrying out public policy for water resources.

3.3. Republic of Tajikistan

Regulation of the Water and Sanitation Sector

Provision of water and sanitation services in most of Tajikistan is the responsibility of State Unitary Enterprise "Khochagii Manziliyu Kommunali" ("Housing and Public Utilities

Company") (SUE KMK). It is a business entity, which carries out a uniform policy in the area of development and operation of housing and public utility assets. SUE KMK develops legislative acts, regulates the operation of housing and public utility assets, and formulates rules and standards. The entity also provides housing and public utility services in the cities and districts of Tajikistan.

In the cities of Dushanbe, Roghun, and Khujand and in Fayzabad District, water and sanitation services are provided by independent enterprises operating under the authority of local government bodies, while in the city of Norak those services are provided by an HPP unit owned by Barqi Tojik. In rural areas, water supply is the responsibility of Tajikselkhozvodoprovodstroy (Tajik Agricultural Water Pipe Construction Company), a company operating under the Ministry of Energy and Water Resources (Annex 3). Various design organisations with government equity participation and private enterprises design, build, and operate water and sanitation systems in the country's cities and villages.

Tajikistan has no separate government body responsible for housing and utility policy development and management functions. The Committee for Construction and Architecture under the Government of the Republic of Tajikistan develops, approves, and implements norms and acts that regulate and govern construction, urban development, and architectural activities. It also controls compliance with those norms and acts, and issues licences to individuals and legal entities engaged in construction and architecture business operations.

The Law of the Republic of Tajikistan "On Drinking Water Supply and Sanitation" No. 1633 was adopted on 19 June 2019. It superseded the previous law "On Drinking Water and Drinking Water Supply" (2010). The new law defines central water supply systems as vital facilities and sources of drinking water which are subject to government control. Water supply facilities may be owned by legal entities and individuals. The state controls and certifies water sources and drinking water quality and safety. However, the Water Code of Tajikistan (2020) does not envisage privatisation of the water supply system, establishing that water supply facilities can only be owned by the state.

Government Programmes

Tajikistan adopted several interrelated state and sectoral programmes to improve supply of drinking water to the population:

- Programme for the Improvement of Access to Clean Drinking Water for the Population of the Republic of Tajikistan for 2007–2021 (2006);
- Programme for the Development of the Housing and Utilities Sector of the Republic of Tajikistan for 2014–2018 (2014);
- Mid-Term Development Programme of the Republic of Tajikistan for 2021–2025 (2021);
- Strategy for the Protection of Health of the Population of the Republic of Tajikistan until 2030 (2021);
- Strategy for the Development of the Construction Sector of the Republic of Tajikistan until 2030 (2022);
- State Ecological Programme of the Republic of Tajikistan for 2023–2028 (2023);
- State Programme for Drinking Water Supply and Sanitation until 2032 (conceptual framework, 2023).

Under the current version of the Strategy for the Development of the Construction Sector of the Republic of Tajikistan until 2030, the government intends to deploy drinking water supply systems and sanitation systems in 90% and 75% of the country's cities, respectively.

The sector is in need of investments, both domestic and external, to the tune of $950 million, or $140 million per year (for the period from 2024 to 2030). It will enable the country to achieve SDG 6 "Ensure availability and sustainable management of water and sanitation for all", as well as water and sanitation development benchmarks until 2030 as defined in the aforementioned Strategy. A computation of investments in the improvement of the water and sanitation sector will be provided in the State Programme for Drinking Water Supply and Sanitation until 2032. The government plans to adopt it in 2024.

To achieve the goals set by the Mid-Term Development Programme of the Republic of Tajikistan for 2021–2025, the Programme for the Reform of the Water Sector of the Republic of Tajikistan for 2016–2025, and other national and sectoral programmes adopted in the water and sanitation sector, the government is going to radically improve operational planning in the sector and the quality of design of water management structures and facilities. It will attract the optimal volume of investments, improve the quality and increase service lives and operational reliability of water management facilities, and radically reduce the number and scope of corruption offenses perpetrated in the course of procurement of services and equipment and construction of water management facilities.

3.4. Turkmenistan

Regulation of the Water and Sanitation Sector

As in the other countries of Central Asia, the housing and utility sector of Turkmenistan is adapting to new economic conditions, subject to certain national characteristics and differences.

Following the abolition of the national Ministry of Public Utilities in 1999, and delegation of its functions to local government bodies, Turkmenistan decentralised its housing and utility sector. The Government reinstated the Ministry of Public Utilities 20 years later, in April 2011. Now it is the executive body responsible for the state governance and implementation of a uniform state policy in the area of housing, utilities, public services, and sanitation. In July 2018, the Government reorganised the Ministry of Utilities by incorporating it in the Ministry of Construction and Architecture as the Public Utilities Division. The Division is responsible for the organisation of central water supply in the cities and work settlements. Water supply in rural areas is still the responsibility of the relevant units of the State Water Management Committee and the Ministry of Agriculture.

The key principles governing the state policy and regulation in the area of drinking water supply are presented in the Law of Turkmenistan "On Drinking Water".

Drinking water supply is regulated by the Cabinet of Ministers of Turkmenistan (Annex 4) and the authorised governing bodies in the area of drinking water supply, including the Public Utilities Division of the Ministry of Construction and Architecture of Turkmenistan; local executive bodies; the Sanitary and Epidemiological Service of the Ministry of Health Care and the Medical Industry of Turkmenistan; Chief State Service "Türkmenstandartlary"; Ministry of Environmental Protection; State Water Management Committee of Turkmenistan; and State Concern "Turkmengeology".

Local executive bodies are competent to "ensure sustainable operation of engineering systems used for drinking water supply, and coordinate the operations of water and sanitation associations and enterprises to meet the needs of drinking water consumers". Specialised

utility entities provide central water supply and sanitation services down to and including the level of distribution networks. Such entities usually report to local government bodies. Finally, there are small systems owned and operated by enterprises and supplying drinking water to adjacent settlements.

Until 2018, utility and drinking water was supplied to the population free of charge. Local and national budgets covered the costs of construction, reconstruction, and operation of water supply systems in settlements. Industrial water supply services are provided on a fee basis in accordance with approved tariffs. Persons guilty of exceeding water intake and untreated industrial effluent discharge limits are penalised by fines. In January 2018, Turkmenistan cancelled preferential water, gas, and electricity tariffs. As of 1 January 2024, the tariff for utility and drinking water supplied to the population was increased from TMT 0.5 per 1 m^3 to TMT 1.0 per 1 m^3. No fee is charged for the provision of sanitation services to the population.

Government Programmes

State and regional drinking water supply programmes are designed to improve the drinking water supply system. They are incorporated into the plans for social and economic development of territories (welayats [provinces], etraps [districts], and cities).

Acting in line with the strategic aims and objectives formulated in the National Programme for Social and Economic Development for 2011–2030 (supplemented with a more short-term document covering 2019 to 2025) and the need to achieve SDG 6 clean water and sanitation targets, Turkmenistan is consistently providing improved water and sanitation services to the population.

The country is implementing the General Programme for the Provision of Access to Clean Drinking Water in Settlements of Turkmenistan within the framework of the National Programme "Village". Programme activities include construction of water treatment and desalination plants, reconstruction of existing water treatment facilities and water pipelines, and implementation of state-of-the-art technologies to save water and accumulate water reserves. In 2008–2022, working under the aforementioned Programme, the country put in operation 9,200 km of water pipeline networks, 1,600 km of sewerage networks, 587 wells, 8 water treatment facilities, and 5 sewerage treatment facilities. Work is also under way to discover new drinking water reserves.

There are plans to build desalination plants on the shores of the Caspian Sea and in the Aral Sea crisis zone, and sewage treatment plants in the country's administrative centres. There is also a programme for the renovation of water and sanitation network equipment. However, the country lacks domestic financial resources to deal with its water supply and sanitation challenges. The share of external investments, including those provided by MDBs, remains extremely low.

Turkmenistan will be able to achieve SDG 6 water supply and sanitation targets, if by 2025–2030 central water supply systems cover 93% of the urban population and 82% of the rural population. That means that access to safe drinking water should be available to at least 95% of the urban population and 75% of the rural population. Statistical data on access of the population to central water supply services are not available; the same is true for information on actual and planned capital expenditures (investments). Accordingly, we can only use expert opinions as the starting point for assessment of the country's progress. According to our calculations, in 2024–2030, the country will need at least $500 million per year to finance upgrades to the fixed assets of water and sanitation companies, or about $4 billion for the whole period. The total amount of required investments may increase to $4.5 billion, if we include the costs required to improve the operation and maintenance of the existing water and sanitation systems.

3.5. Republic of Uzbekistan

Regulation of the Water and Sanitation Sector

Utility and drinking water supply in Uzbekistan is characterised by extreme scarcity of domestic water resources. Accordingly, the state is taking strenuous efforts to ensure that the population has reliable access to water, and to expand the country's water and sanitation sector (Annex 6). We identify three stages in the development of the water and sanitation management system.

At Stage 1 (1991–2001), decentralisation and development of a modern system of self-government bodies became the key components of the transition period in the Republic of Uzbekistan. Housing and utility issues related to water and sanitation, heat and gas supply, repair of blocks of flats, and assumption of responsibility for collecting utility payments were dealt with at the local level.

During that period, Uzkommunhizmat [Uzbek Public Utility Services Agency] was established on the basis of the Ministry of Public Utility Services of the Republic of Uzbekistan. Inasmuch as public utility services were deemed to be within the scope of responsibility of local self-government bodies of municipal formations (regions, cities, districts, and rural settlements), only a small portion of water supply and sanitation functions previously performed by the liquidated ministry was delegated to Uzkommunhizmat, with most such functions going to local government bodies, and some to private sector players. Uzkommunhizmat coordinated the reform of the utility services provision system, developed and implemented the relevant government policy; developed draft programmes, strategies, norms and standards; raised investments to finance technical refurbishment and modernisation; and installed metering and control equipment. Uzkommunhizmat operated four group (interregional) water pipelines (Tuyamuyun–Nukus, Tuyamuyun–Urgench, Damhojin, and Dehqonobod), the Hodjaipak inter-district water pipeline, and the Chimgan–Chorvoq water main.

The operations of territorial water utility companies comprising Uzkommunhizmat are governed by the Law "On Natural Monopolies" (CER, 2011). During the reform, steps were taken to retain state governance and control of the key design institutes and production/construction entities, including water and sanitation commissioning, maintenance, and operation companies.

At Stage 2 (2002–2016), the government upgraded the sector governance system. During that period, it was planned to improve access to quality drinking water and sanitation services, and to streamline the connection system whereby business entities were offered turnkey access to utility networks. Accordingly, the government established State Unitary Enterprise "Suvokova" [Utility Company] (SUE Suvokova) with branches in cities and districts based on the existing water and sanitation entities. At the regional level, they reported to Uzkommunhizmat (Annex 5). SUE Suvokova's transition to new governance methods made it possible to more clearly regulate relations with local government bodies, introduce service contracts, improve water metering at water intake facilities and distribution pipeline branching points, and install individual water meters in households. That created the organisational and economic prerequisites for the establishment of a PPP.

Stage 3 of development of the water and sanitation sector (from 2017 until the present) involves a thorough-going modernisation of the governance system, and an increasing inflow of loans and credits from international financial institutions and investments from a variety of countries. At this stage, Uzbekistan is testing hybrid social and economic systems that employ diverse market practices. The state is actively involved in these practices, as they are designed to deal with a backlog of economic and social problems whose resolution may require adoption of special-purpose programmes.

The Ministry of Housing and Utilities of the Republic of Uzbekistan, reinstated in April 2017, is the authorised government body for all matters related to water supply, sewerage systems, and monitoring the use of drinking water. The Uzbek Agency Uzkommunhizmat was transformed into Agency Kommunhizmat, which was structurally incorporated into the Ministry. The new Agency is developing and implementing housing and utility investment projects with the participation of international financial institutions. A new republican government body was established in April 2017: the State Inspection for Monitoring the Use of Drinking Water under the Cabinet of Ministers of the Republic of Uzbekistan (with territorial inspections).

Due to the shortage of funding, on 20 April 2017, the President signed Resolution No. PP-2910 adopting the Programme for Integrated Development and Modernisation of Drinking Water Supply and Sanitation Systems for 2017–2021. The Clean Drinking Water Fund was established under the Ministry of Finance of the Republic of Uzbekistan. Its resources are used to finance Programme-related projects. The Fund and its territorial units operating under the Ministry of Finance of the Republic of Karakalpakstan, and the chief finance divisions of khokimiyats [Mayor's/Governor's Offices] of the country's regions and the City of Tashkent finance design and survey, construction and reconstruction of drinking water supply and sanitation systems within the framework of the Programme.

The progress of implementation of the Programme is supervised by a special republican Coordination and Monitoring Commission. The Ministry of Housing and Utilities of the Republic of Uzbekistan acts as the public contracting authority, and O'zbekkommunalloyixaqurilish LLC as the chief specialised institute for the design of water and sanitation systems. That design institute ensures application of uniform construction design policies, develops and upgrades water and sanitation facilities in the country.

On 30 November 2018, the Clean Drinking Water Fund under the Ministry of Finance of the Republic of Uzbekistan was transformed into the Fund for the Development of Water and Sanitation Systems by Resolution of the President of the Republic of Uzbekistan No. PP-4040. The new Fund also finances programmes and projects for the construction and reconstruction of sewerage facilities.

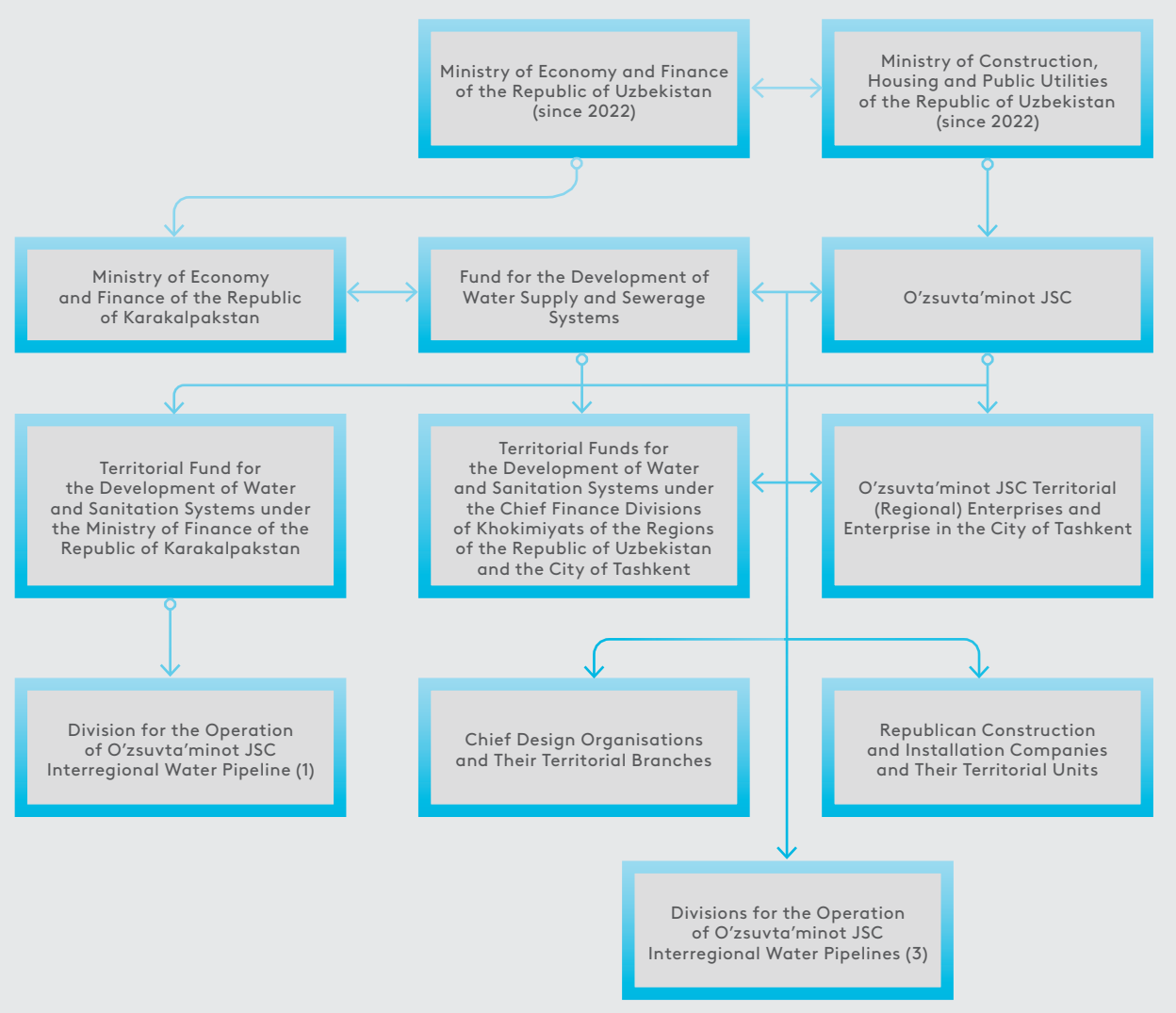
Box 4. The Fund for the Development of Water and Sanitation Systems under the Ministry of Economy and Finance of the Republic of Uzbekistan

In 2019, the initial capital of the Fund was $248.1 million, including $131.8 million from the state budget, and $95.6 million provided by international financial institutions and foreign countries. In 2022, the share of water and sanitation projects financed by the Fund was estimated at 0.6% of total capital investments attracted by the Republic of Uzbekistan. During that year, the Republic of Uzbekistan raised a total of $2.5 billion in direct foreign investment. According to World Bank estimates, it is necessary to raise about $10 billion to ensure achievement of SDG 6. The World Bank expects that, if the Fund intensifies its efforts, it will help to raise about $1.0 billion per year over the next 10 years (World Bank, 2022).

