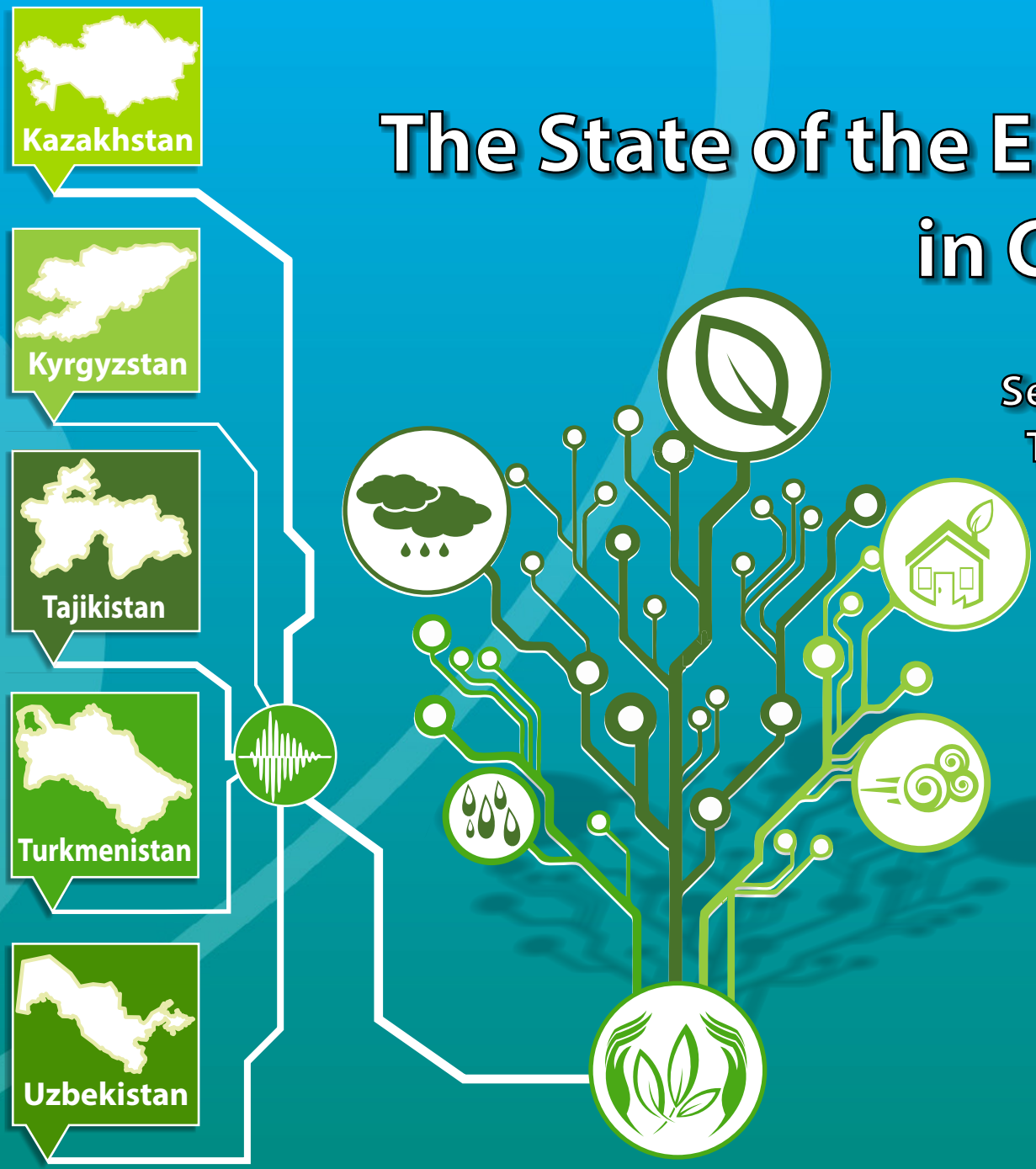
# The State of the Environment in Central Asia:

## Illustrations of Selected Environmental Themes and Indicators

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FLERMONECA

Forest and Biodiversity Governance
Including Environmental Monitoring

# The State of the Environment in Central Asia:

## Illustrations of Selected Environmental Themes and Indicators

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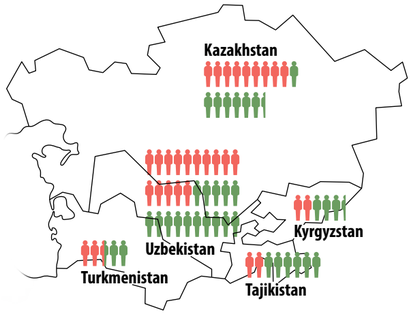
# Contents

# 1 Socioeconomic and environmental features

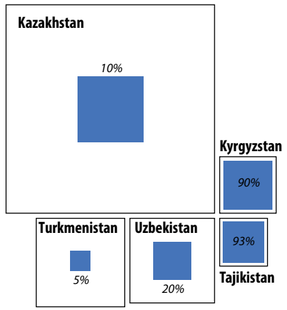



## Population

1 million Urban Rural

Map produced by ZOÏ Environment Network, June 2015
Source: World Bank (www.worldbank.org)

The population of Central Asia continues to grow, and the total for the region in 2015 is estimated at 65 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.

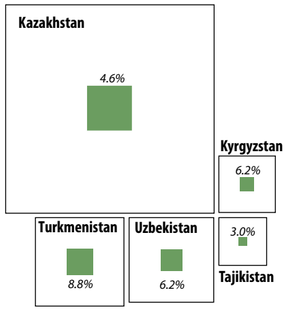



## Proportion of mountain area by country

Total area Mountain coverage in percent of total area

Map produced by ZOÏ Environment Network, June 2015

Deserts, semi-deserts and steppes cover much of Central Asia but each of the countries has mountains that occupy from 5 per cent in Turkmenistan up to 90-93 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 particularly vulnerable to climate change, and whatever happens in the mountains eventually affects the lowlands.



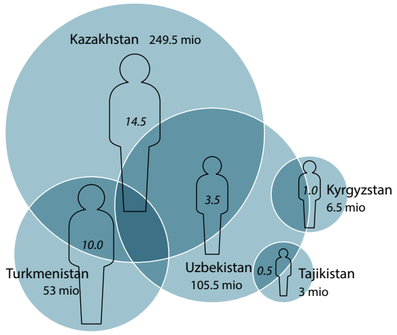

## Forest coverage

Total area Forest coverage in percent of total area

Map produced by ZOÏ Environment Network, June 2015
Source: FAO FRA 2010, State of the Environment reports

Forest cover in the countries of Central Asia ranges from 3 per cent in Tajikistan to 9 per cent in Turkmenistan. Lowland desert forests, such as saxaul 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.






## Greenhouse gas emissions

Total greenhouse gas emissions (million t/year)

Greenhouse gas emissions per capita (t/year)

Map produced by ZOÏ Environment Network, June 2015
Source: World Bank (www.worldbank.org)

During the economic decline of the 1990s and the transition to a market economy, a reduction in energy consumption resulted in declining greenhouse gas (GHG) emissions in Central Asia. Economic recovery in the region has favoured less heavy industrial development, and emissions in Kyrgyzstan and Tajikistan – countries with a high share of hydropower – have remained well below the world average of 5.5 tonnes per person, and are the lowest in the region. Uzbekistan's emissions have been stable for a long time and are slightly below the world average. Growth in industry and energy consumption has caused the greenhouse gas emissions of Kazakhstan and Turkmenistan to rise. About half of Tajikistan's GHG emissions come from the agriculture sector. In all the other Central Asian countries, the energy sector accounts for most of the greenhouse gas emissions.


## Temperature and precipitation

Temperature change 1976 - 2012

0.2 0.4 0.6 +0.8 °C

Precipitation change 1976 - 2012

Minus more than 10%
Plus more than 10%

Map produced by ZOÏ Environment Network, June 2015

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.

# 2 Air quality

## Industrial air pollution

In 1990 stationary industrial sources accounted for the highest share of the region's 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 reserves 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. In light of rapid economic growth and the forecasts 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 as the fuel 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 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 contribution of mobile sources, primarily cars, to total air emissions varies from below 50 per cent in Kazakhstan and Turkmenistan, to 70 per cent in Uzbekistan and nearly 90 per cent in Tajikistan and Kyrgyzstan. Kazakhstan, Uzbekistan and Turkmenistan strive to maintain environmental and fuel standards within advanced levels.

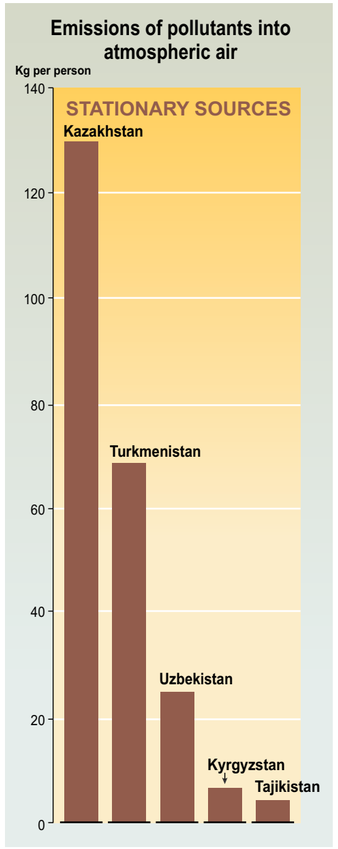
High fuel prices in Tajikistan and Kyrgyzstan – where local petroleum production is insignificant – have prompted conversion of fuel systems in the cars from gasoline to natural gas. In Uzbekistan, the share of cars using liquefied natural gas is also growing.

