Impact of the Afghan crisis on the environment, water and energy in Central Asian regions bordering Afghanistan

Recommendations for the OSCE

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The pronunciation and spelling of names for places, rivers, regions, cities, mountains depend on the common international and local traditions and other factors. In the course of history, renaming occurs, such as the change in Afghanistan from a republic to an emirate in 2021, but the previous or traditional names are used too. This publication uses a unified name spelling.

Photos: O. Shipin, G. Samoylov, L. Hislop, UNDP-GEF Project in Turkmenistan

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Introduction

Three Central Asian states — Tajikistan, Turkmenistan and Uzbekistan — border the northern regions of Afghanistan, where ethnic groups of Tajiks, Turkmens and Uzbeks live. These countries have developed cultural, historical and trade links with each other and are interested in stable cross-border and international relations.

The largest river of Central Asia, the Amu Darya, rises in the high mountains of Pamir and Hindu Kush in Tajikistan (Pamir River) and Afghanistan (Wakhan River) and flows for over 1 000 km along the Afghan border with Tajikistan, Uzbekistan and Turkmenistan. The shared water and natural resources of the Amu Darya basin, the river's function as a border, and joint transport and energy projects are among key factors in the development of relations.

Central Asian countries reacted differently to the change in power structure and balance in Afghanistan following the Taliban's take-over of Kabul in August 2021. Initially, many ties were severed and co-operation suspended. Later, representatives of the new de facto authorities of the "Islamic Emirate" of Afghanistan visited Uzbekistan and Turkmenistan, and representatives of Kazakhstan, Kyrgyzstan, Turkmenistan and Uzbekistan visited Kabul. Tajikistan refused to negotiate and did not recognize the new authorities in Afghanistan, while internationally the Taliban-led government remains unrecognized.

In the 1.5 years since the Taliban take-over, Central Asia countries have experienced no spill-over of insecurity or flow of refugees, but the 2022–2023 humanitarian situation in Afghanistan remains dire and armed extremist groups pose risks to security, while extreme weather and the country's isolation increases suffering.

Afghanistan shares borders with six countries. Like the Central Asian states, Afghanistan's other neighbours have links and influences, notably Pakistan, which shares the 2 640 km long border, promotes trade and supports Pashtun-speaking groups. Iran shares a 920 km border with Afghanistan, and is interested in security and co-ordinated management of the Helmand River water resources, support of Farsi-speaking and Shia groups and energy links. China has the shortest border with Afghanistan (75 km in the Wakhan Valley), but is actively developing its ties and presence, including industrial projects.

In July 2022, an international conference on Afghanistan was held in Tashkent to discuss options, plans and aid projects. In November 2022, the 10th "Herat Security Dialogue" was held in Dushanbe to discuss how to bring about an inclusive Afghan government. Central Asian countries continue to provide Afghanistan with electricity, food and humanitarian aid.

In addition to security risks emanating from Afghanistan, the southern regions of Central Asia bordering Afghanistan are vulnerable to natural disasters and the impacts of the changing climate such as glacial melt, mudslides, floods, dust storms, droughts and locust infestations, many of which originate in Afghanistan.

On top of the Afghan crisis, in 2022, Central Asia was indirectly affected by the conflict in Ukraine through rising food and rental prices, inflation, and job insecurity for migrant workers. Households in Tajikistan and Uzbekistan spend about half of their total income on food (according to data from the Agency on Statistics of Uzbekistan and the Central Bank of Uzbekistan), and their poorer people are particularly vulnerable to price hikes, the energy crisis and the impacts of climate change disasters.

Amu Darya River bank erosion and damaged household, Afghanistan

1. The Amu Darya River basin

The mountains of Afghanistan and Tajikistan are the location of the headwaters of the Amu Darya River, which flows through Uzbekistan and Turkmenistan and terminates in the Aral Sea or what is left of it. The Amu Darya is the largest river of Central Asia, with an average annual water flow of 62 km³. The catchment area of the Amu Darya basin is 500 000 km², and if all the areas with canals and smaller rivers are considered, the total extent is about 1 million km². The confluence of the Panj and Vakhsh Rivers forms the source of the Amu Darya. These two rivers provide 80 per cent of its total flow. The average elevation of the upper Amu Darya River basin is 3 500 m. There are frequent floods in the upper reaches of the Amu Darya and water shortages in the lower parts.

Irrigated lands in the Amu Darya basin cover 5 million hectares: 4 million ha in Turkmenistan and Uzbekistan and 1 million ha in Afghanistan and Tajikistan. The expansion of irrigated lands from the 1950s to the 1980s led to increased water withdrawals from the middle and lower parts of the Amu Darya and dramatically decreased flow in the lower and terminal parts of the river.

Afghanistan uses relatively little water from the Amu Darya directly, mainly relying on its domestic rivers. Years of war and of inadequate controls on resource use have degraded forests, pastures and water canals, but population growth continues. With high levels of poverty, depleted natural resources and inadequate infrastructure, the impacts of floods and droughts in Afghanistan can be catastrophic.

Field work in northern Afghanistan

Water is Central Asia's most valuable natural resource, since most of the population and economy of the southern regions depend on irrigation. The key problem is the significant loss of water due to leaks in canals and evaporation. After irrigating fields, the drainage run-off water either flows into deserts or back into rivers, leading to increased mineralization and pollution of fresh water.

Water losses related to irrigation remain high, many water canals and pipelines are in poor condition, while cold winters (including the 2022–2023 winter) demonstrate the increasing vulnerability of energy systems as populations and their demands grow.

In 2009–2010, under the Environment and Security (ENVSEC) Initiative, the OSCE participated in an ENVSEC assessment of the Amu Darya River, looking at the region's water challenges in the context of climate change, energy and food linkages.

In 2014–2016, jointly with international partners and Central Asian countries, the OSCE conducted an assessment of the links between climate change and security. The Tajik-Afghan and Turkmen-Afghan border areas — the southern regions of Central Asia — were flagged among areas of concern. Here, according to expert judgements and climate change projections, already high temperatures are expected to continue rising, precipitation may decrease and extreme weather events such as droughts, dust storms and pest outbreaks may lead to food insecurity. Options to reduce climate stress in this region are limited due to poor public awareness, lack of alternative income sources and technologies, and limited access to water and energy in remote areas.

Mountain areas are the most vulnerable to the impacts of natural disasters. This factor, combined with the rapid melting of snow and glaciers due to climate warming, increases the risk of mudslides and avalanches and the cost of repairing and maintaining socially and strategically important infrastructure: roads, power lines, water supply canals and pipelines.

These factors are compounded by the risks arising from the instability in Afghanistan and the difficulty of sharing water, weather and climate data and disaster warnings in the Amu Darya River basin.

Other factors are ecologically and economically valuable resources, as well as shared water resources, they include natural forests and pastures, migratory and endangered species of birds, fish and animals, medicinal plants and crop wild relatives. There are several nature reserves, national parks and state forestry areas near the borders to protect rare species of flora, fauna and ecosystems, and the Amu Darya River itself includes important sections of floodplain forests *(tugai)* and habitats for unique fish. Rational use of nature and restoration of degraded forests and pastures can reduce poverty, create additional sources of income for the population and increase resilience to the impacts of climate change. This paper provides specific recommendations.

1.1. Afghanistan

Afghanistan's National Statistics and Information Authority (NSIA) estimates the 2022 population at 34 million people. Eight provinces *(velayats)* of Afghanistan — Herat, Badghis, Faryab, Jawzjan, Balkh, Kunduz, Takhar and Badakhshan — border Central Asian countries. Another four provinces are close to the borders and are economically and culturally linked — Saripul, Samangan, Baghlan and Panjsher. These 12 provinces are home to 12 million people.

The country's population is growing by 2.5–3.0 per cent or 1 million people per year. Almost half of the population (16 million or 48 per cent) are children under the age of 15; 70 per cent of the population (24 million) live in rural areas. The suspension of many international projects in 2021 increased the number of people in need, and more than half of the country's population (20 million people) rely on humanitarian and food aid. The cold winter of 2022–2023 added to the extra burden for the poor. Estimates of the number of refugees, displaced persons and temporary Afghan residents in Tajikistan and Uzbekistan vary over time and by source, but come to around 10 000 in each country.

About half of Afghanistan's population is illiterate (cannot read and write). Girls have fewer opportunities for education: in 2021 they made up 30–45 per cent of students in the country's northern provinces, and only half that in the southern provinces. The situation of girls' and women's rights has deteriorated under the Taliban. Women's livelihoods and freedom of movement have been curtailed, thus increasing their vulnerability to natural hazards and food insecurity.

Afghanistan differs from its Central Asian neighbours in terms of private land ownership and the involvement of local authorities and communities in modern and traditional methods of water and land management. Before the Taliban, thanks to international exchange and support, Afghanistan was making good progress in data digitization, use of cartographic and statistical data, water basin management plans and solar energy deployment. Another feature of Afghanistan is decentralization.

The arrival of the Taliban upset the balance of power and ethnic group representation, while some experienced professionals and managers left the country. In general, the structure and mandates of ministries and agencies were preserved and continue to function.

Afghanistan's power system generates 1–1.3 billion kWh of electricity annually, with 80 per cent from hydropower. Between 2019 and 2021, solar power generation tripled from 20 to 60 million kWh, mainly in Kandahar and Herat provinces. Solar power generation has reached parity with diesel power and continues to grow due to the expansion of pumped irrigation and the energy needs of local businesses, households, hospitals and schools. The country is highly dependent on electricity imports from Central Asian countries, which provide 80 per cent (3.5 billion kWh) of its electricity demand. Due to low domestic generation and import capacities and a lack of transmission lines, businesses and people in Afghanistan continue to live with severe power shortages.

Afghanistan imports about 1.5 million tonnes of petroleum products (petrol, diesel) and 500 000–700 000 tonnes of liquefied petroleum gas annually, totalling $1 billion. Afghanistan's exports, valued at $800 million per year on average for the period 2019–2021, are dominated by fresh and dried fruits, nuts, vegetables and medicinal plants (70 per cent of the country's total exports), with the main export destinations being Pakistan, India and the United Arab Emirates. The volume of food imports exceeds $2 billion annually.

Imports from Turkmenistan and Uzbekistan amount to $350–$650 million each, imports from Tajikistan $85–$100 million, mainly consisting of energy and goods. Kazakhstan has no border with Afghanistan, but is the country's main source of grain and flour (2 million tonnes) and equals or exceeds other Central Asian countries in terms of import volumes ($650 million). Mirror import-export and trade statistics vary by country and source, but generally fall within these values.

In 2019–2021, Afghanistan's wheat crop decreased from 2.5 to 2.0 million hectares (partly due to drought conditions), while areas under onion-growing, vegetables and orchards increased. Domestic wheat production reaches 5–6 million tonnes per year, including 1.5–2.0 million tonnes in the northern regions. To meet domestic consumption needs, Afghanistan imports 2.5 million tonnes of wheat and cereals. Crop and pasture productivity in Afghanistan is influenced by weather conditions and pests. In 2022, compared to 2021, the area treated with agrochemicals against locusts decreased from 60 000 ha to 20 000 ha due to lack of funding.

