

The background of the top half of the cover is a photograph of several wind turbines silhouetted against a vibrant sunset sky. The sky is filled with horizontal bands of orange, red, and yellow, with some darker clouds. The turbines are positioned at different heights and angles, creating a sense of depth.

Investment Gap Analysis of Central Asia's Water, Agriculture, and Energy Sectors

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In brief

Central Asia amassed a cumulative total of \$5 billion for climate finance between 2010 and 2020. This estimate might increase when considering other investments that indirectly impact climate action. Nevertheless, this sum remains notably lower than that of financial resources directed toward other sectors. The predominant investment requirements in the water, agriculture, and energy sectors revolve around infrastructure, resource-efficiency solutions, and the adoption of sustainable and climate-resilient agricultural practices.

The projected total investment needed to realize the Concept for the Transition of the Republic of Kazakhstan to a “Green Economy” by 2050 (Office of the President of the Republic of Kazakhstan, 2013) is around \$112 billion, spread across 2021–2049, averaging \$3–4 billion annually. This comprehensive policy encompasses \$37 billion for implementing energy efficiency measures, \$55 billion for expanding renewable energy sources and gas infrastructure, and \$4 billion dedicated to the agricultural sector. Kazakhstan has set the ambitious goal of sourcing 50% of its energy from renewable sources, with anticipated capital expenditures for water resources reaching up to \$10 billion by 2030.

In the Kyrgyz Republic, climate risk assessments and nationwide communications project an annual climate-related loss of \$1 billion in no-action warming scenarios. The country's nationally determined contributions (NDCs; United Nations Climate Change, 2023) outline climate financing needs, including \$7.1 billion for energy mitigation, \$2 billion for water resources adaptation, and various amounts for other sectors, such as agriculture, health, and forestry.

In Tajikistan, the total climate-related development financing surpassed \$1 billion over the past decade. The projected funding needed to execute the Green Economy Development Strategy for 2023–2037, focusing on climate-related developmental issues, is estimated at \$2.1 billion.

For Turkmenistan, the key sectors drawing investment include oil and gas, agriculture, and construction. However, sectors in urgent need of investment (e.g., agriculture and education) have received scarce attention. Consequently, Turkmenistan has encountered challenges associated with insufficient productive capital, limited technology and technical expertise, and sector-specific experience.

Despite recent efforts to attract foreign investment to Uzbekistan, substantial gaps persist in the country's water, agricultural, and energy sectors. Key issues include a lack of investment in rural water management infrastructure, insufficient funding for modernizing agriculture and developing export-oriented crops, and limited investment in renewable energy projects owing to regulatory challenges and inadequate government support. The country's financial needs for mitigating negative climate impacts on several sectors and decarbonization projects amount to over \$220 billion in the next four decades, according to the World Bank (2023).

A well-designed national action plan can help identify investment projects that contribute to climate-aligned growth objectives and sustainable development plans in Central Asian countries. The lack of such a framework hampers effective coordination among national stakeholders, making it difficult to prioritize climatic factors and secure the necessary finances in response to climate change. Similarly, at the regional level, countries could ramp up cooperation efforts to increase investment in these sectors by fostering interactions among investment promotion agencies.

Executive summary

The development strategies of Central Asian economies over the last three decades, largely influenced by the crucial role of water resources, may require re-evaluation and adjustment in response to current regional climate challenges. Hence, nations in the region must establish the groundwork for increased funding for climate action at the regional level. This is crucial for effectively addressing climate-induced uncertainties that directly affect water resources, agricultural productivity, and energy security. Positioned at the forefront of climate impact augmentation, these countries—not unlike other nations—view their public policies and investments addressing climate change as crucial determinants shaping the primary characteristics of the region's future economic growth. This approach aligns with the pursuit of development goals.

As a beneficiary of diverse climate investments, including international climate project funds, private investments, public-private partnerships, state-funded initiatives, and additional resources, the region collectively attracted \$5 billion for climate finance from 2010 to 2020. This estimate could increase further when considering other investments that indirectly influence climate change actions. Nevertheless, this sum falls significantly short of financial resources allocated to other sectors. Primary investment needs in the water, agriculture, and energy sectors revolve around infrastructure, resource-efficiency solutions, and the adoption of sustainable and climate-resilient agricultural practices.

Key findings

Kazakhstan. While the adverse effects of climate change on the transport and energy sectors pose significant threats, Kazakhstan faces a potential 1.3% reduction in gross domestic product (GDP) by 2060 owing to flooding alone, assuming the absence of adaptation measures. The country generates 0.70% of global greenhouse gas (GHG) emissions, which is the highest among the nations of Central Asia. The energy sector produces 78% of these emissions—with agricultural and industrial processes accounting for 7% and 9% of Kazakhstani emissions, respectively. These sectors are particularly vulnerable to climate change owing to their dependence on water as a primary resource. Meanwhile, the country's outdated infrastructure results in up to 40% water wastage in some areas. Despite receiving \$1.7 billion in climate finance over the past decade, Kazakhstan's overall investments, mainly in mineral resources such as coal, gas, and oil, remain significantly higher. In 2022 alone, the country received \$6.1 billion in foreign direct investment (FDI), with \$4.1 billion being allocated to extractive industries. However, the estimated total investment required for the Concept for the Transition of the Republic of Kazakhstan to a “Green Economy” by 2050 is approximately \$112 billion from 2021 to 2049, averaging \$3–4 billion annually. This includes \$37 billion for implementing energy efficiency measures, \$55 billion for expanding renewable energy sources and gas infrastructure, and \$4 billion for the agricultural sector. The country aims to eventually derive 50% of its energy from renewable sources, with capital expenditure on water resources projected to reach \$10 billion by 2030.

Kyrgyz Republic. Climate finance serves three primary purposes: reducing emissions, adapting to climatic consequences, and compensating for losses and damages. Climate finance plays a crucial role in the Kyrgyz Republic. The annual average direct damage caused by natural disasters in the Kyrgyz Republic, estimated at \$30–35 million, could significantly increase when considering all relevant factors. Climate risk assessments and nationwide communications project a staggering \$1 billion per year in climate-related losses under no-action climate warming scenarios. Despite this, over 90% of FDI in 2022 targets sectors, such as mining, manufacturing, financial intermediation,

insurance, wholesale and retail trade, and information and communication. Kyrgyz Republic's latest NDCs (United Nations Climate Change, 2023) outline its climate financing needs as follows.

1. Mitigation measures: energy, \$7.1 billion; industrial processes and products use, \$500,000; agriculture, \$19 million; forestry and other types of land use, \$63 million; and waste, \$3 million.
2. Adaptation measures: water resources, \$2 billion; agriculture, \$276 million; energy, \$64 million; health, \$144 million; reduction of climate emergency risks, \$310 million; forest and biodiversity, \$46 million; climate-resilient regions and green cities, \$12 million.

Overall, Kyrgyz Republic's financing needs for mitigation total \$7.2 billion, whereas those for adaptation exceed \$2.8 billion.

Tajikistan. Over the last five years, Tajikistan has attracted less than \$1 billion in FDI, the smallest amount in the region, a significant portion of which was concentrated in extractive sectors. Specifically, the mining sector received 61% of the total FDI in 2018, and this trend persisted throughout the subsequent years, including the pandemic period. Over the past decade, Tajikistan secured approximately \$450 million from international climate funds, complemented by a similar amount from multilateral banks such as the European Bank for Reconstruction and Development, World Bank, and the Asian Development Bank. These resources have primarily supported initiatives such as hydropower modernization, agricultural greening, and other climate-related measures. Notably, \$75 million was allocated for disaster risk reduction and climate observation modernization. In summary, all climate-related development financing in Tajikistan over the past decade exceeded \$1 billion. The estimated funding required for the implementation of the Green Economy Development Strategy for 2023–2037, addressing climate-related developmental issues, stands at \$2.1 billion.

Turkmenistan. In 2022, Turkmenistan secured the third position in Central Asia vis-à-vis FDI inflows, totaling \$936 million. The primary sectors attracting investment in the country are oil and gas, agriculture, and construction. However, sectors with pressing investment needs, such as agriculture and education, have received minimal attention. Further, Turkmenistan faces challenges related to a lack of productive capital, modern technology, technical knowledge, and sectoral experience. Additionally, stringent capital controls on FDI have contributed to a slowdown in new hydrocarbon projects amid declining international investments. Notably, around 20% of the total investment comprises FDI, while government officials report a 14.2% increase in the volume of investments, resulting in the creation of 4,000 new jobs in 2022. Over the past decade, Turkmenistan executed climate projects totaling a mere \$200 million from the Global Environment Facility and the Adaptation Fund, with \$20 million being provided as state co-financing.

Uzbekistan. While most of the FDI has previously covered the oil, gas, and mining sectors, following recent economic reforms in 2017, a trend toward increasing FDI in the manufacturing, production, and distribution sectors of electricity, tourism, and banking has been observed. This diversification is supported by improved state regulations and the recently started privatization program. Thus, the country can easily create unique investment opportunities across the water, agriculture, and energy sectors. Despite government efforts to attract foreign investment, significant gaps remain in the water, agriculture, and energy sectors. These issues include a lack of investment in water management and infrastructure, particularly in rural areas; insufficient investment in modernizing agriculture, including the development of value chains and export-oriented crops; limited investment in renewable energy projects owing to regulatory hurdles; and a lack of government support. According to the World Bank (2023), the country would have to allocate an extra \$46.7

billion between 2023 and 2060 to cope with and mitigate the negative climate effects on labor productivity, infrastructure (e.g., roads and bridges), livestock, and the irrigation sector. Similarly, the country's decarbonization initiatives require over \$178 billion in investment from 2023 to 2060.