## Heavy metals

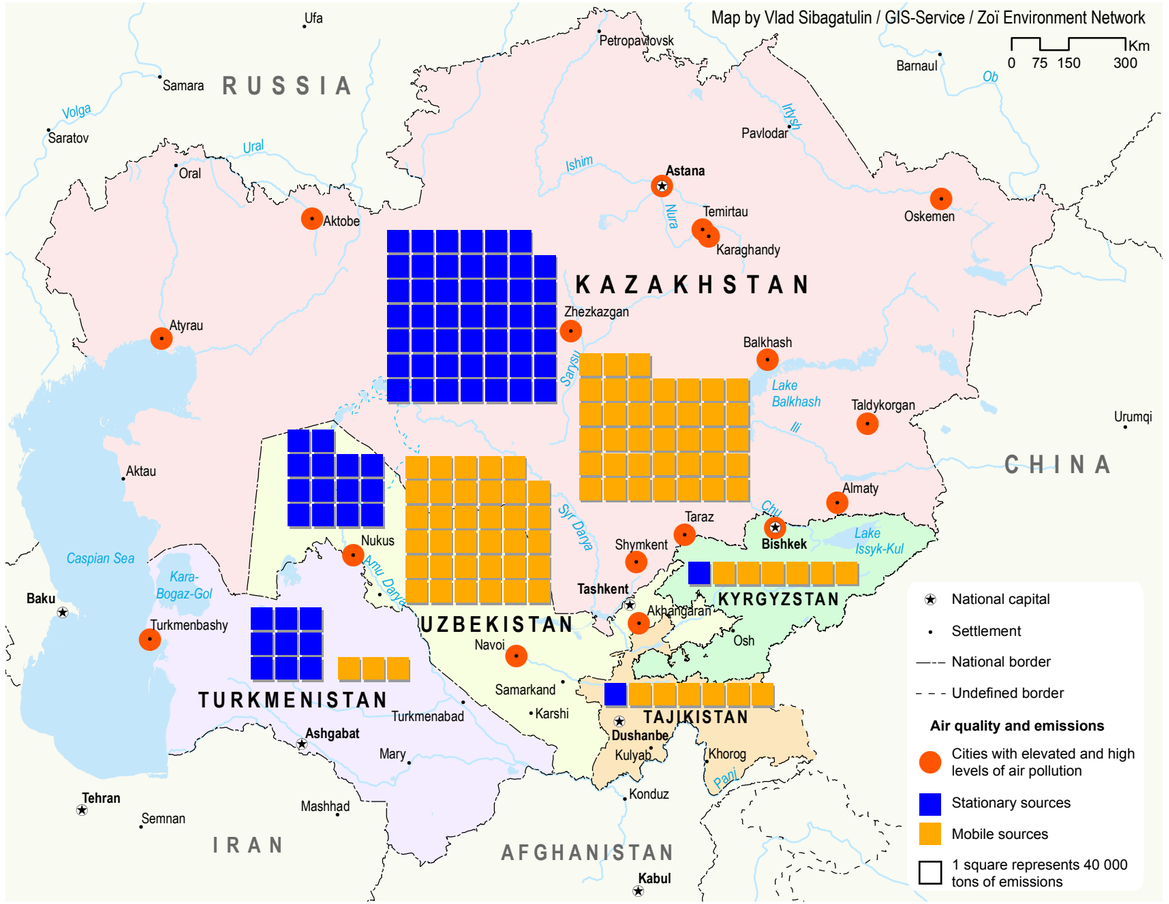
The exploitation of the region's rich mineral resources has included the mining of lead and mercury, two heavy metals with well-known human health and environmental impacts. In the Soviet era, production levels and hence air emissions of these heavy metals were substantial. Nowadays, emissions from heavy metal production are not so significant, but still continue. Lead and mercury emissions from secondary sources – industrial activities and burning of fossil fuels – are lower, but the problem of their control and minimization remains relevant.

## Dust and salt storms around the former Aral Sea

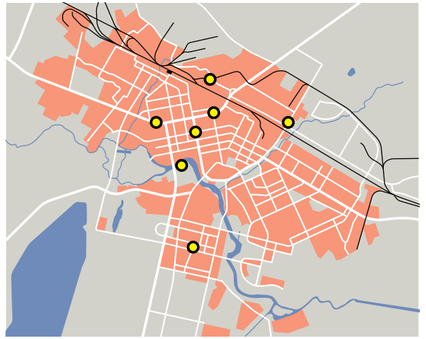
Sand, dust and various salts now cover a vast area that was once the bottom or the coast of the Aral Sea. The wind whips these deposits into dust and sand aerosols that travel hundreds of kilometres, depending on wind speed and direction. These dust storms affect human health in densely populated areas near the former sea, damage vulnerable infrastructure and diminish air quality in Nukus and the Amu Darya delta.




Sources: Latest National State of the Environment reports and statistics (2010-2014), FLERMONECA project reports (2015). Data are for the most recent available year.



# Air quality in major cities



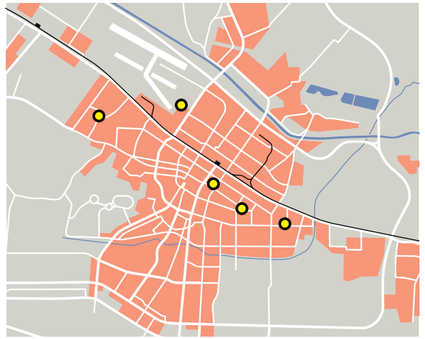
Air quality monitoring stations

**Astana**

0 5 km

Map produced by Zoï Environment Network, July 2015

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 publically 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.



Air quality monitoring stations

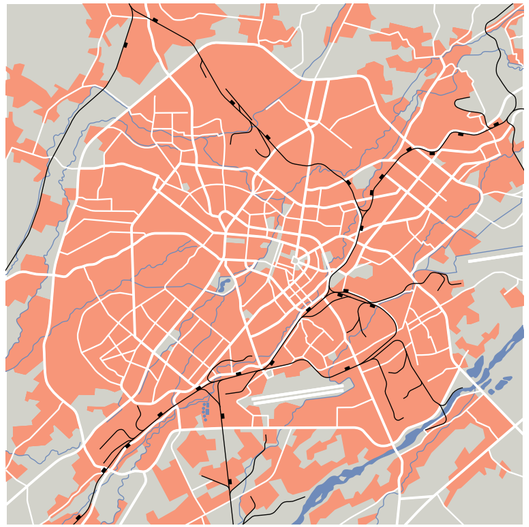
**Ashgabat**

0 5 km

Map produced by Zoï Environment Network, July 2015

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.



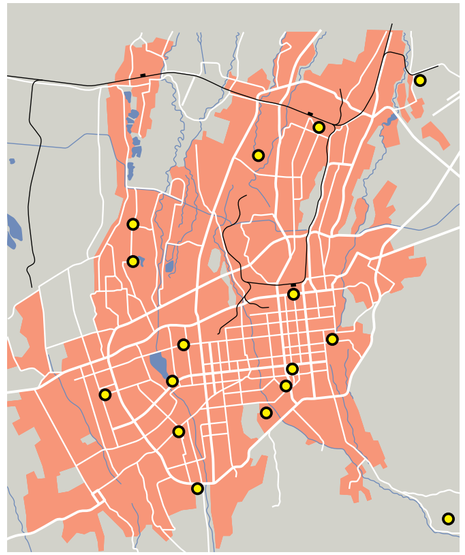


0 5 km

**Tashkent**

Map produced by Zoï Environment Network, July 2015

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.



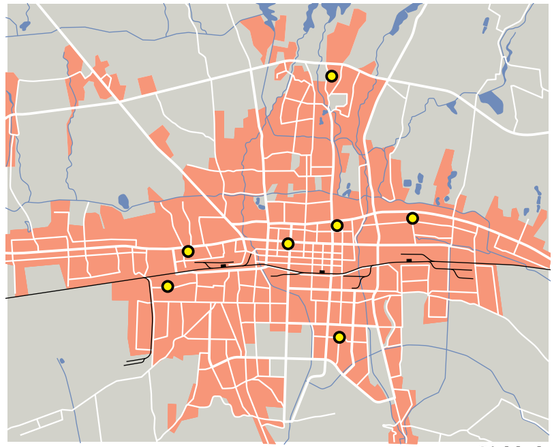
Air quality monitoring stations

**Almaty**

0 5 km

Map produced by Zoï Environment Network, July 2015

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 increased use of public transport, especially metro, broadening the network of pedestrian and bicycle lines, and the promotion of natural gas as a fuel.



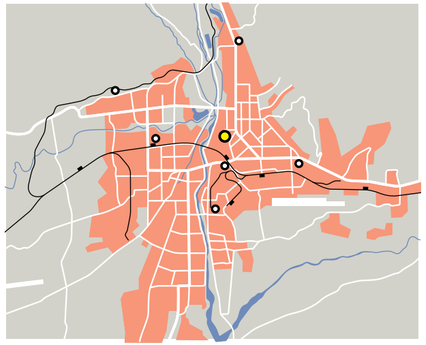
Air quality monitoring stations

**Bishkek**

0 5 km

Map produced by Zoï Environment Network, July 2015

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.



Air quality monitoring stations

Not operational sites

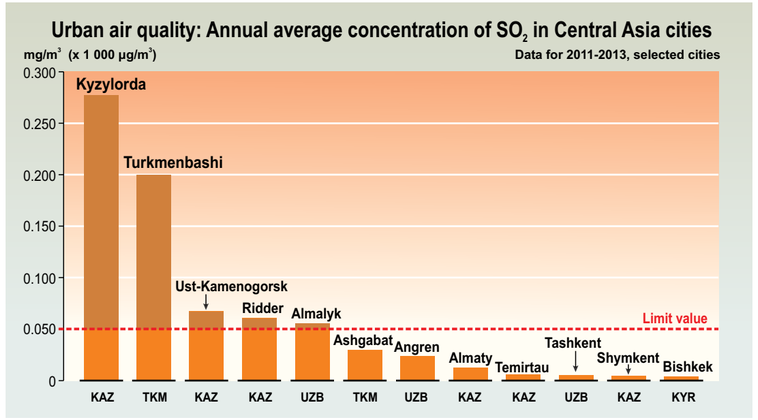
**Dushanbe**

0 5 km

Map produced by Zoï Environment Network, July 2015

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.



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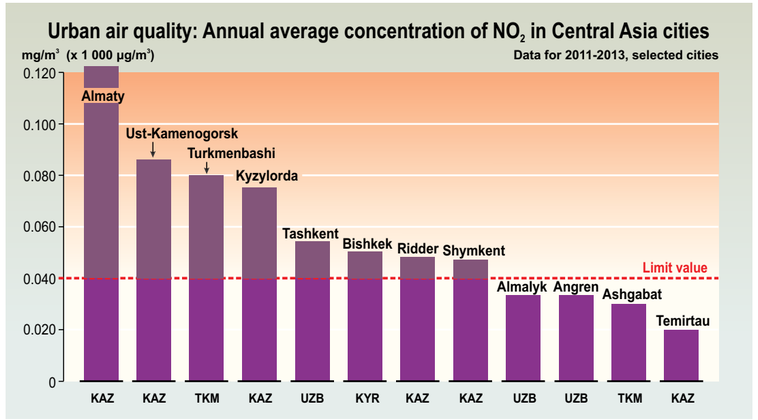


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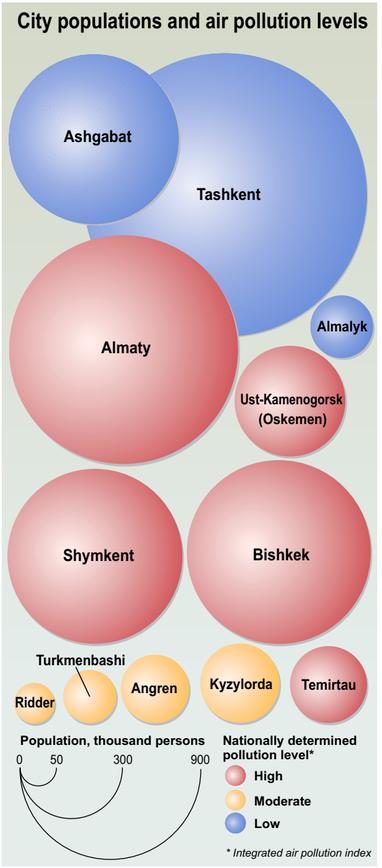
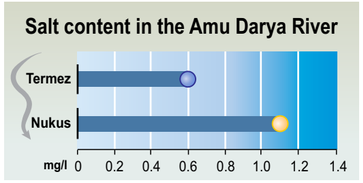



Sources: Latest National State of the Environment reports (2010-2015), FLERMONECA project reports (2015), Kazhydromet. Data are for the most recent available year: 2011-2013

# 3 Water quality

## Agricultural run-off and discharges from densely populated areas

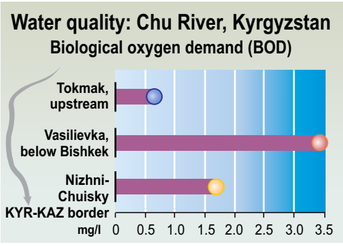
With its high temperatures and low rainfall, Central Asia has long depended on irrigated agriculture for much of its food and fibre production. Wasteful water use practices and overuse of pesticides and mineral fertilizers – legacies of the Soviet era – continue to cause problems today. Irrigation water 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 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.




