The State of the Environment in Central Asia:
Illustrations of Selected Environmental Themes and Indicators

Kazakhstan
Kyrgyzstan
Tajikistan
Turkmenistan
Uzbekistan

2015
The State of the Environment in Central Asia: Illustrations of Selected Environmental Themes and Indicators

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The population of Central Asia continues to grow, and the total for the region in 2015 is estimated at 66 million. The proportion of the population living in rural areas varies from 45 per cent in Kazakhstan to 73 per cent in Tajikistan. The two largest and most populous countries – Uzbekistan and Kazakhstan – also have the most diverse resources and industries, and are the economic leaders in the region. Turkmenistan has the lowest population but its rapidly growing oil and gas sector boosts its economy, especially the construction sector. Both Tajikistan and Kyrgyzstan have seen their poverty rates drop over the past 10-15 years from 75-80 per cent to below 35-40 per cent due to economic growth and labour migration.

Droughts, wars, deserts and steppe cover much of Central Asia but each of the countries has mountainous areas that occupy from 5 per cent in Turkmenistan up to 80-90 per cent in Kyrgyzstan and Tajikistan. The mountain ecosystems in Kyrgyzstan (Tien Shan) and Tajikistan (Pamir) are the water towers for the region and support globally significant biodiversity. Mountains are important habitats for wild flora and fauna species. Forests, which are the water towers for the region and support globally significant biodiversity, are protected, and other ecosystems such as the protection of soil and the regulation of climate. The majority of mountain and flood plain forests are protected, and timber harvesting is prohibited.

Central Asia is among the regions with the highest rate of warming in the world and less in the highlands. The increases vary from 0.2°C to 0.4°C per decade over the last 35 years. The interior parts of Central Asia, such as the semi-desert lowlands of Turkmenistan, Uzbekistan and Kazakhstan, as well as around the former Aral Sea, have seen a small decrease in precipitation. Some increase in precipitation has occurred in mountain areas of Uzbekistan, Kyrgyzstan and Tajikistan. Ice cover in mountain areas of Uzbekistan, Kyrgyzstan and Tajikistan has declined and the smallest glaciers at lower elevations are most vulnerable.

The forest cover in the countries of Central Asia ranges from 3 per cent in Tajikistan to 12 per cent in Turkmenistan. Lowland desert forests, such as the ancient forests, are sparse, while mountain nut-and-fruit and coniferous forests are dense. Forests are the most important habitats for wild flora and fauna species and perform other functions such as the protection of soil and the regulation of climate. The majority of mountain and flood plain forests are protected, and timber harvesting is prohibited.

Population

Turkmenistan

Kazakhstan

Kyrgyzstan

Uzbekistan

Tajikistan

Proportion of mountain area by country

Total area

Mountain area

Mountain coverage in percent of total area


Forest coverage

Total area

Forest coverage in percent of total area


Temperature and precipitation

Temperature change 1976 - 2012

Precipitation change 1976 - 2012

Central Asia is among the regions with the highest rate of warming in Eurasia, with warming more pronounced in the lowlands and less in the highlands. The increases vary from 0.2°C to 0.4°C per decade over the last 35 years. The interior parts of Central Asia, such as the semi-desert lowlands of Turkmenistan, Uzbekistan and Kazakhstan, as well as around the former Aral Sea, have seen a small decrease in precipitation. Some increase in precipitation has occurred in mountain areas of Uzbekistan, Kyrgyzstan and Tajikistan. Ice cover in the mountains has declined and the smallest glaciers at lower elevations are most vulnerable.

Greenhouse gas emissions

Total greenhouse gas emissions (million t/year)

Greenhouse gas emissions per capita (t/year)

Map produced by ZO Environment Network, June 2015


Source: World Bank (www.worldbank.org)
Industrial air pollution

In 1998 stationary industrial sources accounted for the highest share of the reported air pollution. Following independence heavy industries went through a period of restructuring, decline and plant closures, and a transition to new technologies and types of products. As a result of these two trends, industrial pollution levels declined. In recent years, estimates of emissions from stationary sources in Central Asia range from 3.0 million tonnes to 3.5 million tonnes per year. Kazakhstan accounts for 2.2 million tonnes per year of this estimate.