The absence of a National Climate Action Plan that integrates intersectoral activities and climate investments into decision-making and planning poses an obstacle to mainstream climate finance across numerous sectors in Central Asian economies. A well-designed document can aid in identifying investment projects that contribute to climate-aligned growth objectives and sustainable development plans. The lack of such a framework hinders effective coordination among national stakeholders, thus making it challenging to prioritize climatic factors and secure the financial resources necessary to address climate change.

At the regional level, countries could cooperate to increase investment in these sectors by fostering interactions among investment-promotion agencies. Each country in the region has an investment-promoting agency that facilitates the inflow and execution of investment programs. These agencies can be instrumental in creating an attractive business environment for climate investment.

1. Introduction

Arguably, climate change is the most important concern that humanity faces today, as its economic, political, and social ramifications affect all countries worldwide. Further, its compounding consequences and risks for economies and markets are expected to increase at an accelerated rate in the near future. Therefore, climate-associated risks will become unmanageable unless a green transition is successfully implemented globally. This, in turn, requires increased investment in both adaptation and mitigation actions, which can be unlocked through substantial regulatory changes and an improved investment environment worldwide.

A landmark global treaty on climate action was achieved with the Paris Agreement in 2015. However, in subsequent years, there has been a gap between signees' commitments and actual investment. Among these commitments was the mobilization of \$100 billion a year for adaptation and mitigation projects in developing economies. However, the actual investment reached only \$83,3 billion in 2020 (Organisation for Economic Co-operation and Development [OECD], 2022a). Noteworthy, the global pandemic, coupled with geopolitical tensions and other issues, may have led to this reduced investment. Nevertheless, recipient countries should make significant strides to meet the requirements for increased investment.

Central Asian countries are on the frontlines of mitigating climate impact. Globally, public policies and investments addressing climate change will continue to shape the main features of the region's future economy, which is the only way to meet the United Nations' Sustainable Development Goals. This region encompasses Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan, all of which face numerous climate change-related challenges, including water scarcity, desertification, and extreme weather events. Given the vulnerability of the region, climate investment in Central Asia is of utmost importance.

Investment in climate action and sustainability in Central Asia would yield several significant benefits. It would help mitigate the adverse effects of climate change and foster resilience within local communities. For instance, by promoting renewable energy sources such as solar and wind power, these countries could reduce their reliance on fossil fuels and curb their GHG emissions, thereby leading to several social effects, such as improved air quality, widened access to energy, and better environmental health.

Furthermore, climate investment in Central Asia would contribute to the preservation and sustainable management of natural resources, especially water. Enhanced water-resource management is critical for the region's agricultural sector and overall food security. By implementing efficient irrigation systems, promoting water-saving technologies, and supporting sustainable farming practices, Central Asian countries can address the challenges posed by water scarcity and increase their agricultural productivity.

Investment in climate change offers economic opportunities by fostering the growth of green industries and innovation. For example, developing renewable energy infrastructure, such as solar and wind power plants, could not only provide affordable and clean energy but also create job opportunities, thereby stimulating economic growth and employment opportunities in the region. Additionally, investments can have positive spillover effects on tourism, since an eco-friendly infrastructure could attract international visitors, generating revenue and promoting cultural exchange.

Therefore, climate investments in Central Asia are crucial for combating climate change, promoting sustainable development, and improving the quality of life in the region. Governments, international organizations, and the private sector must collaborate to make meaningful investments in climate-change management initiatives.

Hence, this study sheds light on the current state of climate investment in Central Asia by highlighting the main investment trends and challenges across the water, agriculture, and energy sectors. Specifically, this study analyzes investment inflows into these sectors and relevant regulatory aspects. Thereby, this report aims to help policymakers and other stakeholders involved in mobilizing climate-related financing in Central Asia identify areas that need more support to facilitate efficient resource mobilization across the water, agriculture, and energy sectors. Additionally, this report suggests a set of recommendations to determine which aspects of climate action should be reinforced and what other courses of action are available from a financing perspective.

2. Climate investment in Central Asia—A regional overview

Central Asian countries are recipients of various climate investments (including international climate project funds, private investments, private–public partnerships, state-funded initiatives, and other resources) that amounted to \$5 billion between 2010 and 2020 (The Regional Environmental Centre for Central Asia [CAREC], 2020). This estimate may be even higher if other investments that indirectly impact climate action are calculated.

According to a report from the United Nations Conference on Trade and Development (United Nations Conference on Trade and Development [UNCTAD]; 2023), the region’s overall FDI was over \$38 billion over the last five years (Table 1). Kazakhstan and Uzbekistan were the top recipients of investment during these years. Turkmenistan experienced an annual decrease in investment inflow from 2019 onwards, whereas Uzbekistan demonstrated an annual increase, except in 2020—which can be explained by the impact of the COVID-19 pandemic. Overall, Kazakhstan showed a gradual increase in investments over the last three years, almost doubling its investment inflows in 2022 compared to 2021.

Table 1: FDI Inflows in Central Asia (in USD Million) in 2018–2022

Country/region	2018	2019	2020	2021	2022
Kazakhstan	3 898	3 284	3 670	3 337	6 108
Kyrgyz Republic	144	404	-402	226	291
Tajikistan	360	364	107	84	174
Turkmenistan	1 607	1 854	1 436	1 287	936
Uzbekistan	625	2 316	1 728	2 276	2 531
Central Asia	6 633	8 223	6 539	7 210	10 041

Source: UNCTAD (2023)

However, the recent economic growth observed in the region has had various environmental effects. According to the World Bank, losses in Central Asian countries owing to increasing climate-related disasters reach \$10 billion every year (Burunciuc, 2020). Moreover, according to Adelphi and the CAREC (2017), the water sector itself is losing \$4.5 billion or 1.5% of its regional GDP each year because of limited collaboration in the management of transboundary water resources. Its spillover to the agricultural and energy sectors is expected to increase these numbers. Moreover, the

difference between the costs of regional cooperation and the benefits of strengthened regional collaboration in Central Asia may reach 20% of the region's GDP by 2050 (Vinokurov et al., 2021).

Since the water sector is the key to the region's sustainable development, as well as the most vulnerable sector to climate change, it must be prioritized by governments, particularly in the wake of the growing ambitions of the Taliban regime—the de facto government in Afghanistan, which prioritizes agriculture as one of the main pillars of economic growth.

Addressing these issues can be more impactful through the combination of water, agriculture, and energy sectors, and any attempt in this regard must include Afghanistan as an important stakeholder while upscaling investments in these sectors. Regarding the current investment landscape, Central Asian countries face numerous challenges in the water-agriculture-energy nexus. These challenges require significant investments to address and promote sustainable development across these sectors.

2.1 Water

Water scarcity is a major concern in Central Asia because the region relies heavily on irrigation for agricultural production. Adequate investment is required to improve water-resource management, enhance irrigation systems, and promote the integration of water-saving technologies. International organizations such as the World Bank and the Asian Development Bank have provided financial assistance for water infrastructure projects, including dam construction, the rehabilitation of irrigation canal systems, and climate and hydrological services in the region. The World Bank's Central Asia Water and Energy Program, as well as the Climate Adaptation and Mitigation Program for Aral Sea Basin, and the Asian Development Bank's Climate-Smart Water Management Improvement Project and Climate Adaptive Water Resources Management in the Aral Sea Basin Sector Project are some of the ongoing efforts in this regard. However, a significant amount of water was lost in the region before reaching the plots. The Afghan factor must also be considered when executing investment programs.

2.2 Agriculture

Agriculture plays a vital role in the economies of Central Asian countries, providing 5–30% of their GDP. However, limited access to modern farming techniques and equipment, outdated irrigation systems, and insufficient market opportunities have hindered agricultural development. Investments are required to support sustainable farming practices, introduce innovative technologies, and enhance value chains. Public–private partnerships should be encouraged to attract investment in agribusiness, improve access to credit for farmers, and promote agricultural research and development.