In November 2019, the Ministry of Housing and Utilities (MHU) was restructured. The State Water Inspection under the Cabinet of Ministers was reassigned to the MHU, but retained its tasks, functions, and financing arrangements. The previous Agency Kommunhizmat was abolished, and its functions were handed over to the newly created O'zsuvta'minot JSC

[Uzbek Water Supply]. The MHU functions related to business operations were delegated to O'zsuvta'minot JSC. Regional water supply companies (SUE Suvokova branches) were incorporated in O'zsuvta'minot JSC which, being the country's sole water and sanitation operator, was appointed the public contracting authority under all projects envisaging construction, reconstruction, and modernisation of the facilities operated by that company.

↓ Figure 14. The Fund for the Development of Water and Sanitation Systems under the Ministry of Economy and Finance of the Republic of Uzbekistan: Standard Financing Arrangement



Source: Resolution of the President of the Republic of Uzbekistan No. PP-4040 dated 30 November 2018 "On Additional Measures to Develop Renewable Water Supply and Sewerage Systems in the Republic of Uzbekistan".

The legal and regulatory base governing provision of water and sanitation services to the population is being strengthened. The Law of the Republic of Uzbekistan "On Drinking Water Supply and Wastewater Disposal" adopted in July 2022 guarantees that consumers will have access to drinking water of approved quality. The Law also sets up, as a new government institution, an authorised government body in the area of water supply and sanitation. It expressly states that the special authorised government body in the area of drinking water supply and wastewater disposal is the Ministry of Housing and Utilities. On 21 December 2022, it was renamed the Ministry of Construction, Housing and Public Utilities. The Law does not limit the legal and organisational forms of water supply entities, permitting all entities to operate in that area regardless of their status. Drinking water supply entities are liable for all material and moral harm they may inflict on the life, health, and property of consumers.

To ensure proper implementation of administrative reforms, the President of the Republic of Uzbekistan, by Decree No. UP-269 dated 21 December 2022, established a "compact, uniform, results-oriented system of republican executive bodies based on professional governance principles and comprising ministries, committees, agencies, and inspections". The Ministry of Construction, Housing and Public Utilities of the Republic of Uzbekistan was established on the basis of the Ministry of Construction of the Republic of Uzbekistan and the Ministry of Housing and Utilities of the Republic of Uzbekistan. It is responsible for the implementation of government policies for water supply and sanitation both in the cities and in rural settlements. An Inspection for Control of Housing and Utility Construction Projects was created under the Ministry. O'zsuvta'minot JSC, as the country's sole water and sanitation operator, was appointed the public contracting authority under all projects envisaging construction, reconstruction, and modernisation of the facilities operated by that company.

The country also intends to accelerate attraction of foreign and domestic investments. To do that, in July 2023, Project Offices for development and implementation of investment projects were established in 20 ministries and agencies pursuant to Decree of the President of the Republic of Uzbekistan No. UP-111 dated 21 July 2023. Ministries and agencies submit reports on the results of their negotiations with foreign partners on matters related to international economic activities to the Ministry of Investments, Industry, and Trade within three days. The Ministry may issue binding instructions on elimination of deficiencies identified in the activities of government bodies and public authorities. The Ministry appoints "investment managers" who are assigned to each investor and support the investor at all stages, up to and including the project launch. In particular, they deal with such matters as allocation of land plots, connection to utility networks, and issue of required permits. The Ministry also manages the Multi-Partner Trust Fund for Human Safety in the Aral Region.

Pursuant to Resolution No. PP-343 dated 24 October 2023, as of 1 January 2024, drinking water supply and wastewater disposal tariffs are set subject to the production costs, current expenses, system facility development and modernisation costs, financial costs, taxes (with the exception of taxes imposed on process cost overruns and water losses), and other mandatory payments, and subject to O'zsuvta'minot JSC maintenance costs and relevant entity profitability. If the drinking water supply and wastewater disposal tariffs approved by the people's deputies in regional legislatures are lower than the aforementioned total costs, the difference is covered by the state budget under the applicable government procurement mechanism.

Government Programmes

Special-purpose programmes are needed to ensure that consumers have access to quality drinking water. Three such programmes are currently in effect, each with a five-year timeframe. They are adjusted on an annual basis, and receive regulatory guidance in the form of decisions passed by the Head of State or the Government.

A roadmap for improvement of the drinking water supply and sewerage system was approved by Resolution No. PP-343 dated 24 October 2023. The current plan is to raise $1,595.8 million to finance that programme in 2024–2026 ($520 million per year). It is anticipated that three banks will account for 79% of total investments: the ADB (28.2%), the Saudi Fund for Development and the OPEC Fund (26.7%), and the AIIB (24.1%).

On 1 June 2024, the government plans to launch an experimental project envisaging the transfer of drinking water supply and sewerage systems in the cities of Kogon, Shirin, Yangiyer, Bekobod, and Yangiyul to private companies on public-private partnership terms. Also, as of 1 February 2024, equipment and implements for "water" projects are procured exclusively from domestic manufacturers, if those projects are financed from the state budget.

↓ **Table 3. IFI Participation in Drinking Water Supply Programme Financing in 2024–2026**

	2024	2025	2026	Total, $ millions
Asian Development Bank	79.5	120.9	250.3	450.7
Saudi Fund for Development, OPEC Fund	29.7	342.8	54.0	426.5
World Bank	90.0	–	66.0	156.0
Islamic Development Bank	57.5	–	–	57.5
Asian Infrastructure Investment Bank	–	–	385.1	385.1
European Bank for Reconstruction and Development	–	–	120.0	120.0
Total	256.7	463.7	875.4	1,595.8

Source: Resolution of the President of the Republic of Uzbekistan No. PP-343 dated 24 October 2023.

As of 1 January 2024, enterprises should ensure full territorial coverage when designing new drinking water supply and sewerage facilities and systems. As of 1 April 2024, when designing systems whereby individual households are connected to drinking water supply networks, enterprises should provide for digital water metering in all drinking water supply and sewerage structures and networks, installation of water meters in water facilities and networks, as well as installation of water meters in all individual households and their connection to the single billing system.

In 2024, the government of the Republic of Uzbekistan plans to launch a digital map of existing networks and asset management systems, and implement a project to increase the share of the green economy in the water and sanitation sector. This will make it possible to regulate water metering and reduce water loss. The project will be financed with a $100 million ADB loan. It should be noted that at least two authorised representatives of the Council of Ministers of the Republic of Karakalpakstan and of the khokimiyats of the country's regions and the city of Tashkent should be included in the procurement commission charged with the acquisition of goods, works, and services under all projects realised by O'zsuvta'minot JSC with the participation of international financial institutions and foreign public financial institutions.

Protection and defence of water resources is the best way to reduce the cost of purification of water from main water sources, and to eliminate the problem of inadequate access of the population to quality drinking water. An interactive map created and continuously updated within the framework of the Programme will reflect the reserves and quality status of ground and surface water sources in the territory of the country, and the extent of their recovery. The map will be the main work tool to control and supervise availability and utilisation of water resources used by the Ministry of Water Management as regards surface water sources, by the Ministry of Mining and Geology as regards ground water sources, and by other interested ministries and agencies of the Republic of Uzbekistan. The Programme envisages a set of measures to strengthen protection of water resources and prevent their pollution, including imposition of higher fines for the discharge of insufficiently purified wastewater containing excessive amounts of contaminants, and of waste produced by the manufacturing sectors of the economy.

In addition, the Ministry of Economy and Finance, acting within the framework of the Programme for the Development of Social and Production Infrastructure of the Republic of Uzbekistan, allocates UZS 100 billion per year to install energy-saving equipment at drinking water supply facilities, and to purchase special equipment for the organisations producing and delivering drinking water through water mains and other networks.

3.6. Financial Needs of Central Asia for Achievement of SDG 6

Central Asia has achieved certain progress in the improvement of water supply and sanitation. However, there remains a large gap between its budget and plans. So far the countries of Central Asia have been unable to conclusively resolve water and sanitation issues, especially in rural areas. The use of public-private partnerships to finance rural infrastructure construction projects has not gained currency in any of the region's countries due to the absence of an effective mechanism for attracting investments in that sector.

Available and anticipated financing is completely insufficient for the achievement of SDG 6 by 2030. According to WHO and UNICEF estimates (WHO, UNICEF, 2021), in the global dimension, to achieve SDG 6 by 2030 countries around the world must quadruple their current rate of progress and, accordingly, attract more investments. For the least developed countries, those figures have to increase more than tenfold (WHO, UNICEF, 2021). Subject to these WHO and UNICEF recommendations, we conducted an assessment of investment needs for the countries of Central Asia in connection with the development of water and sanitation systems until 2030. It follows a moderate scenario, envisaging a twofold increase in the volume of financing relative to its current level. We identified a significant investment deficit of more than $12 billion for the entire region in 2025–2030 (about $2 billion per year) (Table 4). The largest financing shortfall among the countries of the region is expected to occur in Uzbekistan: $826 million per year, or more than $5 billion in 2025–2030. A large financing shortfall is projected for Kazakhstan at $700 million per year, or $4.2 billion in 2025–2030. In Tajikistan, the financing shortfall will be rather large given the size of the country's economy, reaching $209 million per year, or more than $1 billion in 2025–2030.

A significant share of scheduled water and sanitation sector financing will be covered by the Official Development Assistance (ODA) provided by MDBs, donor countries, and international organisations. However, because of the complex disbursement procedures, one cannot guarantee that the amount of such assistance will be sufficient, meaning that the financing shortfall in each country of the region may increase noticeably.

Drinking water supply in rural areas remains a major challenge in Central Asia. Despite the ongoing urbanisation, the share of rural population will remain quite significant. According to investment projections for 2025–2030, the amount of investments raised to finance water supply and sanitation projects in rural areas will need to be increased. Besides, it is expected that by 2030 urbanisation in Central Asia will be accompanied by a transformation of the GDP structure, with the share of industry going up relative to its current level. That will boost demand for water in the cities with their high concentration of industrial production facilities and rapidly growing transport and services sectors.

Water consumption in the cities is growing, as is the volume of water disposal. It is necessary to build new and to upgrade existing wastewater treatment facilities. Programmes for the construction and reconstruction of drinking water preparation and wastewater purification plants should cover all cities with a population of 100,000 or more. That will prevent the water supply situation from further deterioration due to pollution of drinking water sources and general water scarcity. The private sector will need to be more actively involved in the maintenance of water and sanitation systems because of the national and local budget limitations.

It is necessary to take into account the huge real risks to which infrastructure projects are exposed due to corruption and inefficient decision-making. According to expert estimates, because of corruption and red tape, the cost of construction of 1 km of transport infrastructure in Russia is 2.5 times higher than in the USA, 3.5 times higher than in Brazil, and 4 times higher than in China (Kondratyev, 2011). The situation in the water management sector of the countries of Central Asia is similar (Mukhtarova, 2023).

↓ **Table 4. Estimated Water Supply and Sanitation Financing Needs and Shortfalls for Achievement of SDG 6 in 2025–2030, $ millions**

	Estimated Financing Commitments		Estimated Financing Needs		Financing Gap	
	Annual Average	2025–2030	Annual Average	2025–2030	Annual Average	2025–2030
Kazakhstan, total	**550**	**3,300**	**1,250**	**7,500**	**700**	**4,200**
including						
cities	350	2,100	800	4,800	450	2,700
villages	200	1,200	450	2,700	250	1,500
Kyrgyzstan, total	**128**	**768**	**250**	**1,500**	**122**	**732**
including						
cities	75	450	140	840	65	390
villages	53	318	110	660	57	342
Tajikistan, total	**71**	**426**	**280**	**1,680**	**209**	**1,254**
including						
cities	54	324	120	720	66	396
villages	17	102	160	960	143	858
Turkmenistan, total	**300**	**1,800**	**450**	**2,700**	**150**	**900**
including						
cities	200	1,200	300	1,800	100	600
villages	100	600	150	900	50	300
***Uzbekistan, total**	**974**	**5,844**	**1,800**	**10,800**	**826**	**4,956**
including						
cities	700	4,200	1,150	6,900	450	2,700
villages	264	1,584	650	3,900	386	2,316
Total	**2,023**	**12,138**	**4,030**	**24,180**	**2,007**	**12,042**
cities	1,379	8,274	2,510	15,060	1,131	6,786
villages	634	3,804	1,520	9,120	886	5,316

Note: *WB, 2022.
Source: EDB expert estimates based on programme documents.

Water infrastructure facilities are the most important long-term investment targets in any country. Capital investments in that area determine the quality of life and the state of the economy for 20–30 years to come. That is why it is necessary to design an effective capital expenditure utilisation mechanism. Inasmuch as infrastructure has always been, and will always remain, a public good, infrastructure projects should first and foremost be designed so as to meet public needs, regardless of the form of control or nature of investments. That is possible only with strict public control over design, financing, construction, operation, and maintenance of such facilities (Qasim et al., 2000).

4. INVESTMENTS IN THE WATER AND SANITATION SECTOR OF CENTRAL ASIA

The countries of Central Asia need to raise financing for the water and sanitation sector. This is a challenge, as there is a large gap between the sector's financing needs and its real financing possibilities. For the period from 2025 to 2030, that gap is estimated at $12 billion, or about $2 billion per year.

The gap can be reduced by actively attracting financing from international financial institutions, multilateral development banks, development agencies, etc. Those organisations wield a huge potential for financing the water and sanitation sector in Central Asia, but it is not used to the full extent. International experience and the structure of the global water market show that the sector needs private capital. The state has always been most interested in its development, but, if a correct approach is selected, it can also become an attractive investment target for private players. Balanced strategy and policy are the key to success in investment planning and better maintenance of the existing infrastructure. It is important to clearly define infrastructure investment priorities, and to optimise the volume of mobilised funding. Successful realisation of investment projects in the water and sanitation sector can produce significant economic impact.

4.1. Untapped Potential of International Financial Institutions

The water and sanitation sector of Central Asia has little appeal for potential investors. The profitability of water supply and sanitation projects is too low for private capitalists and foreign investors. Therefore, international financial institutions, multilateral development banks, development agencies, etc. (*abbreviated to "IFIs" in this report for convenience*) are becoming an important source of funding for the development of the "water" sector (Vinokurov et al., 2021).

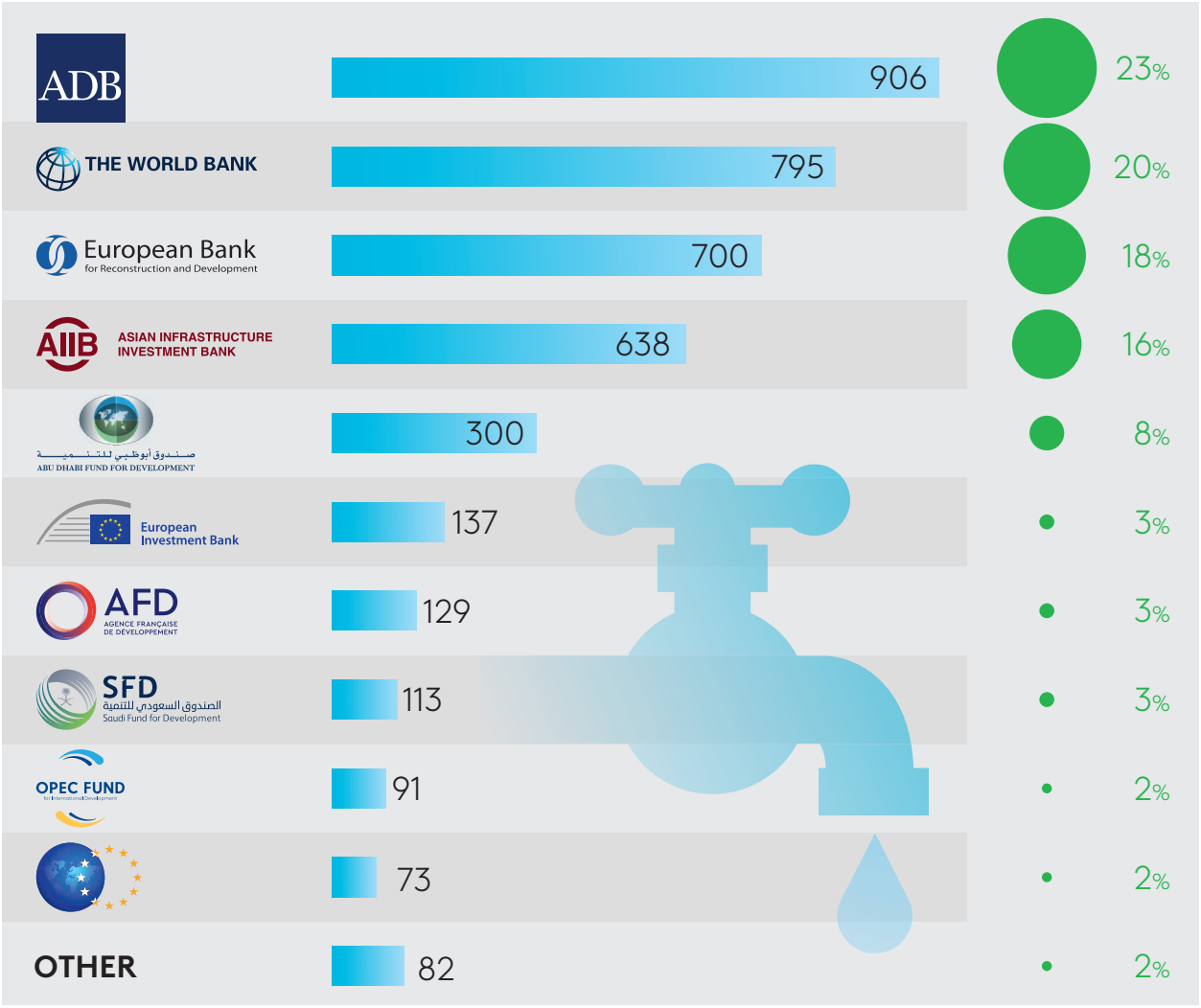
From the beginning of 2008 to the end of 2023, IFIs approved 147 water supply and sanitation projects in Central Asia with total sovereign funding of $4 billion (*EFSD, 2024), which covers projects approved in 2008–2023*). Almost 75% of total funding went to Uzbekistan, with Kyrgyzstan and Tajikistan getting 13% and 9%, respectively. During the period under review, Kazakhstan attracted $113 million (3%). The bulk of funding was provided in 2018–2022 (71%). The ADB tops the list of funding providers, with a portfolio of $906 million, or 23% of total IFI financing in Central Asia. It is followed by the WB ($795 million, or 20%), the EBRD ($700 million, or 18%), and the AIIB ($638 million, or 16%). The remaining 12 players provided a total of $925 million (23%).