Coal's role in the energy mix and manufacturing

Kazakhstan has abundant coal resources and an energy and industrial system based on coal. This has resulted in higher GHG emissions and levels of air pollution, especially from energy and metallurgical enterprises. A high rate of economic growth and the fluctuations for energy use, the role of coal is likely to remain significant, as are the levels of emissions.

In the two lowest emitters of the region – Kyrgyzstan and Tajikistan – the role of coal used to be negligible, but growing energy deficits and the absence of affordable alternative sources has resulted in a switch to coal for the countries’ growing industrial and power production.

Growth in transportation

Industrial air pollution has declined, but the rapid growth in the numbers of cars on the roads has resulted in increased congestion and pollution in the large cities. In the numerous cities with extensive rail transport systems, a personal car has become a more reliable means of transportation and in areas with high levels of development, personal transport has become a sign of status.

Areas with high levels of development, personal transport has become a more reliable means of transportation and in cities with deteriorating public transport systems, a personal car has become a more reliable means of transportation and in areas with high levels of development, personal transport has become a sign of status.

The number of cars on the roads has resulted in increased congestion and pollution in the large cities. In the numerous cities with extensive rail transport systems, a personal car has become a more reliable means of transportation and in areas with high levels of development, personal transport has become a sign of status.
Air quality in major cities

Investments in modernization of the capital city of Turkmenistan in the years since independence have completely transformed Ashgabat (population: about 750,000) from a town with low buildings to a vibrant showplace of modern white high-rise buildings with fountains and green areas. Most industries are located outside the city proper, and air quality is considered good according to the five monitoring stations. City transport is efficient and the number of personal cars is rising but the transport fleet is quite young, with lower emission and fuel consumption levels. Prevailing high temperatures and occasional dust storms and inversions combined with transport emissions are the key factors affecting the air quality in the capital.

The fastest growing city in Central Asia is Astana (population: about 850,000), the capital city of Kazakhstan since 1997. Its location in the steppes means that it has strong winds that keep air pollution at the average level, but excessive air pollution levels are becoming more frequent. The city is seeing active development along with growing environmental pressure. The majority of Astana’s seven air monitoring stations are automated, and their data are publicly available in real time. The authorities are working to regulate traffic in the city and want Astana to be a clean city that sets a good example for the country.

The ancient city of Tashkent (population: 2.3 million) is the biggest metropolitan area of Central Asia and the capital of Uzbekistan. The Uzbek Hydrometeorological service at the Cabinet of Ministers of the Republic of Uzbekistan has a long history of air and climate monitoring in Tashkent. Currently it operates an extensive system of more than 20 air quality monitoring stations. Air quality in Tashkent varies from a moderate to a low level of pollution. The emissions from industries and transport in Tashkent are monitored closely. A clean air campaign is conducted twice a year. The number of cars is growing, but a modern transport fleet, better fuel quality along with emissions control help to reduce air quality impacts.

As the former capital of Kazakhstan, Almaty (population: about 1.6 million; if metropolitan area is included: about 2 million) is the largest city in the country and remains the financial and business hub. Air quality in the city is measured at five standard and 11 automated stations, and varies from moderate to very poor. Commuting within the Almaty suburban areas is significant, and people prefer to drive larger cars with correspondingly higher emissions. Industrial sites are located across the city. The city microclimate has limited air exchanges, and inversions frequently trap pollution in the air above the city. The local authorities are looking for solutions such as modernization of public transport, especially metro, broadening the network of pedestrian and bicycle lines, and the promotion of natural gas as a fuel.
Prior to independence, Bishkek, formerly Frunze (population: about 1 million), the capital of Kyrgyzstan, had industrial sites across the city and even in the city centre, and emitted more pollutants than the capitals of the other republics. Currently, many of its industrial sites are dormant, and industrial air pollution has declined significantly. Bishkek has seven air monitoring stations, and urban air quality varies from moderate to poor. A power station is the main contributor to air emissions from stationary sources. Traffic jams and car emissions are growing along with the increase in the number of cars, and poorly regulated neighbourhood development and the poor conditions at waste sites intensify the city’s environmental stress.