2.3 Energy

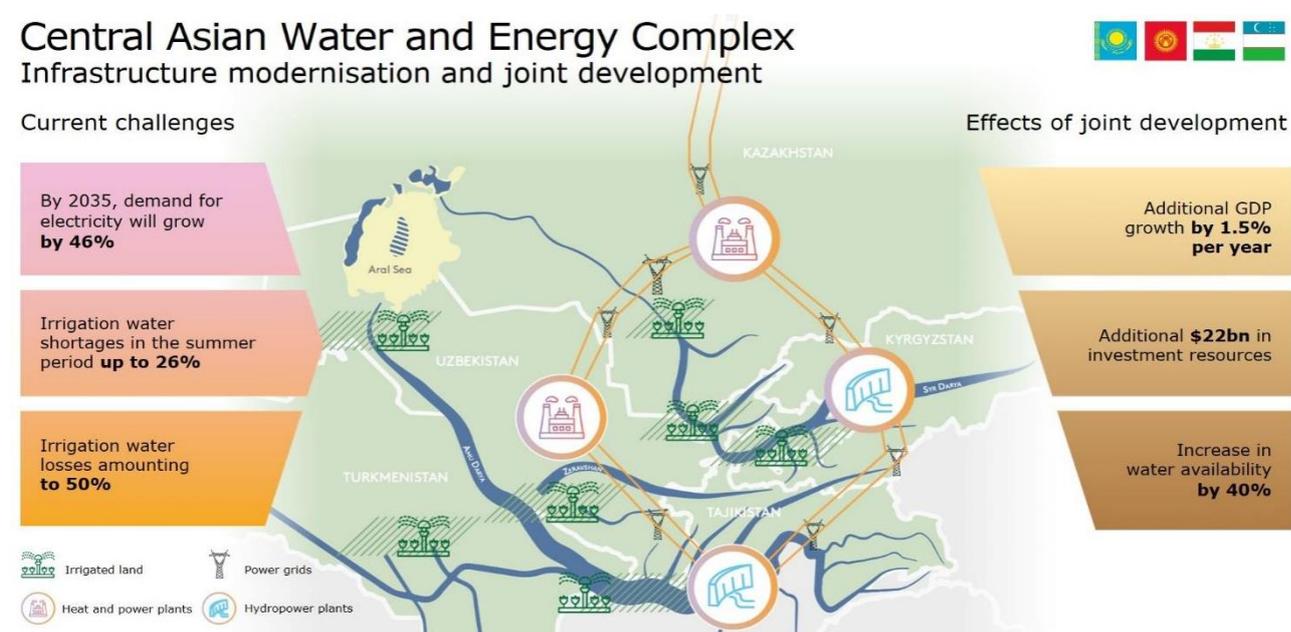
Development dynamics in the energy market are central to the future evolution of climate change. Central Asia is rich in energy resources, particularly fossil fuels and hydroelectric power. However, the region's energy sector faces challenges related to efficiency, infrastructure development, and environmental sustainability. Thus, investments are required to diversify the energy mix, shift toward renewable energy sources, and improve energy efficiency. International cooperation efforts, such as the Central Asia Regional Economic Cooperation Program, support cross-border energy projects, transmission line development, and renewable energy initiatives. Additionally, through

public–private partnerships, countries in the region are mobilizing large investments in the sector, with a focus on solar and wind energy.

2.3 The nexus approach

Recognizing the interdependence of water, agriculture, and energy, the concept of the water-energy-agriculture nexus has gained considerable attention in Central Asia. Investments in this nexus should aim to achieve the integrated and sustainable management of water resources, promote energy-efficient agricultural practices, and foster renewable energy development. The nexus approach encourages coordinated policymaking, investment planning, and cross-sectoral collaboration to address the interconnected challenges faced by these sectors (Figure 1).

Figure 1: Current challenges in the Central Asian Water and Energy Complex, and the effects of joint development.



Source: Vinokurov et al. (2021)

The investment landscape in the water, agriculture, and energy nexus in Central Asia is gradually evolving, with funding being allocated to address challenges related to water scarcity, agricultural development, and energy sector improvements. The involvement of international organizations, public-private partnerships, and regional cooperation initiatives is crucial for attracting investment, promoting sustainable development, and fostering resilience in the face of climate-change challenges.

3. Overview of climate investment—Kazakhstan

3.1 Investment landscape

Kazakhstan is the largest economy in Central Asia and is vulnerable to various climate-driven natural disasters, such as droughts, heat waves, floods, mudflows, and landslides, which result in land degradation, infrastructure destruction, and loss of life. The impact of climate change has spread

unevenly across Kazakhstan, with the most notable consequences being suffered by the agricultural and water sectors. As impacts on the transport and energy sectors are also significant and can disrupt regional and global value chains with adverse economic consequences, the country's damage from flooding alone may reduce its GDP by 1.3% by 2060 in the absence of adaptation (World Bank, 2022).

The country contributes 0.70% of global GHG emissions, making it the largest emitter in Central Asia. The energy sector accounts for 78% of Kazakhstan's GHG emissions, while the agriculture and industrial sectors account for 7% and 9% of GHG emissions, respectively (OECD, 2019). The latter two sectors are the most vulnerable to climate change, as they depend on water as their main resource for functioning. In some parts of the country, up to 40% of water is wasted because of old infrastructure (CAREC Institute, 2023). Certainly, there is a cost associated with constructing or improving infrastructure; however, if the country's water distribution system continues to leak, the lost water can result in an extremely high cost in the wake of growing climate uncertainty.

Despite Kazakhstan's rapid economic development since 2000, diversification remains limited and relies heavily on natural resources. Half of its domestic energy production is supplied by coal (IEA, 2022). Its economy's high dependence on subsidized coal and gas has impeded investments in renewable resources and has led to the inefficient allocation of gas and coal in power generation and industrial processes over the past decade (World Bank, 2022).

Over the past ten years, Kazakhstan has received climate finance from global climate funds and co-financing from multilateral banks and bilateral channels, amounting to \$1.7 billion (CAREC, 2020). However, the country's overall inward investments are significantly higher and are mainly directed toward mineral resources—including 49.5% for coal, gas, and oil; 14.6% for metals; 2.6% for transport; and only 2.2% for renewable energy (OECD, 2019). Throughout 2022, Kazakhstan received \$6.1 billion in FDI, of which \$4.1 billion was allocated for extractive industries (UNCTAD, 2023). However, based on the latest reforms targeting the decarbonization of the economy, the upscaling of investments in sustainability sectors is envisaged. In this regard, the Kazakh Government has issued several documents regulating investment policies in the water, agriculture, and energy sectors.

3.2 Investment policies

In its NDCs for 2023, Kazakhstan outlines its ambition to achieve a 25% reduction in GHG emissions by the end of 2030, compared with the 1990 base year (United Nations Climate Change, 2023). This goal is contingent upon substantial international investment and grant assistance. Further, Kazakhstan seeks to access international technology transfer mechanisms, co-financing opportunities, active participation in international research projects, and the development of promising low-carbon technologies. The country also emphasizes initiatives to foster local expertise aligned with its emission-reduction targets. Adaptation actions prioritize agriculture, water-resource management, forestry, and disaster-risk reduction. These priorities are supported by several national policies that drive investments in these sectors.

According to the country's Entrepreneurial and Tax codes, in certain sectors, both domestic and foreign investments are incentivized. These sectors include agriculture, metallurgy, extraction of metals, ores, chemical and petrochemical industries, textile and pharmaceutical industries, food production, machine manufacturing, waste recycling, and renewable energy (US State Department, 2023a). As the main incentivizing regulatory instruments, these two codes prioritize the extractive

sectors, which receive 60% of the overall FDI in 2022 (UNCTAD, 2023), and consider further climate mitigation actions underlining the agriculture and renewable energy sectors.

However, an important legal framework—the Ecological Code of 2021—prioritizes agriculture, water management, forestry, and civil protection. This document introduced a 10-year exemption from environmental payments for businesses and introduced the best available technologies for reducing emissions. Businesses with no introduction of this policy will double in size by 2025 and will increase fourfold by 2028 and eightfold by 2031.

Similarly, the Concept for the Transition of the Republic of Kazakhstan to a “Green Economy” by 2050 established several significant national goals for the country’s eco-environmental progress, including a national developmental focus. The primary objectives of the Concept include improving the efficiency of resource utilization, upgrading existing infrastructure, constructing new sustainable infrastructure, enhancing the well-being of the population and the environment, and strengthening national security, with a particular focus on water security.

The estimated total investment required for the implementation of the Concept is approximately \$112 billion from 2021 to 2049—an annual average of \$3–4 billion¹. According to the Concept, the required investment will be directed toward implementing energy-efficiency measures, including buildings, heat, and transport (\$37 billion), as well as expanding renewable energy sources and gas infrastructure (\$55 billion), while the agricultural sector will only receive \$4 billion. The country has set a target of 50% of energy to be sourced from renewable energy sources. The capital expenditures for water resources in accordance with the Concept are projected to reach up to \$10 billion by 2030.

Another important national framework is the Strategy (Doctrine) for Achieving Carbon Neutrality of the Republic of Kazakhstan by 2060, which was approved in February 2023. It provides a set of key measures to reduce GHG emissions and decarbonize the economy, aligned with global climate trends, the country’s international obligations, and the current state of key sectors. such as energy, agriculture, waste, industrial processes, product use, and land utilization. The Strategy stipulates that the needed amount of investment in low-carbon technologies in the country exceeds \$600 billion (Government of the Republic of Kazakhstan, 2021).

Considering the report’s overview of the energy sector, noteworthy, the Concept on the Fuel and Energy Complex of the Republic of Kazakhstan for 2023–2029 (Adilet, 2023). Between 2020 and 2022, investments of \$5.7 billion were made in the energy sector within the framework of the capacity market introduced in 2020. The new program Tariffs in Exchange for Investment is currently under development in response to the implementation of the President’s Nation Address on September 1, 2022. This program aims to attract investments of up to \$8.9 billion annually to the energy sector.