Irrigated fields of cotton total 50 000–55 000 ha annually, half of which are in the northern provinces of Balkh and Kunduz. They produce 73 000–77 000 tonnes of cotton for export worth $30–45 million.

The Taliban has banned poppy cultivation, but the lack of alternatives and the high profitability is pushing farmers and middlemen into illicit business. According to United Nations Office on Drugs and Crime (UNODC) data for 2022, poppy cultivation in Afghanistan, mainly in the south-west provinces, increased by 30 per cent to a total of 233 000 ha, and generates income of $1 billion at the farm gate.

Infighting and killing in Afghanistan decreased with the power takeover by the Taliban and the withdrawal of NATO and ISAF forces, but attacks on people associated with the former government, Shia groups and sites, and pressures on resistance groups (Panjsher Valley) increased. In 2021, the defence and public security budget accounted for 50 per cent of the country's expenditures. Both the security forces and the budget had previously been heavily supported by international donors, but in 2022 all support ceased, except for humanitarian projects.

The border security situation in 2021–2022 along the Panj and Amu Darya rivers and other Afghan borders with Central Asia was generally stable, with few incidents of shelling and crossings (by comparison, the border conflict in the Vorukh area between Tajikistan and Kyrgyzstan during the same period was bloodier — at least 150 people killed and wounded). The Regional Risk and Resilience Assessment conducted by the World Bank for the border regions of Central Asia and Afghanistan in the period from September 2020 to June 2021 indicates that Afghanistan does not pose a significant security threat to the region. There were no mass movements of Afghan refugees across the border to Central Asia, except in the autumn of 2021.

Socio-economic situation in Afghanistan

Population

34 million people

12 million people live in the northern regions

Food supply

Grain production 5-6 million tonnes

Grain imports 2-2.5 million tonnes

Water and energy availability

20 million people need food aid

Energy

Production: 1 billion kWh

Import: 3.5 billion kWh

Solar energy use

Power supply deficit and interruptions

Social problems and risks

Restricted freedoms of women

Illegal poppy production and trafficking

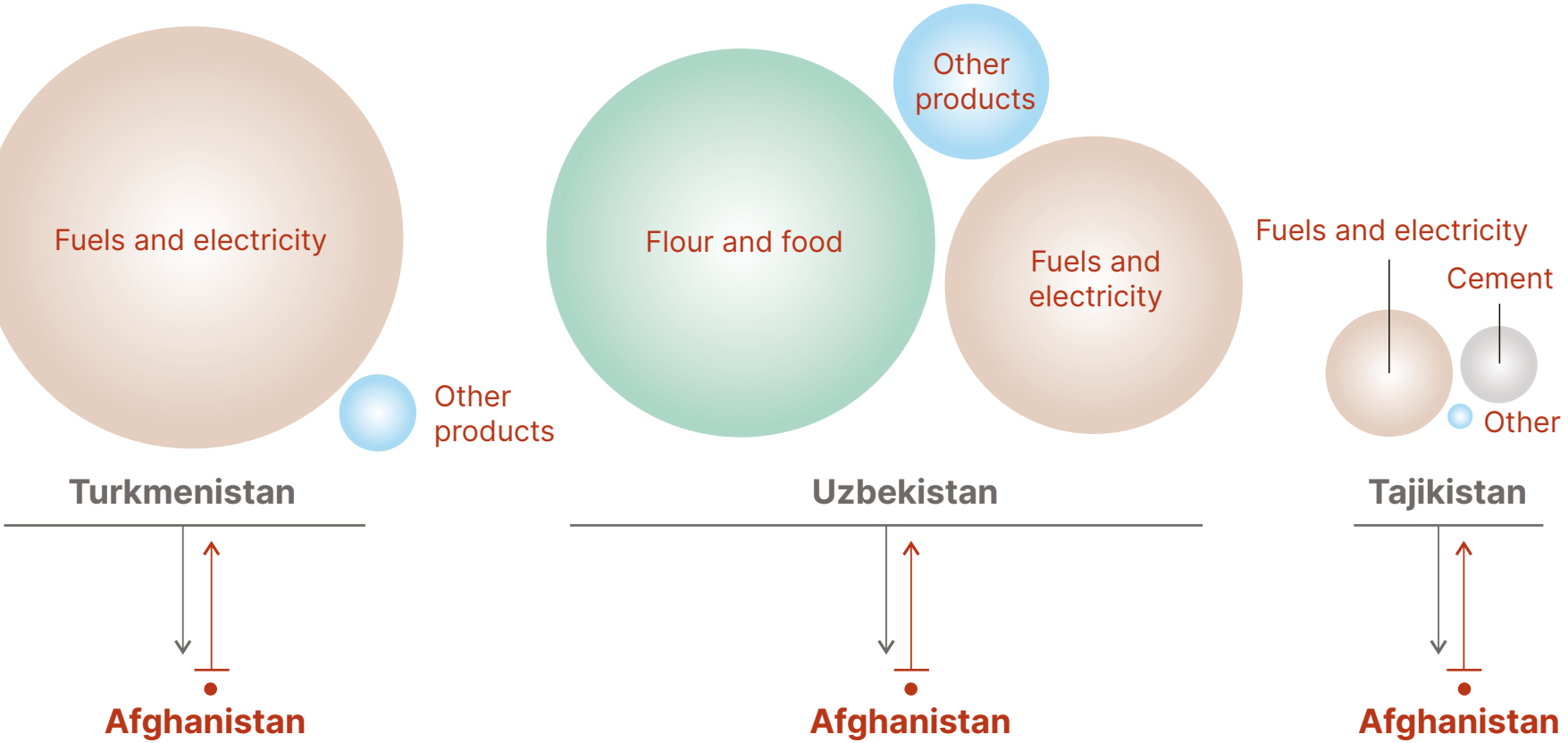
Poverty and weak education

Impact of harsh winters and natural disasters on households

Impacts of droughts and water scarcity on the economy and population

Exports of goods; trade and economic links between Central Asia and Afghanistan

The size of circles reflects the volume of the exported products



1.2. Tajikistan

Among Central Asian countries, Tajikistan has the longest border with Afghanistan — 1 374 km, including 1 184 km along the Panj and Amu Darya River and Lake Zorkul, and 190 km in the Pamir high mountain desert. There are seven border crossings on the Tajik-Afghan border: Ishkashim, Tem (Khorog), Ruzvay (Darvaz), Kokul, Khumrogi, Shohon and Panji Poyen — with the latter being the most important for international traffic. To protect this long and complex border, units of the Russian 201st Military Base are stationed in Tajikistan in the cities of Kulob, Bokhtar (former Kurgan Tube) and Dushanbe. International organizations, neighbouring and other states provide technical assistance to secure the Tajik-Afghan border.

Tajikistan's gross domestic product (GDP) of in 2022 amounted to $11 billion, or about $1 000 per capita. Agriculture and industry contribute about 20 per cent to GDP, while services account for 50 per cent. The majority of the population is rural and works in the agriculture sector. About 1 million people work and live abroad as migrant workers. Over the last 10 years, the poverty rate has fallen by 10 per cent and now stands at 26 per cent of the population. The country's population is growing by 2 per cent per year and during the 30 years of independence (from 1991 to 2022), the number of residents has doubled to 10 million.

About 85 per cent of Tajikistan's population use safe water sources, but access to water services remains low (55 per cent). Energy and water provision during the cold season is limited due to rapid population growth, insufficient water and energy capacities, and equipment wear and tear.

Statistically the entire population of the country has access to electricity, but during the cold season, areas outside of Dushanbe, Khujand and mountain areas served by the Pamir Energy grid receive only a limited electricity supply (in 2022 energy limits were imposed mainly at night). This electricity rationing and deficit that has lasted for years is a source of stress for women, who have to cook, wash and clean their homes and run households using the narrow time slots when electricity is available. Many rural schools do not have electricity in winter, which affects the learning process. With the onset of cold weather, people are forced to cut down trees for firewood or burn coal or dung, causing local air pollution and harming their families' health. The lack of electricity is affecting small businesses too, making it impossible to operate shops and refrigerators to store food for local sales or exports.

The authorities and the population hope that the commissioning of the large Rogun hydropower plant will cut the energy deficit after 2030. The current total capacity of the country's power plants is 6 GW, of which the share of hydropower is 93 per cent (it was as high as 98 per cent seven years ago, before the commissioning of the coal-fired plants). As a result, Tajikistan is the lowest greenhouse gas emitter of the region and one of the lowest in the world. In 2022, with international support, the first solar power plant with a capacity of 180 kW was installed in the Murghab district — the area of the country with the highest elevation, lowest population and the greatest energy deficiency.

Nurek Reservoir and hydropower station, Tajikistan

The cost of electricity supply for the population is cheap — less than 3 cents/kWh — but the country's energy system has high losses (20 per cent) and massive debts due to poor energy metering, outdated infrastructure, problematic tariffs and payments. On the other hand, fuel prices in Tajikistan — LPG, petrol and kerosene — are the highest in Central Asia. Fossil fuel supplies come mainly from Russia and Kazakhstan.

Due to electricity shortages, interruptions in gas supply and the high cost of fuels, coal production and consumption have increased to two million tonnes in the last 10 years. Growth in cement production and the commissioning of coal-fired energy plans have contributed to the increased use of coal in the energy sector and in the economy as a whole. In the past, Tajikistan was a cement importer. By 2020, cement production in the country had increased to 3.5 million tonnes with export capacity of 1 million tonnes, mainly to Uzbekistan (500 000 tonnes) and Afghanistan (400 000 tonnes).

Tajikistan, like other Central Asian countries, exports electricity to Afghanistan, using 220 kW and 110 kW lines. In 2021–2022, Afghanistan faced difficulties paying for Tajik energy due to international sanctions against the Taliban and banking restrictions caused by the conflict in Ukraine and the related Russian sanctions. Some of the Tajik electricity is exported to Uzbekistan. Annual electricity exports reach 2.5 billion kWh or about 10 per cent of the country's total generation, with plans to expand the export capacity to 10 billion kWh.

The CASA-1000 project, which links the energy systems of Kyrgyzstan, Tajikistan, Afghanistan and Pakistan, is nearing completion. The necessary infrastructure in three of the four countries is expected to be ready in 2023. At the same time, options are being explored to resume construction in Afghanistan in 2024, which could eventually receive $50 million/year thanks to electricity transit through CASA-1000. In addition, targeted support to communities along the CASA-1000 route will contribute to local development and cooperative attitudes.

International donors play an important role in Tajikistan's development, including improvements in water, energy and transport systems, disaster risk reduction, climate change, modernization of hydrometeorological services and nature conservation efforts. In Afghanistan, donors have helped build bridges to promote trade and improve access to remote mountain areas, and are supporting projects to improve border security. They previously supported co-operation between Tajikistan and Afghanistan on water, hydrology, environment and natural disasters. Many of these ties and co-operation areas were suspended after the Taliban takeover.