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

## Wastewater treatment and biological pollution

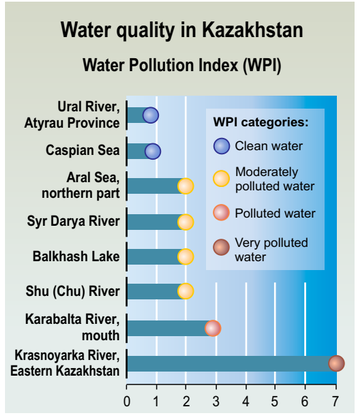
Low maintenance, ageing and inadequately sized sewage treatment facilities in many cities undermine the overall efficiency of wastewater management. The growth of population in both urban and rural areas creates additional pressure on water resources. Quite often the quality of surface water downstream 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.



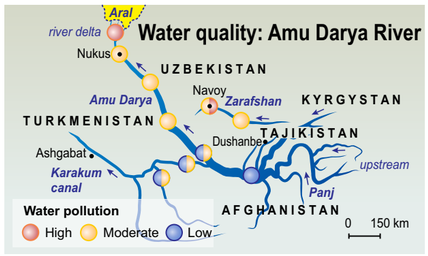

Sources: FLERMONECA project reports (2015), Kyrgyzhydromet. Data for 2013.

## 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, mud slides and heavy rains can wash the pollutants into surface waters, and significantly affect water quality. Groundwater pollution by industries, even where the production was stopped, also deserve attention.




Source: Kazhydromet (http://www.kazhydromet.kz). Data for 2014.


Sources: Latest National State of the Environment reports and statistics (2010-2014), FLERMONECA project reports (2015), SIC ICWC-UNECE web-portal "Water quality in Central Asia". This map reflects and generalizes the situation in 2010-2014.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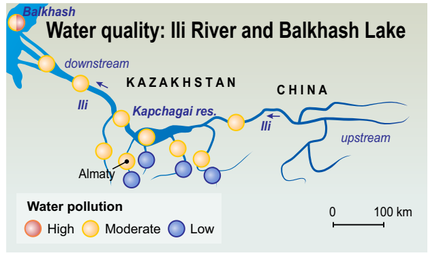



Sources: Environmental bulletins of Kazakhstan and State of the Environment reports (2010-2014), FLERMONECA project reports (2015), SIC ICWC-UNECE web-portal "Water quality in Central Asia". This map reflects and generalizes the situation in 2010-2014.

Alaudin Lakes, Fann Mountains, Tajikistan



The Amu Darya River at Nukus, Uzbekistan

# 4 Protected areas

Each of the countries in the region makes a significant effort to conserve wild nature, and each has its own network of protected areas. In addition, the countries cooperate in the monitoring and protection of populations of migrating species of birds and animals, and work together on transboundary issues.

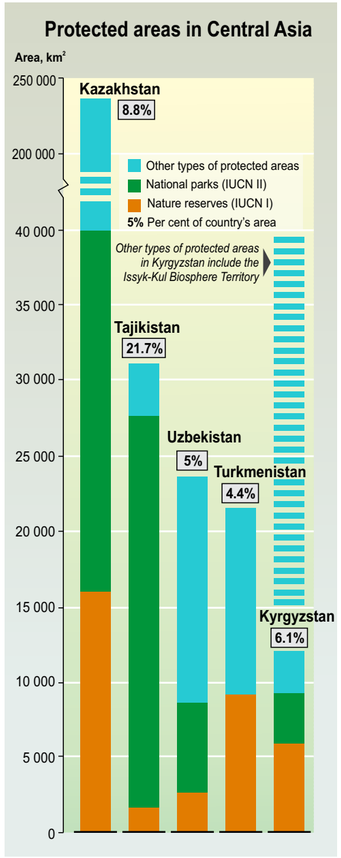
Protected areas of **Kazakhstan** cover 8.8 per cent of the country and consist of nearly 100 sites, including 10 strict nature reserves, 12 national parks, 5 special nature protection zones and numerous other sites with sustainable natural resources management or species conservation status. Kazakhstan's 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 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 Kyrgyz forests are considered as high-value ecosystems for which monitoring, control and conservation measures have been established.

**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 13 species management areas. Overall, protected areas occupy almost 22 per cent of the country – the biggest share among Central Asian countries.

**Turkmenistan's** nine strict nature reserves cover 925 000 hectares with a wide range of ecosystems. Additionally, there are a number of 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.

**Uzbekistan** has a wide network of protected areas – eight strict nature reserves, three natural parks, 12 species management areas, one biosphere reserve and several centres for captive breeding of rare birds and animals. Together these areas cover almost 2.4 million hectares or around 5 per cent of the country's territory. In addition, there are 25 water protection zones. The development programme for protected areas anticipates expansion of up to 8.1 million hectares.




Source: Latest National State of the Environment reports and statistics (2010-2014), FLERMONECA project reports (2015). Data are for the most recent available year.
*Kyrgyzstan's other types of protected areas include the Issyk-Kul biosphere territory


Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
0 100 200 400 Km
RUSSIA
KAZAKHSTAN
UZBEKISTAN
KYRGYZSTAN
CHINA
Ufa
Samara
Saratov
Oral
Aktobe
Volga
Ural
Omsk
Petropavlovsk
Barnaul
Irtysh
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Southern Kazakhstan
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Karaagash
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Altyn Dala
Turgay
Irgiz-Turgai
Bektauata
Kukan
Alakol
Toktinsky
Lepsinsk
Zhongar-Alatau
Upper-Koksu
Altyn-Emel
Karoy
Kogashik
Balkhash
Zhusandaly
Andasai
Charyn
Karakunuz
Berikkara
Karatau
Kargaly
Torangylsay
Barsakelmes
Syrdarya
Chu
Ili
Naryn
Amudarya
Arys-Karaktau
Southern Kazakhstan
Novinsky
Akzhayik
Aktau-Buzachi
Karak-Karakol
Kenderli-Kayasan
Ustyurt
1
Timur
Zhambyl
Akdaly
Zadara
Arys Karaktau
2
Irsu Daubaby
Boraldaу
Sairam Ugam
Aksu Zhabagly
3
Ile Alatau
Almaty
Алматы
Kolsay kolderi
National capital
Settlement
National border
UNESCO World Heritage Site
Protected areas
Strict nature reserve
National park
Integrated protected area
Species management area
Protected area with sustainable use of natural resources


Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
0 20 40 80 Km
KAZAKHSTAN
KYRGYZSTAN
UZBEKISTAN
TAJIKISTAN
CHINA
Kapchagay
Kapchagaiskoe Res.
Zhanatas
Shu
Karatau
Taraz
Shymkent
Lenger
Tashkent
Bishkek
Almaty
Talgar
Tokmok
Kara-Archa
Jarly-Kaindy
Yablonevaya Shel
Chon-Aryk
Chon-Kemin
Malaya Ak-Suu
Ken-Suu
Tup
Issyk-Kul
Lake Issyk-Kul
Teplokluchenka
Karakol
Jety-Oguz
Ottuk
Jargylchak
Sarychat-Ertash
Maimak
Karabuura
Talas
Besh-Tash
Chychkan
Ak-Suu
Ala-Archa
Kochkor
Suusamyr
Besh-Aral
Uzunakamatsky
Chatkal
Chanach
Sary-Chelek
Padysha-Ata
Batrakhansky
Toktogulskoe Res.
Lake Song-Kol
Miskin-Saisky
Kuru-Kolski
Jel-Tiybes
Razan-Say
Tash-Kumyr
Dashmansky
Kyrgyz-Gava
Saimaluu-Tash
Kan-Achuu
Min-Kush
Naryn
Salkyn-Tor
Karatal-Japaryk
Koshi-Tektir
Namangan
Akhangaran
Kokand
Andijan
Osh
Jalalabat
Jilgyndy
Yasinky
Kara-Shoro
Kulun-Ata
Gulcho
Bel-Uli
Ak-Bura
Kairakkumskoe Res.
Khudzand
Fergana
Kyzyl-Kiya
Kyrgyz-Ata
Isfara
Janchakty
Chirandy
Sarkent
Sary-Mogol
Bolshoy Oi-Kaiyn
Surmatash
Kashi
Garm
Jirgital
Lake Karakul
National capital
Settlements
National border
Protected areas
Strict nature reserve
National park
Flora species management area
Species management area
Forest reserve
Fauna species management area
Biosphere Reserve Issyk Kul


Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
0 20 40 80 Km
Tashkent
UZBEKISTAN
KYRGYZSTAN
TAJIKISTAN
CHINA
AFGHANISTAN
Namangan
Jalalabat
Andijan
Osh
Fergana
Oktosh
Syr Darya
Fetghana Canal
Kayrakkum Res.
Gulistan
Djizzak
Khudzand
Shahriston
Kusavli-Say
Zerafshan
Say-Vota
Ayni
Iskanderkul
Kamarov
Garm
Dzhirgital
Romit
Shirkent
Varzob
Almosy
Dushanbe
Shahrinav
Faizabod
Sarikhosor
Tavildara
Nurek
Childukhtaron
Nurek Res.
Obikiik
Vanch
Sangvor
Lake Karakul
Tajik National Park
Muzkul
Lake Sarez
Murgab
Rushan
Yaksh
Kulyab
Kurgan-Tube
Shuroabod
Dasht-i Djum
Karatagh
Dzhilikul
Beshkent
Tigrovaya Balka
Kofarnihon
Pamir
Kokcha
Feyzabad
Khorog
Zor Kul
Konduz
Taloqan
Ishkashim
National capital
Settlement
National border
Undefined border
UNESCO World Heritage Site
Protected areas
Strict nature reserve
National park
Species management area
Natural park
Historical natural park


Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
0 25 50 100 Km
UZBEKISTAN
TURKMENISTAN
IRAN
AFGHANISTAN
Lake Sarykamysh
Sarygamysh
Dashoguz
Kara-Bogaz-Gol
Gaplangyr
Lake Golden Age
Urgench
Lake Aidarkul
Turkmenbashi
Khazar
Balkanabat
Khazar
Kum Dag
Bereket
Serdar
Ogurjaly
Caspian Sea
Berekteli Karakum
Amudarya
Navoi
Bukhara
Samarkand
Seydi
Turkmenabad
Karshi
Main collector
Syunt-Hasardag
Kopetdag
Ruhabat
Ashgabat
Guryhovdan
Repetek biosphere reserve
Amu Darya
Hojaburjebelent
Kerki
Hojapil
Koytendag
Kelif
Hojagaravul
Garlyk
Karakumsky Canal
Mary
Bairam-Ali
Tedzhen
Iolotan
Kopetdag
Sheberghan
Mashhad
Badkhyz
Gyzyldzhar
Chemenabit
Serhetabat
National capital
Settlement
National border
Protected areas
Strict nature reserve
Species management area



Altyn-Emel National Park, Aktau Mountains, Kazakhstan


Repetek Nature Reserve, Turkmenistan


Gissar Mountains, Tajikistan and Uzbekistan


Nurata Nature Reserve, Uzbekistan

Kopetdag Mountains, Turkmenistan

Sarez Lake, the Tajik National Park

Dinosaur footprints, Kugitang (Koytendag) Mountains, Turkmenistan



Ala-Archa National Park, Kyrgyzstan

# 5 Endangered and rare species

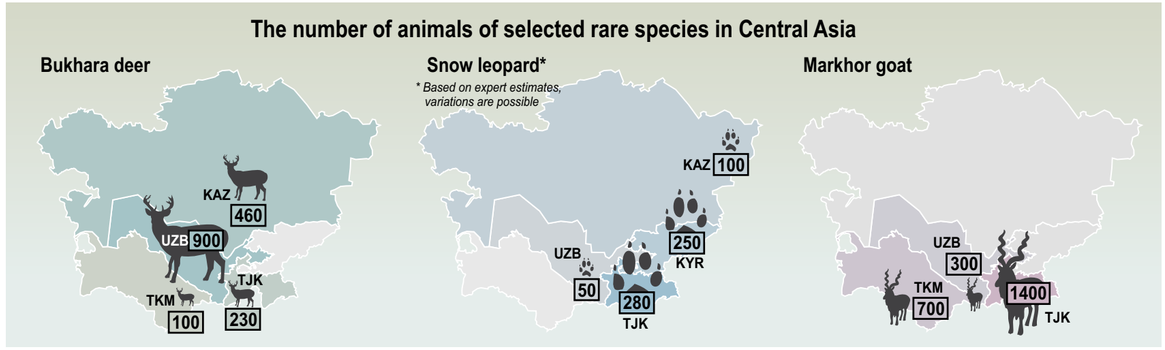
The intensive and unregulated hunting of large rare mammals together with the loss and fragmentation of habitats has had a negative effect across Central Asia, but state efforts to record and protect rare species and establish responsible hunting are underway. The countries are developing transboundary cooperation for the protection of the snow leopard, argali, Bukhara deer and Saiga antelope, 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, goitered gazelle, kulan and Bukhara deer.

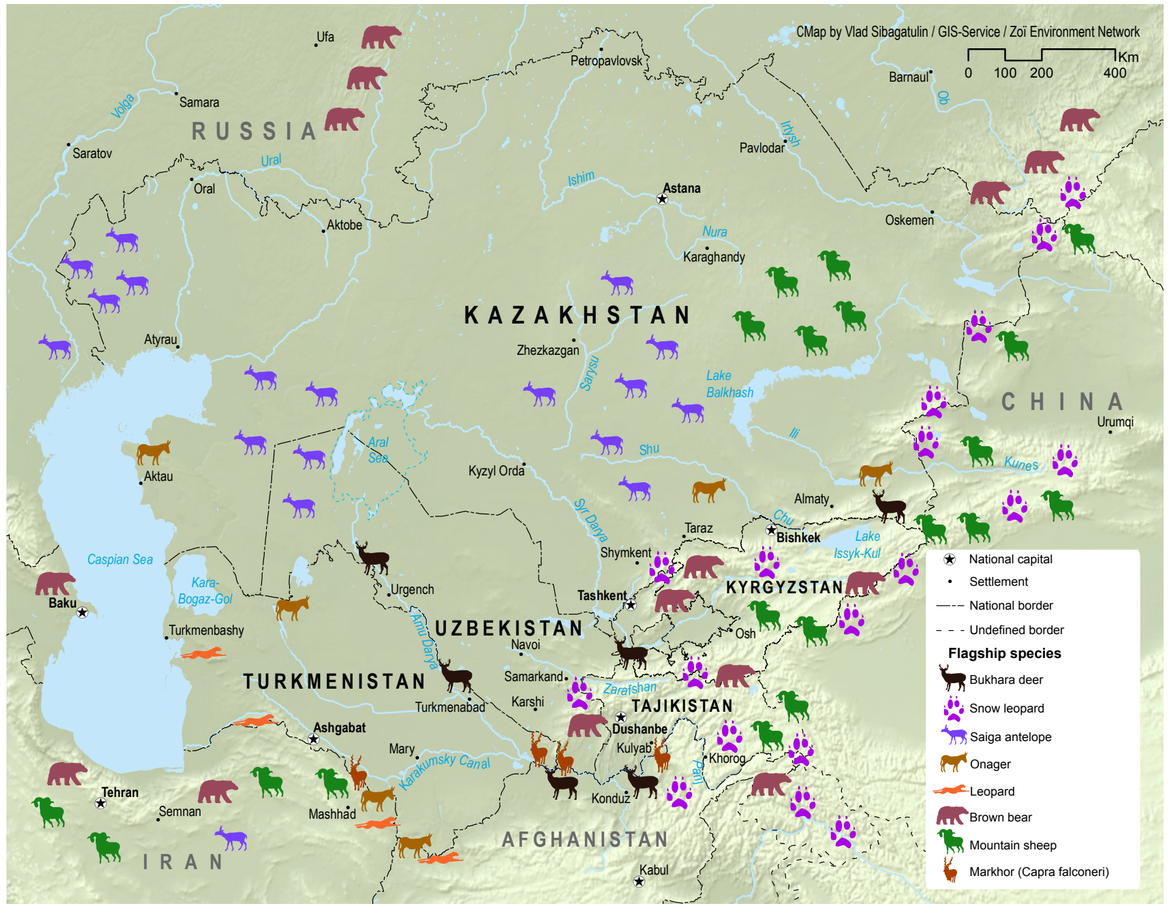
Nearly half of all mammals **in Kyrgyzstan and Tajikistan** are included on the Red List. Rare and endangered species include the snow leopard, argali, the markhor goat, Bukhara mountain sheep and Bukhara deer as well as the Tien Shan bear. Integration of new technologies for recording and monitoring 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.

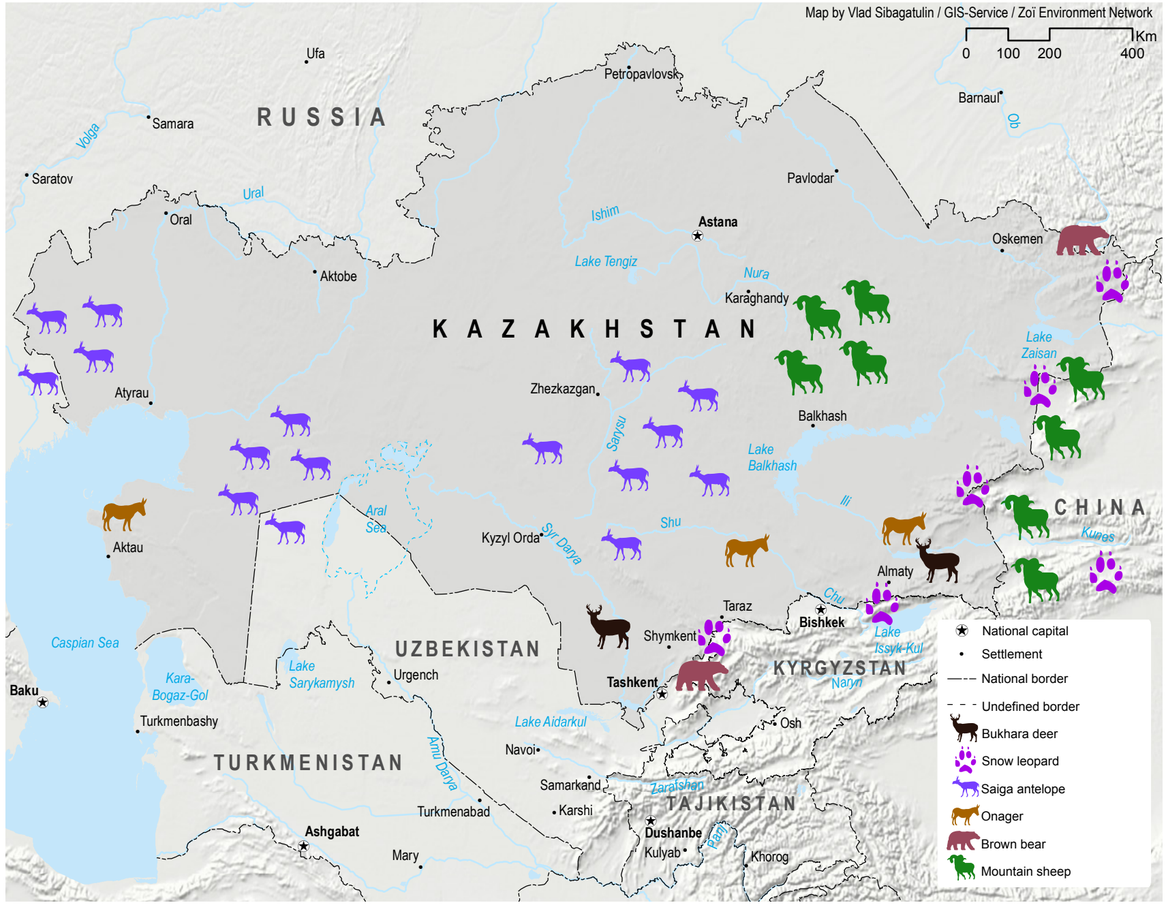
**Turkmenistan and Uzbekistan** are studying the goitered gazelle, Bukhara deer, mountain urial and other rare species, and are working for their protection and reproduction. Turkmenistan takes pride in preserving the only remaining population of the Asian leopard in Central Asia.