The Concept of the State Water Resource Management Program of the Republic of Kazakhstan by 2030, which was formulated based on the Water Code and the Security Council’s Protocol on Water Security, dated June 26, 2019. Its primary objective is to ensure the efficient management and preservation of water resources within the country. However, it is estimated that the funding required for the period from 2020 to 2030 will be around \$4.51 billion. Of this, approximately \$4.09

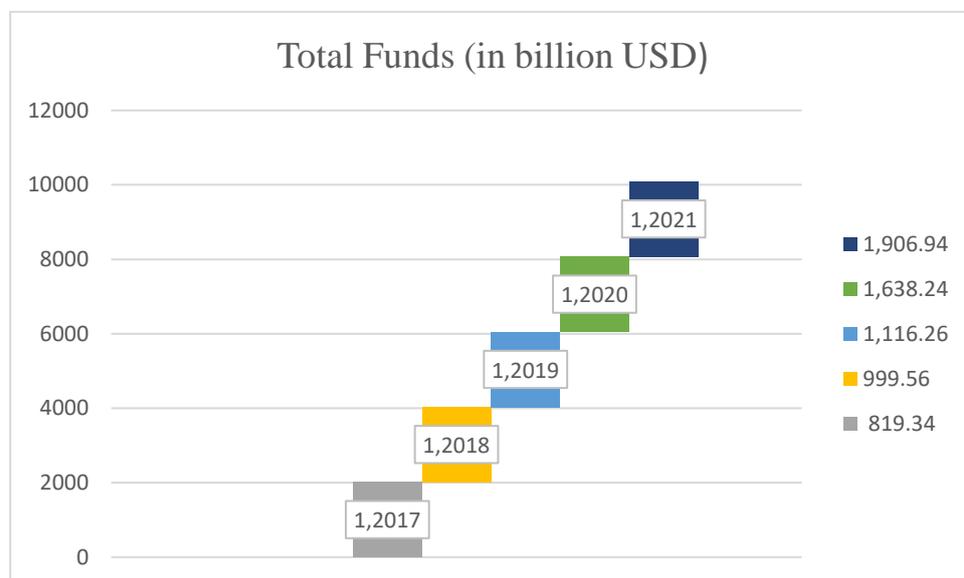
¹ Author’s calculation based on the Concept for the Transition of the Republic of Kazakhstan to a “Green Economy” by 2050 (Office of the President of Kazakhstan, 2013).

billion will be allocated from the national budget, \$0.16 billion from local budgets, and an additional \$0.35 billion will be obtained from sources outside the regular budgetary framework.

According to the 2021 OECD report, Kazakhstan is actively working to improve its water supply systems. In this regard, numerous projects related to water supply are being developed, with a total cost of \$471.1 million. Among the total number of projects, 56.3% focus on the development of Kazakhstan’s water supply and sanitation systems, whereas the remaining 43.7% aim to improve irrigation systems and water-resource management in the country.

From 2017 to 2021, Kazakhstan implemented the State Program for the Development of the Agro-industrial Complex. This program aimed to double the volume of gross agricultural output and increase exports of processed products by 2.5 times, with a target of \$2.7 billion. The total budget from the state and external sources for implementing the program was \$6.48 billion (Figure 2) (Adilet, 2017).

Figure 2: Funds Allocated for the Agricultural Sector’s Development 2017–2021



Source: Adilet (2017)

By 2021, the highest budget allocation was \$1,906.94 billion. Funds allocated over five years were aimed at supporting and advancing the project’s objectives.

Considering the country’s agricultural development and investment needs, the National Project for the Development of the Agro-industrial Complex of the Republic of Kazakhstan for 2021–2025 is noteworthy. The funds required for the new plan’s implementation are as follows (Official Information Source of the Prime Minister of the Republic of Kazakhstan, 2021):

- Required funds from the state budget: \$6.97 billion.
- Required funds from external sources: \$8.04 billion.
- Total funding required: \$14.01 billion.

Table 2: Funds Required for the Implementation of the National Project for the Development of the Agro-industrial Complex of the Republic of Kazakhstan for 2021–2025.

Year	Required funds from the state budget	Required funds from external sources
2021	\$1.05 billion	\$1.8 billion
2022	\$930 million	\$2.31 billion
2023	\$1.09 billion	\$2.26 billion
2024	\$1.5 billion	\$1.04 billion
2025	\$1.4 billion	\$1.63 billion
Total: \$14.01 billion		

Source: National Project for the Development of the Agro-industrial Complex of the Republic of Kazakhstan for 2021–2025.

3.3 Investment gaps and opportunities

Although the National Project has been allocating a state budget, according to the Development Strategy of the Agrarian Credit Corporation for 2020–2023, the financing of agriculture by second-tier banks is limited because of the following reasons: conservative risk assessment in the sector, lack of hedging instruments, low liquidity of collateral in rural areas, lack of long-term funding in local currency, high interest rates on loans, and high costs of regional network development.

Considering the drought that occurred in 2021 is important. This precipitated numerous problems for livestock farmers from the western region, who found it difficult to pay back loans to second-tier banks. This is one reason why second-tier banks consider the agricultural sector as high risk when providing loans. However, one practical measure in this situation involves conducting climate stress tests before issuing loans for farmers; these tests provide a forecast for climate-related activities, droughts, and other climate-induced risks.

Another issue is related to fertilizers. The government allocates subsidies amounting to approximately 50% of fertilizer costs. However, the volume of fertilizers provided does not meet the established or recommended standards; therefore, the carbon contained in the atmosphere is not absorbed by the soil or plant, leading to the same level of emissions. Private farming investments cannot be made because of the high subsidies provided by the government for fertilization and diesel-fuel activities.

To strengthen the requirements for land cultivation, it is necessary to establish and ensure compliance with fertilizer quality standards that meet the recommended levels. This results in the volume of fertilizer applied to meet the requirements for optimal carbon absorption and emission reduction.

Moreover, it is necessary to introduce targeted subsidy reforms, instead of providing general subsidies for fertilizers and diesel fuel, which encourage the introduction of sustainable practices. For example, subsidies should be provided for specific environmentally friendly fertilizers that contain more nitrogen, materials for organic farming, and energy-efficient equipment.

The Kazakhstan 2050 strategy and the Concept for the Transition of the Republic of Kazakhstan to a “Green Economy” by 2050 are aimed at solving problems related to water supply and irrigation water to improve water security in the country. More specific state programs, such as the National Project for the Development of the Agro-industrial Complex of the Republic of Kazakhstan for 2021–2025, aim to increase agricultural equipment by entraining subsidies, especially for water-saving technologies for irrigation, by 2025.

At a government meeting held on February 8, 2022, the President of the Republic of Kazakhstan commissioned the drafting of a new Water Code. During the meeting, the following items were considered: to find a decision on the protection and rational use of water and the obligation to apply water-saving technologies, as well as to take into account secure exploitation.

Given the current problems of water scarcity in the municipal sector, the new Water Code should not be limited to water abstraction and protection. This should include water reform related to current climate change issues. For instance, it is key to establish the water cycle in the housing and utilities sector, not only in terms of withdrawal but also in terms of reuse and treatment. In sum, this code should include measures in accordance with the realities of climate change in the country; in the case of water shortages, both enterprises and the population should be prepared.

The Samruk-Kazyna and World Bank report (2018) indicated water management challenges in the Republic of Kazakhstan, including inefficient water use (compared with other countries), inadequate tariff systems in agriculture, insufficient water conservation measures, a lack of investment in infrastructure and maintenance, inadequate aging infrastructure, and a lack of an information database on water bodies and reservoirs.

The Kazakhstan Energy Sector Review (2022) highlighted the importance of energy prices, which reflect long-term costs and environmental impacts. This encourages energy efficiency and new energy sources’ development and enhances the playing field. Price increases are accompanied by measures to protect vulnerable populations from the effects of these changes.

The continuous enhancement of energy statistics may be achieved by updating the master plan of the National Statistics Bureau and developing energy efficiency indicators based on best international practices, which would enable an overview of the impact of energy efficiency policies. In the coal sector, it is recommended to develop the Best Available Technologies reference, which is in the process of developing the International Green Technologies and Investment Projects Center. Additionally, this reference must be developed based on the specifications and indicators of the energy sector’s requirements.

Regarding environmental performance, Kazenergy recommends policymakers reduce the number of governing bodies and regulations to improve environmental performance. The IHS Markit recommends transferring decision-making authority over environmental payments to logical organizations, as opposed to creating new public bodies. For instance, the Ministry of Ecology should supervise companies’ compliance with legal requirements and be given the authority to make decisions about environmental payments. This simplification of regulation is expected to increase efficiency.

The country became the first in Asia to create a GHG regulation system (in 2013) that would also stimulate carbon-neutral projects. However, owing to its low carbon costs (\$0.9–1.4 US dollars per ton) it does not stimulate the required amount of investment. For example, for a company focused on raw materials, oil, gas, and coal, it would be easier to spend money on purchasing quotas rather

than attracting investments. The price of carbon remains low; therefore, it must be increased to attract investments in carbon projects.

Overall, the lack of climate policy is the main barrier to encouraging stakeholders across all sectors to take climate action. Climate policies, such as carbon pricing or emissions standards, would help make green investments cost-effective (World Bank, 2022).

4. Overview of climate investment—Kyrgyz Republic

4.1 Investment landscape

In the Kyrgyz Republic, climate finance plays a key role, mainly for three purposes: reducing emissions, adapting to climate change's consequences, and compensating for the resulting losses and damages. After the Paris Agreement, the Kyrgyz Republic activated a climate-finance agenda to benefit from the availability of external funding opportunities for its climate commitments. Therefore, in 2017, the Climate Finance Center was established under the Ministry of Natural Resources and the Ministry of Natural Resources, Ecology, and Technical Supervision of the Kyrgyz Republic. It has been tasked with mobilizing external financing to pursue climate intervention in the country. This Center also performs a coordination function vis-à-vis NDCs' progress.