The relatively young city of Dushanbe (population: 800,000) is the capital of Tajikistan and its largest city. Only one out of the city’s seven air monitoring stations operates, so the environmental picture of the city is incomplete. According to the latest available data, urban air quality in Dushanbe is good, but occasional dust storms and inversions may lead to elevated levels of pollutants. Vehicular traffic is growing and so are congestion and emissions. The public transport system has been neglected and does not meet the demands of the city. Historically, industrial sites were located on the outskirts of the city. Many of these operations went dormant after the split of the Soviet Union, but some of them are now restarting and new sites are located in the city proper. As a result, industrial emissions and air pollution levels are growing.
Agricultural run-off and discharges from densely populated areas

With its high temperatures and low rainfall, Central Asia has long depended on irrigated agriculture for much of its food and fiber production. Water use practices and overspill of irrigation and mineral fertilizers – legacies of the Soviet era – continue to cause problems today. Irrigation and drainage run-off either evaporate in the deserts or return to the rivers, thus increasing the mineralization content and decreasing water quality. Water quality in the large rivers of Central Asia is mainly determined by agricultural run-off from irrigated lands and densely populated valleys. In the upper reaches of the rivers the water quality is normally quite good, while in the lower reaches it gets worse with higher mineralization. The rivers the water quality is normally quite good, while in the lower reaches it gets worse with higher mineralization. The rivers the water quality is normally quite good, while in the lower reaches it gets worse with higher mineralization.

Wastewater treatment and biological pollution

Low maintenance, ageing and inadequate sized sewage treatment facilities in many cities underline the overall efficiency of wastewater management. The growth of population in both urban and rural areas creates additional pressure on water resources. Quite often the quality of surface water downstream of cities is unsatisfactory, especially in terms of biological pollution. In smaller cities and rural areas with poorly organized sewage and wastewater treatment systems, heavy rains and flash floods may flush biogenic pollutants into the rivers and canals, and increase the spread of waterborne diseases. Between 10 per cent and 30 per cent of Central Asia residents – mainly in smaller cities and provincial areas – lack access to safe water sources.

Industrial water pollution

The closing of many industries after the break-up of the Soviet Union lowered the industrial pollution of surface waters. Industrial and mining waste and obsolete pesticide dumps in some areas, however, lack controls and supervision, and the situation has become unpredictable. Flash floods, melt diluted and heavy rains can wash the pollutants into surface waters, and significantly affect water quality. Groundwater polluted by industries, even where the production was stopped, also deserves attention.

Water quality in Kazakhstan

Water quality in Kazakhstan is mainly determined by agricultural run-off from irrigated lands and densely populated valleys. In the upper reaches of the rivers the water quality is normally quite good, while in the lower reaches it gets worse with higher mineralization. The downstream communities and several river deltas do not receive the necessary, and quite often even the minimal recommended flow. An inadequate flow poses a problem for both ecosystems and human health.

Salt content in the Amu Darya River

<table>
<thead>
<tr>
<th>Location</th>
<th>mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Termez</td>
<td>0.8</td>
</tr>
<tr>
<td>Nukus</td>
<td>1.2</td>
</tr>
<tr>
<td>Yarkhankui below Briskh</td>
<td>1.4</td>
</tr>
<tr>
<td>Nukus below Kirgich</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Sources: FLERMONECA project reports (2015), Uzhydromet. Data for the years 2010-2011.

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Sources: FLERMONECA project reports (2015), Uzhydromet. Data for the years 2010-2011.
This map reflects and generalizes the situation in 2015.

**Water pollution**

Uzbekistan

- Low
- High

Karakum

- Main Collector

Turkmenistan

- Canal

Karakumsky Canal

- Lake

Uzbekistan

- Sea

Aral

- Downstream

Amu Darya River

- Upstream

Water quality: Amu Darya River

- Low
- Moderate
- High

Uzbekistan

- Sea

Aral

- Former lake

Water quality: Chu and Talas Rivers

- Downstream

Chu

- Upstream

Water quality: Chu and Talas Rivers

- Low
- Moderate
- High

Kazakhstan


This map reflects and generalizes the situation in 2015.