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.




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.




Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
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RUSSIA
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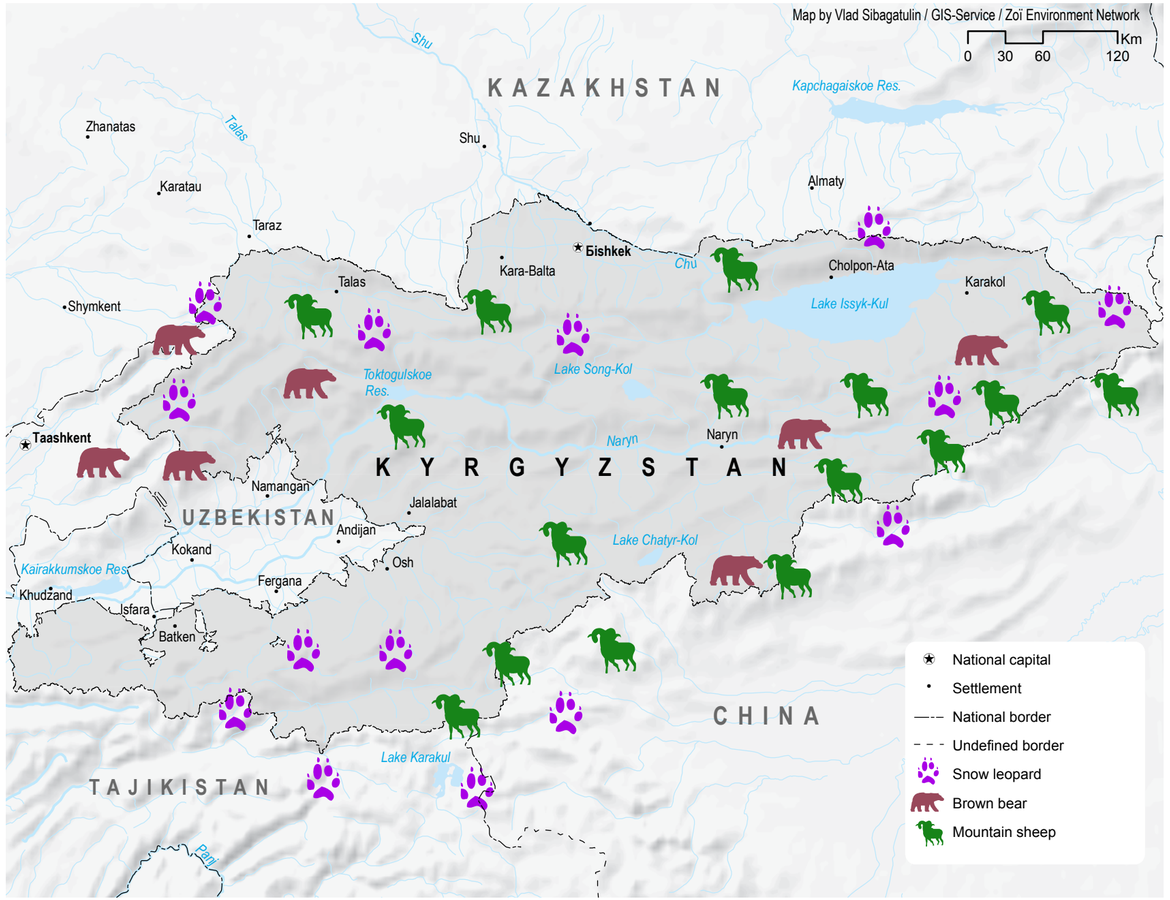
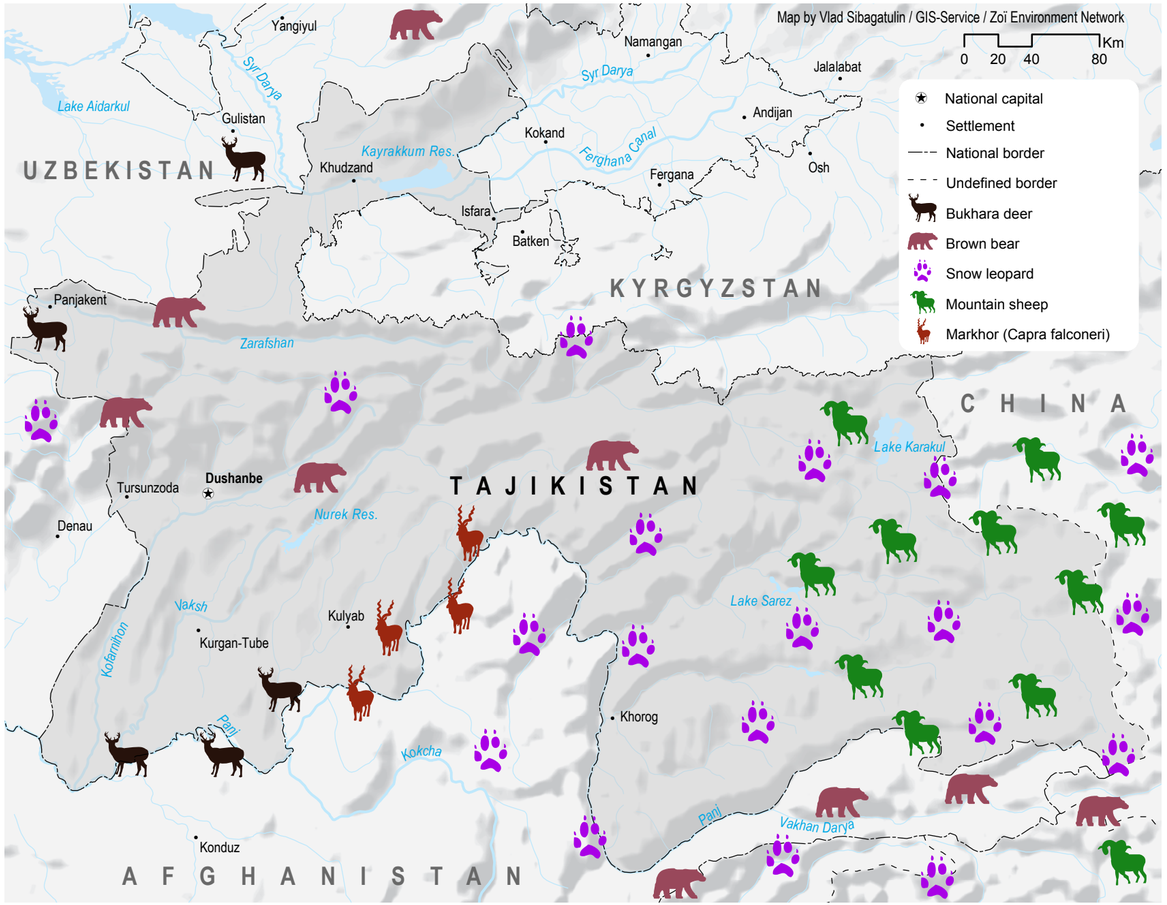
CHINA
UZBEKISTAN
TURKMENISTAN
KYRGYZSTAN
TAJIKISTAN
Ufa
Samara
Saratov
Oral
Aktobe
Atyrau
Aktau
Petropavlovsk
Barnaul
Pavlodar
Astana
Oskemen
Karaghandy
Zhezkazgan
Balkhash
Kyzyl Orda
Almaty
Taraz
Shymkent
Bishkek
Tashkent
Urgench
Turkmenbashy
Baku
Navoi
Samarkand
Karshi
Turkmenabad
Ashgabat
Mary
Osh
Dushanbe
Kulyab
Khorog
Volga
Ural
Ishim
Ob
Nura
Lake Tengiz
Lake Zaisan
Lake Balkhash
Sarysu
Aral Sea
Syr Darya
Shu
Ili
Kunes
Chu
Naryn
Lake Issyk-Kul
Caspian Sea
Kara-Bogaz-Gol
Lake Sarykamysh
Lake Aidarkul
Amu Darya
Zeravshan
Kafirnigan
National capital
Settlement
National border
Undefined border
Bukhara deer
Snow leopard
Saiga antelope
Onager
Brown bear
Mountain sheep


Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
0 30 60 120 Km
KAZAKHSTAN
KYRGYZSTAN
UZBEKISTAN
TAJIKISTAN
CHINA
Shu
Kapchagaiskoe Res.
Zhanatas
Talas
Karatau
Taraz
Shymkent
Kara-Balta
Bishkek
Almaty
Cholpon-Ata
Karakol
Talas
Chu
Lake Issyk-Kul
Lake Song-Kol
Toktogulskoe Res.
Taashkent
Naryn
Namangan
Jalalabat
Andijan
Osh
Kokand
Fergana
Khudzand
Isfara
Batken
Kairakkumskoe Res
Lake Chatyr-Kol
Lake Karakul
Pamir
National capital
Settlement
National border
Undefined border
Snow leopard
Brown bear
Mountain sheep


Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
0 20 40 80 Km
National capital
Settlement
National border
Undefined border
Bukhara deer
Brown bear
Snow leopard
Mountain sheep
Markhor (Capra falconeri)
UZBEKISTAN
KYRGYZSTAN
TAJIKISTAN
CHINA
AFGHANISTAN
Yangiyul
Namangan
Jalalabat
Andijan
Osh
Fergana
Kokand
Khudzand
Gulistan
Isfara
Batken
Panjakent
Tursunzoda
Dushanbe
Denau
Kulyab
Kurgan-Tube
Konduz
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Lake Aidarkul
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Kayrakkum Res.
Ferghana Canal
Zarafshan
Nurek Res.
Yakshi
Kofarnihon
Panj
Kokcha
Lake Karakul
Lake Sarez
Vakhan Darya


Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
0 40 80 160 Km
National capital
Settlement
National border
Bukhara deer
Onager
Leopard
Mountain sheep
Markhor (Capra falconeri)
UZBEKISTAN
TURKMENISTAN
IRAN
AFGHANISTAN
Nukus
Dashoguz
Urgench
Lebap
Navoi
Seydi
Turkmenabad
Karshi
Kerki
Turkmenbashi
Khazar
Balkanabat
Serdar
Ruhabat
Ashgabat
Tedzhen
Mary
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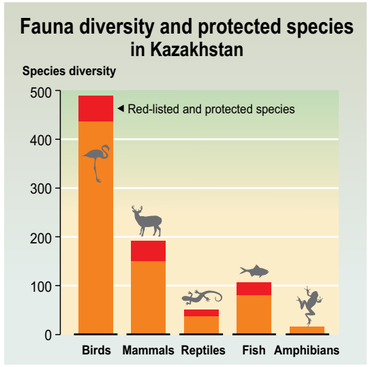
Iolotan
Mashhad
Serhetabat
Kara-Bogaz-Gol
Caspian Sea
Lake Sarykamysh
Lake Golden Age
Lake Aidarkul
Amu Darya
Main collector
Atrek
Karakumsky Canal

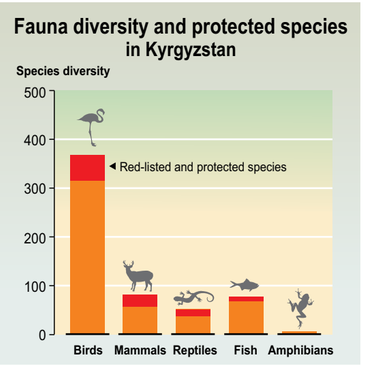



## Fauna diversity and protected species in Kazakhstan



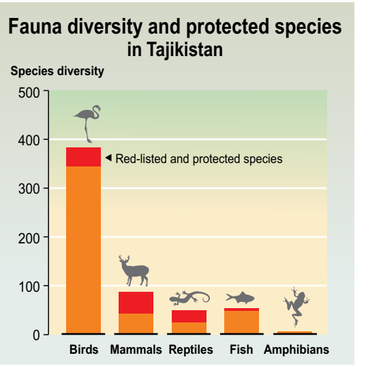

Sources: Kazakhstan Fifth National Report for the Convention on Biodiversity (2015), FLERMONECA project reports (2015). Data are for the most recent available year.