The Kyrgyz Republic is a landlocked mountainous country in Central Asia. This makes it highly susceptible to natural hazards, including earthquakes, landslides, and floods, which adversely impact water, agriculture, and energy resources, as well as cause economic and social disruptions. Since 2010, the scale and frequency of climate-induced challenges have increased by 150%, while these events are estimated to create an economic liability of 0.5–1.3% of its GDP every year (Climate Change Knowledge Portal, Kyrgyz Republic).

Based on the CAREC's 2020 research, the annual average direct damage caused by natural disasters in the Kyrgyz Republic is estimated to be \$30–35 million, with the potential for significantly higher losses if all relevant factors are considered. Further, climate risk assessments and national communications indicate a staggering \$1 billion per year in climate-related losses under a no-action climate warming scenario (CAREC, 2020).

Continued global warming poses a threat to Kyrgyz Republic's glaciers, adversely affecting key sectors, such as agriculture and energy. Currently, agriculture, which employs 31.7% of the country's workforce, relies on water from seasonal glacial runoff, whereas hydroelectric power plants account for 87% of the country's electricity generation (OECD, 2019).

In 2022, more than 90% of FDI inflow was directed toward sectors such as mining, manufacturing, financial intermediation, insurance, wholesale and retail trade, information, and communications, as reported by the National Statistical Committee of the Kyrgyz Republic.

The Green Economy Development Program in the Kyrgyz Republic for 2019–2023 set various priority activities for sustainable financial development, such as establishing the National Green Investment and Credit Fund with a budget of \$40 million (with 75% of funds being secured from external sources); environmental, social, and governance standards applications; adoption of CO₂ emissions taxes; and the green financial market's development.

Over the last two years, a positive trend has been observed in Kyrgyz Republic's attempt to promote green financial markets in Central Asia and the Kyrgyz Republic (Global Green Growth Institute,

2022). Green local commercial institutions (The Union of Banks of Kyrgyzstan, 2023) are now attempting to learn about the benefits resulting from sustainable financing, green bond issuance, and green taxonomy projects (Doscredo Bank, n.d.). The country is also renewing its tax policies and exploring tax opportunities that can reduce the effects of climate change. Tax incentives already exist for electric vehicles (24.kg News Agency, 2020) and the construction of power plants using renewable energy sources.

The role of private-sector finance mobilization is significant in reducing the impacts of climate change. Simultaneously, it creates several challenges, such as uncertainty. However, some degree of predictability is required to attract investments and financing. The Public-Private Partnership Center of the Kyrgyz Republic is working to attract private companies through public-private partnership arrangements for key sectors of the economy.

4.2 Investment policies

The country generates 0.03% of the world's GHG emissions and estimates show that \$10 billion would be sufficient to implement both mitigation and adaptation measures (NDC Kyrgyzstan 2021). According to its NDCs, with international support, the Kyrgyz Republic remains committed to reducing its GHG emissions by 36.61% and 43.62% by 2025 and 2030, respectively (United Nations Climate Change, 2023). The NDCs also identified key areas for both mitigation and adaptation measures by indicating the amount of financial resources required (Table 3). As stipulated in the updated NDCs, the Kyrgyz Republic government aims to catalyze private investment in climate projects using public-private partnership schemes.

Table 3: Key Areas for Mitigation and Adaptation Measures in the Kyrgyz Republic

Mitigation measures (in USD million)		Adaptation measures (in USD million)	
Sectors	Financial resources	Sectors	Financial resources
Energy	7,155.807	Water resources	1,977.65
Industrial processes and products use	0.551	Agriculture	276
Agriculture	19.257	Energy	64.92
Forestry and other types of land use	63.007	Health	144.05
Waste	3.820	Reduction of climate emergency risks	309.90
		Forest and biodiversity	46.15
		Climate-resilient regions and green cities	12.65
		Improvement of adaptation reporting system	1.60
Total	7,242.442	Total	2,832.87

Source: United Nations Framework Convention on Climate Change (2023).

In 2021, the Kyrgyz Republic became a participant in the Global Methane Pledge; hence, it aligned its efforts with the objective of limiting global warming to 1.5° C by catalyzing action to reduce methane emissions. This commitment can create opportunities for foreign companies interested in investing in sectors including hydropower, energy efficiency, and methane abatement within the Kyrgyz

Republic. The Kyrgyz Republic has pledged to achieve net-zero carbon emissions by 2050, as outlined in the 2023 Climate Investment Statement for the Kyrgyz Republic; however, it has yet to unveil comprehensive policy measures to realize this ambitious goal.

The key investment regulatory instrument in the country is the investment law, which regulates the relationship between the state and investors and establishes the main principles of the country's approach to foreign investment. Under this law, the Kyrgyz Republic guarantees equal treatment to investors, while placing no limit on foreign ownership or control. It provides an open and liberal regime for FDI and includes guaranteed national treatment, expropriation protection, free repatriation, freedom of monetary transactions, legal stability, compliance with intellectual property rights, and access to international arbitration. In addition to this investment law, key laws regulate investment: licensing law, joint-stock company law, mining law, free economic zones, tax codes, land codes, customs codes, civil codes, forest codes, and water codes. There are no specific laws governing climate investments.

Several national framework documents and presidential decrees articulate the government's commitment to advancing a climate-resilient economy with specific targets. However, these documents lack explicit details on the tools and strategies aimed at enhancing the investment climate within the country. An illustrative example is the National Development Strategy of the Kyrgyz Republic for 2018–2040, outlining the government's overarching vision for long-term development. According to this strategy, the country aspires to cultivate a competitive economy by emphasizing the application of innovative and environmentally friendly technologies. Its ultimate goal is to foster a diversified, balanced, and inclusive economy, thus creating a favorable environment for investment.

The presidential decrees "On the protection of property and support for entrepreneurs and investors" from 29 January 2021 and "On measures to improve the management system in the field of investment and increase the investment potential of the Kyrgyz Republic" from March 10, 2022, are aimed at creating a favorable investment climate and incentives for foreign entrepreneurs to invest in the Kyrgyz Republic, outlining the provisions of constitutional guarantees for the protection of property, the stimulation of sustainable economic growth, the exclusion of unreasonable state interference in the economic activities of entrepreneurs, and an increase in investor confidence.

The National Investments Agency under the President is an execution entity that promotes foreign investment in the country. Additionally, numerous institutions, such as the Investment Council under the Cabinet of Ministers, the Institute of Business Ombudsman, and the International Business Council, are engaged in improving the dialogue between the authorities and the private sector, protecting the rights and interests of businesses from illegal actions of state bodies, local governments, and state enterprises.

The Kyrgyz Republic aims to create a carbon market and find new ways to boost climate change financing. For this purpose, the country plans to create a database of GHG emissions, publish information on fossil fuel subsidies and emissions, plan a voluntary carbon market, and explore options for a local carbon market trading system (Government of the Kyrgyz Republic – Development Finance Assessment, 2023).

4.3 Investment gaps and opportunities across the water, agriculture, and energy sectors

To enhance agricultural financing, the Kyrgyz Republic has proposed various financing strategies including scaling up agricultural value chain finance, improving agricultural insurance to deal with

climate change, introducing new risk transfer mechanisms, agricultural factoring, scaling up agricultural leasing, and green and climate bonds (DFA, 2023). These strategies are supported by the implementation of loans, leases, agricultural factoring credits, and crop insurance. These activities are expected to pique the interest of investors while providing substantial financing for the agricultural sector in line with climate commitments.

The Government of the Kyrgyz Republic has similar suggestions for the energy sector, aiming to enhance the transition of the country to a green economy. The suggested financing strategies include the introduction of green and climate bonds, carbon pricing, energy efficiency insurance, green loans, green venture capital funds, energy service companies, and green crowdfunding and equity crowdfunding.

Overall, the country's capacity to access donor funds should be enhanced. If financing continues to slow, the Kyrgyz Republic will be unable to meet its climate goals. Failure to secure external funding exacerbates the burden on the state budget for implementing climate targets. Thus, risk-management tools are necessary to avoid these discrepancies. Funding flows should be tracked and monitored at the national level for climate finance tracking purposes.

Climate change, disaster risk reduction, and green economy have one common characteristic: they can increase the synergetic effects and added value of donor-funded projects. Enhancing the effectiveness of climate finance necessitates better coordination and reporting among various stakeholders at all levels, including ministries, agencies, county-level government entities, international donor partners, and private sector stakeholders. As the energy, water, and agricultural sectors are interrelated, a lack of coordination in one sector may impact and jeopardize others. Further, improving farmers' access to climate and weather smart technologies is another important gap.

National financial stakeholders' limited awareness and knowledge regarding global climate-change agendas, including opportunities for information, tools, technical assistance, and project funding, must be addressed through comprehensive capacity-building activities.

Meteorological services should be enhanced, while information about hazard risks and climate change projections should be made accessible and easily understandable for the public to better plan for climate-affected sectors, such as agriculture and healthcare.

The regulatory framework is underdeveloped, as there are inconsistent implementation regulations and court orders in commercial transactions that do not align with international practices. Factors such as a complex bureaucracy, limited accessibility to decision-makers responsible for investment promotion, and frequent changes in leadership owing to political instability collectively erode investors' confidence in the country (US State Department, 2023b). The adoption of national framework documents such as the National Adaption Plan and the Low-Carbon Development Strategy will strengthen Kyrgyz Republic's positioning and capacity toward the Paris Agreement targets by creating a more convenient environment for investment inflow.