Tajik agriculture produces 1.6 million tonnes of cereal, 3 million tonnes of fruit, vegetables and grapes, and 1 million tonnes of potatoes annually. The country imports 1 million tonnes of wheat and flour from Kazakhstan to meet its domestic consumption needs. The total area under cultivation is 860 000 ha; the area under secondary sowing or cultivation is 200 000 ha. Part of the arable land is unused due to soil degradation. Some agricultural products are exported to Afghanistan for sale and supplied as part of humanitarian aid.

Two provinces of the Republic of Tajikistan border Afghanistan: Khatlon Region and Gorno-Badakhshan Autonomous Region (GBAO).

Natural disasters — floods, mudslides, avalanches, rock falls, heavy rains and strong winds — occur annually in the Khatlon and GBAO regions, causing significant damage. In 2021, Afghan refugees came to temporary shelters installed in both provinces. In 2022, Tajikistan continued strengthening and rebuilding roads and bridges destroyed by disasters, improving an early warning system for the Sarez Lake and establishing rescue centres and warehouses for potentially displaced people and refugees in the border areas on the Panj River.

Socio-economic situation in Tajikistan

Population

10 million people

3 million people live in the southern regions

Food supply

Grain production

1.6 million tonnes

Grain imports

1 million tonnes

Water and energy availability

Limited access to water supply and sanitation

Energy

Electricity

Production

21 billion kWh

Export

2.5 billion kWh

Increased use of coal

Limited power supply in the cold season

Social problems and risks

Increased burden on women due to labour migration of men

Low cost of electricity, high cost of fuels

Border conflicts

Impact of natural disasters on water and energy infrastructure

Poverty and limited social protection

Khatlon Region

The Khatlon Region occupies 24 000 km² and has a population of 3.5 million people; the length of the border with Afghanistan along the Panj and Amu Darya rivers from Dashti-Jum to Ayvaj is 420 km. Two free economic zones have been established: "Panj", near the border with Afghanistan, and "Danghara", near the city of Danghara, with enterprises for processing cotton, oil and agricultural products.

A section of the Vakhsh River in the Khatlon Region features a cascade of hydropower plants capable of generating 15–18 billion kWh annually or 90 per cent of the country's total electricity production. Although Khatlon is the centre of power generation in the country, in wintertime the local rural population receives only limited electricity supply.

The area under agricultural crops and orchards in the Khatlon Region is 425 000 ha, of which 227 000 ha are irrigated. The region produces 70 per cent of the country's cotton, 60 per cent of cereals, 55 per cent of vegetables, 50 per cent of meat and milk. The main export products are cotton, onions, lemons and fresh and dried fruits and vegetables. In 2022, 80 000 ha of agricultural lands were treated with agrochemicals for locust control.

The water supply to the population of the Khatlon Region, including those living near the Panj and Vakhsh rivers, is limited. Most of the population (80 per cent) uses water from open sources — rivers and irrigation canals — and wells. More than half the local water pipelines do not meet sanitary requirements — they are worn out, and water treatment and disinfection systems are absent.

The impact of the Afghan crisis on the region's water resources is not obvious, but flooding in the Panj River sometimes causes damage to crops and infrastructure, particularly in the Hamadoni District. Co-ordination of riverbank protection works and flood control measures on both the Tajik and Afghan sides of the river is important.

Gorno-Badakhshan Autonomous Oblast

The GBAO Region covers all of eastern Tajikistan, 45 per cent of the country, with a population of 225 000. The administrative centre is Khorog city. Almost the entire local population lives in the intermountain valleys. The contribution of the local economy to the volume of production of the country for industry is just 1 per cent, for energy 2 per cent. The population is engaged in agriculture and farming — vegetables, fruits, livestock. The poverty level in the areas close to Afghanistan (Ishkashim, Darwaz) is twice as high as the country's average, and prices of fuel and food, except locally produced meat, are higher than in the rest of the country. The transboundary Panj River has vast hydropower potential, but only small hydropower plants are installed and operated within domestic rivers of Tajikistan and Afghanistan.

The border between the GBAO and Afghanistan's Badakhshan Province is 950 km long, running along the Panj River and the Pamir high mountain desert. Under the Taliban, these hard-to-patrol sections of Afghanistan have become less secure and the presence of various armed groups has increased. In the GBAO, too, the internal security situation is sometimes complex (in May 2022, more than 30 people were killed and injured). Small populations of the Afghan and Tajik Badakhshan living in large mountainous areas are affected by natural disasters, poverty and local skirmishes. On the other hand, humanitarian and educational projects, development of roads, small-scale hydropower and trade help to reduce tensions, while nature conservation measures — forest planting, conservation of rare emblematic species and nature-based disaster risk reduction — help build the resilience of local communities and incomes.

1.3. Turkmenistan

In 2022, Turkmenistan conducted a census, but its results and population statistics were not available at the time of this study. According to UN estimates, the country's population is 6.2 million.

Turkmenistan has the largest natural gas reserves in Central Asia and, according to BP estimates, the fourth largest in the world. Gas-fired power plants produce 100 per cent of the country's electricity, natural gas is available to nearly all residents, and energy prices are the lowest in the region. In 2019, natural gas production was 70 billion m³/year, half of which was used for domestic consumption and half exported. The energy sector accounts for 80 per cent of the country's exports, supplying natural gas to China and electricity and oil products to Uzbekistan and neighbouring countries. For about twenty years, Turkmenistan has been supplying electricity to the northern and western provinces of Afghanistan (1.7 billion kWh/year recently) and helping to expand their power grids. In January 2021, the 150 km Kerki-Sheberghan high voltage power transmission line was commissioned by the Presidents of both countries.

The prospective Turkmenistan-Afghanistan-Pakistan-India (TAPI) mega-project, a 1 840 km gas pipeline with a capacity of 33 billion m³/year, was launched in 2015 and completed on the territory of Turkmenistan, but progress has been slow due to land acquisition and security issues in the 800 km long Afghan section. If the pipeline is built, Turkmenistan will have a new gas export route, while Afghanistan will receive annual transit fees estimated at $300–400 million and be able to buy gas for its own needs. Another mega-project, the Turkmenistan-Afghanistan-Pakistan (TAP) high-voltage transmission line, was launched in 2018, but its progress, too, is slow as it is linked to the TAPI route.

Turkmenistan has 7 GW of installed power capacity and produces 25 billion kWh of electricity annually, 15 per cent of which is exported to neighbouring countries, including to Afghanistan. Solar and wind energy is not used, but in December 2020, the Head of State signed the National Strategy for the Development of Renewable Energy to 2030 and in March 2021, the Law on Renewable Energies came into force. As follow-up, in November 2022, Turkmenistan and the United Arab Emirates, represented by Turkmenenergo and Masdar, signed an agreement to build a 100 MW solar power plant. Country-wide modernization of the power network is underway to address energy losses in the power grid and keep the voltage stable in adverse weather.

In October 2017, in Ashgabat, five countries — Turkmenistan, Azerbaijan, Georgia, Turkey and Afghanistan — agreed on the Lapis Lazuli transit, trade and transport route at the Regional Economic Co-operation Conference on Afghanistan (RECCA). Turkmenistan, as the first transit country in this route, has made a significant contribution to the development and integration of Afghanistan into the transport and logistics of this corridor through the construction of the Kerki-Imamnazar-Akin-Andkhoy railway and modernization of the Serhetabat-Turgundi railway, with the prospect of extending this railway to Herat.

Every day, 70 railway wagons and 160 trucks carrying oil products, LPG, wheat, flour and other goods pass through the Imamnazar-Akina and Serhetabat-Turgundi terminals. In Serkhetabad, an elevator is planned in co-operation with Kazakhstan to store 100 000 tonnes of wheat for export to Afghanistan. In 2022–2023, the importance of the North-South route from Russia via Kazakhstan, Azerbaijan and Turkmenistan to the ports of Iran and further to India

has increased with the intensity of negotiations and investment plans. The advancement of this route and the parallel development of the Lapis Lazuli corridor, construction of the Mazar-e-Sharif-Kabul-Peshawar railway, planned gas pipelines and power lines, increases the importance of Turkmenistan and Afghanistan as transit and connection hubs.

In Turkmenistan's agriculture system, state orders and fixed prices are applied to the main agricultural crops, cotton and wheat. Water resources are managed top-down by administrative units, which sometimes leads to local water shortages.

The rural population lives mainly on subsistence agriculture, while some work as labour migrants in the cities of Turkmenistan and Turkey. The level of poverty in the country is low (poverty statistics are not available, but for 2021 the ADB estimated that the proportion of the employed population below $1.90 a day was 0.5 per cent) and the lack of income is compensated by the state support system.

About 80% of Turkmenistan is affected by dust and sandstorms, which annually cause an estimated $350 million in economic losses and damages. To solve this problem, actions to combat desertification, establish forests, shelterbelts and urban green spaces are being systematically implemented.

The urban population receives water from centralized water supply systems 24 hours a day, but in rural areas water is available for only a few hours a day. In the irrigation water supply, the authorities prioritize crops ordered by the State — cotton and wheat.

The main sources of water for the southern regions of Turkmenistan are the Amu Darya and the Karakum Canal (Garagumdarya), which is fed by the Amu Darya, with a flow capacity 500 m^3/s and a length of 1 400 km. Most settlements are located in the oases along this river and the irrigation canals.

Another source of water is the Murgab River, with sources in the mountains of Afghanistan, flowing south to north. Of its total length of 850 km, 350 km is in Turkmenistan's Mary Province, with an average discharge of 52 m^3/sec at Takhtabazar and peak water flows at 350–600 m^3/sec in spring. The river is fed by snowmelt and rainfall in the mountains. Near the city of Mary, the waters of the Murgab mix with those of the Karakum Darya Canal. Due to drought conditions in 2021–2022, the surface area of the Sary-Yazi reservoir in the upper Murgab was one third to one half its usual size. Conversely, in spring 2019, heavy rainfall in southern Turkmenistan led to devastating mudslides and the complete filling of this reservoir. In January 2023, a cold snap killed hundreds of cattle, while extensive ice formation on rivers and canals constrained rural water supply.

Two provinces (velayats) of Turkmenistan border Afghanistan – Lebap and Mary.