Water quality in Central Asia


This map reflects and generalizes the situation in 2015.
Alaudin Lakes, Fann Mountains, Tajikistan

The Amu Darya River at Nukus, Uzbekistan
Protected areas of Kazakhstan: transboundary issues.

Protected areas of Kazakhstan cover 6.8 per cent of the country and consist of nearly 100 sites, including 10 strict nature reserves, 12 national parks, 5 special nature protection zones and numerous other sites with sustainable natural resources management or species conservation status. Kazakhstani biodiversity conservation plans call for a further increase in the number and coverage of nature reserves and parks and for improved efficiency.

The existing network of protected areas in Kyrgyzstan includes 10 strict nature reserves, 10 national parks and more than 50 species management areas and nature monuments, covering 6 per cent of the land area. In 1998 Kyrgyzstan designated the entire Issyk-Kul province, including the famous mountain lake, as a biosphere territory. If the Issyk-Kul biosphere reserve is developed, Turkmenistan is actively working on the greening of areas around settlements and near the Aral Sea. Such green plantations, along with natural forests, are protected by the state.

The existing network of protected areas in Uzbekistan includes 10 strict nature reserves, 10 national parks and more than 50 species management areas and nature monuments, covering 4.4 per cent of the land area. Uzbekistan’s other types of protected areas include the Issyk-Kul biosphere territory, designated the entire Issyk-Kul province, including the famous mountain lake, as a biosphere territory. If the Issyk-Kul biosphere territory is included, the area under nature conservation status in Kyrgyzstan comes to one quarter of the country’s total area. In addition, nearly all the fynbos forests are considered as high-value ecosystems for which monitoring, control and conservation measures have been established.

Turkmenistan’s six strict nature reserves cover 8.8 per cent of the country’s territory. In addition, there are 10 species management areas. Management plans and expansion of the whole network of protected areas, including establishment of a national park have been developed. Turkmenistan is actively working on the greening of areas around settlements and near the Aral Sea. Such green plantations, along with natural forests, are protected by the state.

Tajikistan’s protected areas system includes four strict nature reserves, one national park that covers nearly half of the Tajik Pamir, the Shirkent and Saryhosor natural-historical parks, several Ramsar sites and 11 species management areas. Overall, protected areas occupy almost 22 per cent of the country – the biggest share among Central Asian countries.

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Kopetdag Mountains, Turkmenistan

Sarez Lake, the Tajik National Park

Dinosaur footprints, Kugitang (Koytendag) Mountains, Turkmenistan

Ala-Archa National Park, Kyrgyzstan
The intensive and unregulated hunting of large rare mammals together with the loss and fragmentation of habitats has had a negative effect across Central Asia, but state efforts to record and protect rare species and establish responsible hunting are underway. The countries are developing transboundary cooperation for the protection of the snow leopard, argali, Bukhara deer and Saiga antelopes, with new initiatives aimed not only at the conservation of species, but also at the sustainable management and conservation of their habitats.

In Kazakhstan, the Saiga antelope living in semi-deserts has recovered from the near-extinction caused by intensive hunting and illegal poaching for horns, but is still under threat from dangerous epidemics. The country’s measures for monitoring and protecting rare species have led to the growth in the populations of the moufflon, goat, kulan and Bukhara deer.

Nearly half of all mammals in Kyrgyzstan and Tajikistan are included on the Red List. Rare and endangered species include the snow leopard, argali, the markhor goat, Bukhara mountain sheep and Bukhara deer as well as the Tien Shan bear. Integration of new technologies for recording and monitoring of large ungulate animals in both countries provided more accurate data on their populations, habitats and migration corridors. This information can be used for decision-making and the implementation of conservation measures.

Turkmenistan and Uzbekistan are studying the goat and snow leopard, Bukhara deer, mountain urial and other rare species, and are working for their protection and reproduction. Turkmenistan takes pride in preserving the only remaining population of the Asian lion in Central Asia. The Caspian tiger, the biggest predator in Central Asia, was once common in the jungles and river plain forests from Kazakhstan to Tajikistan, but the clearing of the forests removed the tiger’s natural habitat, and excessive, uncontrolled hunting caused the disappearance of the remaining animals by the middle of the twentieth century. Scientists are mapping the former habitat, and are imagining the reintroduction of the big cats to the region.