## Fauna diversity and protected species in Kyrgyzstan



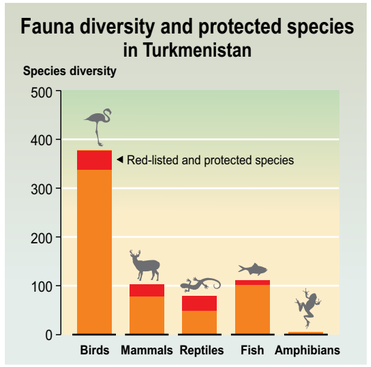

Sources: Kyrgyzstan Fourth National Report for the Convention on Biodiversity (2010), FLERMONECA project reports (2015). Data are for the most recent available year.

## Fauna diversity and protected species in Tajikistan



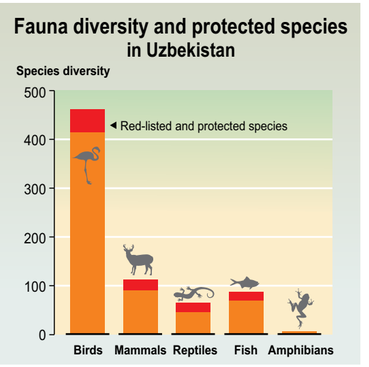

Sources: Tajikistan Fifth National Report for the Convention on Biodiversity (2015), FLERMONECA project reports (2015). Data are for the most recent available year.

## Fauna diversity and protected species in Turkmenistan



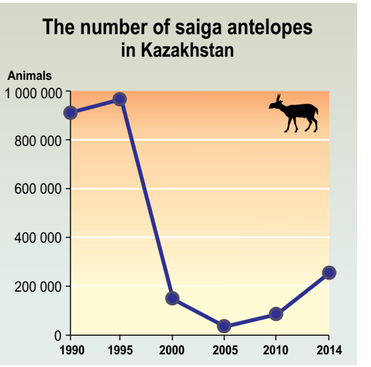

Sources: Turkmenistan Fourth National Report for the Convention on Biodiversity (2010), FLERMONECA project reports (2015). Data are for the most recent available year.

## Fauna diversity and protected species in Uzbekistan




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




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

Snow leopard, Kyrgyzstan

Markhor goat, Tajikistan



Saiga antelope, Kazakhstan

# 6 Forest resources

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.

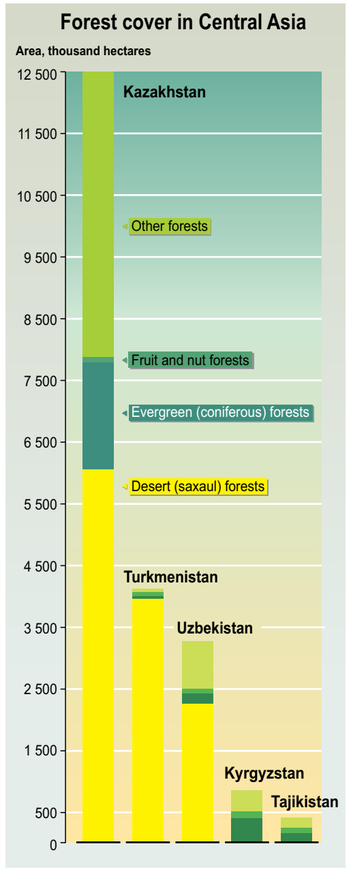
Saxaul forests grow in the deserts of Central Asia. Their largest areas are located in southern Kazakhstan (6 million ha); in Turkmenistan (4 million ha); and in Uzbekistan (2 million ha). Saxaul trees help regulate the water balance and microclimate and are used to fight desertification around the former Aral Sea, and to reduce the blowing of sand into canals, oases 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 pistachio and other forests are found in the mountains of Kopet Dag in the south of Turkmenistan.

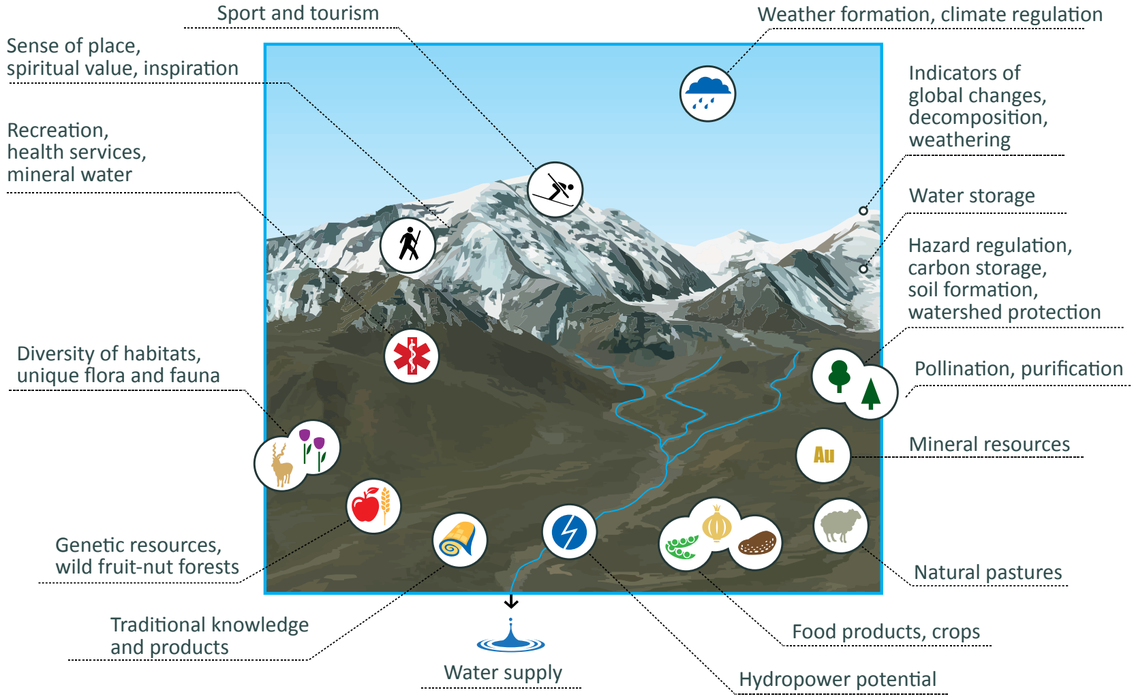
The once vast flood plain forests of Central Asia shrank significantly in the twentieth century. Some remain along Amu Darya and other rivers. They play an important role in soil and bank protection and serve as valuable habitat for birds and other animals.

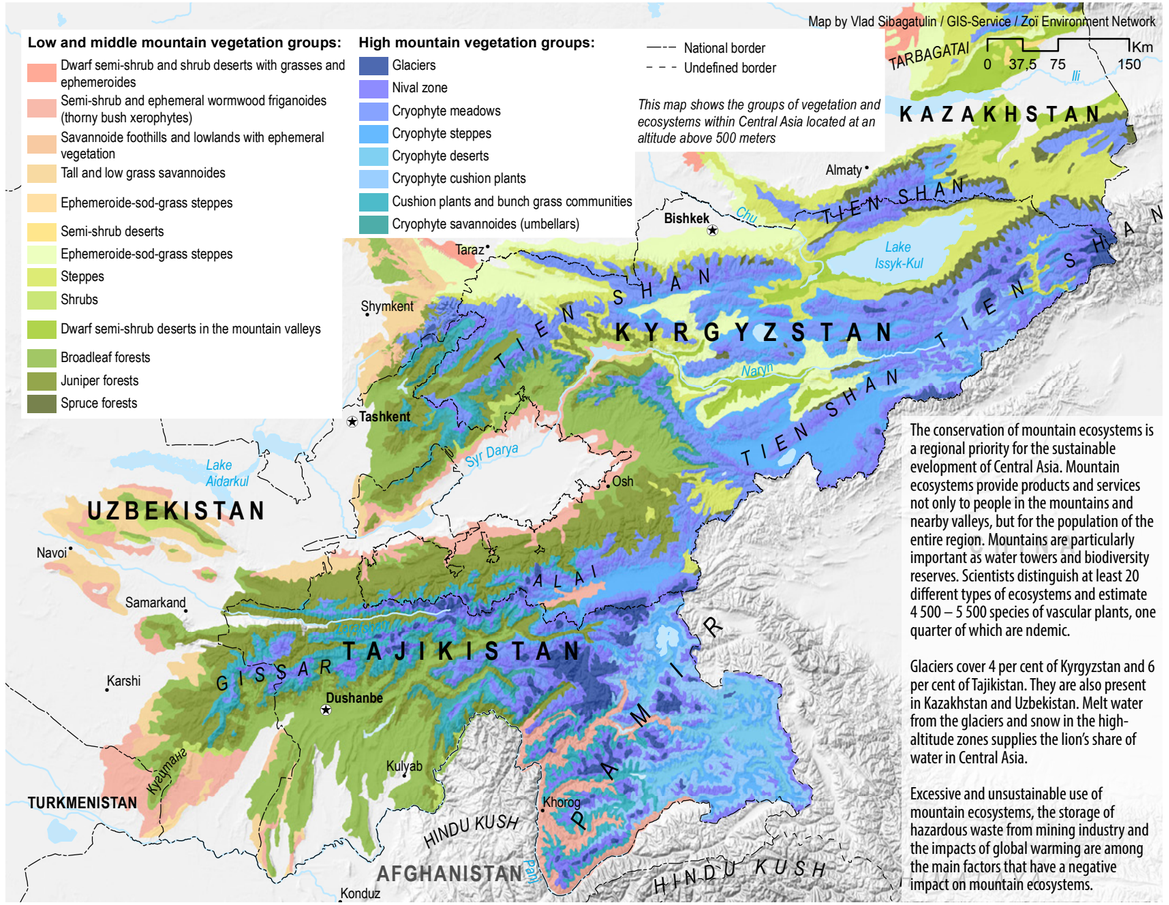
Spruce forests, Kyrgyzstan




Source: Latest National State of the Environment reports and statistics (2010-2015), FLERMONECA project reports (2015), FAO Forest Resources Assessment 2010

# 7 Mountain ecosystems




The conservation of mountain ecosystems is a regional priority for the sustainable evelopment 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 ndemic.