Socio-economic situation in Turkmenistan

Population

6.5 million people

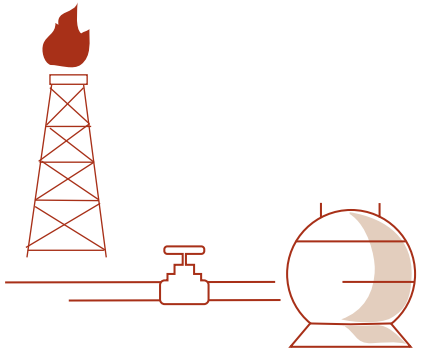
3 million people live in the southern regions

Energy

Electricity

Production: 25 billion kWh

Export: 4 billion kWh

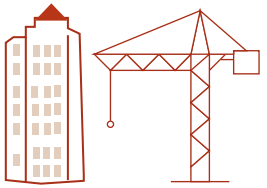


Major producer and exporter of natural gas

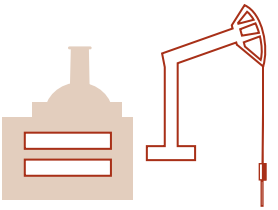
Main sectors of the economy

Cotton and grain production

Other types of agricultural products



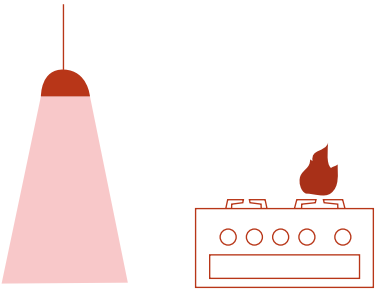
Construction and building materials



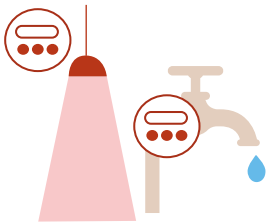
Petrochemical industry

Textiles, carpets and other products

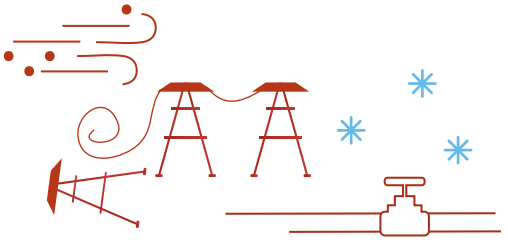
Access to water and energy



All population is connected to natural gas and electricity



Low cost of water and energy, poor metering



Impact of extreme weather on water and energy supply systems

Lebap

Lebap, with an administrative centre in Turkmenabat and a population of 1.4 million, occupies an area of 93 000 km². The border with Afghanistan runs along the Amu Darya River for 80 km, and in the desert for another 150 km. Lebap produces 70 per cent of the country's rice, 40 per cent of its gas, 25 per cent of its cotton, wheat and potatoes. Lebap's power plant produces 100 million kWh of electricity a month, which is used domestically and exported to Afghanistan.

Over the past 2–3 years, the region has experienced several extreme weather events. A strong wind in the spring of 2020 blew off roofs, felled trees and damaged power lines. Locust infestations were observed in the spring-summer of 2020 in Koytendag, Charshangy, and Dostlyk. In July 2021, Turkmenabat recorded one of the highest temperatures in the history of local weather observations +45.8 °C, while in January 2023 one of the lowest temperatures at –25.4 °C.

In view of the growing local impacts of climate change, seminars and consultations are conducted for local authorities and populations to reduce losses and damages from extreme weather.

Mary

With a population of 1.5 million, Mary occupies and area of 87 000 km². Its administrative centre is in Mary, and the border with Afghanistan stretches through mountains and deserts for about 500 km. Industry includes natural gas, fertilizer and electricity production, wool and carpet factories, and a sugar plant.

Mary's power plants, with a total capacity of 3 500 MW produce half of the country's electricity, as well as exports to Afghanistan and, prospectively, to Pakistan.

The irrigated area is 438 000 ha, with cotton and wheat as the main crops. The average farm size is 5–10 ha with yields 1 500–2 000 kg/ha. The increased salinity of soils, the uneven surface of the irrigated fields and lack of water reduce crop yields and limit options for more efficient land use, as well as reduced incomes for households, dependent on their kitchen gardens.

The summer of 2021–2022 featured high temperatures and elevated soil dryness, resulting in reduced crop yields and increased soil salinity. In January 2023, record low temperatures at –27 °C in Serkhetabad and a series of cold waves affected the stability of water, gas, and electricity production and supply. Hydrate clogging formed in the pipelines of the Galkynyysh Gas Field, interrupting gas exports from Turkmenistan.

1.4. Uzbekistan

The population of Uzbekistan reached 36 million in early 2023. The number of poor and vulnerable people is estimated at 12–15 per cent (4–5 million people). Migrant workers abroad transfer $5–7 billion in remittances annually, according to the Central Bank of Uzbekistan. The amount of remittances received in Uzbekistan in 2022 is estimated at a record high $17 billion — this is related to the conflict in Ukraine through "parallel import" transactions via Uzbekistan. Up to 80 per cent of all remittances come from Russia, so the economic situation there affects household incomes in Uzbekistan.

In 2023, Uzbekistan's ministries and state committees were reorganized: a new Ministry of Ecology, Environmental Protection and Climate Change was created on the basis of the (former) State Committee for Environmental Protection and UzHydromet. Previously, Uzbekistan had launched a National Strategy for Transition to a Green Economy 2030, a Green Economy Council and reforms in the energy sector. Plans for a gradual increase in domestic gas and electricity prices were delayed by the impacts of the pandemic and the winter energy crisis. Agreements have been signed with international banks and energy companies for renewable energy development. It is envisaged that solar and wind power capacity will reach 13 GW by 2030. The current capacity of all power plants in Uzbekistan is 13 GW, with the natural gas contribution at 85 per cent. Over the last five years, 2017–2022, total power generation in Uzbekistan has increased from 60 to 74 billion kWh/year. In 2022, the country's power capacity increased by 1.5 GW.

In 2022, Uzbekistan agreed to supply 2 billion kWh of electricity to Afghanistan, but during the autumn and winter, gas shortages and blackouts caused interruptions of energy supplies both to Afghanistan and domestically in Uzbekistan, affecting businesses, transport, schools, greenhouses and the quality of life in both countries. Export potential will increase to 6 billion kWh after completion of energy expansion plans.

Uzbekistan is a major water user in the Amu Darya basin and is preoccupied by the social and environmental challenges of the Aral Sea. Less than 10 per cent of irrigated land is equipped with water-saving technologies. The Government is taking measures to save water, and farmers are adopting crop rotation, growing drought-tolerant crops, orchards with drip irrigation, greenhouses and plant shelterbelts. Every year, up to 50 000 ha of tree plantations are added to restore the landscape, combat desertification and reduce the impact of dust storms in the Aral Sea region and around densely populated areas.

Uzbekistan is developing socially and economically important projects with Afghanistan: the 260 km Surkhan-Puli-Khumri power transmission line, which will double electricity export capacities; technical and economic planning of the 600 km Termez-Mazar-e-Sharif-Kabul-Peshawar railway and training for Afghan students in railway professions in Termez; and the restoration of Mazar-e-Sharif airport. In 2021–2022, to reduce the impacts of the Afghan crisis, Uzbekistan sent humanitarian aid — food, medicines, clothing and fuels.

Surkhandarya Region

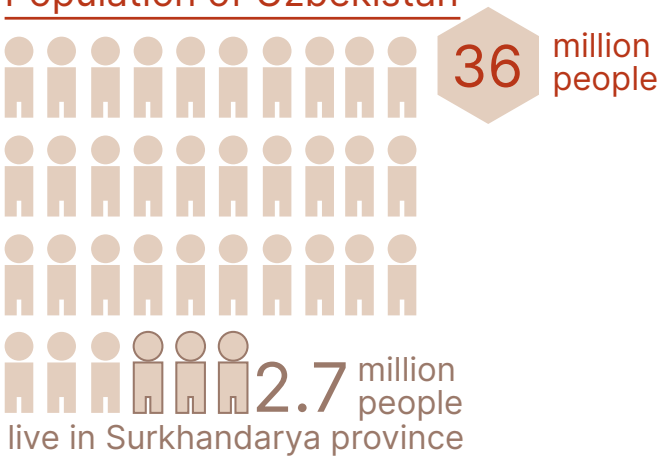
With an administrative centre in Termez and a population — 2.7 million, Surkhandarya Region occupies an area of 20 000 km², and its border with Afghanistan runs along the Amu Darya River for 144 km. The entire border between Uzbekistan and Afghanistan runs along the river, supported by a security barrier. The Hairatan-Termez border crossing provides rail and road connections, and the Free Economic Zone and the Training Centre in Termez for Afghan students have been operating here since 2018.

About 70 per cent of the Surkhandarya population lives in rural areas, with a poverty rate of 15 per cent. By gross regional product per capita, the province ranks the lowest out of Uzbekistan's 14 regions. The region produces 10 per cent of the country's fruit and vegetables, cotton and grain.

In the cold winter of 2023, the population of Surkhandarya faced shortages of natural gas and electricity. To solve this problem, in 2022–2023, the Uzbek Government launched the construction of a 1 550 MW thermal power plant in Angor and 450 MW solar power plant in Sherabad. These plants, once operational (tentatively in 2025), are expected to provide electricity to 500 000 households in the Surkhandarya province and export 3–4 billion kWh of electricity to Afghanistan.

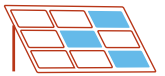
Half of the population of Surkhandarya has no access to drinking water. In 2021, construction began on a 361 km main water pipeline from the Tupalang reservoir with a capacity of 200 000 m³ per day; once operational, it will supply drinking water to the southern districts of this province.