IFIs play an important role in the development of the water and sanitation sector because they offer grant-based or soft-termed financing due to extended cycles and high costs. In this arrangement, it is impossible to raise market-based financing fully covering all project implementation costs on reasonable terms and at an acceptable level of risk.

The potential of IFI financing of the water and sanitation sector in Central Asia is significant. At this time, the sector accounts for only 6% of total IFI-approved financing provided to the countries of Central Asia (*$67.5 billion in 2008–2023*). Apparently water management projects are less attractive than other projects. However, as the sector's investment appeal improves, IFIs may potentially resolve to expand its financing. Besides, great potential is available in the

non-sovereign financing segment. For example, in Kazakhstan in 2008–2023, IFIs approved non-sovereign financing for five water supply and sanitation projects, for a total of $47 million (*0.47% of total non-sovereign financing of $10 billion approved by IFIs for Kazakhstan in 2008–2023*). The EBRD is the only entity which has a track record of such financing.

↓ **Figure 15. Sources of Sovereign Financing of Water and Sanitation in Central Asia, $ millions**

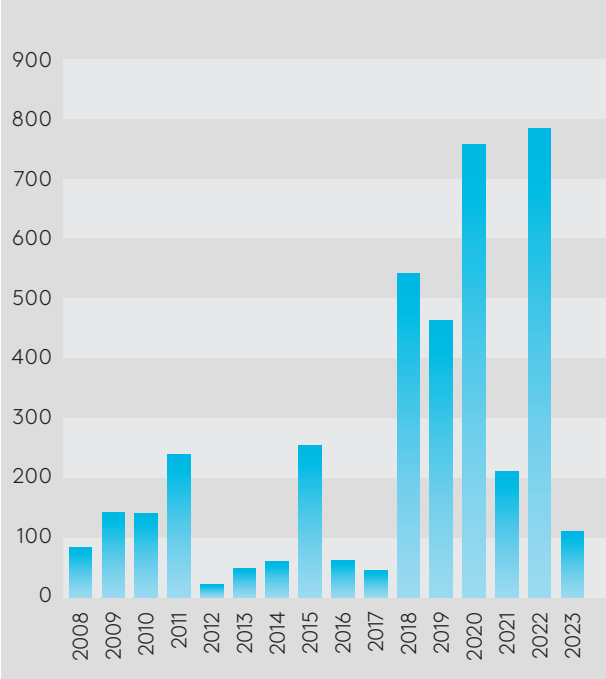


Source: EDB expert calculations based on EFSD, 2024.

Box 5. Shymkent Water Treatment Plant Upgrade Project

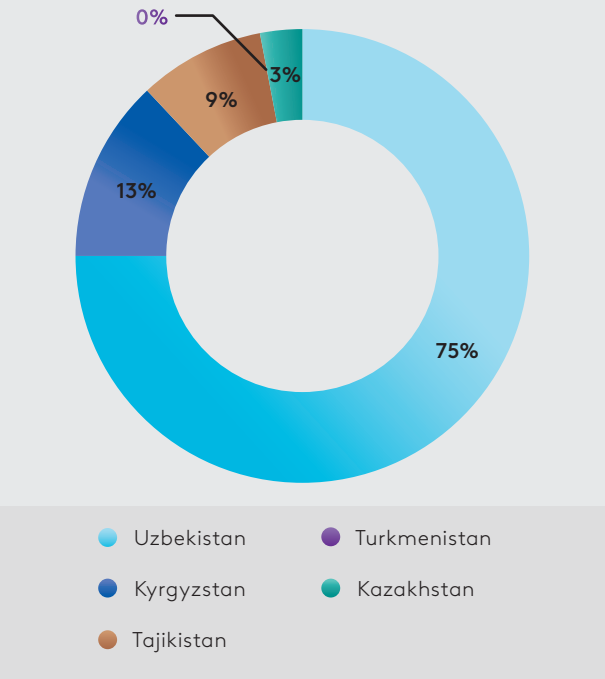
This project envisaged extension of a KZT 3.3 billion (€6.9 million) credit to finance the investment programme of Water Resources — Marketing LLP. The purpose of the programme was to expand the capacity of the treatment plant from 150,000 m^3/day to 200,000 m^3/day, and to upgrade the sewerage network. The project is expected to improve the quality of wastewater purification services by expanding the treatment plant's capacity and service area, reducing the number of sewerage network accidents and failures, and effectively managing the growing volume of wastewater. The Government of Kazakhstan took part in the project by extending sovereign capital expenditure guarantees for the entire principal amount of the loan. Water Resources — Marketing LLP is a private water and sanitation company registered in Shymkent, a city with a population of more than 1.1 million. The company is the only provider of central water supply and sanitation services for 98% and 55% of the city's population, respectively.

↓ Figure 16. Approved Sovereign IFI Financing of Water and Sanitation in Central Asia, $ millions



Source: EDB expert calculation based on EFSD, 2024.

↓ Figure 17. Country Structure of Sovereign IFI Financing of Water and Sanitation in Central Asia, %



Source: EDB expert calculation based on EFSD, 2024.

4.2. Water and Sanitation Sector Financing: International Best Practices

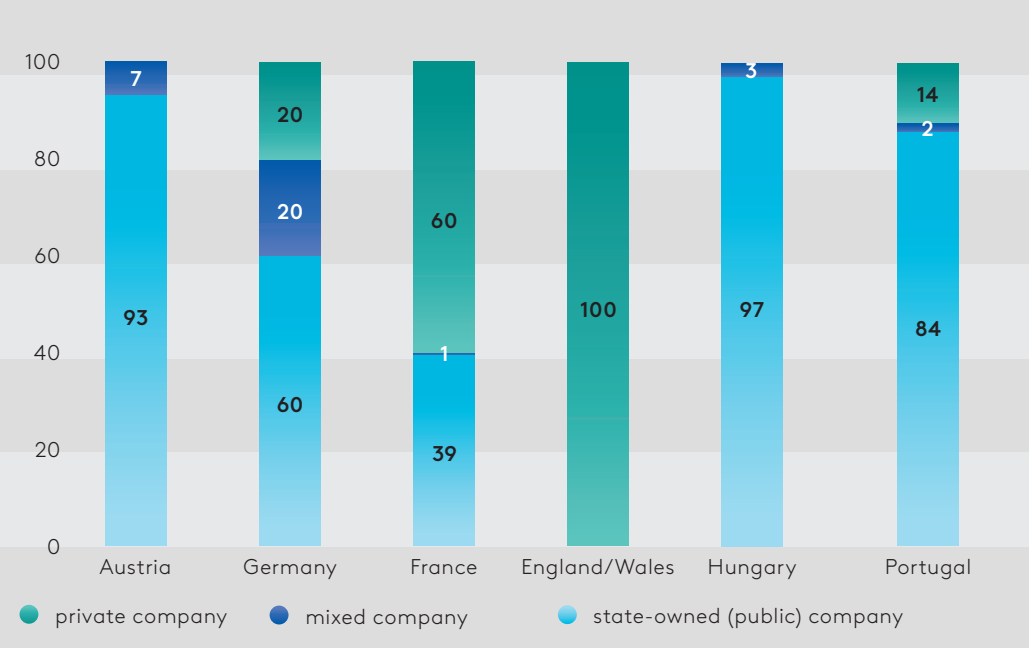
On the global agenda, water is a national treasure which is extremely important for human health and progress. In the 1990s, many countries around the world carried out large-scale institutional reforms in the area of housing and utilities, including the water and sanitation sector. The governments were always responsible for utility services, regardless of who actually provided those services. There emerged theoretical preconditions for the development of utility water supply models. Under such models, water supply to the population should not be entrusted to private companies whose purpose is to extract maximum profits, even to the detriment of social interests.

As a result, municipal utility companies are the main water providers, while private operators, if present in the drinking water market, are strictly controlled by the state. It is important to note that privatisation (*full sale of state-owned water and sanitation assets*) is done very rarely. Nevertheless, the private sector is taking an increasingly active part in supplying water to people around the world.

In European countries, there are several organisational and legal forms of governance of water and sanitation companies. Water and sanitation infrastructure is invariably owned by municipal government bodies and managed using various types of PPPs. In the UK, utility water supply is regulated at the national and regional levels. Local authorities must either ensure that water is supplied to the residents of the relevant city or village, or assign that duty to one or more regional companies under privatisation deals. In Hungary, local authorities are responsible for managing the water supply, although the actual regulatory arrangements were changed repeatedly. The highest share of wholly state-owned companies serving 93% of the population is in Hungary (97%), where privatisation was either cancelled or stopped. It is followed by Austria, where public companies serve 93% of the population. In Portugal, that indicator stands at 84%, while in Germany, with a particularly large number of mixed-type enterprises, it is 60%. Finally, in France 39% of the population are served by public companies.

In Germany, mixed-ownership (public-private) water companies serve 20% of the population, in Austria, that share stands at 7%, in Hungary, Portugal, and France, at 3%, 2%, and 1%, respectively. In England/Wales, the whole population is served by privatised utility companies. In France, private companies provide services to 60% of the population, in Germany and Portugal, to 20% and 14%, respectively.

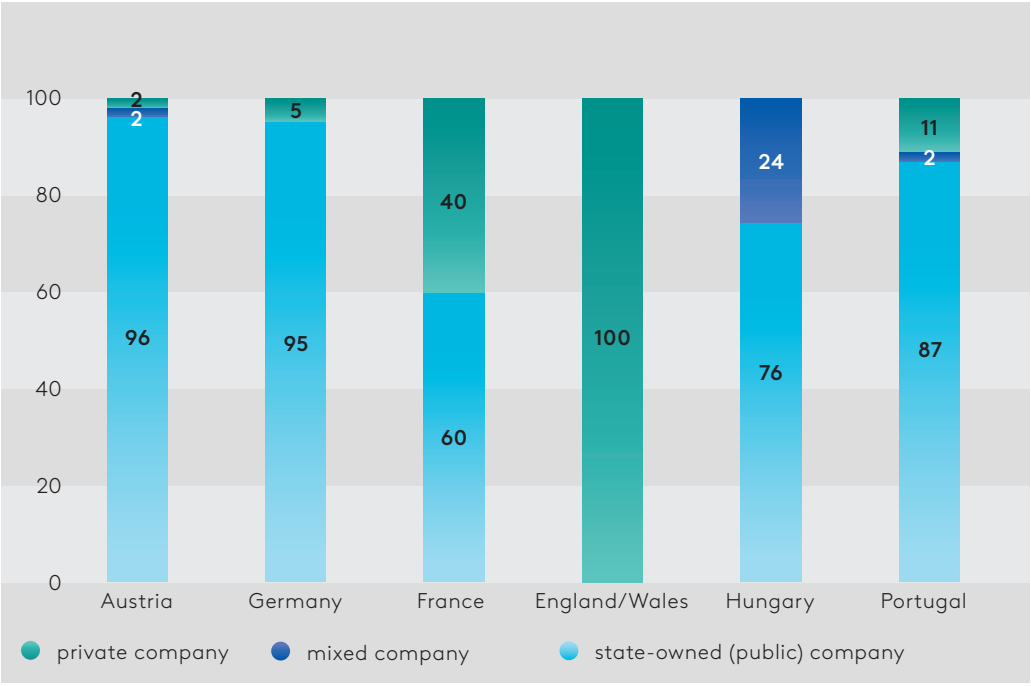
The situation is somewhat different in the sanitation subsector, where the share of public and private companies is slightly higher than in the water supply sector. Thus, in Austria, state-owned (public) sanitation companies serve 96% of the population, in Germany 95%, in Portugal 87%, in Hungary 76%, and in France 60%. Private sanitation companies hold a significant share in France (40%), while in Austria, Germany, and Portugal, their share does not exceed 2%, 5%, and 11%, respectively. In Hungary, there are no private sanitation companies. The example of England/Wales (where 100% of water supply and sanitation companies are private) shows that "private" operations do not necessarily always focus on extracting maximum profit, and that they may focus instead on provision of better services, and be quasi-corporate, or open for international financial investors.



← **Figure 18. Share of the Population Served by Water Supply Companies with Different Organisational and Legal Forms, %**

Source: Getzner et al., 2018.

In most EU countries, the costs incurred by companies are covered by tariff revenues and other municipal charges and fees. Despite the financial and economic stability of water and sanitation companies, in most cases they resort to borrowings to ensure that their "water supply" systems remain technologically sophisticated. To support their water and sanitation systems, EU countries use both external and federal (national) loans, as well as their own funds. Investment requirements are stipulated by both EU legislation and national laws and regulations. In Germany, investments are financed by network connection fees, their own funds, and borrowings (whose share in total assets upgrade and modernisation costs may reach 50%). In France, the share of loans in total financing of water and sanitation companies may be as high as 17–20%. In Hungary, the main sources of investment financing of water and sanitation systems are EU structural and target funds, as well as loans provided by European banks. Portugal funds its water and sanitation investment projects with allocations from EU funds and, in the case of interregional water and sanitation systems, from local budgets. In Austria, investments are financed with loans and subsidies provided by the federal and state governments, their own funds, and water and sanitation system connection fees. England and Wales have been raising required investments independently under various debt financing arrangements since the time of privatisation of their water and sanitation companies.



← **Figure 19. Share of the Population Served by Sanitation Companies with Different Organisational and Legal Forms, %**

Source: Getzner et al., 2018.

The amount of annual investments in water and sanitation depends on a variety of external and internal factors. In the water subsegment, England and Wales have the highest unit investments per 1,000 residents, at €56.22. They are followed by France with €30.96, Austria with €30.68, and Germany with €28.08. Hungary and Portugal report much lower unit investments per 1,000 residents, at €17.37 and €19.84, respectively. In the sanitation subsegment, significant unit investments per 1,000 residents are reported by France (€89.20) and Austria (€87.58), which come ahead of England/Wales (€62.76), Germany (€58.44), Hungary (€51.00), and Portugal (€36.23) (Getzner et al., 2018).

Water and sanitation are capital-intensive, non-productive subsectors. They require relatively high (long-term) debt financing and subsidies. Provisions for government subsidies are made in the budgets of the countries under review to improve protection and defence of water resources, and to boost the technical and engineering capabilities of water and sanitation systems. As a rule, most water and sanitation government subsidies are provided by federal or national budgets. In the water subsegment, the lowest unit subsidies per 1,000 residents are reported by Germany at €1.59, while France, Austria, and Hungary allocate €6.64, €7.14, and €7.93, respectively. The highest subsidies are in England/Wales: €13.88 per 1,000 residents. In the sanitation subsegment, Germany also has the lowest unit subsidies per 1,000 residents at €9.11, while Portugal and Austria allocate €14.69 and €19.83, respectively. The highest unit subsidies per 1,000 residents are reported by England/Wales at €25.28, France at €31.78, and Hungary at €35.07.

There are several public-private partnership forms in the water and sanitation sector: service contract, management contract, lease contract, joint venture, concession agreement, privatisation, and others. The state plays a special role in regulating relations with private entrepreneurs. Moreover, the private sector helps to define long-term strategic aspects of water policy. It is involved in making laws, setting up governance structures and related institutions, implementing investment projects, and distributing liability and potential risks. Globalisation of the economy expands the geographic coverage of global water and sanitation markets.

The concession-based public-private partnership is the most widespread form of private sector participation in global water and sanitation operations. Several large global (*transnational*) companies act as concessionaires in the international water market. The key players are

French and English holding companies, such as Veolia Environnement, Suez Environnement, Severn Trent, and Thames Water. Contracts for the lease (concession) of water and sanitation systems are usually made in large cities with affluent populations. Transnational companies (TNCs) have little, if any, commercial interest in smaller cities and settlements situated in low-income regions, especially in rural areas.

Box 6. Establishment of Public-Private Partnerships (Mixed-Type Companies) in the Water and Sanitation Sector

On 6 October 2015, the administration of the French city of Dole and SUEZ, one of the largest French water and sanitation companies, signed an agreement on the establishment of Doléa Eau, a water company with a charter capital of €408,000, and Doléa Assainissement, a sanitation company with a charter capital of €572,000.