5. Overview of climate investment – Tajikistan

5.1 Investment landscape

Tajikistan, primarily an agrarian nation, relies on key economic sectors, such as agriculture (cotton and wheat), industry (including energy), and services. Its industrial sector encompasses mechanical

engineering, aluminum production, cement manufacturing, vegetable oil processing, mineral fertilizer production, textile and light industries, and energy and consumer goods manufacturing. Despite recent disruptions in its mining activities, the country remains rich in mineral deposits and it engages in gold extraction. Economic and geographical challenges include the region's remote and isolated nature, limited transport infrastructure, highly mountainous terrain, and lack of access to the sea, which contribute to a generally unfavorable position.

To cultivate a conducive investment and business climate and attract foreign investment throughout its period of independence, Tajikistan has implemented over 100 normative and legal acts. These include laws such as On the State's Support of Entrepreneurship, Investments, Foreign Economic Activity, Financial Rent (Leasing), Investment Agreements, Concessions, Free Economic Zones, and Public-Private Partnerships, among other regulatory measures. These laws are designed to legally safeguard investments, provide investors with fiscal and non-fiscal incentives, and facilitate their involvement in privatization initiatives and infrastructure development. Over the last five years, Tajikistan has received less than \$1 billion in FDI (UNCTAD, 2023), the smallest amount in the region.

The predominant share of FDI is channeled into the extractive sector, with the mining sector receiving 61% of the total FDI in 2018, a trend that persisted in subsequent years, including the pandemic period (OECD, 2022b). Substantial potential exists for expanding and diversifying investments, including FDI, particularly in sectors, such as agribusiness, tourism, and textiles. Given its position as a significant regional producer of fruits and vegetables, coupled with established expertise in cotton, grain, and silk production, the country holds potential for textile manufacturing aimed at both the CIS markets and beyond (UNCTAD, 2016).

The government consistently emphasizes the need to promote private-sector-led growth, giving priority to attracting investments in national development strategies, with a specific focus on industrialization, technological development, fintech, and advancing Tajikistan's agriculture and light industries along the value chain (US State Department, 2023c). Nevertheless, bureaucratic and financial obstacles compounded by numerous business and tax inspections adversely affect investor confidence in the country.

Over the last decade, Tajikistan has secured approximately \$450 million from international climate funds, supplemented by co-financing (CAREC, 2020). A comparable sum was also sourced from multilateral banks, including the European Bank for Reconstruction and Development, the World Bank, the Asian Development Bank, and others. These resources primarily targeted hydropower modernization, initiatives for greening agriculture, and other measures relevant to climate action. Notably, \$75 million was allocated for disaster-risk reduction and the modernization of climate observations. In total, climate-related development financing in Tajikistan during the past decade exceeded \$1 billion.

The global green investment market is divided into two main areas: the social green market (projects that consider the social process of housing financing, access to education, gender equality, and healthcare) and sustainable development financing (based on innovations in the green process and alignment with the SDGs). The country's banks can significantly contribute to the transition to a green economy by offering favorable loan conditions. As Tajikistan embraces the principles of a green economy and intends to attract foreign investments, a substantial requirement for domestic financing also prevails.

5.2 Investment policy

In line with its updated NDCs, Tajikistan remains dedicated to GHG-emission mitigation, targeting a reduction of up to 60% by 2030, contingent on significant international funding and technological support (United Nations Climate Change, 2023). The energy sector contributes 60% of the country's total GHG emissions, followed by the agricultural sector (35%).

The National Development Strategy of the Republic of Tajikistan by 2030, established in 2016, outlines economic development directions and measures to minimize the impact of climate change. It emphasizes the use of renewable energy sources, reducing transportation's environmental impact, fostering green employment, and supporting environmental entrepreneurship and services.

The National Strategy for Adaptation to Climate Change of the Republic of Tajikistan for the period up to 2030, adopted in 2019, aligns with the Paris Agreement's goals. Prioritizing energy, water, transport, and agriculture involves identifying risks, threats, and adaptive measures. This strategy details adaptive measures, financing mechanisms, and financing sources for key economic sectors.

With the development of the Green Economy Development Strategy in Tajikistan 2023–2037, sectoral programs are underway and are being financed annually from various sources. The estimated funding required for this strategy's implementation is \$2.1 billion, contributing to the gradual development of these sectors (Silk Road Briefing, 2022).

5.3 Investment gaps and opportunities across the water, agriculture, and energy sectors

Tajikistan adopted a comprehensive approach to climate action by seamlessly integrating climate resilience into its major infrastructure planning and local adaptation measures. Agricultural adaptation strategies encompass using greenhouses, cultivating frost and drought-resistant fruit tree varieties, and providing shelter for livestock to mitigate heat stress.

Despite its economic and population growth, Tajikistan has pledged to maintain its GHG emissions below 1990 levels, leveraging its reliance on hydropower to maintain its emissions among the lowest globally. The completion of the Rogun hydropower plant is poised to double the country's clean energy production. Although agriculture remains a significant emissions source for the country, Tajikistan has the lowest emissions per unit of agricultural production in Central Asia.

To unlock an economy's full potential and achieve inclusive growth, a transition to market-oriented resource allocation is imperative. Structural reforms that reduce the state's economic footprint, foster entrepreneurship, and enhance private sector development are key priorities. The recent enactment of the Law on Public Procurement, the Permit System Law, and amendments to the Law on Inspections of Business Entities' Activities signify positive steps toward good governance and a conducive business climate. The ongoing implementation of these measures is critical and complemented by expanded social safety nets to protect vulnerable populations.

Mitigating climate-related vulnerabilities in Tajikistan is pivotal for unlocking sustainable growth opportunities. Given a country's susceptibility to climate change and the imperative to curtail the environmental repercussions of rapid industrialization, climate reform stands as a linchpin for the economy's enduring potential. The Green Economy Development Strategy 2023–2037 delineates a comprehensive path toward greening the economy and attaining crucial mitigation and adaptation objectives.

Emphasizing adaptation measures is paramount for fortifying the resilience of climate-sensitive sectors and fostering sustainable and inclusive growth. To underpin this strategy, robust policy and institutional frameworks are essential, creating fiscal space for climate reforms, enhancing access to climate funding, and ensuring sufficient human capital and social protection. A concerted effort to implement these measures will be instrumental in leading Tajikistan toward a more climate-resilient and sustainable economic path.

In general, according to the OECD (2022b), there are a few initial actions that countries may benefit from to enhance their attractiveness. First, as investors find it difficult to locate information about investment opportunities in Tajikistan, it would be helpful to benefit from clearer branding as an investment destination through clear and consistent messaging by leveraging various digital platforms. Second, the country lacks a clear structure when it comes to mandates of relevant government stakeholders by streamlining and clarifying for investors their roles. The third issue concerns the country's limited resources to retain existing investors. Addressing this issue could help maintain good relationships with investors by offering logistical facilitation and aftercare services.

6. Overview of climate investment—Turkmenistan

6.1 Investment landscape

Turkmenistan is an upper-middle-income country in Central Asia; it has the second-highest GDP per capita in the region and 91% of its exports are mineral products, mainly gas, while 83% of its exports go to China. However, Turkmenistan has a complex investment environment that makes it difficult for investors to conduct investment programs (OECD, 2019).

In 2022, Turkmenistan secured the third position in Central Asia vis-à-vis FDI inflows, amassing \$936 million. The primary sectors attracting investments are the oil and gas, agriculture, and construction sectors. However, investments in sectors with considerable potential such as agriculture and education remain low. Consequently, the country grapples with deficiencies in productive capital, modern technology, technical expertise, and sector-specific experience.

Strategic capital controls on FDI persist, thereby impeding the initiation of new hydrocarbon projects against a backdrop of diminishing international investment. Government sources indicate that FDI constitutes approximately 20% of total investment. Notably, the volume of investment in Turkmenistan showed a commendable increase of 14.2% in 2022, which generated 4,000 new jobs.

Even though the economy's diversification and increased openness to FDI are fostered by the government, the measures to promote these strategies are executed in a fragmented manner, which affects the effectiveness of all efforts. Fostering accelerated economic development in Turkmenistan necessitates more than the intensive utilization of limited domestic resources. Addressing the challenges of innovative development is inherently challenging without tapping into external sources of financing.

Countries' climate-change investments originate predominantly from international sources in the form of grants or technical assistance. Over the past 10 years, Turkmenistan has implemented climate projects with a value of \$200 million from the Global Environment Facility and the Adaptation Fund, which includes \$20 million from state co-financing (CAREC, 2020). While international funds are mainly used for climate reporting, climate-policy development, and demonstration projects, Turkmenistan's government earmarked substantial state funding for clean energy, green cities, water, and afforestation projects.

The agriculture sector contributes almost 12% of the GDP, employs almost half of the population (CAREC, 2020), and is third in terms of the consumption of electricity produced in the country. Agriculture remains the primary consumer of water resources, accounting for 92% of the country's total water consumption by 2021. Agriculture creates the basis of food abundance in the country and is a source of raw materials for the processing industry, a source of employment for the rural population, and a factor affecting the state of the environment. GHG emissions in this sector account for 12.44% of the total emissions and are growing annually. Therefore, the development of innovative resource-saving technologies for the production of agricultural products that can reduce environmental pressure is a key task.