Population of Uzbekistan

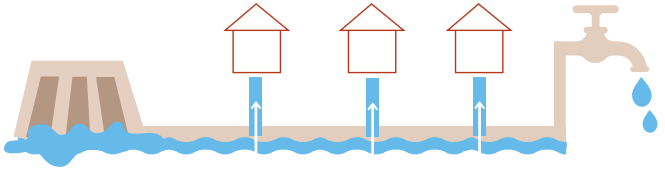


Planned expansion of water and energy systems

Construction of thermal power plants



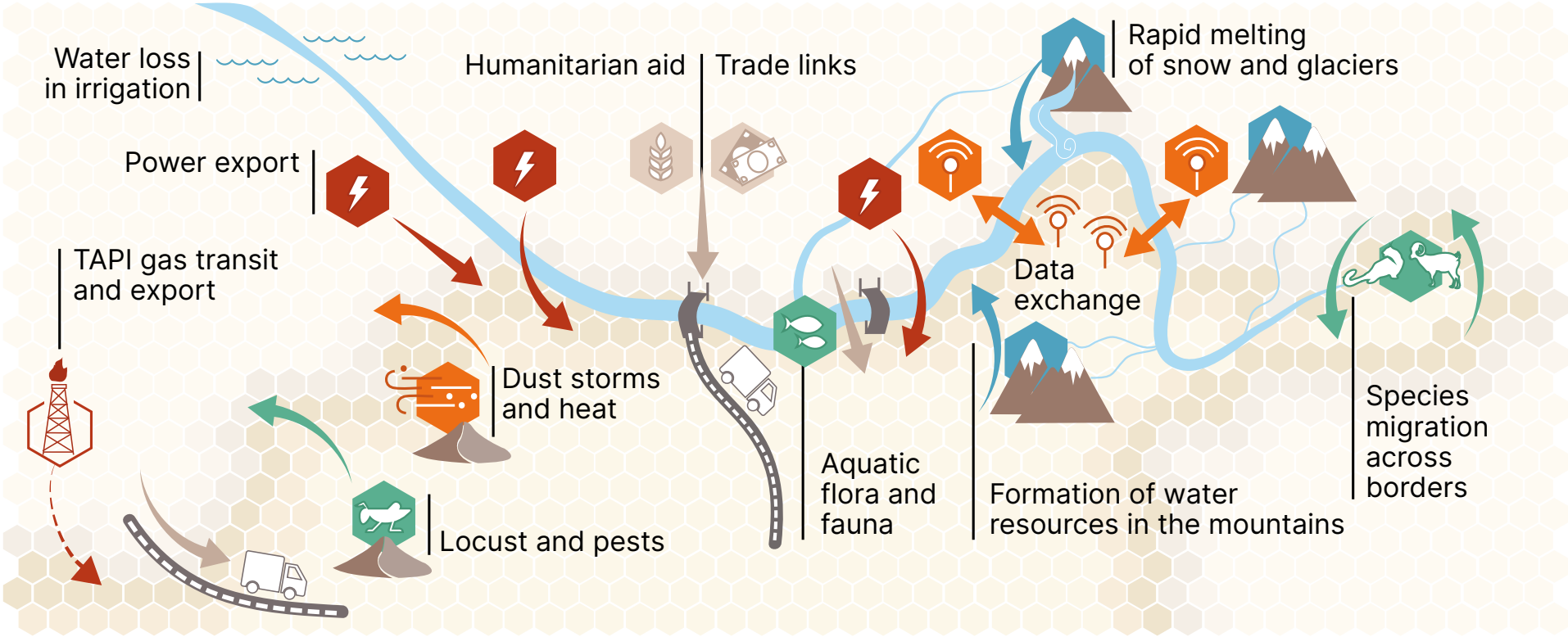
Construction of solar power plants



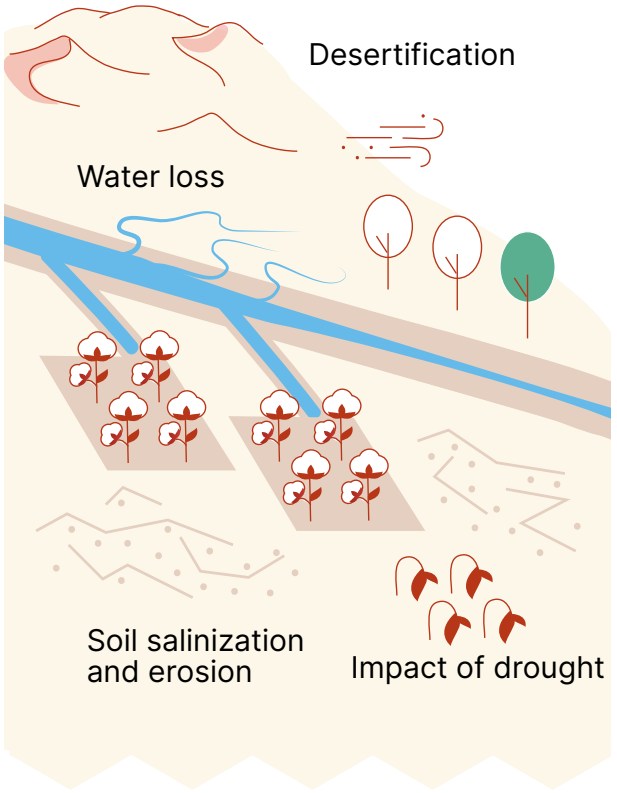
Construction of the main water pipeline

2. Environmental challenges, water and energy supply

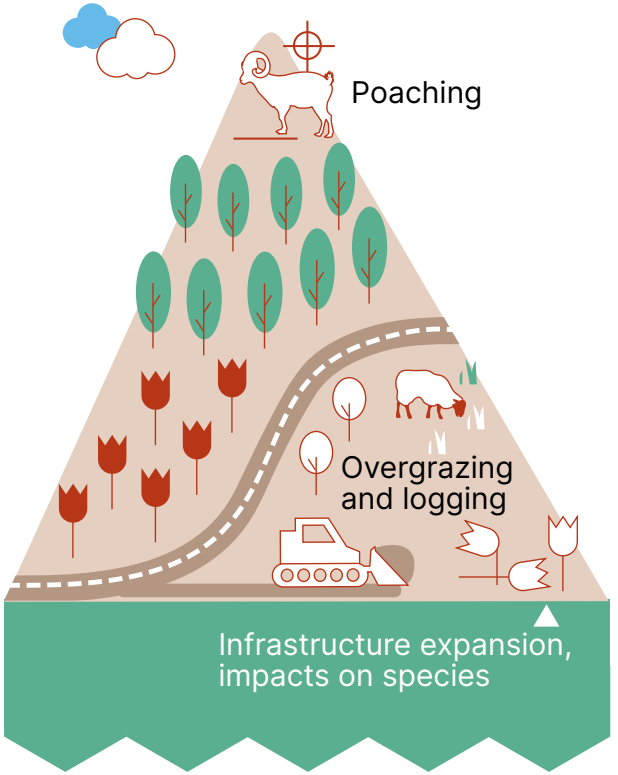
The Amu Darya River, mountains and deserts form a natural border between Afghanistan and Central Asia. The previous chapter and the schematic diagram show trade and economic links and prospective projects, including energy and transport. This chapter provides a brief analysis of environmental challenges and links, common natural processes such as water and weather formation, climate change and hazards, and the shared natural resources — rare and endangered species of animals and plants, soils and forests.



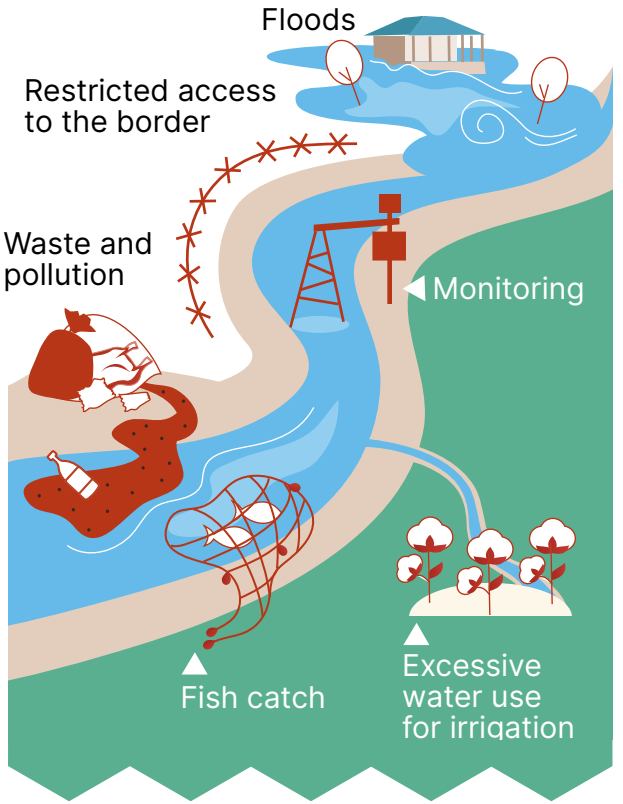
Common environmental challenges in the southern regions of Central Asia and Afghanistan



Desert ecosystems



Mountain ecosystems



Aquatic ecosystems

2.1. Social and environmental problems and the impact of the Afghan crisis

People in the region face several common socio-environmental challenges:

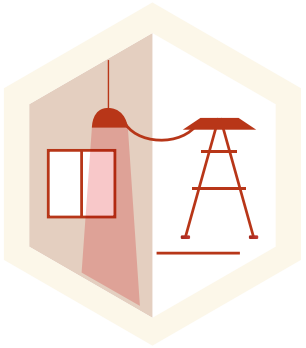
- Poor quality and unreliable supply of water for drinking and irrigation in rural areas;
- Lack of energy, especially in cold seasons; use of dirty fuels (coal, dung, firewood) for cooking and heating; air pollution and health risks;
- Degradation of farmland and pastures, locust infestations, food insecurity;
- Impacts of climate change, including extreme weather events and droughts;
- Effects of heat and cold waves on the health of rural workers, children and women;
- Depletion of wild nature: excessive and uncontrolled collection of rare, unique and medicinal plants, illegal hunting of animals, deforestation and cattle grazing in forests, impacts of polluted run-off, excessive water abstraction, lack of river bank protection, effects of infrastructure expansion on water ecosystems, and extinction of species.

Afghan crisis links:

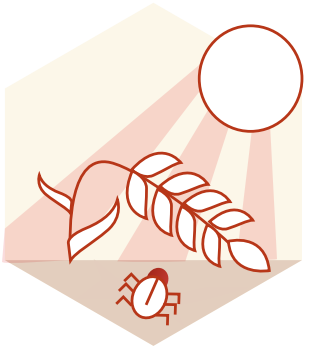
- Rapid population growth and socioeconomic measures to overcome poverty have led to increased demand for water, while availability of water resources at best remains stable or even decreases due to climate change;
- Land mismanagement and droughts, combined with insufficient monitoring, information sharing and pest control (locusts), cause ecologically driven migration and displacement;
- Restrictions on the movement and education of girls and women in Afghanistan increase their vulnerability, including to impacts of climate change;
- Overuse and poor environmental governance in Afghanistan may have indirect effects in Central Asia: reductions in migratory species, increased dust storms and sedimentation due to soil erosion;
- Meteorological and hydrological stations and services in Afghanistan continue to operate with some limitations, but information exchange and contacts with Central Asia have ceased. These factors can potentially affect weather forecasts, seasonal water projections and early warnings, at least for those hydrometeorological processes (dust storms, heatwaves, heavy rains) and river basins linked to Afghanistan (upper Amu Darya, Murghab).

Social-environmental challenges in the southern regions of Central Asia and the impacts of the Afghan crisis

Unreliable water supply



Unreliable power supply



Land degradation, reduced crops

Climate change impacts

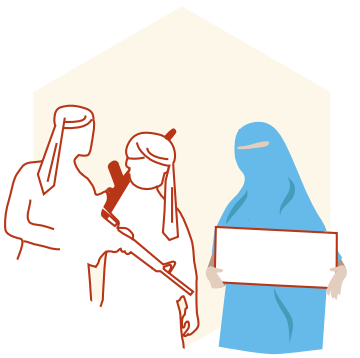
Natural disasters

Vanishing species

Water resource reduction

Limited data exchange

Overuse of nature



Restrictions on women's rights and freedoms

2.2. Energy and water supply

Of the four nations considered, Turkmenistan is the most energy sufficient (although, despite huge solar power potential, very little is used), while Afghanistan is the least. Uzbekistan's energy security is deteriorating, but the ongoing energy sector reforms and growing investment could change this situation soon. Tajikistan relies on hydropower and is expanding coal-fired capacity, but most of its population has lived with electricity rationing in cold seasons for more than two decades, while fossil fuel prices are the highest in the region.

In Afghanistan's cities, electricity is available only for a few hours a day, and the current situation is worse than it was a couple years ago. The rural population uses dung, firewood and coal as main sources of energy, and only 30 per cent of the population (mostly in cities and selected rural areas with high international support) use clean energy sources for cooking (gas, electricity), compared to 80–95 per cent in Central Asia. Centralized power supply is accessible to 11 per cent of the rural population and to 90 per cent of the urban.

Impact of power shortages on the population

Households | Small businesses | Schools and hospitals

Electricity consumption in Afghanistan is less than 200 kWh/person per year, about 7 per cent of the global average. Domestic energy production is inadequate, as are imports of electricity from Central Asia. Diesel generators are common, but they pollute the air and are expensive to run. The number and capacity of solar power installations are growing, and this energy is used by households, irrigation pumps, schools and hospitals.