Note. The public-private partnership mechanism (Société d'Economie Mixte à Opération Unique, or SEMOP) enables joint management of water and sanitation systems, including modernisation and new construction, with the participation of communes and a private operator chosen in a selective tendering procedure. Each mixed-type company is created to deal with one specific task (water supply or sanitation). Communes are involved in the approval of each decision related to SEMOP operations with the same voting power as the operator. The board of directors is created in accordance with the principle of equal representation, with the Dole administration and SUEZ authorised to appoint three members each. The city of Dole owns 49% of the shares in the two companies, and SUEZ Group owns 51%.

The operations of Doléa Eau and Doléa Assainissement are financed by the fees paid by consumers for water and sanitation services. The agreement was made for 13 years. Upon expiry of that term, or upon completion of all actions stipulated by the agreement, it terminates automatically. Doléa Eau and Doléa Assainissement are to perform the following technical tasks: replace 600 pipe couplings and 12 km of distribution network pipes, and protect biodiversity in the River Doubs by upgrading sanitation networks and optimising effluent allocation in the sanitation system so as to reduce the amount of clean water discharged into the sewerage network.

Source: The Institute for Urban Economics Fund, 2018.

Many of the water supply concession projects realised by TNCs improved performance, reduced water loss, and increased water delivery volumes and pipeline coverage areas. On the other hand, there were several unsuccessful large-scale projects. The best known is the Buenos Aires water supply concession agreement (Argentina). It was signed for 30 years in December 1992. The concession was to be granted to a consortium of foreign companies in 1993 (Alcázar et al., 2000). The tender was won by the Aguas Argentinas consortium headed by the French company Lyonnaise des Eaux-Dumez. After several years of successful work, the concessionaire failed to allocate funding to expand the water network in poor quarters. The company began to sustain losses. It resorted to cross-subsidisation, using revenues from solvent customers to cover the "social" network expansion costs. The consortium also suffered from the risks created by the economic crisis in Argentina. In 2002, the concessionaire reported a net loss of $1.6 billion from its Buenos Aires operations. In 2005, the concession agreement was terminated.

Foreign TNCs also show a lot of interest in water supply and sanitation operations in large industrial cities and capitals of several CIS countries. The population in such places has a level of income sufficient to cover the investor's costs through water and sanitation tariffs.

Armenia is a good showcase. There are conflicting opinions regarding the results of TNC involvement in the sector's governance. Upon completion of the water and sanitation sector reform in early 2001, it became possible to create PPPs in Armenia. After a tender held in 2000, a five-year contract for the management of the water and sanitation system in the city of Yerevan was awarded to the Italian company Acea (later renamed into A-Utility) (Martusevich, 2006). In June 2006, a tender was announced with the support of the World Bank for the lease of the Yerevan water and sanitation system; the contract was awarded to the French company Veolia Water. At the end of 2003, Armvodokanal [Armenian Water Utility Company] was placed under management by the French company Saur until 2010. Since August 2009, all large water and sanitation systems in Armenia have been managed by international operators, mostly from France. As of 1 January 2017, the assets of five active Armenian operators (Yerevan Jur, Armvodokanal, Shirak vodokanal, Lori vodokanal, and Nor Akunk) were placed under management by the company Veolia Jur for a term of 15 years (until 2031).The new single operator of Armenia's water pipeline network paid a 15-year concession fee of AMD 89.75 billion ($18.6 million). Taking into consideration the social and economic situation in the country, on 16 March 2023, the Government of Armenia provided to Veolia Jur subsidies to enable a reduction of drinking water and water disposal tariffs. Armenia attracts international loans and grants to finance all its public-private partnership projects. Such loans are provided by the World Bank ($26 million), KfW ($25 million), the EBRD ($15 million), the ADB ($45 million), the USAID ($22 million), the Government of France ($27 million), and other donor countries and multilateral development banks (MDBs). Therefore, capital expenditures related to the restoration and expansion of the water and sanitation systems are covered with international loans and grants.

Despite TNC involvement in Armenia's water and sanitation system governance and the improvement of some indicators, the sector is still experiencing severe problems. Water loss remains very high at 60–70%. Underground aquifers in the Ararat artesian basin, the main source of drinking water in the country, are becoming depleted. Over the last 30 years, they have subsided by 35 metres. This may impair the access of the country's population to drinking water, and have critical environmental, social, and economic consequences.

Legislation of the countries of Central Asia offers a variety of private sector participation forms. For example, Uzbekistan intends to allow private sector players to participate in the provision of water and sanitation services, especially in small cities and rural areas. Depending on specific contractual terms agreed by the parties (local government body [owner] and private company), private sector players may select one of the following forms of participation, each with its own advantages and disadvantages.

1. A service/outsourcing contract is used when the state-owned or private water and sanitation company resolves that another specialised company may perform its functions more effectively. Outsourcing contracts are usually relatively short-term (1–5 years).

2. A management contract is expedient in situations where managers are capable of working more effectively, but lack training and knowledge of modern governance systems and methods. Their governance potential can be strengthened by bringing in qualified specialists from a third-party entity. As a rule, the management contract is also made for a short term (maximum five years).

3. Corporatisation is the process where the state-owned organisation is segregated from the overall administrative structure and authorised to operate on commercial principles while it continues to be owned by the state. Corporatisation does not, in and of itself, amount to private sector involvement, but it is the most effective way to make the organisation more independent, and reduce its dependence on local government bodies.

4. Under a lease, the private contractor pays the state owner of water infrastructure facilities for the exclusive right to operate those facilities and provide water and sanitation services. The contractor bears all commercial risks related to the provision of such services. The company's personnel become the lessee's personnel for the duration of the lease contract. The lease contract is usually made for 8–12 years, and does not require the lessee to invest in the leased infrastructure facilities. The lease itself does not provide an opportunity to finance capital expenditures by involving private capitalists. Nevertheless, the lease contract may contain a proviso to the effect that the lessee is responsible for capital expenditures. In such cases, the contract should be made for a longer term (*25 years*) to enable loan repayment.
5. A concession contract includes all lease contract terms, but in this case the contractor plans, designs, and finances construction/reconstruction/modernisation to expand or replace certain fixed assets as stipulated by the contract. All water and sanitation personnel passes under the control of the concessionaire.
6. A public-private partnership (*joint stock company*) is used where the state-owned company intends to retain its interest in the profitable provision of services. To attain that objective, the company should improve its managerial and operational performance, and attract additional capital to expand or modernise its infrastructure. In turn, private sector participation in the PPP can employ different approaches and combinations.
7. The legislation of the countries of Central Asia (with the exception of Kazakhstan) does not permit privatisation of water and sanitation infrastructure facilities. All fixed and current assets should continue to be owned by the local government bodies, and cannot be put up for sale.

4.3. Positive Impact of Investing in the Water and Sanitation Sector

Sustainable and stable water supply, sanitation, and treatment of wastewater have a beneficial effect on people's health, the economy, and the environment. As a rule, investments in water and sanitation services produce a certain economic, ecological, and social impact. Access to clean drinking water and sanitation reduces health risks, frees up time for education and other productive activities, and increases the productivity of the labour force. Safe disposal of wastewaters helps to improve the quality of surface waters. It benefits the environment (*e.g., functioning of ecosystems; biodiversity*), as well as other economic sectors (*fishing, agriculture, tourism*) (OECD, 2011).

Wastewater treatment interventions can generate significant benefits for public health, the environment, and certain other economic sectors, such as fisheries, tourism, and property markets. They may be more difficult to assess in monetary terms, and they may be less obvious. Finally, protecting water resources from pollution and managing water supply and demand in a sustainable manner can deliver clear and sizeable benefits for both investors in the services and end users of water.

Investments in water supply and sanitation are an important condition for the reliable functioning of water supply and sanitation systems, which, in turn, is considered a key factor in ensuring the safety of drinking water and, consequently, public health and the provision of water-related social services. The need for investment in water resources management will increase with widening water scarcity, deteriorating water quality in water sources and increasing levels of urbanisation across the region.

On average, every $1 invested in improving water supply and sanitation yields returns of between $4 and $12, depending on the measures taken and their scale (WWAP, 2009). In some cases, the economic impact can range from US$ 3 to US$ 34, and additional measures to improve drinking water quality (e.g. water treatment directly at the point of use) can be even higher, reaching up to US$ 60 per unit of investment (WHO/UN Water, 2010). However, the positive effects of water services are rarely fully accounted for.

The full magnitude of the benefits of water services is seldom considered for a number of reasons. Non-economic benefits are often underestimated: they are difficult to quantify, but they are of high value to society (*dignity, social status, cleanliness, overall well-being, etc.*). In addition, assessment of such benefits is, to a large extent, highly location-specific (*e.g., it may depend on the prevalence of diseases related to water pollution*), or subject to availability and condition of water sources.

↓ **Table 5. Typology of Benefits from investments in the Water and Sanitation Value Chain**

Types of Investment	Positive Effects of Investment
Providing access to safe water and sanitation	
Access to clean water • Build water access points • Build and extend networks (water and sewers) • Build and operate water treatment plants • Provide point-of-use water treatment methods ***Access to sanitation*** • Build sanitation facilities • Promote adoption of improved wastewater treatment technologies ***Wastewater collection and transport*** • Collect wastewater via sewerage networks • Collect and transport pit sludge outside the home	***Health benefits*** • Reduced incidence of diseases, especially waterborne diseases ***Economic benefits*** • Time saved for productive activities • Increase in labour productivity • Reduced coping costs • Impact on tourism from improved recreational facilities ***Other benefits*** • Increase in sanitary and hygienic safety • Increased school attendance (especially for girls)
Investing in wastewater treatment for safe disposal and reuse	
Wastewater treatment • Build and operate wastewater treatment plants • Rely on natural treatment processes • Safe disposal of residual sludge	***Health benefits*** • Additional health benefits, such as improved quality of recreational waters ***Environmental benefits*** • Reduced eutrophication (biogenic saturation) of water bodies ***Economic benefits*** • Reduced pre-treatment costs (for drinking water and water for industrial purposes) • Protection of commercial fish stocks and aquaculture • Enhanced tourism activities • Increased water supply for irrigation • Saving on fertilisers through use of sludge ***Other benefits*** • Improved amenity • Increased property values
Investing in managing water resources to achieve supply/demand balance	
Protecting water resources • Establish catchment protection zones • Establish voluntary agreements • Establish regulations ***Augmenting and ensuring supply*** • Build water storage capacity • Build water abstraction capacity • Develop alternative sources, such as aquifer recharge, desalination, reuse of treated effluent • Adopt drought and flood management plans ***Managing demand*** • Reduce leakages (on the network and in households) • Introduce incentive pricing • Install water-saving devices • Raise awareness, educate the public	***Environmental benefits*** • Reduced pressure on available resources and improved river flows • Economic impact on use of water for economic activities (agriculture, hydropower) ***Economic benefits*** • Reduced in-water pre-treatment costs • Uninterrupted supply for production processes • Reduced coping costs from unreliable water supplies • Downsizing of facilities • Reduced need for desalination ***Other benefits*** • Increased quality of life due to reliable water supply • Indirect benefits: recreational activities on dams or reservoirs

Source: OECD, 2011.

The benefits from investing in water and sanitation are hard to evaluate, as various countries are at different stages of infrastructure development. The least developed countries need significant investments to secure or improve access to water and sanitation. Most developed countries, on the other hand, invest mostly in wastewater treatment to assure regulatory compliance. Still, despite the significant benefits from providing access to water and sanitation, investments need to be consistent. Otherwise, there may emerge negative effects, such as water access without concurrent access to sanitation.

In addition, investments in wastewater treatment (as a rule, the last in line) may generate significant benefits, but their effectiveness is likely to abate with time, as additional investments in quality usually produce diminishing returns. Finally, our calculations often disregard non-quantifiable benefits, such as pride and dignity (with respect to access to services), or value for convenience (with respect to wastewater treatment), as these are harder to express in monetary terms.

As with any other production process, it is possible to build a "value chain" for water and sanitation services: water intake (*ground or surface water*) — delivery to consumption point (*households, industrial or institutional consumers in the case of water and sanitation services*) — collection for processing and safe disposal.

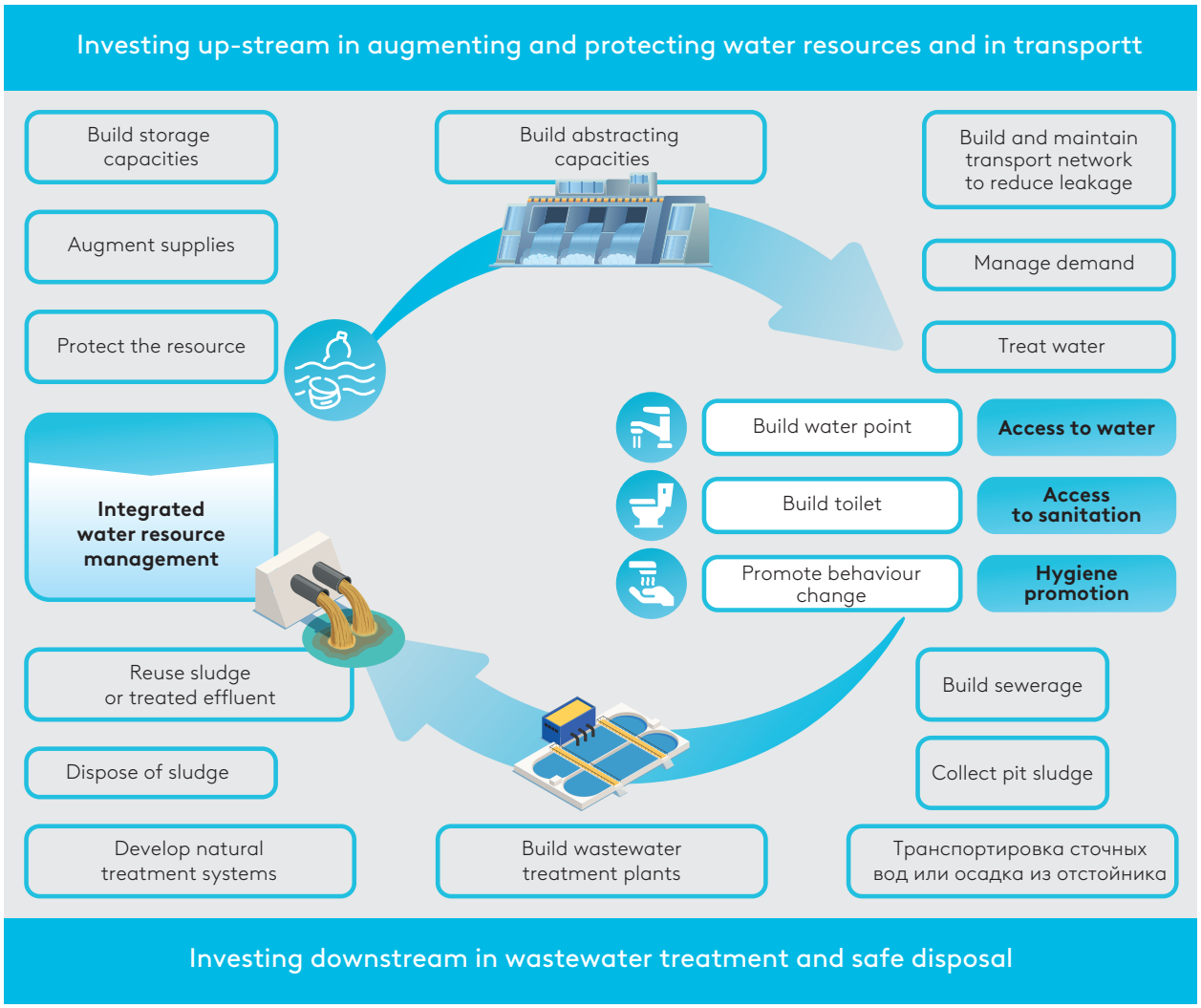
To ensure steady provision of services, it is necessary to make certain investments, and then operate and maintain investment targets for a protracted period of time at each value creation stage. Taking into consideration the fact that the natural water cycle was compromised by anthropogenic activity, it is becoming increasingly important to invest in adequate supply of water resources and purification of wastewater to the point where it complies with applicable standards and produces minimum adverse impact. Although most attention is usually paid to water and sanitation services (*as reflected, for example, in the SGDs*), sustainability requires additional investments both up and down the chain.

Managing water resources (in addition to providing access to water) is an inseparable part of securing a sustainable water supply. Taking into consideration that water resources have many uses (internal consumption, agriculture, industry, environmental protection), *integrated management of water resources goes well beyond the scope of investments and activities whose sole purpose is to provide water and sanitation services.*

To ensure sustainable long-term provision of drinking water services, it is necessary to guarantee effective protection and management of water resources. In the context of global climate change which already threatens both developed and developing countries, the importance of this issue is rising. Developing countries are particularly vulnerable to potential changes in precipitation patterns and water scarcity risks. This is especially relevant for the countries of Central Asia. In this regard, despite the water consumed for municipal and domestic needs has an insignificant share in the total water consumption structure, the fact that its consumption is a priority, sustained demographic and economic growth, growing water scarcity and increasing unpredictability of the hydrological regime will lead to increased competition for this resource. The drinking water supply sector will be affected in any case by the general problem of water scarcity.