### The number of animals of selected rare species in Central Asia

<table>
<thead>
<tr>
<th>Species</th>
<th>KAZ</th>
<th>TJK</th>
<th>UZB</th>
<th>TKM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bukhara deer</td>
<td>100</td>
<td>250</td>
<td>280</td>
<td>230</td>
</tr>
<tr>
<td>Snow leopard*</td>
<td>460</td>
<td>280</td>
<td>1400</td>
<td>100</td>
</tr>
<tr>
<td>Markhor goat*</td>
<td>900</td>
<td>250</td>
<td>300</td>
<td>50</td>
</tr>
</tbody>
</table>

* Based on expert estimates, variations are possible

Sources: National reports to the Convention on Migratory Species (CMS), National reports to the Convention on Biodiversity (CBD), FLERMONECA project reports (2015), national Red List data, scientific assessments. Data are for the most recent available year: 2009-2015.
Fauna diversity and protected species in Kazakhstan

Species diversity

Sources: Kazakhstan Fifth National Report for the Convention on Biodiversity (2015), FLERMONECA project reports (2015). Data are for the most recent available year.

Fauna diversity and protected species in Kyrgyzstan

Species diversity

Sources: Kyrgyzstan Fourth National Report for the Convention on Biodiversity (2010), FLERMONECA project reports (2015). Data are for the most recent available year.

Fauna diversity and protected species in Tajikistan

Species diversity

Sources: Tajikistan Fifth National Report for the Convention on Biodiversity (2015), FLERMONECA project reports (2015). Data are for the most recent available year.

Fauna diversity and protected species in Turkmenistan

Species diversity

Sources: Turkmenistan Fourth National Report for the Convention on Biodiversity (2010), FLERMONECA project reports (2015). Data are for the most recent available year.

Fauna diversity and protected species in Uzbekistan

Species diversity

Sources: Uzbekistan Fifth National Report for the Convention on Biodiversity (2015), FLERMONECA project reports (2015). Data are for the most recent available year.

The number of saiga antelopes in Kazakhstan

Source: Kazakhstan Fifth National Report for the Convention on Biodiversity (2015), FLERMONECA project reports (2015). Data are for the most recent available year.
Markhor goat, Tajikistan
Snow leopard, Kyrgyzstan
Saiga antelope, Kazakhstan
Mountain forest ecosystems of Central Asia harbour many wild relatives of cultivated plants and domesticated nut and fruit trees. The genetic resources of forests are important for further development of agriculture, horticulture and higher resistance to pests, diseases and climate change.

Saxaul forests grow in the deserts of Central Asia. Their largest areas are located in southern Kazakhstan (6 million ha), in Turkmenistan (4 million ha), and in Uzbekistan (2 million ha). Saxaul trees help regulate the water balance and microclimate and are used to fight desertification around the former Aral Sea, and to reduce the blowing of sand into canals, rivers and roads. They also serve as pastures.

All the mountain forests play a vital soil protection and water regulation role and are protected by the state. They attenuate erosion processes, regulate run-off and stabilize mountain slopes and soil, reducing the risk of natural hazards.

Natural fruit and nut forests, including wild apple, pear, plum, almond, pistachio and walnut, grow in the mountains of Kyrgyzstan, Tajikistan, Uzbekistan and southeastern Kazakhstan. Valuable areas of pistachios and other forests are found in the mountains of Kopet Dag in the south of Turkmenistan.

The once vast flood plain forests of Central Asia shrank significantly in the twentieth century. Some remain along Arys Darya and other rivers. They play an important role in soil and bank protection and serve as valuable habitat for birds and other animals.

Forest resources

<table>
<thead>
<tr>
<th>Country</th>
<th>Area, thousand hectares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>11 500</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>10 500</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>9 500</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>8 500</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>7 500</td>
</tr>
</tbody>
</table>

The conservation of mountain ecosystems is a regional priority for the sustainable development of Central Asia. Mountain ecosystems provide products and services not only to people in the mountains and nearby valleys, but for the population of the entire region. Mountains are particularly important as water towers and biodiversity reserves. Scientists distinguish at least 20 different types of ecosystems and estimate 4,500–5,500 species of vascular plants, one quarter of which are endemic.