In Tajikistan, 93 per cent of electricity is generated by hydropower, but the energy system cannot cope with rapid economic and population growth, and power rationing in cold weather is common. With the gradual commissioning of the Rogun hydropower plant (3.6 GW), power generation is growing, peaking at 21 billion kWh in 2022. This plant is supposed to be completed by 2030, and with parallel modernization of the Nurek and Kairakum plants and building of new power plants (Yavan), Tajikistan can export excess electricity to Central Asia, Afghanistan and Pakistan via CASA-1000.

In Turkmenistan and Uzbekistan, electricity is generated mainly by gas-fired power stations. Due to growing populations and an ageing energy infrastructure, Uzbekistan faces energy shortages in cold weather. Uzbekistan used to produce enough natural gas for its own needs and for export, but currently gas exports have stopped, and in the autumn-winter of 2022 there were shortages of natural gas and electricity across the country. As a result, Uzbekistan has increased electricity and gas imports from Turkmenistan to 20 million kWh of electricity per day and 1.5 billion m^3 of gas per season. In January 2023, Kazakhstan and Uzbekistan signed gas sector development road maps with Russia's Gazprom, including options for gas supplies from Russia. To mitigate the energy crisis, Uzbekistan plans to convert some greenhouses and boiler houses to coal in 2023. According to local news, the switch to coal by households has increased air pollution and led to several cases of carbon monoxide poisoning.

In terms of water supply, the situation in northern Afghanistan is fragile. In 2022, a mega-project was launched in Balkh to construct the 280 km Qosh-Tepa canal to draw water from the Amu Darya. It is not known how much water will be diverted (the mass media suggest 5–10 km^3/year), when this project is fully in operation (the mass media indicate five years), and how much was agreed or communicated to the regional water bodies (ICWC, BWO Amudarya) in which Afghanistan does not participate, or in a bilateral format.

Despite the abundance of water in Tajikistan, the population in its southern regions faces water shortages for drinking and irrigation. The country has launched 15 programmes and action plans to rehabilitate and expand urban and rural water systems, and install toilets, wells and pumps. However, in Khatlon and the GBAO, 80 per cent of the population still have no access to drinking water and sanitation. People spend a lot of time and effort fetching water on foot or by transport.

In Uzbekistan, water availability varies from region to region, with the most difficult situation in the lower parts of the Amu Darya near the Aral Sea. In the upper Amu Darya, there is no shortage of irrigation and drinking water. In Surkhandarya Province, half the population has access to water supply systems that rely on groundwater. There are no centralized water supply systems in mountainous areas, where people use water from rivers and springs. Access to water supply is lowest and irregular in Muzrabad and Sherabad districts of this province. In most settlements, water is supplied less than six hours a day, and only 5 per cent of the region's population (mainly urban dwellers) have access to a sewerage system.

Information on drinking water supply and irrigation water availability at the district level in south Turkmenistan is not available.

2.3. Climate change and weather-related hazards

The rates of climate warming in the region are estimated at 0.25-0.50 °C/10 years, or 1–2 °C over 40 years. Under climate change scenarios that depend on global greenhouse gas emissions and meeting the goal of the Paris Agreement, the temperature could increase by 2–3 °C or more by 2070–2100. In the south-central desert areas of Turkmenistan and Uzbekistan, precipitation has decreased over the past 40–50 years. In the mountain regions, changes in precipitation are mosaic and not clearly expressed.

Climate warming affects the melting of glaciers and snow cover, which is then reflected in the flow of rivers. From 1990 to 2015, Afghanistan's glaciers decreased by 15 per cent (1 per cent per year) and could melt by 50 per cent by 2050. In the Panj River Basin (Tajikistan and Afghanistan), current ice reserves are estimated at 479 billion tonnes, but could decrease by 30–50 per cent by 2050–2100 due to climate warming. Smaller glaciers at lower elevations, such as in the Hissar Mountains (Tajikistan and Uzbekistan), may totally disappear or shrink drastically.

The flow of mountain rivers fed by high altitude snow and glaciers may initially increase as a result of rapid glacier melt, with an increased risk of glacial lake outburst floods and debris flows, and then decrease as ice reserves and snow caps are depleted. The flow of rain- and snow-dependent rivers, such as Murgab (shared by Afghanistan and Turkmenistan) and other small rivers in northern Afghanistan, may decline by half, and the peak flow may shift to start and end earlier.

In addition to the long-term and distant future effects of climate change, the region is currently facing numerous extreme weather events (a list of selected 2020–2022 events is provided in the annex):

- Severe dust storms and winds affect energy systems and transport safety;
- Heavy and intense rainfall damage property and crops;
- Mudslides and floods cause loss of life and damage to farmland and infrastructure;
- Drought leads to water shortages, crop losses, food insecurity;
- Landslides, rockfalls and avalanches in the mountains block strategic roads and cause property damage and loss of life;
- Waves of hot (+45 °C) and cold (–25 °C) weather affect health and increase mortality, cause energy crises with overloaded power lines and gas supply problems, and damage agriculture crops and kill livestock.

In winter 2023 (like in winter 2008), cold air from the Arctic and Siberia penetrated deep into the southern regions of Central Asia and northern Afghanistan and brought a cold wave. The growing influence of climate change on the regional atmospheric processes could be one of the causes of this anomalous weather.

2.4. Protected nature areas and key biodiversity areas

The region's nature and geography are diverse and includes mountains and glaciers, rivers and lakes, cold highland and hot lowland deserts, canyons and caves, forests and pastures, arable lands and settlements and settled lands. All countries of the region have national strategies, plans and laws to protect nature, flora and fauna, forests and water resources.

Several ecosystems (their number and scientific names depend on classification) and 20 key biodiversity areas (KBAs) are identified in the region. KBAs are defined according to the IUCN Global Standard by one or several criteria such as presence of unique species (endemics); site of importance for migratory species; number and density of rare and endangered species. KBAs should be considered in planning and decisions on infrastructure and environmental projects. Another global value of this region is the wealth of its genetic resources and wild crop relatives: pistachio, apple, pear, almond, melon, tulip, and many other species.

Government agencies, scientific organizations and communities protect nature in a variety of ways. Nature reserves, national parks and wildlife sanctuaries are established to protect unique natural sites or species of flora and fauna, and are funded by the government. Hunting reserves and forests may be leased to the private sector or stay in community use on top of state ownership. Scientists are involved in updating the national red lists based on monitoring of the numbers and habitats of animals and plants. Infrastructure projects must follow Environmental Impact Assessments (EIAs) to ensure they do not harm nature. Many individuals and NGOs are involved in species conservation, nurseries, and spreading knowledge and awareness.

Afghanistan

Before the Taliban seized power, three national parks were established in the country: Wakhan National Park on the border with Tajikistan; Band-e Amir National Park and Nuristan National Park. Science and community groups in the mountains of northern Afghanistan were involved in wildlife monitoring. Co-operation with Tajikistan on conservation, including exchange visits and information sharing, helped to assess the state and trends of the environment and migratory species.

Tajikistan

Tajikistan has the highest percentage of protected areas (22 per cent) in relation to the total area of the country, thanks to its vast Tajik National Park (2 million ha) in the Pamirs, which has UNESCO status and recognition as a world heritage site. There is also the Zorkul Nature Reserve, the Karakul Wildlife Refuge and hunting areas with mountain sheep (argali), snow leopard and other species. Links and co-operation with Afghanistan in these areas are highly desirable to establish an ecological network of corridors for species migration, cross-border monitoring and conservation.

Tigrovaya Balka Nature Reserve *(Beshai Palangon in Tajik)* is located at the confluence of the Vakhsh and Panj Rivers and covers 50 000 ha. Originally it was established to protect riparian forests, Bukhara deer, rare birds and fish species, and the Turan tiger lived here before it vanished 70 years ago.

The Dashti-Jum nature reserve and sanctuary was established on the southern slopes of the Darvaz range to protect the markhor goat and endemic plant species. These protected areas on the

border with Afghanistan have been declared as areas of ecotourism, but the development of infrastructure (Tajik road to Khorog and China, Afghan road) potentially poses risks to wild nature, and measures for monitoring, awareness and community involvement in nature conservation, as well as information exchange and co-operation with Afghanistan, are needed.

Pistachio forests in the Karatag and Babatag mountains of southern Tajikistan, bordering Afghanistan and Uzbekistan, are threatened by uncontrolled grazing and illegal tree felling. These forests, nature reserves and parks, as well as Darwaz and Aywaj KBAs on the Tajik-Afghan border, require special attention.

Turkmenistan

The proportion of protected areas in Turkmenistan (3 per cent) is small in relation to the country's total area, but the quality of conservation is high. Most of the country's nature reserves are located along its borders, including those near Uzbekistan and Afghanistan.

On the Amu Darya River, downstream of Turkmenabat, there is the 49 000-ha Amu Darya Nature Reserve, where aquatic fauna, including the Amu Darya shovelnose sturgeon, and the *tugai* forests are protected. The Kelif wetlands under the management of this reserve, is located the upstream Amu Darya and attracts numerous migratory bird species, meeting the criteria of key biodiversity area.

The 34 000-ha Repetek Nature Reserve in the Karakum desert between Turkmenabat and Mary, protects sandy desert ecosystems, including endemics and rare species of reptiles, birds and mammals.

In the south-east Turkmenistan, on the border with Uzbekistan and Afghanistan, the Kugitang (Koytendag) Nature Reserve and the associated nature refuges of Karlyuk, Hojapil, Hojaburjibelent and Hojagaravul, cover an area of 100 000 ha. This area is famous for caves and underground lakes, sacred pistachio forests, dinosaur footprints, habitats of markhur goat and other flagship mammals, unique fish, reptiles and plant species. Recent drought and climate change have dried up many of Kugitang's watercourses, affecting the ecosystem.

The 90 000-ha Badhyz Nature Reserve, located next to the borders with Iran and Afghanistan in the extreme south of the country, connects three nature refuges — Kyzyldjar, Pulihatum and Chemenabyt. It protects rare animals (e.g. kulans, gazelles and Persian leopards), unique plant species and intact pistachio forest patches. Environmental co-operation in this area with Afghanistan may help restore badly damaged pistachio forests of Afghanistan and ferula (medicinal herb) habitats.

Uzbekistan

In 2022, Uzbekistan significantly expanded its protected areas coverage from 6 per cent to 13.5 per cent of the country's total area by creating new national parks and reserves. Previously, protected areas were managed by different state agencies and ministries. The new Ministry of Natural Resources, established in 2023, will aim to improve and co-ordinate the management of the protected areas network.

In southern Uzbekistan, in the Kugitang range at an elevation of 1 000–2 500 m on the border with Turkmenistan, the Surkhan Nature Reserve covering 24 000 ha protects rare animal and plant species. Pistachio and juniper forests are protected in Uzun, Babatag, Boysun, Kyzyryk and Hissar. A medicinal plant, *ferula*, is cultivated in the Boysun district. The main problem in many nature reserves and forests is overgrazing.

Co-operation between Afghanistan and Central Asia is necessary for the protection and monitoring of the endangered and migratory species: Amu Darya shovelnose sturgeon, markhor, Bukhara sheep, Bukhara deer, Persian leopard, gazelle. The state of the environment of the Amu Darya River itself remains little known: joint expeditions, data exchange and co-operation with border security authorities for safe access is needed. Carefully designed ecotourism and alternative sources of income may reduce pressures on pastures and forests (overgrazing in forests remains a key problem) and help preserve rare animals and plants.