The provision of drinking water will directly depend on the efficiency of water supply and demand management in general. The main areas of investment and action include (see Table 5): water protection *(establishment of catchment protection zones, voluntary agreements, development of regulations)*; provision and improvement of water supply *(creation of water storage capacity, creation of water withdrawal capacity, development of alternative sources such as aquifer recharge, desalination, reuse of treated wastewater, drought and flood control measures)*; demand management *(reduction of leakages in the network and in the home); introduction of incentive pricing, installation of water-saving devices, awareness raising, public education, etc.).*

↓ **Figure 20. Value Chain of Sustainable Water and Sanitation Services**



Source: OECD, 2011.

For example, flooding in Kazakhstan and Russia in April 2024 triggered significant drinking water supply problems requiring solutions at the level of overall water management. Contaminated water floods wells and boreholes and other water intakes, and carries various hazardous wastes with it, rendering water supply sources unsuitable for domestic drinking water purposes.

The floods have revealed a large number of accumulated problems, the solution of which requires a radical restructuring of the water resources management system and the fight against water-related disasters. First of all, it is necessary to increase responsibility for the condition and maintenance of hydraulic structures, eliminate a large number of ownerless structures that are in unsatisfactory condition, as evidenced by the breach of many dams and protective dikes. In flood zones, a large number of structures have been built from rapidly deteriorating materials and are unable to withstand even small floods. There are serious problems in the legal and regulatory framework for flood management planning and implementation.

Forecasting hydrological phenomena and planning flood and inundation control measures is very difficult, given the drastic reduction in the number of hydrological posts and their extremely low technical equipment and communication facilities. Other reasons for the high damage caused by the past floods include the lack of preparedness of managers, especially local authorities, in the prevention and elimination of emergency situations. At the same

time, the population is unprepared to perceive warnings of dangerous phenomena and to act in case of threat and emergencies. In rural areas, there is no system of notification of the population and the number of wire broadcasting networks has decreased.

Flood defence measures are divided into operational (urgent) and technical (preventive) measures. Operational measures should be implemented in conjunction with technical measures. Technical measures include the early design and construction of special protective and regulating structures and facilities. These include: flow regulation in the river channel; flood water diversion; regulation of surface runoff in the catchment area; bunding; straightening of river channels and dredging; construction of bank protection structures on river channels; filling of water protection dams and interception channels in the built-up area; limitation of construction of residential and economic facilities in the zone of possible flooding and other measures.

5. PRACTICAL RECOMMENDATIONS

The challenges faced by the water and sanitation sector in the countries of Central Asia cover institutional/legal (managerial), technical, and financial/economic aspects of the sector's operations. Accordingly, any viable solution requires an integrated approach.

5.1. Adoption of Modified Regulatory Approaches to Managing the Water and Sanitation Sector

There is an increasingly strong link among water resources, food and energy security, and urbanisation. Accordingly, public policies in those areas must be comprehensive, providing for both effective use and protection of water. The growing demand for water in all sectors of the economy calls for integrated management of water resources.

Water resources are unique and irreplaceable, which makes them different from many other natural resources. Legal support of privatisation in the water sector warrants special attention, as does observance of constitutional norms regarding the exclusive competence of the state to dispose of water resources. The state must ensure complete safety of water use and preserve water resources, regardless of the form of ownership of water utility companies. This can be done by application of various regulatory and economic mechanisms.

Intersectoral efforts may be coordinated by a government body with sufficient powers and responsibilities. In Uzbekistan, the Ministry of Construction, Housing and Public Utilities is responsible for public policy in that sector of the economy. Related business functions are performed by O'zsuvta'minot JSC and its subsidiaries (water utility companies). They design infrastructure facilities, supervise their construction, and introduce modern management methods in the maintenance of water and sanitation assets across all regions of the country. Some of its important tasks are to implement international financial and human resources management standards, and boost the effectiveness of tariff and investment policy tools in the course of stage-by-stage increase in profitability of water and sanitation companies.

High quality and stability should become the main strategic objectives of the water and sanitation sector in the provision of services. These objectives are to be realised in national action plans setting realistic, measurable, and time-bound targets for the volume and quality of services provided by water and sanitation companies. Subject to the specific conditions that exist in the countries of Central Asia, it is advisable to establish an independent national regulatory body to limit the monopolistic market power of water and sanitation companies and/or protect them from excessive political pressure. To do that, it is necessary to clearly define regulatory objectives, and provide the tools required to achieve them.

Many countries are reforming their public water utilities. Water assets are transferred to municipal and private ownership, which facilitates emergence of a water services market. Importantly, privatisation of a water asset does not relieve the owner of the responsibility for ensuring safe operation and reliability of the water facility in line with applicable laws and standards, and full compliance is required in that area.

Urbanisation in the countries of Central Asia has a great impact on the structure of consumption of water resources, with the shares of utility and household sector, sanitation, and industry gradually increasing. Changes in the water consumption structure lead to revision of water management policies and priorities, and increasingly active and varied involvement of the private sector in the organisation of water supply to the population and the economy.

To create the market for water services, it is necessary to examine the full range of existing problems, and undertake an in-depth review of various privatisation methods to design sound policy measures in that area. Due to the lack of funds of its own, the private sector cannot finance water infrastructure, which is more capital-intensive than the other sectors of the economy. Absorption of technical advances is a very costly process. That is why it is necessary to strengthen public-private partnerships — they will become the solution to this problem. A good example is provided by Uzbekistan, which intends to expand the application of diverse forms of private sector participation in enhancing water and sanitation services.

Inasmuch as water infrastructure projects require large financial resources, they stimulate attraction of additional financing and private investments. Public-private partnerships come to the forefront, offering the most effective methods to finance and reform the water sector, including new forms of ownership and management of water companies and facilities.

When planning changes in ownership structure, the legislative and regulatory framework, and methods of managing public utility companies, it is necessary to consider the experience of other countries. In each country, water and sanitation sector management practices have their advantages and disadvantages, which can be attributed to different social, economic, and political factors.

In most European countries, construction of most infrastructure facilities took several decades, and was financed with state budget allocations and EU assistance. Several new facilities are being built with the participation of private capital (only in England and Wales). Such capital is much more expensive, but it accounts for only a small part of total fixed assets. Still, tariffs are rising faster than ever before, and the population is not happy about it. Introduction in the EU of more stringent water management standards leads to a significant increase in the amount of capital investment required for further improvement of water services in EU member states. This encourages water companies to merge, leading to the emergence of large conglomerates and substantial cost reductions. The state participates in the regulation of sector development by offering various subsidies and soft bank loans. This prevents rapid growth of water and sanitation tariffs.

Local government bodies should grant water utility companies the status of autonomous private operators, and efficiently supervise their operations. Tariffs should be set and reviewed by water and sanitation companies, but this should be done under the supervision of local government bodies or an independent regulator, and with feedback from the general public. Such functions should be delegated to the companies gradually. When developing water management reform strategies, local government bodies and water and sanitation companies should, to the extent possible, involve private operators in the provision of water and sanitation services. Selection of the PPP form should be informed by relevant provisions of the national water and sanitation reform strategy.

It is the state, rather than the companies, that is responsible for assuring that low-income and socially disadvantaged groups have equal access to water and sanitation services. To assist such groups, it is necessary to introduce target subsidies, taking into account the cost of other utility services and the full range of household needs.

Modern water use concepts imply not only regulation of water needs and water quality, but also preservation of natural ecosystems within the boundaries of the relevant river basin. However, no country has so far succeeded in elevating environmental protection to a level precluding emergence of ecological risks. The priority objective of the regional water strategy and policy is to preserve the water resource potential of a river system, ensure its ecological safety, and implement appropriate nationwide measures. National water protection action plans should ensure systemic coverage of all water use aspects considering the nexus factors.

5.2. Identification of Priority Strategic Goals and Objectives in the Water and Sanitation Sector

High quality and accessibility of services should become the main strategic objective of the water and sanitation sector. This objective should be realised in national and local action plans, setting specific deadlines and targets which make it possible to monitor and control the quality of water and sanitation services. Achievement of approved targets should inform selection of measures to minimise an adverse impact on health, economic activity, and critical water ecosystems. The water and sanitation sector should be integrated in the basin-level water resources management system. Adoption of an investment programme to supply the population with drinking water requires availability of an approved water and sanitation scheme. In that connection, priority tasks must be defined, including the following:

- Conduct a universal technical inspection of water and sanitation systems and, based on the results, develop and approve, at the central and local (municipal) levels, water and sanitation schemes (plans) for cities and rural settlements, and integrate such schemes (plans) with general, basin-level, and territorial comprehensive water use and protection schemes, master plans of cities and rural settlements, subject to the development and distribution of economic assets;
- Design water supply systems for facilities concurrently with designing sanitation systems for the settlements where they are located;
- Improve and expand the technical regulatory framework for the design and construction of utility infrastructure;
- Apply modern information technologies to ensure rational use of water resources and support strategic decision-making to develop urban and rural utility infrastructure;
- Streamline water and sanitation tariffs as part of the general service quality improvement policy, with the participation of all stakeholders and subject to consumer solvency limitations;
- Strengthen the human engineering and technical potential of water utility companies on the basis of modern business management methods, best practices, and technological achievements. In-house personnel training programmes and university engineering education curricula should be reviewed.

Each water and sanitation company should develop and approve preliminary activities to facilitate subsequent enhancement of its services. Initially such activities should not involve prohibitive costs.

New construction standards for central drinking water supply and sanitation systems should be developed. Unfortunately, the countries of Central Asia have discontinued almost all research needed to adjust water consumption norms and water quality standards in line with modern trends, technologies, scientific and technical advances. Design organisations are forced to use outdated water consumption norms that were in effect 40–50 years ago, which causes dramatic social, economic, and environmental losses, and exacerbates the water shortage.

One of the ways to combat water shortage is to minimise the use of water from utility pipelines by industrial enterprises in their technological processes, in line with modern technologies, scientific and technical advances. The use of water from utility pipelines (which is prepared for drinking) as process water is economically and environmentally unreasonable. Industrial enterprises operating in various sectors of the economy should universally employ recycling systems enabling repeated or multiple use of water, and preventing discharge of unpurified wastewater into the sewerage system or natural water bodies.

5.3. Sustainability of Water Supply and Sanitation in Rural Areas Should Be a Political and Economic Priority

Drinking water supply in rural areas remains an important challenge in the countries of Central Asia, as the share of rural population is likely to remain significant throughout the region.

In many situations where there is a need to provide primary access to clean water and sanitation — for example, by supplying the population with drinking water — it is possible to employ simple and proven water and sanitation solutions. Inasmuch as the problems related to water supply in rural areas are shared by all countries of Central Asia, it is advisable to take the following steps to solve those problems:

- Switch rural water supply systems drawing water from surface water bodies to ground water sources;
- Install desalination plants of various types and designs in all areas that experience a shortage of fresh ground water;
- Switch to local use of water treatment and drinking water conditioning systems directly at water consumption points;
- Build shared agricultural water supply systems with an economically optimal range of operation. If the length of the water pipelines exceeds that range, build local water purification and decontamination stations;
- Organise (establish and restore) PPP-based inter-district and district mobile water system maintenance and operation units.

There is no central water supply in many rural areas. Accordingly, it is necessary to strengthen the protection of small rivers used as drinking water sources.

Because of the intensive pollution and depletion of surface water sources used for water supply in Central Asia, the strategic importance of ground water for the utility and household water supply is growing rapidly. However, unauthorised construction of water intake facilities has considerably depleted ground water reservoirs and aquifers. The problem is further exacerbated by unregulated intake of ground water by industrial and agricultural enterprises. The above factors have reduced the reserves of fresh ground water in the region.

The steps described above require less investment. Their implementation will improve rural water supply, and increase the sanitary and hygienic safety of water use in the countries of Central Asia.

It is necessary to implement pilot water and sanitation projects in rural areas in each country of Central Asia. Their results should be taken into consideration when designing the programme to provide the rural population with universal access to water and sanitation services. Additionally, it appears expedient to test different organisational and legal forms of PPP-based units authorised to operate water and sanitation systems in rural areas.

Investing in water resources, including preservation of their quality, is the key financial tool enabling safe water use. It contributes to sustainable development, and produces diverse economic, social, and environmental benefits.

5.4. New Technologies Should Increase the Operational Reliability of Water and Sanitation Systems

Stable operation of urban and rural water and sanitation systems depends on the reliability and good state of repair of their pipelines, their most capital-intensive and vulnerable component.

Physical degradation of underground pipes reduces water pressure, while encrustation diminishes their capacity. Corrosion impairs the physical and chemical properties of transported drinking water. It is recommended that works related to reconstruction, repair, and construction of urban water supply and distribution networks and headers be performed using trenchless technologies. These make it possible to lay pipes without digging trenches, facilitate construction of new water and sanitation systems, and significantly simplify repair and restoration of worn-out infrastructure.

One of the most widespread methods to restore corroded pipe capacity is descaling, followed by sand/cement lining. The advantages of this technology include relative simplicity and low cost of repairs, at merely 30% of the cost of new construction. Capital repair of water mains with protective sand/cement lining improves their reliability and hydraulic properties. The quality of water transported from water preparation stations to consumers also remains adequate due to removal of pipe scale.

Other water main rehabilitation methods include pulling a new pipe into the damaged old pipe (with or without its preliminary destruction) using special devices; pulling a new polymer pipe into the old pipe; using a flexible combined sleeve (hose) to make a new composite pipe inside the old pipe; application of polymer spray coating to the internal surface of the pipe. Selection of a specific method depends on the state of repair of the pipe, remote diagnostic results, and the possibility of installing and using equipment and mechanisms required to use the method at the point of reconstruction. The main method used to protect steel pipes from corrosion and reduce the risk of accidents and loss of integrity is insulation in combination with electrochemical protection (Primin, 2022).

Long-lasting pipes guarantee reliability of water pipeline networks. Pipe material is selected at the same time as the corrosion protection method, i.e., the type of protective insulation and the possibility to use electrochemical protection. For pipes and mains in urban water pipeline networks, the no-replacement service life should be at least 50 years. The following pipe types should be preferred when laying new water pipelines: ductile iron pipes with external zinc lining and internal sand/cement lining; double-wall PE100 polyethylene pressure pipes.

The countries of Central Asia have well-established facilities that manufacture polymer pipes for water and sanitation systems (composite materials are imported into most countries, with the exception of Uzbekistan, which produces them domestically). However, the region lacks facilities for industrial production of equipment for preparation of drinking water and purification of wastewater. No research or design activities are carried out to develop new treatment equipment, or adapt state-of-the-art technologies and best practices to local conditions. Therefore, we propose to complement investment programmes with projects for the modernisation of the existing industrial production base so as to strengthen the region's science and research potential, and organise local production of modern equipment for the water and sanitation sector.

It is recommended that the countries of Central Asia, following the example set by Uzbekistan, design and realise urgent measures to supply drinking water and sanitation services by implementing modern drinking water quality monitoring methods and existing wastewater treatment technologies.

Taking into account the ongoing public utilities reform, the phasing-out of budget grants and subsidies, and the fact that the population pays the full cost of water and sanitation services, more attention should be paid to optimisation of investment plans designed to upgrade and expand water- and energy-saving capabilities, and improve the energy efficiency of industrial enterprises through the use of modern information technologies.

Water and sanitation companies should actively employ modern information systems, which can be used in projects for modernisation, reconstruction, capital construction, and operation of water and sanitation infrastructure facilities. Wide deployment of information technologies enables creation of systems for integrated continuous network control, monitoring of universal metering of water consumption and water losses, and prompt detection and elimination of leaks. It will bring energy consumption and commercial water loss to an economically viable level. Moreover, digital instrumental water metering can be used to calculate economically viable tariff rates, and reduce non-productive expenses and direct drinking water leaks. Such an approach will encourage the population to use water in a rational and economical fashion.

An important prerequisite of safe provision of water and sanitation services is availability of qualified personnel capable of adopting advanced management, financing, operation, and maintenance methods. Accordingly, it is necessary to put in place vocational training and skill development programmes, including apprenticeship and on-the-job coaching programmes.

5.5. Water and Sanitation Investments Should Be Attracted on the Basis of Integrated Planning and Modern Management

Investments in modern water infrastructure lay the foundation for future economic development and growth. The reliable operation of that infrastructure requires stable financing. as well as ongoing technical support and modernisation as new needs arise, and new technologies emerge in the market. International practices show that countries that invest in their infrastructure are better equipped to deal with transboundary water use challenges and expand the scope of basin-level co-operation.

Due to its infrastructural nature, the water and sanitation sector has links to all other sectors of the economy. That is why its reliable operation will support the national security of the country, helping it to achieve SDGs and implement its social and economic development strategies. The countries of Central Asia committed themselves to achieve SDG 6 by 2030, and those commitments may help eliminate the backlog of problems related to the provision of quality water and sanitation services. They will potentially make an important contribution to the strengthening of regional co-operation and regional security in all its dimensions.

To attract more financing, it is necessary to use borrowings (on available terms) and other forms of (repayable) external market financing. Projected growth of capital expenditures cannot be offset by tariffs, taxes, and transfers alone. To cover such growth, the countries of Central Asia will need external repayable financing, mostly in the form of loans from international financial institutions. City water tariffs, such as planned by Uzbekistan, should cover debt service, if taxes and transfers fail to cope with that.

It is important to correctly define water and sanitation infrastructure investment priorities, and to optimise the volume of attracted funding. A significant share of capital expenditures is released due to adequate selection of projects and their best options, and optimisation of infrastructure project portfolios. Enhancement of the selection process and faster realisation

of projects, as well as maximisation of returns from existing water and sanitation assets, help to streamline the process and scope of attracting investments, both external and internal.