Attracting investments in the fixed capital of agriculture, which covers the construction and reconstruction of buildings and structures for industrial purposes include also the purchase of technical equipment, machinery, equipment, and other capital expenditures. Indubitably, all these costs modernize agriculture in line with the ongoing policy for agriculture's development, natural resources' rational use, and adaptation to climate change. Investments are directed by the state budget, funds of enterprises and organizations of state and non-state forms of ownership, and business structures. In reality, investments in agriculture's development are significantly larger because the agricultural sector's development is closely related to the protection and restoration of natural resources, measures to improve soil fertility and protection against desertification, and the rational use of water resources and other areas.

6.2 Investment policies

As part of the obligations to be fulfilled within the 1995 Framework Convention on Climate Change, the Turkmenistan government has stepped up its investment activities and made significant efforts to reduce GHG emissions. Current investment activities are built in accordance with the programs on socioeconomic development for 2012–2016 and 2019–2025, where priority financing was recognized for facilities that stipulated adaptation components for climate change processes. The electric power industry has been developing in a close relationship with the oil and gas sector and is fully supplied by gas. Therefore, the volume of investment in these sectors should be considered in parallel.

The investment policy initiated in the country's previous Strategic Development Programs has found its continuation in the new medium-term and long-term programs: the program of the President of Turkmenistan on the socio-economic development of the country for 2022–2028 and the long-term development program Revival of a New Era of a Powerful State: The National Program for the Socio-economic Development of Turkmenistan in 2022–2052. The adopted programs foresee significant investments in the modernization of the electric power industry in the coming years.

6.3 Investment gaps and opportunities across the water, agriculture, and energy sectors

Turkmenistan has created a political and legal framework for the implementation of sectoral climate policies in the form of strategic development programs, adopted laws, and a legal mechanism for the implementation of investment policy; significant funding is allocated for the implementation of planned measures. International development partners who also invest in innovative and intersectoral approaches facilitate the introduction of adaptation measures. However, not all areas of activity are involved in developing these sectors. There remain some areas that require large-scale investments, and their financing will significantly increase the effectiveness of adaptation measures and their innovative nature.

In all three sectors, a reserve remains to attract innovation and improve efficiency—i.e., investment in research. The Third National Communication of Turkmenistan, under the UN Framework Convention on Climate Change, noted the need to intensify scientific research to search for innovative adaptation measures (Ministry of Nature Protection of Turkmenistan, 2015).

An important area of research in agriculture is the salinity of lands and the development of methods for their purification. Investment in this area of research will support the development of science-based methods to prevent soil salinization and identify its causes. Additionally, the restoration of soil fertility can be combined with the large-scale production of organic fertilizers, such as vermicompost (biohumus), the technology of which is based on the processing of organic waste. Regarding organic waste, most of it comprises processed food products, raw food materials, and spoiled food residues. Therefore, studies and recommendations in the field of organic fertilizer concentrations in various types of soils, including sandy and semi-sandy soils, are of scientific interest. Further, the use of organic fertilizers is one way to reduce land degradation.

In Turkmenistan, where agriculture is highly dependent on irrigation, hydrometeorological observations and forecasting of water availability for the growing season are of decisive importance for making management decisions at the national, sectoral, and agricultural levels when compiling the water consumption quotas of velayats, etraps, and other types of farms. Because of climate variability, annual flows enter the country in different amounts; therefore, reliable forecasts are necessary to ensure that the agricultural sector is prepared to reduce the risks of losses from droughts and floods. A significant reduction in the number of observation stations, along with poor equipment in the remaining networks, has resulted in a lack of data and general deterioration in the quality of hydrometeorological services. Moreover, the technical capacity of hydrological forecasting, like the capacity of hydrometeorological institutions, has exhibited a general decline.

The main reasons for the deterioration of relevant meteorological services have been insufficient government funding for climate and hydrological observations and the lack of adapted weather and climate forecast models. Since the independence of Central Asian states, there has been no evident modernization of most hydrometeorological organizations in terms of observation techniques, data collection, and forecasting methods. Therefore, the technological modernization of hydrometeorological stations (posts) is an important area of investment that can equip them with remote monitoring capabilities using digital technologies, programs, and models for forecasting climatic and weather conditions.

Additionally, Turkmenistan has limited climate-change mitigation activities, including analysis and assessment of methane emissions. These assessments would provide data regarding and an understanding of ongoing processes as well as allow an assessment of their scale, along with facilitating the comprehension and identification of the most appropriate means to solve the problem. The preparation of joint project proposals to reduce emissions with the state corporations such as Turkmengaz and Turkmenneft along with the Ministry of Agriculture could be an important initial step to launch pilot activities for the reduction of methane emissions.

The next direction, which has not yet been developed, is the creation of a permanent GHG inventory system and its regulatory framework (instructions, reporting forms, etc.). In their work, the inventory system was based on institutional structures such as interdepartmental working groups and secondary legislation. New digital platforms with remote data entry and processing can be applied to develop this system.

7. Overview of climate investment—Uzbekistan

7.1 Investment landscape

Uzbekistan is a landlocked country with vast natural resources for the water, agriculture, and energy sectors. The government of Uzbekistan has been working to attract foreign investment in these sectors and promote economic growth and modernization. Historically, following a protectionist trade policy, Uzbekistan has embarked on a greater openness policy to trade since 2017, pushing for a country-wide economic reform agenda to improve the investment climate for both domestic and foreign investors. The current government has also prioritized economic diversification and moving value chains upward toward high-tech industries (OECD, 2019).

Uzbekistan has the potential to become a strong regional economy with a dynamic and entrepreneurial population (the largest in Central Asia) and a large potential consumer market (US State Department, 2023d). Although most FDI covered the oil, gas, and mining sectors in the past, following recent economic reforms, a trend toward increasing FDI in the manufacturing, production, and distribution of electricity, tourism, and banking sectors has been observed. This diversification is supported by improved state regulations and the recently started privatization program. Thus, the country can easily create unique investment opportunities across the water, agriculture, and energy sectors.

The government has made significant efforts to improve the country's business environment by implementing economic reforms, simplifying procedures, and reducing bureaucracy. The government has also offered investors various incentives and tax breaks to encourage investment.

The country is rich in water resources, with rivers and lakes covering more than 4% of the country's territory. However, water management is a major challenge because of the country's arid climate and irrigation-intensive agriculture. Thus, investment in water infrastructure, including irrigation systems and water treatment plants, is a government priority. Key investment trends in the water sector include public-private partnerships and foreign investment. The main challenge in this sector is achieving sustainable water use because Uzbekistan is one of the world's most water-stressed countries.

Agriculture is a key sector of the Uzbek economy, accounting for a significant portion of the GDP (27%) and employment (CAREC Institute, 2023). Accordingly, the government has prioritized investment in modernizing and diversifying the sector to increase productivity and export potential. Key investment trends in the agricultural sector include the adoption of new technologies and machinery, as well as the establishment of agribusiness partnerships. The main challenge in this sector is the need for greater investments in infrastructure, such as transportation and storage facilities, to improve efficiency and reduce waste.

Uzbekistan has substantial potential for renewable energy, particularly solar and wind power. Accordingly, the government is actively seeking foreign investment in the energy sector to diversify its energy mix and reduce its dependence on fossil fuels. Key investment trends involve the development of renewable energy projects and the modernization of the existing energy infrastructure. Uzbekistan has already attracted FDI to establish nearly 8,000 MW of solar and wind generation capacity by 2026, aiming to increase the share of renewables to 25% and reduce annual natural gas usage by 3 billion m³. The primary challenge in the energy sector is the imperative for a more favorable regulatory environment to stimulate investment and innovation (US State Department, 2023d).

7.2 Investment policies

Uzbekistan is committed to reducing specific GHG emissions per unit of GDP by 35% by 2030, compared with 2010 levels. This document clearly indicates the sectors that focus on mitigation and adaptation measures (Table 4).

Table 4: Climate-change Mitigation and Adaptation Measures in Uzbekistan

Priority sectors for mitigation measures	Priority sectors for adaptation measures
Sectors	Sectors
Energy	Water resources
Industrial processes and product usage	Agriculture
Agriculture	Energy
Forestry and other types of land use	Health
Waste	Reduction of climate emergency risks
	Forest and biodiversity
	Climate-resilient regions and green cities
	Improvement of the adaptation reporting system

Source: United Nations Climate Change (2023)

To execute these climate commitments, in the context of the latest government reforms, Uzbekistan issued several policies that identify the next steps in developing the water, agriculture, and energy sectors and highlight potential ways of attracting investments into them. Approved in October 2019, the Green Economy Transition Strategy for 2019–2030 focuses on the following goals.

- Decreasing GHG emissions per unit of GDP by 10%, compared with 2010 levels.
- Doubling energy efficiency indicators and reducing the carbon intensity of the GDP.
- Expanding renewable energy sources, covering more than 25% of the country’s total electricity generation.
- Increasing the energy efficiency of industrial enterprises by at least 20% and development of electrical vehicles.
- Introducing drip irrigation technology to an area of up to 1 million hm² and increasing the crop yield cultivated on it by 20–40%.
- Achieving a neutral balance of land degradation.
- Increasing the average productivity of the main types of agricultural food products by 20–25%.