Dashtijum nature reserve, Tajikistan

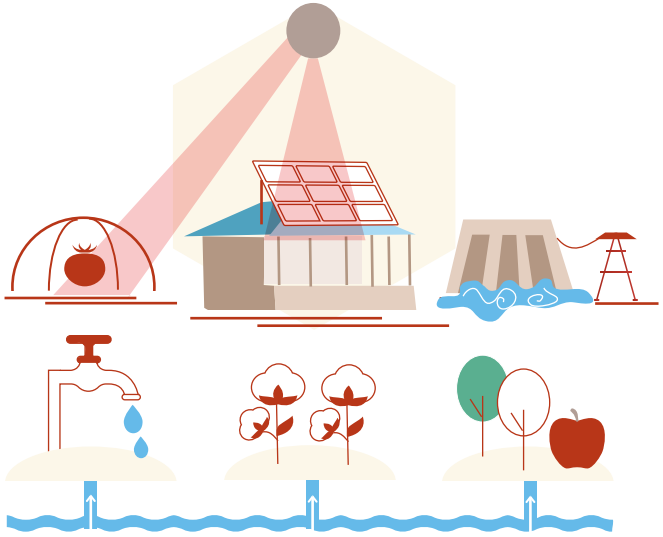
Pistachio forests in southern Uzbekistan, Surkhandarya

Mountainous area in southern Uzbekistan, Surkhandarya

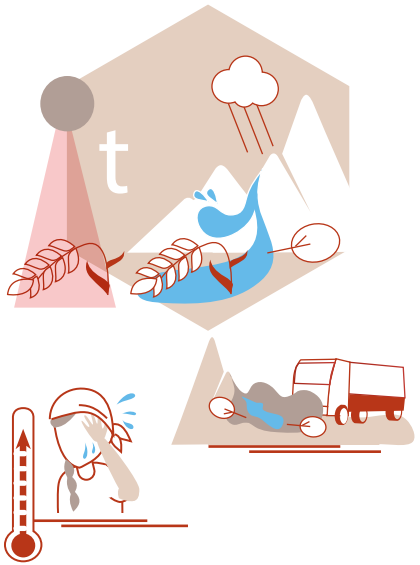
3. Solutions

The previous chapters described the current situation and impact of the Afghan crisis on the environment, shared natural resources, water and energy in Central Asia. This chapter provides a brief overview of agreements and projects to address these issues, and makes recommendations for local actions, capacity- and confidence-building. Clusters of problems and solutions include: access to clean water and energy; reduction of the impacts of extreme weather and climate change on vulnerable groups of populations; and conservation and sustainable use of forests, pastures and the wild nature.

Main action areas



Access to clean water and energy



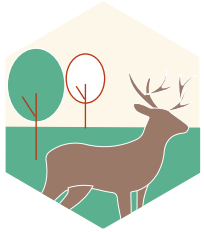
Climate change and disasters

Conservation of forests, pastures, and wildlife

3.1. Co-operation opportunities under inter-State agreements

Tajikistan (at the time of writing, co-operation with Afghanistan has remained suspended since August 2021)

Memorandum of Understanding on **emergency response co-operation** signed in 2019: promotes exchange of experience and information, joint assessments, workshops and expeditions, preparedness and mutual assistance in case of disasters and emergencies in the Panj River basin. Two meetings and visits to exchange experience were arranged under this MoU; with the resumption of activities, countries can practise nature-based solutions for natural disaster preparedness, improving links and communication between their hydrometeorological and early warning systems.

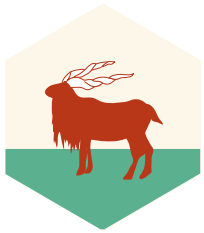


Memorandum of Understanding on **environmental co-operation** signed in 2020: promotes exchange of experience and information, joint assessments, workshops, expeditions and activities to protect and study ecosystems and habitats of rare species, water quality, Environmental Impact Assessment (EIA). When co-operation resumes, this MoU provides a wide range of opportunities for joint activities.

Memorandum of Understanding on **hydrology co-operation** signed in 2014 with extension to 2020 and extension for a further 3 years by mutual agreement between the two countries: facilitates data exchange on Panj River water gauging stations, installation of new stations, joint expeditions, training, assessments. In the period 2012–2020, the countries held 10 meetings, 5 expeditions, installed new gauging stations on the Afghan side and modernized Tajik stations, published atlases and reports. When co-operation resumes and contacts are updated, the MoU experience can be used to broaden data exchange with other States and organizations in the Amu Darya River basin, while the new technical tools (CAFEWS) can be introduced to improve forecasting of floods, flash floods and seasonal river flow.

The intergovernmental agreement on co-operation in the **development and management of water resources of the Panj and Amu Darya rivers** signed in 2010: promotes co-ordination in hydrology, prevention and mitigation of natural disasters, and water resources management.

Despite the suspension of official contacts and co-operation, Tajikistan maintains economic, trade and humanitarian links with Afghanistan. Under the CASA-1000 (Central Asia South Asia) high-voltage transmission project to transfer electricity from hydropower stations in Kyrgyzstan and Tajikistan to Afghanistan and Pakistan via the 1 387 km line, in 2023 Tajikistan will complete construction of its sections, pending equipment and system tests. In Kyrgyzstan and Pakistan, work on CASA-1000 will be mainly completed in 2023, while in Afghanistan construction was suspended due to the political regime change and freeze on World Bank funding. Partners work on solutions to complete the Afghan section in 2024 or later.

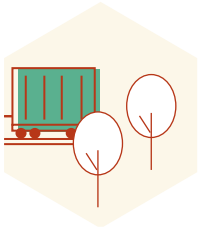


The security situation along the Tajik-Afghan border is often fluid, but local actions are feasible in the areas of wildlife conservation, community awareness on climate change and extreme events, improving access to clean water and energy. Similar projects in Afghanistan are possible through the international partners present there such as the ICRC, UN, Aga Khan Network, and other humanitarian and development actors.

Turkmenistan

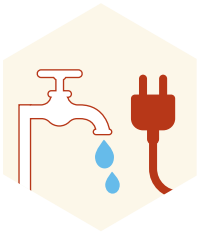
The agreements between Turkmenistan and Afghanistan focus on economic issues:

- Memorandum of Understanding in the **oil and gas sector**
- Memorandum of Understanding on Turkmen **electricity** transfers to the Herat Province
- Memorandum of Understanding on the construction of the Akina-Andhoy **railway**



In addition to bilateral agreements, a regional agreement on TAPI gas pipeline, where both Turkmenistan and Afghanistan are key actors, promotes socio-economic co-operation between the countries and creates common ground for environmental planning and considerations.

Within the framework of existing agreements and economic co-operation projects, environmental subprojects can be considered and implemented — e.g. creation of shelterbelts around infrastructure, joint environmental impact assessment of projects (EIA).



Turkmenistan often provides humanitarian aid to Afghanistan, assists in rural electrification, co-operates on security issues and trains Afghan students. The Turkmen-Afghan trading house “Turkmenistan” established in Mazar-e-Sharif in 2017 supports trade relations. To reduce environmental risks to local communities in Turkmenistan, with consideration of the impacts of the Afghan crisis and of climate change, actions may target solar energy development, improving access to drinking and irrigation water, including reduction in water salinity. Humanitarian projects in Afghanistan could be complemented with Turkmen expertise and materials in pistachio planting, reforestation and combating desertification.

Uzbekistan

Uzbekistan and Afghanistan signed 20 agreements and memorandums on security, energy and transport, including electricity exports; the construction of the Surkhan-Puli-Khumri power line; design of the Mazar-e-Sharif-Herat and Mazar-e-Sharif-Kabul-Peshawar railways, and the training of Afghan students in Termez. The social and environmental governance (ESG) components in the implementation of economic projects may include forest planting, support to rural communities in electrification and water supply provision.

Uzbekistan promotes a diplomacy and socio-environmental platform for interaction with Afghanistan at regional level by organizing conferences in Samarkand and Tashkent. In June 2018, the Central Asian International Environmental Forum was organized in Tashkent, with the participation of a delegation from Afghanistan. In 2022, specialists from Uzbekistan and Tajikistan exchanged experiences, organized joint visits to protected natural areas in the Amu Darya basin, and signed a memorandum on environmental co-operation.

Diplomats and international experts suggest that the lack of humanitarian support and the dire socio-economic situation in the remote and disadvantaged parts of Central Asia and Afghanistan may contribute to radicalization, while higher socio-economic resilience, improvements in energy and water supply, the education and engagement of women in the public sector and a non-degraded environment are important factors for social stability and cohesion.

3.2. Projects funded by donors and governments

As a low-income country with high poverty and insecurity, Afghanistan received substantial support from international organizations and the West for two decades (2001–2021). After the Taliban came to power in August 2021, this support abruptly stopped and only humanitarian projects still run.

Development projects in Central Asia are diverse. Tajikistan is the largest recipient of international (grant and soft loan) projects. Uzbekistan is increasing the number of development projects on clean water and energy in the southern parts of the country. In Turkmenistan, the Government funds all energy and transport projects, while environmental projects involve the public organizations and scientists who study and protect species.

In addition to governments, projects funded by GEF, CEPF, GIZ and other donors support measures on species conservation, improvements in environmental monitoring and equipment, diversifying and creating alternative sources of income, study of climate change impacts on crop wild relatives and adaptation, including nurseries, and help strengthen protected areas and preserve forests.

At the regional level, projects to expand power transmission lines (unified power system of Central Asia and CASA-1000), develop transport and logistical links (CAREC corridors, TAPI, TAP, Lapis lazuli, Belt and Road) increase trade and export opportunities, may reduce energy shortages and lower freight costs. In contrast to local and national economic projects, the environmental impact of regional projects is more difficult to assess and monitor, while opportunities for public engagement are more limited.

In 2021, the Interstate Commission on Sustainable Development of Central Asia adopted the Central Asian Sustainable Development Program till 2030, while a regional climate adaptation strategy is being developed. Afghanistan is not involved in regional environmental and water processes.

The results and lessons from the development projects could be useful in tackling the effects of the Afghan crisis. Project types and geographies are listed below (see references for additional details):

- **Humanitarian aid for Afghanistan:** food, medicines, clothing;
- **Border security assistance:** equipment, supplies, training;
- **Energy transition and reforms in Uzbekistan and Tajikistan:** development of renewable energy sources, construction of new power lines, modernization of power plants, energy metering;
- **Water and sanitation projects in Tajikistan and Uzbekistan:** extension of water supply and sewerage networks, modernization of pumping stations and canals, water metering;
- **Agricultural projects:** introduction of modern irrigation methods and greenhouses, locust control, product processing and extension services, orchards;
- **Climate resilience and disaster risk reduction in Tajikistan and Uzbekistan:** improving roads and their protection against avalanches, floods and other hazards, modernizing hydrometeorological services, early warning systems for droughts, floods and Sarez Lake;
- **Forest and land management, landscape restoration:** sectoral reforms, improved resource management, monitoring and inventory, afforestation, soil erosion control;
- **Conservation of rare and endangered species and key biodiversity areas:** public participation in conservation, science expeditions, tree nurseries, technical equipment, new methods, national red list updates, alternative sources of income;
- **Education and training:** new schools and universities, improving the quality and conditions for education.