In addition to massive investments in upgrading and enhancing the infrastructure, it is necessary to transform the entire water and sanitation governance system, encouraging each enterprise (water utility company) to switch to modern management processes, best practices, and advanced production organisation methods. This will require a transition to integrated water and sanitation management that involves numerous government institutions responsible for regulation of financial, economic, social, sanitary, hygienic, natural-resource-related, environmental, and personnel aspects of operations that, in their totality, ensure a stable and safe supply of drinking water.

Scarce investment resources should be directed to attain the following objectives:

- Reduction of operating expenses by focusing on high-return investments (demand management, elimination of various types of water loss, energy conservation);
- Increase in water use safety and water supply reliability in line with applicable sanitary and hygienic healthcare standards;
- Restoration of the key wastewater collection and treatment facilities in line with applicable sanitary and hygienic healthcare standards.

It is necessary to develop and provide a realistic assessment of financial strategies, listing both the objectives of financing and its potential sources and scope. It is important for such strategies to indicate what needs to be done to raise sufficient funds from diverse sources (including water utility companies) and reach agreed targets.

Long-term infrastructure planning should focus primarily on demand management, renovation of infrastructure facilities, and other solutions that do not require significant capital expenditures. Competent maintenance of water and sanitation infrastructure not only produces significant financial returns for the owners, but can also generate many other long-lasting benefits related to more effective water supply and better-quality drinking water.

Following the example set by Uzbekistan, it is necessary to step up design activity and dramatically intensify efforts to train personnel capable of improving the quality of investment projects for the construction and modernisation of water facilities. Implementation of such projects should proceed with financial participation of international financial institutions and government financial organisations. Assuring top quality at all project stages, from feasibility study to detailed design, and effective construction site supervision will significantly decrease the incidence of various corruption offences, and reduce budget expenditures and water facility construction and operation costs. *It should be emphasised that Uzbekistan is the only country in Central Asia and the CIS which took extensive measures to drastically improve design activity and train design engineers for the water and sanitation sector, a sector of strategic importance in all countries of Central Asia.*

Uzbekistan's experience should also be adapted in the area of attraction and effective utilisation of investments in water management. Project Offices for development and implementation of investment projects were established in 20 approved ministries and agencies. Project documentation is furnished to domestic and foreign investors free of charge. The Ministry of Investments, Industry and Trade assigns an "investment manager" to each investor. These managers support investors at all stages, up to and including the project launch stage. They are competent to deal with a variety of issues, including allocation of land plots, connection to utility networks, and issue of required permits. "Investment managers" have a status equal to that of a ministry division head. They interact directly with deputy

heads of ministries, agencies, business associations, and local government bodies authorised to deal with investment, industry, and trade matters.

First and foremost, the countries of Central Asia need to finance action plans and investment projects related to water management, as this remains the key issue for the region. It takes careful investment planning to attain approved targets. Specific financing mechanisms, contractual arrangements, and meticulously prepared projects are required to bring in private investors, including international investors. The proposed mechanisms for reducing risk and maximising returns can make projects more attractive for investors.

Due to the above circumstances, multilateral development banks play a critical role in the development of the water and sanitation sector in the countries of Central Asia. They could contribute to the preparation of projects for the construction and reconstruction of drinking water treatment plants, renovation of network facilities in urban and rural areas, and modernisation of wastewater purification stations.

5.6. Regional Co-operation Will Improve Access of the Populations of the Countries of Central Asia to Quality Drinking Water

The level and nature of economic co-operation among the countries of Central Asia will determine the vector of future development and improvement of access to drinking water and sanitation, subject to the operation of natural, geographic, and geopolitical factors and strong transboundary water dependence in the region.

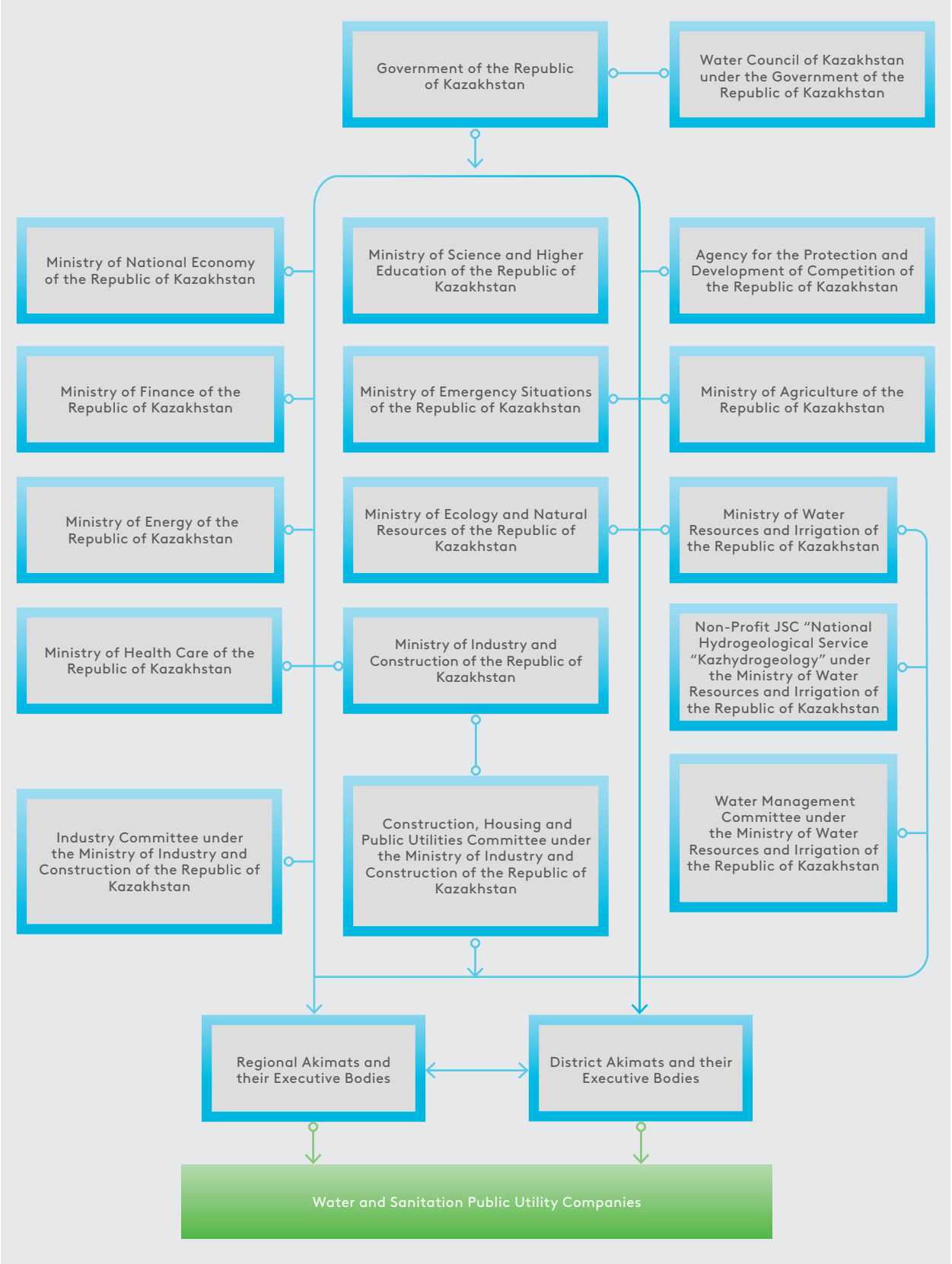
To deal with international water use challenges, it will be necessary to find new co-operation mechanisms and tools to be used in transboundary river basins. That will require deeper economic integration of the countries of Central Asia. Considering their compelling need for Official Development Assistance (ODA), the International Fund for Saving the Aral Sea (IFAS) should occupy an increasingly prominent place on the regional political agenda. Coordination of efforts aimed at achieving SDG 6 should be granted a top-priority status, and may become a part of a unified roadmap for the implementation of national strategies in the water and sanitation sector.

Regional UN commissions (UNESCAP and UNECE) jointly with the IFAS can facilitate regional co-operation and integration in the area of social and economic development. It is necessary to develop, under the auspices of those organisations, a Water and Sanitation Programme that will benefit the residents of the Aral region who suffered from the Aral catastrophe, and set up a consortium of international banks to finance priority projects. When creating the consortium for the construction of large-scale water and sanitation facilities, it is necessary to rely on international best practices and experience accumulated by the countries of Central Asia in the course of co-operation in the IFAS format.

Special attention should be paid to upgrading sanitation systems in small cities and rural settlements by implementing standard water and sanitation design solutions. It is suggested that an umbrella water and sanitation design consulting entity be established on the basis of PPP principles in Kazakhstan and other interested countries of Central Asia to coordinate design activities and pursue uniform scientific and technological policies in that area. That entity could also interact with donor countries and MDBs by providing them with up-to-date information on water and sanitation projects, together with related feasibility studies.

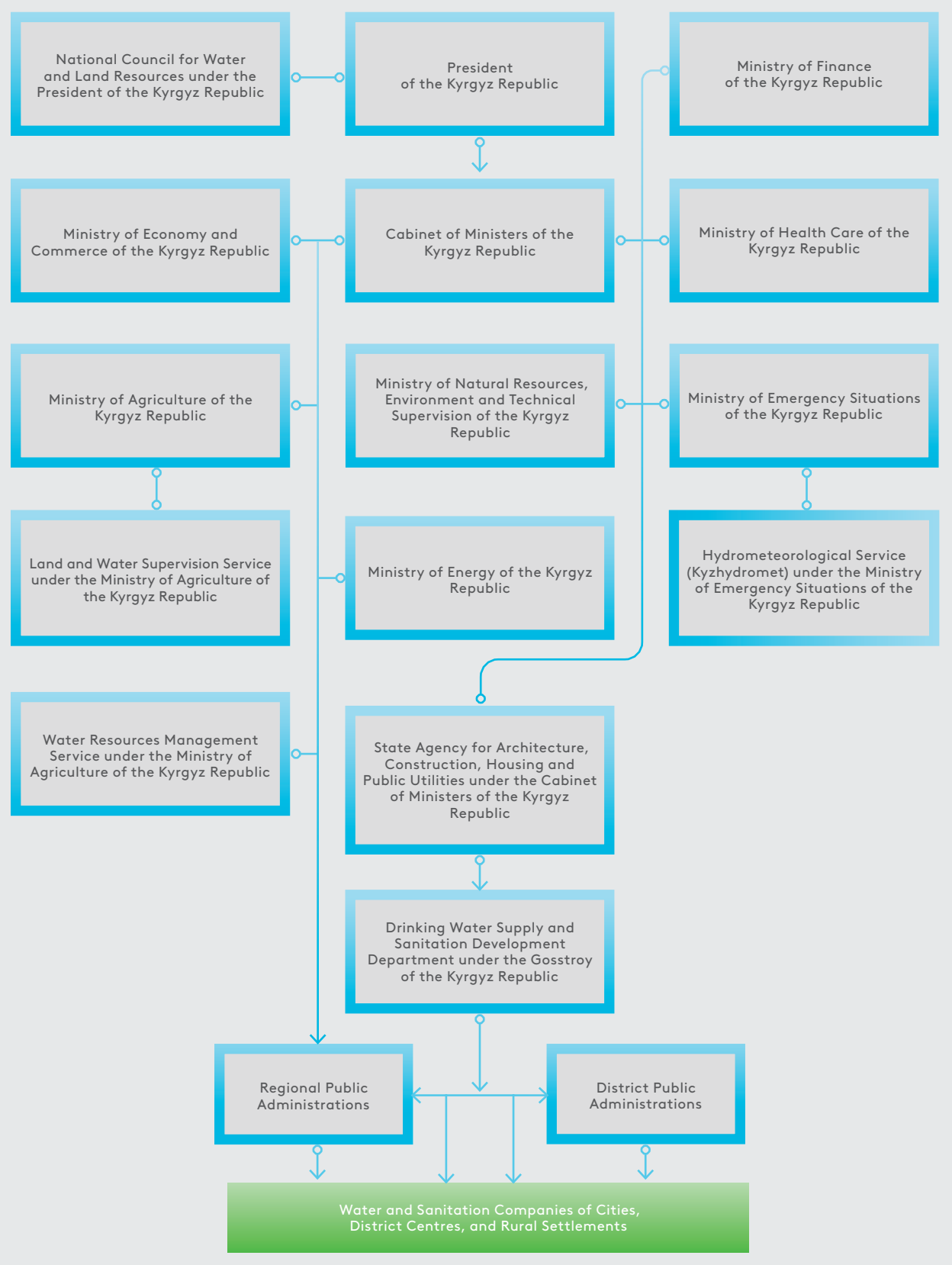
ANNEXES

↓ No. 1. Water and Sanitation Management Scheme: Republic of Kazakhstan



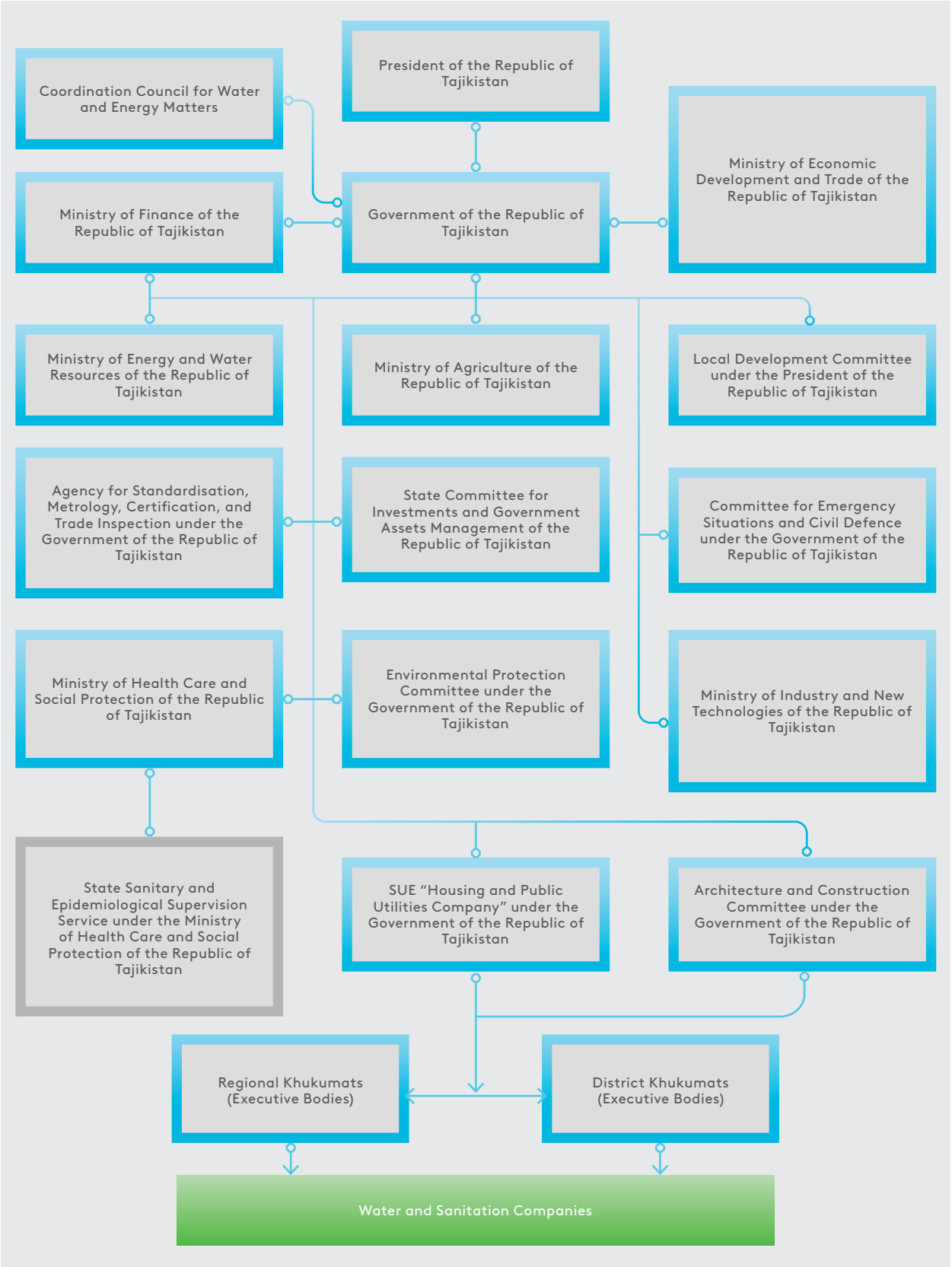
Source: EDB.