Glaciers cover 4 per cent of Kyrgyzstan and 6 per cent of Tajikistan. They are also present in Kazakhstan and Uzbekistan. Melt water from the glaciers and snow in the high-altitude zones supplies the lion's share of water in Central Asia.

Excessive and unsustainable use of mountain ecosystems, the storage of hazardous waste from mining industry and the impacts of global warming are among the main factors that have a negative impact on mountain ecosystems.
The problem of desertification and land degradation is relevant to all the countries of Central Asia and is recognized as one of the regional priorities. The drying up of the Aral Sea and the conversion of large areas of the former sea to sand has led to intense dust storms that cause considerable damage to nearby agricultural regions and human health. Poor planning of hydraulic works, ill-considered development of steep slopes for croplands, salinization and waterlogging of irrigated lands and overgrazing led to a loss of soil fertility and degradation, and a loss of crop and pasture productivity.

In the last 5-10 years, the countries have made a great effort in improving the condition of land resources, in the modernization of irrigation and drainage networks, and in reducing water losses and soil erosion. On the dry former bottom of the Aral Sea, Uzbekistan has established more than 250 thousand ha of protective forest plantations.
Environmental monitoring and progress towards SEIS

Environmental monitoring in Central Asia has longstanding traditions. All countries have good scientific and organizational bases, and long series of observations and statistics, but not all data are open for public use and available over the internet. The break-up of the Soviet Union, staff reorganization in the majority of countries, and equipment for environmental monitoring outdated. New technologies, methods and automated means are available, but not widely used due to high costs, the need for staff training or other reasons.

Country maps provide a picture of the current state and coverage of the monitoring network for surface waters and air quality. There are more than 600 monitoring stations and a dedicated web portal for its State of the Environment report, which was recently adopted by a resolution of the national government. Its content is structured according to international recommendations and local experience and serves as an example for many other countries.

The Shared Environmental Information System (SEIS) is an initiative to maintain and simplify the collection, exchange and use of data for the development and implementation of state environmental policy. Implementation of the main SEIS principles can help the countries of Central Asia develop cooperation for regional environmental and sustainable development programmes and projects. The Interstate Commission for Water Coordination (ICWC) also operates in the region and its scientific and information centres have significant data related to water and the environment. In spite of efforts over a 15-year period, the region has not established an effective system of information exchange and shared indicators for environmental planning and policy-making. Nevertheless, some initiatives are paving the way for the introduction of SEIS for the benefit of all the countries in the region.

One of the initiatives is the PLERMONECA project financed by the European Union. Some of its achievements include the modernization of the regional environmental ICSD eco-portal and an online environmental monitoring information system that can enable data and information exchange to support strategy development, decision-making and regional cooperation. Progress in the development of shared regional environmental information systems varies from country to country.

Kazakhstan is implementing e-governance and monitoring portals related to public services. Recently the country created a dedicated portal for its State of the Environment report, and publishes bulletins on the state of the environment on a monthly and quarterly basis. In addition, it makes all of the nationally available indicators recommended by UNECE accessible online on the national statistics website. It develops cadastres of natural resources and target indicators for various national and regional level strategies.

Kyrgyzstan is improving its inter-agency cooperation on environmental data exchange, and is expanding opportunities for open access to environmental information and indicators over the Internet. Various agencies are involved in the development of the Kyrgyz State of the Environment Report, which was recently adopted by a resolution of the national government. Its content is structured according to international recommendations and local experience and serves as an example for many other countries.

Turkmenistan’s implementation of e-governance and information systems is in the initial stage. Similarly, the State of the Environment reporting and publishing need more work to become sustainable and available online. Currently, the environmental statistics are limited and many cadastres are still missing.

Uzbekistan also maintains a wide environmental monitoring system, which largely remained from the Soviet era, and its current state meets the needs of the country, which intends to publish indicators and State of the Environment reports online. The transition to e-governance and more openness, however, requires high-level decisions.