Environmental and climate considerations are reflected in several policy papers, including the National Sustainable Development Goals, Environmental Protection Concept, Agricultural Development Strategy, Renewable Energy Plan, Municipal Solid Waste Policy, and Water Code. Currently, the government is working on a climate-change strategy for the next decade, which is expected to define concrete steps for executing climate commitments across sectors.

Uzbekistan is also drafting its National Adaptation Plan with the support of the United Nations Development Programme and the Green Climate Fund, which may provide a framework for new regulatory incentives in six priority sectors: agriculture, water resources, healthcare, biodiversity, energy-efficient housing, and emergency management (US State Department, 2023d).

7.3 Investments gaps and opportunities across the water, agriculture, and energy sectors

Despite government efforts to attract foreign investment, significant gaps remain in the water, agriculture, and energy sectors. These include:

- Lack of investment in water management and infrastructure, particularly in rural areas.
- Insufficient investment in modernizing agriculture, including the development of value chains and export-oriented crops.
- Limited investment in renewable energy projects owing to regulatory hurdles and a lack of government support.

Based on its NDCs, Uzbekistan aims to mobilize financial resources for several adaptation measures across the water, agriculture, and energy sectors. In terms of water management, these initiatives enhance the utilization of water resources and prevent additional salinization and land degradation (United Nations Climate Change, 2023). This involves the construction and reconstruction of hydraulic facilities, pumping stations, and reservoirs, as well as the upgrade, modernization, and automation of water-management facilities. The NDCs focus on the implementation of energy-efficient and water-saving technologies for crop irrigation, integration of information and communication technologies and innovations into water management practices, and enhancement of incentives for water conservation through the development of sustainable water management mechanisms.

In the agricultural sector, the key objectives include crop diversification (involving the expansion of perennial tree plantations and perennial grasses), along with crop reseeded to maintain a consistent coverage of arable land. The NDCs also focus on attracting investment in both production and processing and establishing robust value chains for agricultural and food products. Hence, the country would have to allocate an extra \$46.7 billion between 2023 and 2060 to cope with and mitigate the negative climate effects on labor productivity and the infrastructure (e.g., roads and bridges), livestock, and irrigation sectors (World Bank, 2023).

To address these gaps and needs in the energy sector, which will have positive spillover effects on other sectors, the Uzbekistan government is working to improve its investment climate and attract foreign investment. Key initiatives include the development of investment promotion agencies and the implementation of regulatory reforms to encourage private sector participation. For decarbonization purposes, the country will need over \$178 billion in investment between 2023 and 2060 (World Bank, 2023).

Although the government has succeeded in making significant changes to improve the country's business environment by implementing economic reforms, the regulatory environment in Uzbekistan remains complex, and bureaucratic procedures can be cumbersome, which can discourage investment. Additionally, Uzbekistan has been criticized for its lack of transparency, particularly in the energy sector (Bertelsmann Stiftung, 2022). This can create uncertainty for investors and complicate informed investment decisions. Another limitation is Uzbekistan's infrastructure, particularly in rural areas, which needs significant investment (United Nations Development Programme, 2020). This poses a challenge for investors, particularly those in the agricultural and energy sectors.

Investment in various areas could improve this situation. To this end, it is paramount to develop policies and regulations to promote the sustainable and efficient use of water, energy, and agricultural resources. For instance, water pricing is a powerful tool to encourage water

conservation and efficiency. By charging users for the amount of water they use, water pricing can help ensure that water is used wisely and that those who use more water pay more for it (Sustainable Sanitation and Water Management Toolbox, n.d.). Of course, this must consider the conditions of unprivileged citizens.

Sustainable agricultural practices, including crop rotation, cover cropping, and no-till farming, can be implemented to reduce the environmental impacts of agriculture (Mann et al., 2019; Nyong et al., 2007). By encouraging R&D, the government can improve the productivity and efficiency of water, energy, and agricultural systems, which can be accomplished via R&D centers.

8. Policy actions

As a near-term action, governments should allocate financing to reduce the risks for the energy, agriculture, and water sectors using protective measures such as dam safety against flooding. In the long term, nature-based solutions, including afforestation, could be launched. Relocating houses and other buildings is a costly solution; however, in the long run, it is likely to be less expensive and more effective than rebuilding every time a flood occurs (CAREC, 2020).

In the agricultural sector, countries should focus on financing farm-level measures, such as providing shelter for livestock and introducing greenhouses. Diversifying crops by cultivating more climate-resilient and drought-resistant crops is another crucial adaptive response. The introduction of agroforestry practices offers greater long-term protection. Similarly, rainwater collection and water conservation practices such as drip irrigation can improve the situation at the farm and household levels.

Countries in the region lack national climate action plans, which could better integrate intersectoral activities and climate investments into the decision-making and planning of diverse national stakeholders. Creating such documents could also help identify projects for financing that contribute to Central Asian countries' climate-aligned growth objectives and sustainable development plans. The absence of such a framework policy document makes it difficult to coordinate different countries' public agencies to provide due urgency to climate factors and allocate the necessary financing for needs considering climate change.

Better cooperation at the regional scale is also important for increasing investments in these sectors. Each country in the region has an investment-promoting agency that promotes and facilitates the inflow and execution of investment programs. The World Economic Forum (2023) emphasized the important role of these agencies in creating a business environment that is attractive for climate investment. To do so, four measures were suggested that would ultimately upscale climate investments (Table 5).

Table 5: Climate FDI Facilitation Measures

Measure 1	Measure 2	Measure 3	Measure 4
Align investment promotion agencies' strategies, key performance indicators, investment incentives, and de-risking	Create a database of domestic suppliers with sustainability dimensions and launch a supplier development program to help	Map multinational enterprises' climate commitments to investment opportunities in host economies and	Work with governments and stakeholders to potentially include climate FDI facilitation provisions in international investment agreements and

instruments to achieve climate goals.	domestic firms become more sustainable.	create a pipeline of endorsed and vetted climate-friendly investment projects that help such enterprises deliver on their commitments.	strengthen national frameworks.
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The first measure focuses on expediting climate investments by integrating investment promotion strategies and risk-reduction projects. Developing countries, including those in Central Asia, face challenges in luring and sustaining capital-intensive climate projects owing to heightened risks, limited subsidies, and complex financing conditions. Investment promotion agencies should prioritize easing and mitigating risks for climate FDI projects by identifying and addressing specific commercial, financial, technological, and political challenges. This involves defining climate FDI strategies, identifying priority sectors, aligning incentives, and establishing a robust investment–facilitation framework with measurable key performance indicators to gauge the success of attracting climate FDI.

The second measure aims to enhance the visibility of sustainable suppliers through online databases and implement programs to enhance companies' sustainability practices. Reliable supplier databases streamline the identification of potential suppliers for foreign and domestic firms, reduce transaction costs, and expedite market entry. These databases also assist investors in evaluating the quality of local suppliers, understanding market dynamics, managing supply chain risks, and accessing high-quality inputs. Beyond their practical benefits, supplier databases serve as promotional tools that increase the likelihood of attracting multinational investments by showcasing local sourcing opportunities. These databases' implementation involves a five-step approach: defining the inclusion criteria, identifying existing domestic firms, assessing compliance, collaborating with a technical partner for database development, and ensuring continuous improvement of both database and supplier development programs.

The third measure centers on creating a dynamic pipeline of sustainable projects viable for investment by multinational enterprises to advance countries' SDGs. Climate FDI faces information gaps, particularly in emerging markets. Investment promotion agencies can address this by cultivating and promoting investment projects ready to offer, thereby allowing multinational enterprises to fulfill climate commitments aligned with national climate goals. This process involves understanding multinational enterprises' climate commitments, identifying investors with aligned goals, developing a project pipeline based on specific criteria, creating vetted and endorsed promotional materials, and matching project opportunities with said enterprises to prioritize and promote them.

The fourth measure involves evaluating, revising, and creating international investment agreements with provisions specifically addressing FDI to promote climate-aligned initiatives. Considering the evolving global investment landscape and pressing need for climate action, aligning these agreements with sustainable development commitments is crucial. This process includes reviewing existing agreements to ensure that they allow sufficient policy space for climate regulation, establishing domestic working groups to share best practices for incorporating climate FDI provisions, and defining principles for harmonizing national and international frameworks to create a level playing field for climate FDI.

In addition to these measures to promote investments on a national scale, Central Asia's investment agencies could launch a platform for coordinating regional projects to attract regional investments with a focus on the water, agriculture, and energy sectors. This would not only facilitate regional climate finance but also provide an opportunity for exchanging knowledge and best practices and devising effective regional responses to existing and future challenges from an investment perspective. As climate challenges have a cascading effect irrespective of boundaries, this approach can be instrumental in directing more efficient efforts toward addressing climate change.

9. Conclusion

Central Asian countries share a common past and similar challenges regarding the water–agriculture–energy nexus. These sectors suffer from outdated infrastructure and require immediate modernization. As most of these sectors' infrastructure was built in the 1970s or earlier, its modernization is a primary regional challenge.

Another issue is these sectors' high vulnerability to climate change, exacerbated by the absence of sufficient adaptation measures. The higher the temperature in the region, the more challenges related to water availability, agricultural productivity, and energy consumption. Therefore, adaptive activities are crucial. Climate-related investments must be boosted across strategic sectors by increasing investments in adaptation activities.

To achieve the desired transition effectively and efficiently, using the available investment opportunities, coordinating policies should be enacted in these countries. Efficient national actions, combined with coordinated regional initiatives, can upscale financing for climate action and contribute to the region's sustainability.

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