↓ No. 2. Water and Sanitation Management Scheme: Kyrgyz Republic



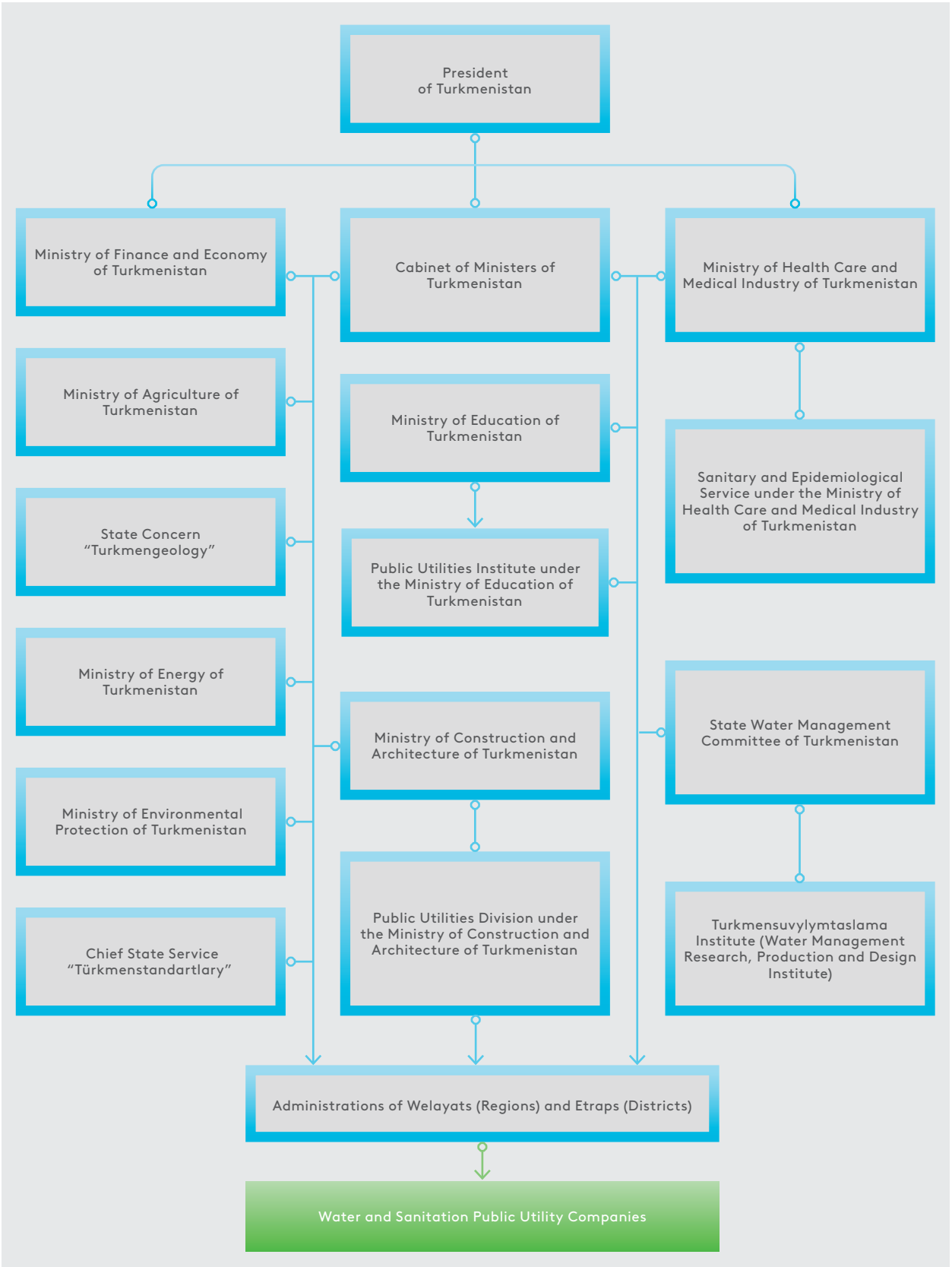
Source: EDB.

↓ No. 3. Water and Sanitation Management Scheme: Republic of Tajikistan



Source: EDB.

↓ No. 4. Water and Sanitation Management Scheme: Turkmenistan



Source: EDB.

↓ No. 5 Water and Sanitation Management Scheme: Republic of Uzbekistan

Source: EDB.

↓ No. 6. Key Water and Sanitation Laws and Regulations, 2017–2023

Resolution of the President of the Republic of Uzbekistan No. PP-2836 "On Improvement of the Quality of Development of Preliminary Documentation for Investment Projects" dated 15 March 2017
Decree of the President of the Republic of Uzbekistan No. UP-5017 "On Measures for Further Improvement of Management of the Housing and Public Utilities System" dated 18 April 2017
Decree of the President of the Republic of Uzbekistan No. UP-5018 "On Establishment of the State Inspection for Control of Utilisation of Drinking Water under the Cabinet of Ministers of the Republic of Uzbekistan" dated 18 April 2017
Resolution of the President of the Republic of Uzbekistan No. PP-2899 "On Organisation of Activities of the State Inspection for Control of Utilisation of Drinking Water under the Cabinet of Ministers of the Republic of Uzbekistan" dated 18 April 2017
Resolution of the President of the Republic of Uzbekistan No. PP-2910 "On the Programme for Integrated Development and Modernisation of Drinking Water Supply and Sanitation Systems for 2017–2021" dated 20 April 2017
Resolution of the President of the Republic of Uzbekistan No. PP-2954 "On Measures for Normalisation of Monitoring and Recording of Rational Utilisation of Ground Water Reserves for 2017–2021" dated 4 May 2017
Resolution of the President of the Republic of Uzbekistan No. PP-3003 "On Measures for Radical Improvement of the Engineering and Technical Personnel Training for Agriculture and Water Management" dated 24 May 2017
Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 430 "On Measures for Further Normalisation of Activities in the Area of Utilisation of Ground Water" dated 27 June 2017
Resolution of the President of the Republic of Uzbekistan No. PP-3286 "On Measures for Further Improvement of the Water Bodies Protection System" dated 25 September 2017
Decree of the President of the Republic of Uzbekistan No. UP-5241 "On Measures for Cardinal Improvement of Payment Discipline in the Water and Sanitation Sector" dated 16 November 2017
Resolution of the President of the Republic of Uzbekistan No. PP-4040 "On Additional Measures for the Development of Drinking Water Supply and Sanitation Systems in the Republic of Uzbekistan" dated 30 November 2018
Resolution of the President of the Republic of Uzbekistan No. PP-4486 "On Measures for Further Improvement of the Water Resources Management System" dated 9 October 2019
Decree of the President of the Republic of Uzbekistan No. UP-5883 dated 2019 November 5883 "On Measures for Improvement of Water Resources Management in the Republic of Uzbekistan to Increase Access of the Population to Drinking Water and Improve Its Quality" dated 26 November 2019
Resolution of the President of the Republic of Uzbekistan No. PP-4536 "On Further Improvement of the Water Supply System of the Republic of Uzbekistan" dated 26 November 2019
Decree of the President of the Republic of Uzbekistan No. UP-6024 "On Approval of the Conceptual Framework for the Development of the Water Sector in the Republic of Uzbekistan in 2020–2030" dated 10 July 2020
Decree of the President of the Republic of Uzbekistan No. UP-6074 "On Measures for Further Improvement of the Drinking Water Supply and Sanitation System and to Increase the Effectiveness of Investment Projects in That Area" dated 25 September 2020
Decree of the President of the Republic of Uzbekistan No. UP-60 "Strategy for the Development of New Uzbekistan for 2022–2026" dated 28 January 2022
Resolution of the President of the Republic of Uzbekistan No. PP-257 "On Additional Measures for the Improvement of Access of the Population to Drinking Water Supply and Sanitation Services in the Republic of Uzbekistan" dated 24 May 2022
Law of the Republic of Uzbekistan No. ZRU-784 "On Drinking Water Supply and Wastewater Disposal" dated 22 July 2022
Decree of the President of the Republic of Uzbekistan No. UP-269 "On Measures for the Implementation of Administrative Reforms of New Uzbekistan" dated 21 December 2022
Decree of the President of the Republic of Uzbekistan No. UP-111 "On Measures for the Effective Organisation of Public Governance in Investment, Industry, and Trade within the Framework of Administrative Reforms" dated July 21, 2023
Decree of the President of the Republic of Uzbekistan No. UP-151 "On Measures for the Effective Organisation of Public Governance in Construction, Housing and Public Utilities within the Framework of Administrative Reforms" dated 28 August 2023
Resolution of the President of the Republic of Uzbekistan No. PP-343 "On Additional Measures for Further Improvement of the Drinking Water Supply and Sanitation System" dated 24 October 2023

Source: web site of the National Database of Legislation of the Republic of Uzbekistan (https://lex.uz).

REFERENCES

ADB (2020) *Asian Water Development Outlook 2020: Advancing Water Security across Asia and the Pacific*. Metro Manila. Philippines. Available at: https://www.adb.org/publications/asian-water-development-outlook-2020 (Accessed 11 May 2024).

Alcázar, L., Abdala, M., Shirley, M. (2000) *The Buenos Aires Water Concession*. Policy Research Working Papers. No. 2311. Washington DC: World Bank. Available at: http://documents.worldbank.org/curated/en/718361468769245711/The-Buenos-Aires-water-concession (Accessed 11 May 2024).

AQUASTAT (2024) *FAO global information system on water resources and agricultural water management*. Available at: https://data.apps.fao.org/aquastat/?lang=en (Accessed 11 May 2024).

AUC-AMCOW (2016) *African Water Resources Management Priority Action Programme 2016–2025* (WRM — PAP). Available at: https://knowledgehub.amcow-online.org/resource/the-african-water-resources-management-priority-action-programme-2016-2025 (Accessed 11 May 2024).

Borisova, D., Eremin, G., Nikulenkov, A., Mozzhukhina, N. (2021) Analysis of International Legislation on Protection of Ground Water Sources (Literature Review). *Hygiene and Sanitation*. Vol. 100, No. 8. Available at: https://www.rjhas.ru/jour/article/view/1625/1220 (Accessed 11 May 2024).

Centre for Economic Research (CER) (2011) *Improvement of Urban Governance and Urban Infrastructure in Uzbekistan: Problems and Search for New Mechanisms and Tools*. Analytical Report. Tashkent: CER. Available at: https://unece.org/fileadmin/DAM/hlm/prgm/cph/experts/uzbekistan/UZB-Urban-Development-2011-RUS.pdf (Accessed 11 May 2024).

Centre for Economic Research (CER) (2013) *Urbanisation in Central Asia: Challenges, Problems and Prospects*. Tashkent: CER. Available at: https://www.unescap.org/sites/default/d8files/Urbanization%20in%20CA_RUS_0.pdf (Accessed 11 May 2024).

Commission for Regional Processes: Intercontinental Process for Central Asia (2011) Ensuring sustainable water supply for drinking needs. Concept note. International conference "Towards the 6th World Water Forum — joint actions towards water security" May 12–13, 2011, Tashkent, Uzbekistan. Available at: http://www.cawater-info.net/6wwf/conference_tashkent2011/files/2-watsup.pdf (Accessed 11 May 2024).

Danilov-Danilyan, V., Gelfan, A. (2015) *Water Security*. Federal Reference Book. National Security of Russia. Vol. 2. Moscow: Strategic Partnership Centre Publishers; President Publishing Centre; Strategic Programmes Centre.

Dukhovny, V., Sorokin, D. (2016) *Development of the Water and Agriculture Sector of Turkmenistan in 2020–2050. Transboundary Water Management Adaptation in the Amudarya Basin to Climate Change Uncertainties (USAID Project)*. Tashkent: SIC ICWC. Available at: http://www.cawater-info.net/projects/peer-amudarya/pdf/report_2-2b_ru.pdf (Accessed 11 May 2024).

EFSD (2024) EFSD Sovereign Financing Database, Version 2.0, Available at: https://efsd.org/research/sfd (Accessed 11 May 2024).

Elpiner, L. (2013) Medical and Environmental Aspects of the Drinking Water Supply Crisis. *Hygiene and Sanitation*. No. 6-2013. Moscow: Institute of Water Problems, RAS. Available at: https://cyberleninka.ru/article/n/mediko-ekologicheskie-aspekty-krizisa-pitievogo-vodosnabzheniya(Accessed 11 May 2024).

Foundation of the Institute for Urban Economics (2018) *Review of Practices and Emerging Trends Related to Attracting Investments in Central Water and Sanitation Systems by Implementation of Concession Agreements for Such Systems (Including Small Municipalities)*. Moscow. Available at: https://www.urbaneconomics.ru/sites/default/files/investicii_koncessionnye_soglasheniya_viv.pdf (Accessed 11 May 2024).

Getzner, M., Köhler, B., Krisch, A., and Plank, L. (2018) *Vergleich europäischer Systeme der Wasserversorgung und Abwasserentsorgung*. Kammer für Arbeiter und Angestellte Wien. Available at: http://hdl.handle.net/20.500.12708/24466 (Accessed 11 May 2024).

Hejazi, M., Edmonds, J., Clarke, L., Kyle, P., Davies, E., Chaturvedi, V., Wise, M., Patel, P., Eom, J., and Calvin, K. (2014) Integrated assessment of global water scarcity over the 21st century under multiple climate change mitigation policies. *Hydrology and Earth System Sciences*, Vol. 18. Available at: https://hess.copernicus.org/articles/18/2859/2014/hess-18-2859-2014.pdf (Accessed 11 May 2024).

International High-Level Panel on Water Investments for Africa (IHLPWIA) (2023) *Africa's Rising Investment Tide: How to Mobilise US$30 Billion Annually to Achieve Water Security and Sustainable Sanitation in Africa*. Available at: https://aipwater.org/wp-content/uploads/2023/03/How-to-Mobilise-US%EF%BF%BD30-Billion-Annually-to-Achieve-Water-Security-and-Sustainable-Sanitation-in-Africa-New-York-Version-21-March-2023.pdf (Accessed 11 May 2024).

Kondratyev, V. (2011) Infrastructure and Economic Growth. *World Economy and International Relations*. No. 11. Available at: https://www.imemo.ru/index.php?page_id=1248&file=https://www.imemo.ru/files/File/magazines/meimo/11_2011/FullText-112011.pdf (Accessed 11 May 2024).

MacAlister, C, Baggio, G., Perera, D., Qadir, M., Taing, L., and Smakhtin, V. (2023) Global Water Security 2023 Assessment. Hamilton: University Institute for Water, Environment and Health, UN. Available at: https://collections.unu.edu/eserv/UNU:9107/n23-116_UNU_Water_Security_WEB_Final_updated.pdf (Accessed 11 May 2024).

Martusevich, R., Sivaev, S., and Khomchenko, D. (2006) *Public-Private Partnerships in Public Utilities*. Moscow: Foundation of the Institute for Urban Economics. Available at: https://urbaneconomics.ru/sites/default/files/3432_import.pdf (Accessed 11 May 2024).

Ministry of Justice of the Republic of Kazakhstan (MoJ RK) (2011) *On Approval of the Ak bulak Programme for 2011–2020. Decree No. 570 of the Government of the Republic of Kazakhstan dated 24 May 2011. Voided by Decree No. 728 of the Government of the Republic of Kazakhstan dated 28 June 2014*. Available at: https://adilet.zan.kz/rus/docs/P1100000570 (Accessed 11 May 2024).

Ministry of Justice of the Republic of Kazakhstan (MoJ RK) (2023) *Concept of development of housing and communal infrastructure for 2023-2029 (in edition of Decree of the Government of the Republic of Kazakhstan from 28.03.2023 № 265)*. Available at: https://adilet.zan.kz/rus/docs/P2200000736 (Accessed 11 May 2024).

Ministry of Justice of the Kyrgyz Republic (MoJ KR) (2020) *Programme for the Development of Drinking Water Supply and Sanitation Systems in Human Settlements of the Kyrgyz Republic until 2026. Decree No. 330 of the Government of the Kyrgyz Republic dated 12 June 2020*. Available at: https://cbd.minjust.gov.kg/157536/edition/1037006/ru (Accessed 11 May 2024).

Ministry of Justice of the Republic of Tajikistan (MoJ RT) (2022) *Strategy for the Development of the Construction Sector of the Republic of Tajikistan until 2030. Decree No. 203 of the Government of the Republic of Tajikistan dated 27 April 2022*. Available at: http://www.adlia.tj/show_doc.fwx?rgn=142093 (Accessed 11 May 2024).

Mukhtarova, A. (2023) Water Corruption in Central Asia A Rapid Review. *Central Asian Journal of Water Research* 9(2). Available at: https://water-ca.org/wp-content/uploads/3.-Water-Corruption-in-Central-Asia-A-Rapid-Review.pdf (Accessed 11 May 2024).

National Statistical Bureau, Strategic Planning and Reforms Agency of the Republic of Kazakhstan (NSB SPRA RK) (2023) *On Operation of Water and Sanitation Systems in the Republic of Kazakhstan in 2022*. Available at: https://stat.gov.kz/api/iblock/element/42143/file/ru/ (Accessed 11 May 2024).

OECD (2011) *Benefits of Investing in Water and Sanitation. An OECD perspective*. https://www.oecd-ilibrary.org/environment/benefits-of-investing-in-water-and-sanitation_9789264100817-en (Accessed 11 May 2024).

OECD (2012) *OECD Environmental Outlook to 2050: The Consequences of Inaction*. Paris: OECD Publishing. Available at: https://www.oecd.org/environment/indicators-modelling-outlooks/oecd-environmental-outlook-1999155x.htm (Accessed 11 May 2024).

OECD (2016) *Water Governance in Cities*. OECD Studies on Water. Paris: OECD Publishing. Available at: https://www.oecd.org/environment/water-governance-in-cities-9789264251090-en.htm (Accessed 11 May 2024).

OECD (2019) *Sustainable Infrastructure for Low-Carbon Development in Central Asia and the Caucasus: Hotspot Analysis and Needs Assessment*. Available at: https://www.oecd.org/publications/sustainable-infrastructure-for-low-carbon-development-in-central-asia-and-the-caucasus-d1aa6ae9-en.htm (Accessed 11 May 2024).

OECD (2020) *Overview of the use and management of water resources in Central Asia. A discussion document*. Available at: http://cawater-info.net/library/eng/overview-wm-ca-en.pdf (Accessed 11 May 2024).

Primin, O. (2022) *Water Leakages*. Moscow: MISI–MGSU Publishers (Moscow State University of Civil Engineering).