3.3. Development of capacity and confidence

The UN Regional Centre for Preventive Diplomacy in Turkmenistan is involved in water and energy co-operation, assisting with early warning information bulletins on water security, supporting conferences on glaciers and water resources.

In Tajikistan a network of Aarhus Centres supported by OSCE is dealing with environmental information and knowledge dissemination, including co-operation with Afghanistan. In Turkmenistan, the Tebigy Kuwwat NGO promotes the Aarhus Convention principles and works with the local population and civil society groups.

A training centre for Afghan students in Termez, Uzbekistan, could expand its curriculums to include themes on the environment, water and energy.

On the initiative of Tajikistan, the year 2025 has been declared by the UN as the "International Year of Glaciers' Preservation". On this occasion countries can organize joint expeditions in the Amu Darya to assess glaciers, design regional approaches to climate action and disseminate knowledge.

Environment:

- Environmental information: co-operation between the Aarhus Centres, national and local authorities on environmental data, assessments and public awareness of environmental issues;
- Strategic environmental assessments and co-operation in environmental impact assessments (EIAs) for regional and transboundary socio-economic projects;
- Regular exchange of information (environmental, hydrometeorological, climate, disasters) between the relevant government agencies of the countries;
- Preparation of easily understandable and visual modern environmental information at the local level (provinces or river basins) for the public and authorities;
- Scientific and public actions in support of governmental policies and goals: expeditions and monitoring, national red list update, information campaigns on nature conservation, actions on climate change response, pollution and waste reduction, use of clean fuels and energy.

Confidence-building:

- Promote collaboration between border security authorities, hydrological and environmental services in planning expeditions along or near the Panj and Amu Darya rivers;
- Working with women's groups, entrepreneurs and mahallas to address social cohesion and engagement, including environmental actions on tree planting, clean-up of waste from community areas and water sources;
- Regional forums on diplomacy, positive media coverage of issues and co-operation with Afghanistan;
- Support for Afghan youth and students in Central Asia, particularly in Uzbekistan and Tajikistan, through educational and information materials and scholarships.

3.4. Actions on the ground

Natural resource management:

- Improving assessments and control measures for forests and pastures, preventing cattle grazing in forests, reduction in deforestation through development of alternatives (fodder for livestock, energy);
- Cross-border co-operation to conserve regionally and globally important biodiversity areas, rare and unique plant and animal species.

Natural disaster risk management:

- Nature-based solutions to reduce floods and strong winds: reinforcing river banks with locally sourced materials, creating protective shelterbelts;
- Study the morphology and channel processes of the Panj River and other rivers to predict river behaviour during and after major mudslides and floods;
- Examine riverbank protection and channel control infrastructure planned and constructed by neighbouring countries to reduce negative impacts on adjacent areas;
- Measures to improve the early warning and prevention system for floods and other emergencies.

Access to clean water:

- Targeted local measures to improve drinking water supply and treatment, combined with province-wide interventions;
- Expansion of water metering, monitoring of drinking water quality and wastewater treatment.

Access to water for irrigation:

- Reduce irrigation water losses and increase water use efficiency by lining canals, introducing drip irrigation and improving field levelling;
- Creation of community-based water user groups with involvement of women leaders;
- Drainage and land improvement;
- Construction of water reservoirs and minimisation of water seepage and evaporation losses.

Access to clean energy:

- Replacement (upgrade) of pipes and irrigation pumps to save water and energy;
- Replacement (upgrade) of low-voltage electrical networks to reduce losses;
- Sun-powered pumps for drinking water supply and irrigation;
- Low-cost sun-powered greenhouses;

- Low-cost solar stoves and driers;
- Mini grids and energy saving lamps;
- Increased access to natural gas and efficiency stoves;
- Improving insulation, building energy-efficient homes and schools to reduce heat and energy loss;
- Improving the quality and accessibility of communications and the Internet.

Adaptation to climate change:

- Micro-credit and grant programmes covering a wide range of climate adaptation needs for local communities and agricultural practices;
- Support for local implementation of national climate adaptation strategies and action plans.

Tree planting, southern Turkmenistan

Women returning from field work, Turkmenistan

Information sources

Mass media and telegram channels:

https://asiaplustj.info

https://avesta.tj

https://caa-network.org

CAWEP Media Digest

https://fergana.ru

https://e-cis.info/news

http://energo-cis.ru/news

https://eurasianet.org

https://gazeta.uz

https://kun.uz

https://metbugat.gov.tm

https://meteojurnal.ru

https://rus.ozodi.org

https://pajhwok.com

https://podrobno.uz

https://t.me/axborot_xizmati

https://t.me/MCHSUzbek

https://thediplomat.com

https://tolonews.com

https://turkmenportal.com

https://yuz.uz

https://uz.sputniknews.ru

Online maps, atlases and databases:

Afghanistan humanitarian needs and natural hazard maps → https://www.humanitarianresponse.info/en/operations/afghanistan

AIMS and FAO: Watershed Atlas of Afghanistan. 1st edition. R. Favre, G. M. Kamal, eds. (2004) → http://aizon.org/watershed_atlas.htm

Afghanistan Relief Web monitor → https://response.reliefweb.int/afghanistan

BP → https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html

Central Asia Water Information Database → http://www.cawater-info.net/bd/index.htm

Central Asia Climate Information Portal (CACIP) → https://centralasiaclimateportal.org

Climate, temperatures and precipitation, WorldClim → https://www.worldclim.org

Food and Agriculture Organization (FAOSTAT) → https://www.fao.org/faostat

Global Facility for Disaster Reduction and Recovery (GFDRR) and the World Bank (WB). Think Hazard → https://thinkhazard.org/en

International Energy Agency (IEA) → https://www.iea.org/countries

Observatory of Economic Complexity (OEC) → https://oec.world/en

OCHA Humanitarian Data Hub → https://data.humdata.org/dataset

Rivers in Crisis database → https://riverthreat.net/nature.html

Spatial agent → https://spatialagent.org

University of Readings, climate change visualization “Show Your Stripes” → https://showyourstripes.info

Zoï Environment Network (2013). Visual Atlas of Co-operation on Hydrology and Environment, Afghanistan and Tajikistan → https://zoinet.org/product/afg-taj-coop-atlas

Data and reports from international organizations:

Asia Development Bank (2022) → CAREC Energy Outlook 2030 → https://www.adb.org/sites/default/files/publication/850111/carec-energy-outlook-2030.pdf

Asia Development Bank: Turkmenistan country information → https://www.adb.org/countries/turkmenistan/poverty

Bioversity International and CGIAR: UNEP-GEF project on horticultural crops and wild fruit tree species in Central Asia → http://centralasia.bioversityinternational.org

BP Global Gas Infographics (2022) → https://www.bp.com/en/global/corporate/news-and-insights/reimagining-energy/global-view-of-gas-infographic.html

Critical Ecosystem Partnership Fund (CEPF): Ecosystem profile and grant programme for the Mountains of Central Asia → https://www.cepf.net/our-work/biodiversity-hotspots/mountains-central-asia

European Union Agency for Asylum EUAA (2022): Afghanistan Security Situation update → https://euaa.europa.eu/coi-publications

Global Facility for Disaster Reduction and Recovery (GFDRR) and the World Bank (WB). Disaster risk country profiles → https://www.gfdrr.org/en/disaster-risk-country-profiles

Organization for Security and Co-operation in Europe (OSCE, 2022): Climate Change and Security in Central Asia → https://www.osce.org/secretariat/355471 / https://www.osce.org/secretariat/331991

Organization for Security and Co-operation in Europe (OSCE, 2016): Advancing Energy Security in Central Asia → https://www.osce.org/oceea/513787

UNEP, UNDP, UNECE, OSCE: Environment and Security in the Amu Darya River basin (2011) → https://zoinet.org/product/envsec-amudarya

UNECE, 2012–2018 and the World Bank (2019) → Proceedings of the environment and hydrology co-operation meetings between Afghanistan and Tajikistan.

UNECE and UNESCAP (2021) → International Forum on Innovating and Modernizing Energy and Water in Central Asia, November 2021. Summary Report → https://unece.org/media/documents-download/events/362348

UNESCAP (2022): The Aral Sea, Central Asian Countries and Climate Change in the 21st Century. M Narbayep, V. Pavlova, eds. → https://www.unescap.org

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UN Regional Centre for Preventive Diplomacy for Central Asia (UNRCCA) Transboundary Water Early Warning Bulletins → https://unrcca.unmissions.org/early-warning-bulletins-2022

UN Turkmenistan Common Country Analysis (2022) → https://turkmenistan.un.org/sites/default/files/2022-12/CCA_EN_web.pdf

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World Bank (2018): Afghanistan. Multi-hazard risk assessment → https://www.gfdrr.org/sites/default/files/publication/Afghanistan_MHRA.pdf

World Bank Afghanistan province-level dashboard (2019) → https://www.worldbank.org/en/data/interactive/2019/08/01/afghanistan-interactive-province-level-visualization

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World development indicators (WDI) → https://datatopics.worldbank.org/world-development-indicators

World Food Programme (WFP) Tajikistan data and reports → https://www.wfp.org/countries/tajikistan

Zoï Environment Network and CAREC (2019–2020): Climate change information products for Central Asia → https://zoinet.org

Zoï Environment Network and the World Bank (2019–2020) → Hydromet Atlas of Central Asia (published) and Afghanistan (unpublished): https://zoinet.org

National statistics, official websites, and reports:

Afghanistan, Tajikistan, Turkmenistan and Uzbekistan National Communications (NCs) and Biannual Update Reports BURs to the UNFCCC → https://unfccc.int/non-annex-I-NCs

Afghanistan National Statistics and Information Authority (NSIA) → http://nsia.gov.af

Afghanistan National Environmental Protection Agency (NEPA) → https://www.nepa.gov.af

Tajikistan Agency on Statistics → https://www.stat.tj

Tajikistan Committee on Environmental Protection → http://tajnature.tj

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Tajikistan Ministry of Foreign Affairs → https://mfa.tj

Tajikistan President (statements) → http://president.tj

Turkmenistan Ministry of Agriculture and Environmental Protection → https://minagri.gov.tm

Turkmenistan Ministry of Energy → https://www.minenergo.gov.tm

Turkmenistan Academy of Sciences → https://science.gov.tm

Uzbekistan Investment Promotion Agency → https://invest.gov.uz/ru/regional-map/surhandarinskaya-oblast

Uzbekistan Ministry of Energy → https://minenergy.uz

Uzbekistan Ministry of Economy and Finance → https://mineconomy.uz

Uzbekistan National SDG portal → https://nsdg.stat.uz

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Chamber of Commerce and Industry, Administration of Surkhandarya, UNDP (2019) → Invest in Surkhandarya https://www.undp.org/uzbekistan/publications/surkhandarya-region-new-opportunities-and-prospects

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