Regional Process Commission: Intercontinental Process for Central Asia (Regional Process Commission) (2011) *Sustainable Drinking Water Supply. Policy Brief. International Conference "Towards the 6th World Water Forum — Cooperative Actions for Water Security", 12–13 May 2011, Tashkent, Uzbekistan*. Available at: http://www.cawater-info.net/6wwf/conference_tashkent2011/files/2-watsup.pdf (Accessed 11 May 2024).

Qasim, S. R., Motley, E.M., Zhu, G. (2000) *Water Works Engineering Planning Design and Operations*. Dallas: Prentice Hall PTR, 2000.

UBS (2022) *Water scarcity — update. Longer Term Investments*. Chief Investment Office GWM Investment Research.

UNECE (2013) *Summary Report in Accordance with Article 7 of the Protocol on Water and Health for the Republic of Tajikistan*. Available at: https://unece.org/DAM/env/water/Protocol_reports/reports_pdf_web/2013_reports/Tajikistan_report_RUS_060513.pdf (Accessed 11 May 2024).

UNECE (2015) *Uzbekistan. Country Profile on Housing and Land Management*. ECE/HBP/185. New York. Geneva. Available at: https://unece.org/DAM/hlm/documents/Publications/CP_Uzbekistan_withCorr.RU.pdf (Accessed 11 May 2024).

UNEP (2010) *Clearing the Waters. A focus on water quality solutions*. Nairobi: UNEP. Available at: https://sswm.info/sites/default/files/reference_attachments/UNEP%202010%20Clearing%20the%20Waters.pdf (Accessed 11 May 2024).

UNESCO (2020) *The United Nations World Water Development Report 2020: water and climate change*. Available at: https://digitallibrary.un.org/record/3892703?ln=ru&v=pdf (Accessed 11 May 2024).

UNCTAD (2023) *World Investment Report 2023. Investing in sustainable energy for all*. New York: UNCTAD. Available at: https://unctad.org/system/files/official-document/wir2023_en.pdf (Accessed 11 May 2024).

United Nations (UN) (2003) *General Comment No. 15. The right to water (arts. 11 and 12 of the International Covenant on Economic, Social and Cultural Rights)*. E/C.12/2002/11. Available at: https://digitallibrary.un.org/record/486454?v=pdf (Accessed 11 May 2024).

United Nation (UN) (2016) *Resolution adopted by the General Assembly on 21 December 2016. International Decade for Action, "Water for Sustainable Development", 2018–2028*. A/RES/71/222. Available at: https://documents.un.org/doc/undoc/gen/n16/459/99/pdf/n1645999.pdf?token=2laQrjkkFOMEKuQ7cq&fe=true (Accessed 11 May 2024).

United Nations (UN) (2017) *Report of the Special Rapporteur on the human rights to safe drinking water and sanitation*. A/HRC/36/45. 19 July. Available at: https://documents.un.org/doc/undoc/gen/g17/216/95/pdf/g1721695.pdf?token=EXt3UpLZOOrUxDKVtf&fe=true. (Accessed 11 May 2024).

United Nation (UN) (2022) *World Population Prospects, the 2022 Revisions*. Department of Economic and Social Affairs. Population Division. Available at: https://population.un.org/wpp/ (Accessed 11 May 2024).

United Nations (UN) (2023) *The United Nations World Water Development Report 2023: Partnerships and Cooperation for Water*. Paris: UN. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000384655 (Accessed 11 May 2024).

United Nations Children's Fund (UNICEF) and World Health Organization (WHO) (2023) *Progress on household drinking water, sanitation and hygiene 2000–2022: special focus on gender*. New York. Available at: https://www.unwater.org/sites/default/files/2023-07/jmp-2023-wash-households-launch-version_0.pdf (Accessed 11 May 2024).

UN-Water and UNESCO (2023) *World Water Development Report 2023*. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000384655 (Accessed 11 May 2024).

Usmanov, I., Musaeva, A., Khodzhaeva, G. (2019) *Operational Status of the Systems for the Supply of Drinking Water to the Rural Population of Uzbekistan. Practical Research Journal "Land Reclamation Gazette". No. 1*. Moscow: Land Reclamation Department of the Ministry of Agriculture of Russia and FGBNU VNII "Raduga" (Federal State Budget Research Institution "All-Russian Irrigation and Agricultural Water Supply Systems Research Institute 'Rainbow'"). Available at: https://www.elibrary.ru/item.asp?id=38513067 (Accessed 11 May 2024).

Vinokurov, E., Ahunbaev A., Usmanov, N., Tsukarev, T., and Sarsembekov, T. (2021) *Investment in the Water and Energy Complex of Central Asia*. Reports and Working Papers 21/3. Almaty, Moscow: EDB. Available at: https://eabr.org/upload/iblock/185/EDB_WEC_CA_Report_RU_web.cleaned.pdf (https://eabr.org/analytics/special-reports/regulirovanie-vodno-energeticheskogo-kompleksa-tsentralnoy-azii-/ Accessed 11 May 2024).

Vinokurov, E. (ed.), Ahunbaev A., Usmanov, N., and Sarsembekov, T. (2022) *Regulation of the Water and Energy Complex of Central Asia*. Reports and Working Papers 22/4. Almaty, Moscow: EDB. Available at: https://eabr.org/analytics/special-reports/regulirovanie-vodno-energeticheskogo-kompleksa-tsentralnoy-azii-/ (Accessed 11 May 2024).

Vinokurov, E. (ed.), Akhunbaev, A., Chuev, S., Adakhaev, A., and Sarsembekov, T. (2023) *Effective Irrigation and Water Conservation in Central Asia*. Reports and Working Papers 23/4. Almaty, Moscow: EDB. Available at: https://eabr.org/analytics/special-reports/effektivnaya-irrigatsiya-i-vodosberezhenie-v-tsentralnoy-azii/ (Accessed 11 May 2024).

Vinokurov, E. (ed.), Akhunbaev, A., Chuev, S., and Adakhaev, A. (2024) *Infrastructure of Eurasia: Short-Term and Mid-Term Trends*. Reports and Working Papers 24/3. Almaty: EDB. Available at: https://eabr.org/upload/iblock/c99/EDB_Infrastructure-Trends_RU_2024_03_21.cleaned.pdf (Accessed 11 May 2024).

Wang, M., Bodirsky, B.L., Rijneveld, R. et al. (2024). A triple increase in global river basins with water scarcity due to future pollution. *Nature Communications*. Available at: https://www.nature.com/articles/s41467-024-44947-3 (Accessed 11 May 2024).

World Bank (2017) *Glass Half Full: Poverty Diagnostic of Water Supply, Sanitation, and Hygiene Conditions in Tajikistan*. Washington: World Bank. Available at: https://openknowledge.worldbank.org/entities/publication/834f50cd-692c-5cc6-b7e2-7562ecc0ca25 (Accessed 11 May 2024).

World Bank (2022) *Uzbekistan Public Expenditure Review: Better Value for Money in Human Capital and Water Infrastructure*. Available at: https://documents1.worldbank.org/curated/en/099143503032336097/pdf/P17314006f90d90630997e0a6bf69ede625.pdf (Accessed 11 May 2024).

World Bank (2024) *World Bank Open Data*. Available at: https://data.worldbank.org/ (Accessed 11 May 2024).

World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) (2021) *Progress on household drinking water, sanitation and hygiene 2000–2020: five years into the SDGs*. Geneva: WHO. Available at: https://www.who.int/publications/i/item/9789240030848 (Accessed 11 May 2024).

World Health Organization (WHO) and UN-Water (2010) UN-Water Global Annual Assessment of Sanitation and Drinking-Water (GLAAS) 2010 Report. Geneva: WHO. Available at: https://www.who.int/publications-detail-redirect/9789241599351 (Accessed 11 May 2024).

World Wide Fund for Nature (WWF) (2011) *Big Cities. Big Water. Big Challenges. Water in an Urbanizing World*. Berlin: WWF. Available at: https://media.wwf.se/uploads/2019/01/big-cities_big-water_big-challenges_2011.pdf (Accessed 11 May 2024).

World Water Assessment Programme (WWAP) (2009) *The United Nations World Water Development Report 3: Water in a Changing World*. Paris: UNESCO, and London: Earthscan. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000181993 (Accessed 11 May 2024).

World Water Assessment Programme (WWAP) (2012) *The United Nations World Water Development Report 4: Managing Water under Uncertainty and Risk*. Paris, UNESCO. Available at: https://digitallibrary.un.org/record/3892696?ln=ru&v=pdf (Accessed 11 May 2024).

World Health Organization (WHO) (2014) *Investing in water and sanitation: increasing access, reducing inequalities. UN-water global analysis and assessment of sanitation and drinking-water (GLAAS) 2014 report*. Geneva: WHO. Available at: https://iris.who.int/bitstream/handle/10665/139735/9789241508087_eng.pdf?sequence=1&isAllowed=y (Accessed 11 May 2024).

ABBREVIATIONS

ABII	Asian Infrastructure Investment Bank
ADB	Asian Development Bank
ASBP	Programme of Action for Assistance to the Aral Sea Basin Countries
bln	billion
CA	Central Asia
CIS	Commonwealth of Independent States
COS	sewage treatment plant
CPP	cement-sand pavement
EAEU	Eurasian Economic Union
EBRD	European Bank for Reconstruction and Development
EDB, Bank	Eurasian Development Bank
EFSD	Eurasian Fund for Stabilisation and Development
ESCAP	Economic and Social Commission for Asia and the Pacific
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Corporate Statistical Database website of the Food and Agriculture Organisation of the United Nations
GDP	gross domestic product
HCS	Housing and Communal Services
HPP	hydropower plant
IDB	Islamic Development Bank
IFAS	International Fund for Saving the Aral Sea
IFIs	International Financial Organisations
JSC	Joint Stock Company
km	kilometre
km³	cubic kilometre
KR	Kyrgyz Republic
LLP	Limited Liability Partnership
m	metre
m³	cubic metre
m³/year	cubic metres per year
MDBs	Multilateral Development Banks
MHCO	Ministry of Housing and Communal Services
m	million
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development.

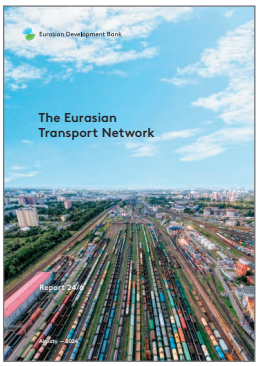
OPEC	The Organisation of the Petroleum Exporting Countries
PPP	public-private partnership
PRC	People's Republic of China
RK	Republic of Kazakhstan
RT	Republic of Tajikistan
RU	Republic of Uzbekistan
RF	Russian Federation
SDGs	Sustainable Development Goals
SUE	state unitary enterprise
TNC	transnational corporations
TrIn	trillion
UNECE	United Nations Economic Commission for Europe
UNICEF	United Nations International Children's Emergency Fund
UN	United Nations Organisation
US$	dollar
USA	United States of America
USSR	Union of Soviet Socialist Republics
WASH	Water, Sanitation and Hygiene
WB	World Bank
WHO	World Health Organisation

RESEARCH AT THE EDB WEBSITE

Macroeconomic Outlook
(RU/EN)

Macroeconomic Outlook 2024–2026

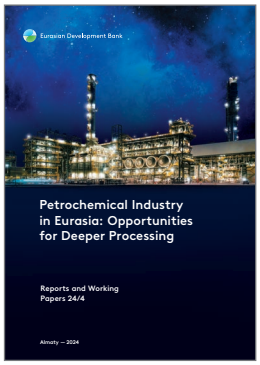
The EDB forecasts that the aggregate GDP of the Bank's member countries will grow by more than 3% in 2024. The economic growth rates of the Eurasian region will be higher than the global average



Report 24/6
(RU/EN)

The Eurasian Transport Network

The report examines ten system elements of the Eurasian transport framework concept. Among them are the formation of a transport crossroads in Central Asia, priorities for intraregional transport connectivity, an impetus for realizing the agro-industrial potential of the countries of the region, and improvement of soft infrastructure.



Report 24/4
(RU/EN)

Petrochemical industry in Eurasia: Opportunities for Deeper Processing

The analytical report uses a balance approach to assess the production and export potential of the petrochemical complex of the Eurasian region (Armenia, Belarus, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan) in the perspective up to 2035.

Report 24/3
(RU/EN)

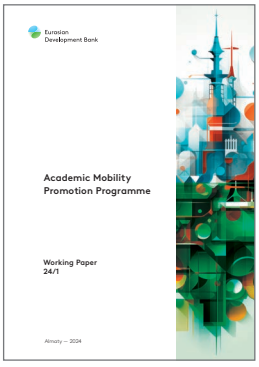
Infrastructure in Eurasia: short-term and medium-term trends

The EDB's report highlights ten important short- and medium-term investment and institutional trends in the region's energy, transportation, logistics, water supply and telecommunications sectors.

Report 24/2
(RU/EN)

Economic Cooperation in Eurasia: Practical Solutions

The EDB's report "Economic Cooperation in Eurasia: Practical Solutions" contains a "menu" of pragmatic applied solutions that can be enabled relatively fast and with flexible configurations among participating countries aimed at fostering mutually beneficial economic cooperation among Eurasian countries.



Report 24/1
(RU/EN)

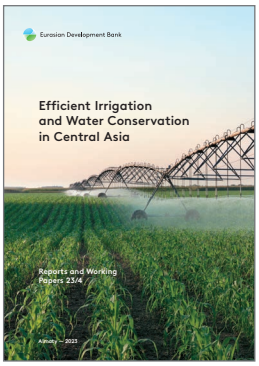
Academic Mobility Promotion Programme

The EDB's working paper "Academic Mobility Promotion Programme" contains a comprehensive analysis of problems and specific practical solutions to ensure the sustainable growth of interuniversity relations and educational exchanges across the Eurasian region (the EAEU and CIS countries).

Report 23/5
(RU/EN)

EDB Monitoring of Mutual Investments — 2023

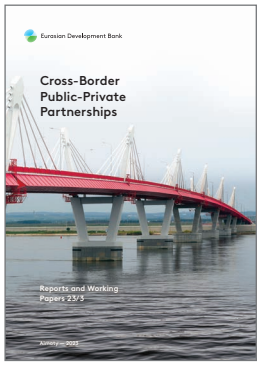
Eurasian countries' FDI stock reached $48.8 billion by mid-2023, following a 5.4% increase in 2022 and with continued growth in 2023.



Report 23/4
(RU/EN)

Efficient Irrigation and Water Conservation in Central Asia

A new EDB study outlines ten practical steps for preserving irrigated land potential and promoting water conservation. The list includes four recommendations for adoption at the regional level and six at the national level.



Report 23/3
(RU/EN)

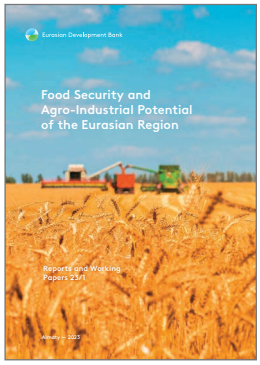
Cross-Border Public-Private Partnerships

The report outlines the criteria and scope of cross-border PPP projects, evaluates their potential for fostering cross-border infrastructure development in the EAEU, Central Asia, and the South Caucasus, and suggests guidelines for the successful implementation of cross-border PPPs in the region.

Report 23/2
(RU/EN)

Global Green Agenda in the Eurasian Region. Eurasian Region on the Global Green Agenda

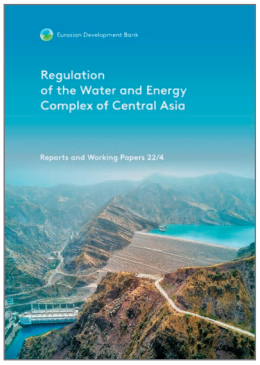
The report provides a comprehensive analysis of the challenges and prospects for low-carbon transition in Eurasia, covering EAEU countries, Tajikistan, and Uzbekistan.



Report 23/1
(RU/EN)

Food Security and Agro-Industrial Potential of the Eurasian Region

Based on the balance approach, the report analyses the production, resource, and export potential of the agro-industrial complexes of the EAEU countries, Tajikistan, and Uzbekistan for the period until 2035.



Report 22/4
(RU/EN)

Regulation of the Water and Energy Complex of Central Asia

The report scrutinises historical data and international experience to suggest five institutional solutions for effective regulation and development of Central Asia's water and energy complex that would benefit all countries of the region.

Report 22/3
(RU/EN)

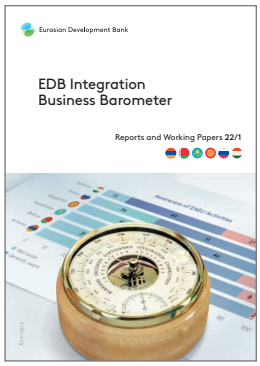
The Economy of Central Asia: A Fresh Perspective

The report provides a renewed perspective on Central Asia as a large, dynamic and promising economic region and analyses its current structural changes and major growth areas.

Report 22/2
(RU/EN)

International North–South Transport Corridor: Investments and Soft Infrastructure

The study assesses the investment potential of the INSTC, identifies barriers to its development and provides recommendations on how to eliminate them.



Report 22/1
(RU/EN)

EDB Integration Business Barometer

About 73% of companies feel positive about the EAEU and say it makes doing business easier.

Eurasian Development Bank

RESEARCH DEPARTMENT
EURASIAN DEVELOPMENT BANK

Your comments and suggestions
concerning this document
are welcome at: pressa@eabr.org

Eurasian Development Bank

www.eabr.org