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.

# 8 Desertification and land degradation

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 agricultural fields, 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.

Sand desert, Kazakhstan

Intense erosion, Javan Valley, Tajikistan

# 9 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. After the break-up of the Soviet Union, staffing potential declined in the majority of countries, and equipment for environmental monitoring became outdated. New technologies, methods and automated means are now 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 sampling sites across the region.

**The Shared Environmental Information System (SEIS)** is an initiative to modernize and simplify the collection, exchange and use of data for the development and implementation of state environmental policy. Integration of the main SEIS principles can help the countries of Central Asia develop cooperation for data exchange, assessment and indicator-based reporting on the environment on the national as well as regional levels, and can be useful in informing the public.

**The International Fund for Saving the Aral Sea (IFAS)**, the leading regional high-level, environmentally focused organization with all five Central Asia states as members, serves as a platform for discussion and management of regional environmental issues. Operating under the IFAS structure, **the Interstate Commission for Sustainable Development (ICSD)** assesses regional environmental challenges as well the state of the environment, and coordinates the planning and implementation of 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 policymaking. 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 **FLERMONECA 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 environmental information systems varies from country to country.

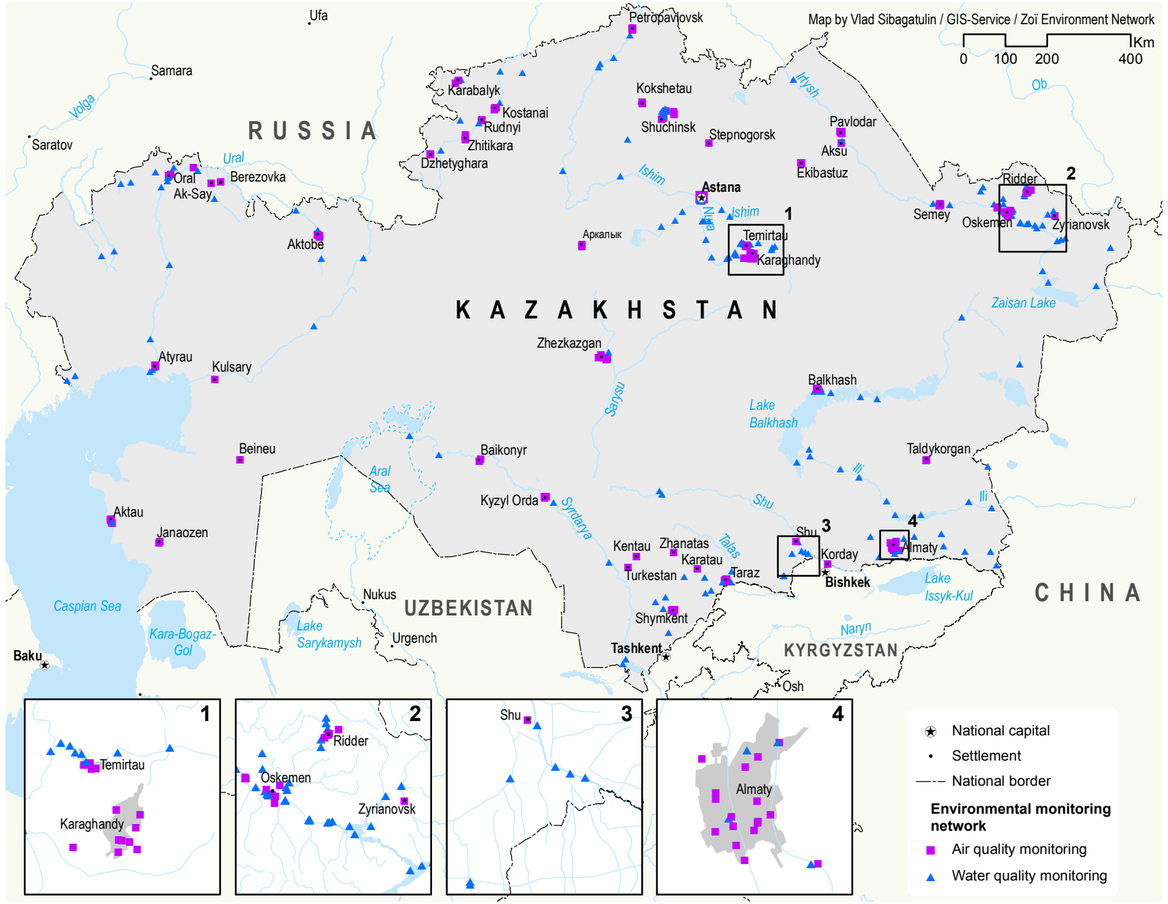
**Kazakhstan** is implementing e-governance and maintaining portals related to public services. Recently the country created a dedicated web portal for its State of the Environment report, and publishes bulletins on the state of the environment on a monthly and quarterly basis. In addition, it makes 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 experiences and serves as an example for many other countries.

**Tajikistan's** implementation of e-governance and information systems is at 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.

**Turkmenistan's** environmental monitoring system survived the transition period from the Soviet era and in 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.

**Uzbekistan** also maintains a wide environmental monitoring system, which largely remained from the Soviet era, and collects and analyses data on almost 100 indicators, many of which are compatible with international and UNECE-recommended formats. The country intends to publish indicators and regularly develops State of the Environment reports as print and PDF publications. Uzbekistan's SEIS progress largely depends upon high-level decisions, and current priorities of the country include development of a forward-looking indicator system.


Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
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KYRGYZSTAN
CHINA
Ufa
Samara
Saratov
Petropavlovsk
Karabalyk
Kostanai
Rudnyi
Zhitikara
Dzhetyghara
Kokshetau
Shuchinsk
Stepnogorsk
Pavlodar
Aksu
Ekibastuz
Ridder
Semey
Oskemen
Zyrianovsk
Astana
Temirtau
Karaghandy
Aktobe
Oral
Ak-Say
Berezovka
Atyrau
Kulsary
Zhezkazgan
Balkhash
Taldykorgan
Beineu
Baikonyr
Aktau
Janaozen
Kyzyl Orda
Kentau
Zhanatas
Karatau
Turkestan
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Shu
Korday
Almaty
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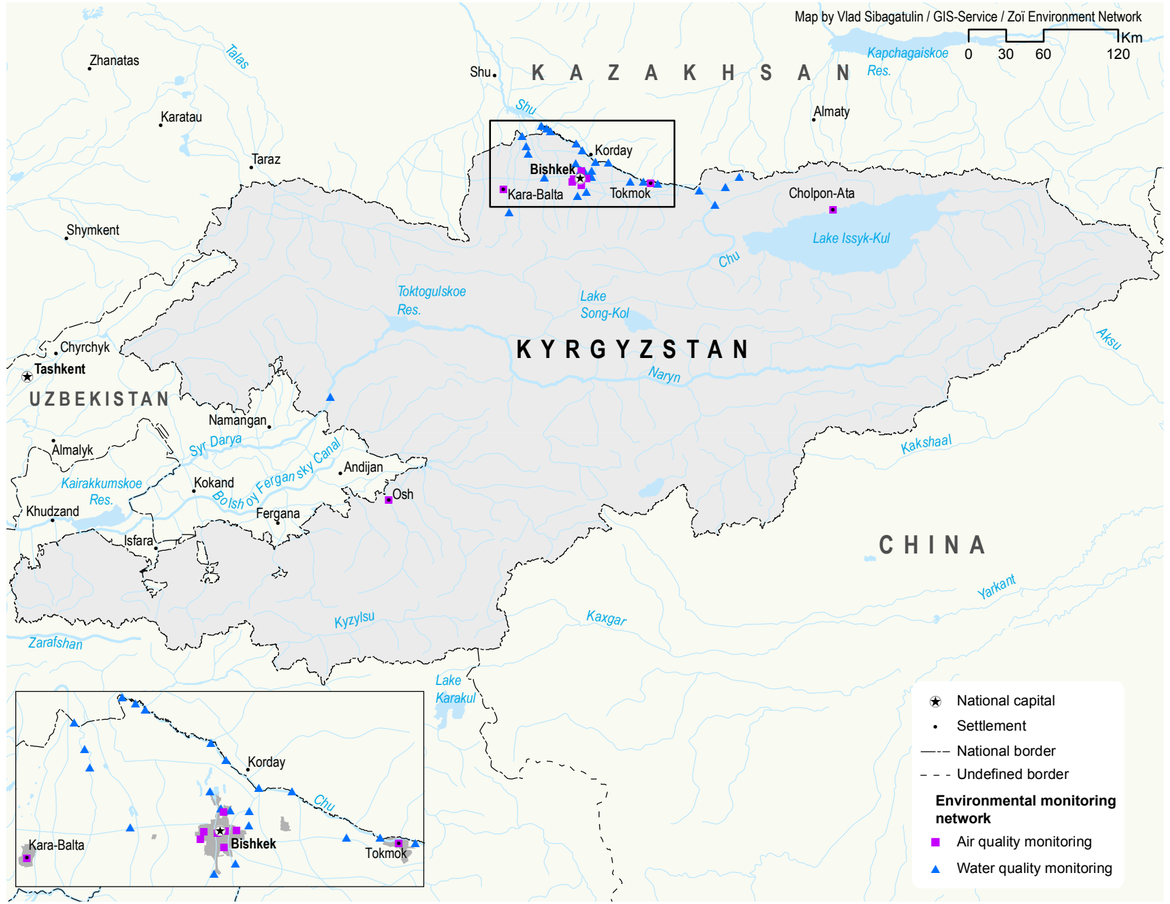
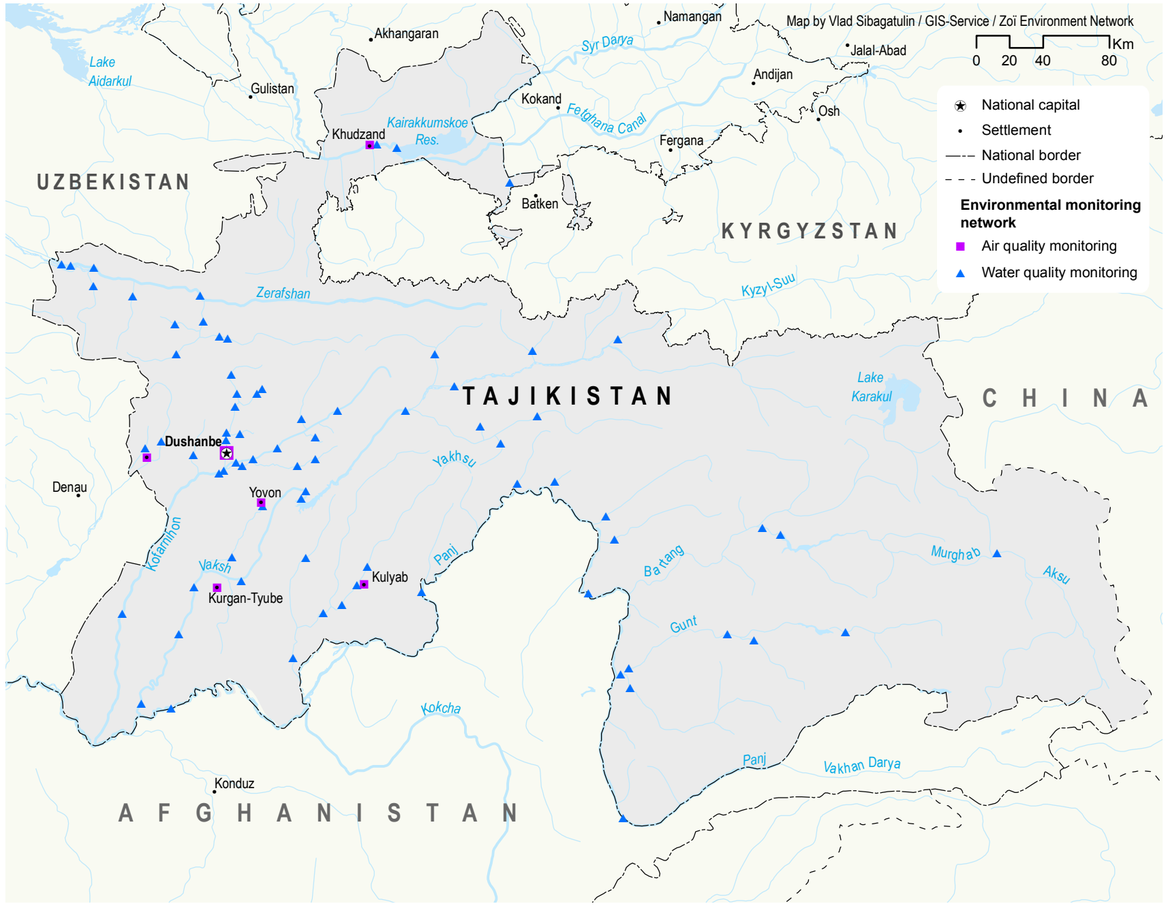
Urgench
Shymkent
Tashkent
Osh
Baku
Caspian Sea
Aral Sea
Lake Balkhash
Lake Issyk-Kul
Lake Sarykamysh
Kara-Bogaz-Gol
Zaisan Lake
Volga
Ural
Irtysh
Ob
Ishim
Nura
Syrdarya
Talas
Ili
Naryn
Аркалык
1
2
3
4
Temirtau
Karaghandy
Ridder
Oskemen
Zyrianovsk
Shu
Almaty
National capital
Settlement
National border
Environmental monitoring network
Air quality monitoring
Water quality monitoring


Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
0 30 60 120 Km
KAZAKHSTAN
KYRGYZSTAN
UZBEKISTAN
CHINA
Zhanatas
Karatau
Taraz
Shymkent
Tashkent
Chyrchyk
Namangan
Almalyk
Kokand
Andijan
Osh
Khudzand
Fergana
Isfara
Shu
Almaty
Korday
Bishkek
Kara-Balta
Tokmok
Cholpon-Ata
Talas
Chu
Lake Issyk-Kul
Lake Song-Kol
Toktogulskoe Res.
Kapchagaiskoe Res.
Kairakkumskoe Res.
Naryn
Aksu
Kakshaal
Syr Darya
Kyzylsu
Kaxgar
Yarkant
Zaraftshan
Lake Karakul
Bolshoy Ferganskiy Canal
National capital
Settlement
National border
Undefined border
Environmental monitoring network
Air quality monitoring
Water quality monitoring


Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
Km
0 20 40 80
National capital
Settlement
National border
Undefined border
Environmental monitoring network
Air quality monitoring
Water quality monitoring
UZBEKISTAN
KYRGYZSTAN
TAJIKISTAN
CHINA
AFGHANISTAN
Akhangaran
Namangan
Jalal-Abad
Andijan
Osh
Gulistan
Kokand
Khudzand
Kairakkumskoe Res.
Fergana
Batken
Lake Aidarkul
Syr Darya
Fedchenko Canal
Zerafshan
Kyzyl-Suu
Lake Karakul
Dushanbe
Denau
Yovon
Yakhsu
Kofarnihon
Vaksh
Kurgan-Tyube
Kulyab
Panj
Bartang
Murghab
Aksu
Gunt
Kokcha
Konduz
Panj
Vakhan Darya


Map by Vlad Sibagatulin / GIS-Service / Zoï Environment Network
Km
0 40 80 160
National capital
Settlement
National border
Environmental monitoring network
Air quality monitoring
Water quality monitoring
UZBEKISTAN
TURKMENISTAN
IRAN
AFGHANISTAN
Nukus
Dashoguz
Urgench
Lake Sarykamysh
Amu Darya
Kara-Bogaz-Gol
Lake Golden Age
Lake Aidarkul
Turkmenbashi
Balkanabat
Yasga Lake
Caspian sea
Navoi
Turkmenabad
Karshi
Main collector
Sumbar
Arak
Ashgabat
Karakum Canal
Mary
Hanhovus res.
Zeid res.
Murgab
Mashhad
Tejen
Sariyaz res.
Doosti res.


# Sources of information and useful links

10

## Main sources of information:

### *National level:*

Kazakhstan: National report on the state of the environment, an online version http://ecodoklad.kz/ Ministry of Energy of the Republic of Kazakhstan

Kazakhstan: Bulletins and monitoring data compilations on the state of the environment http://www.kazhydromet.kz/ru/monitor_osreda Kazhydromet, Ministry of Energy of the Republic of Kazakhstan

Kazakhstan: Online near real-time air quality monitoring reporting http://www.atmosphera.kz/ Kazhydromet, Ministry of Energy of the Republic of Kazakhstan

Kazakhstan: Environmental indicators and statistics http://www.stat.gov.kz/faces/homePage/ecolog Statistics Committee, Ministry of National Economy of the Republic of Kazakhstan

Kyrgyzstan: National report on the state of the environment, an online version http://nd.nature.kg/ State Agency on the Environment and Forestry of the Kyrgyz Republic

Kyrgyzstan: Air quality data http://www.meteo.kg/environment_air.php and water quality data http://www.meteo.kg/environment_water.php Kyrgyzhydromet, Ministry of Emergencies of the Kyrgyz Republic

Kyrgyzstan: Environmental statistics http://www.stat.kg/ru/statistics/turizm-otdyh-ohrana-okruzhayushej-sredy National Statistics Committee of the Kyrgyz Republic

Tajikistan: Official information on the environment http://hifzitabiat.tj/ Committee on Environmental Protection under the Government of the Republic of Tajikistan

Tajikistan: National report on the state of the environment, an online version (prototype) http://www.gksintranet.tj/ecostat/ Agency on Statistics under the President of Tajikistan

Tajikistan: Air quality monitoring data http://www.meteo.tj/ Tajikhydromet

Uzbekistan: Air quality monitoring data http://www.meteo.uz/

Uzbekistan: Official information on the environment and state of the environment reports http://www.uznature.uz/ Uzbekistan State Committee for Nature Protection

### *Regional level:*

Environment and Sustainable Development in Central Asia, Interstate Sustainable Development Commission regional assessment reports on priority environmental issues: http://ecoportalca.kz/

Environmental monitoring system of Central Asia (prototype): http://aralbasin.net/

The Central Asia water sector database: http://www.cawater-info.net/

North Eurasia Climate Centre, climate monitoring in the CIS countries, Roshydromet: http://seakc.meteoinfo.ru/climatemonitoring

## Atlases and other cartographic and GIS sources:

Central Asia Atlas of Natural Resources: http://www.adb.org/publications/central-asia-atlas-natural-resources Asian Development Bank, 2010. Funded by GEF and Central Asian Countries Initiative for Land Management (CACILM). *Selected maps and databases by V. Sibagatulin*

The Western Tien Shan Biodiversity Atlas. Bishkek, 2005. The GEF and the World Bank. Central Asian transboundary project on biodiversity conservation in the Western Tien Shan Mountains. http://tilia.zf.mendelu.cz/ustavy/554/www_kyrg/ATLAS+uprav.pdf

Maps and other information materials of ECONET Central Asia project, UNEP-WWF Russia: http://www.wwf.ru/about/where_we_work/asia/closed/econet/maps Funded by UNEP-GEF. *Selected maps and databases by V. Sibagatulin*

UNECE Convention on Long-range Transboundary Air Pollution spatial data: http://www.ceip.at/ms/ceip_home1/ceip_home/new_emep-grid/

International Union for Conservation of Nature, The IUCN Red List of Threatened Species spatial data: http://www.iucnredlist.org/technical-documents/spatial-data

Environmental Atlas of Uzbekistan. Tashkent, 2007. The Ministry of High and Special Education of the Republic of Uzbekistan and UNESCO Office in Uzbekistan. http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Tashkent/pdf/atlasUzbekistana.pdf

Indicator-based Environmental Atlas of Uzbekistan. Tashkent, 2008. Uzbekistan State Committee for Nature Protection, UNDP, State Research and Production Enterprise "Kartografia" http://www.undp.uz/en/download/index.php?type=publication&id=170&parent=3232&doc=100912

## Scientific information and articles:

Bykova E. 2012. Rare species of large mammals in Uzbekistan and illegal poaching of the Saiga antelope. In Journal: Modern problems of wildlife management. #1/2012. http://cyberleninka.ru/article/n/resursy-redkih-vidov-kopytnyh-uzbekistana-i-ih-nelegalnyy-promysel-na-primere-saygaka.pdf

## Other useful links and information resources:

Regional Environmental Center for Central Asia (REC CA): http://carececo.org

Zoï Environment Network: http://www.zoinet.org

Environmental indicators of the UN Economic Commission for Europe (UNECE): http://www.unece.org/env/indicators.html

UNEP-Live environmental information system: http://uneplive.unep.org

European Environment Agency: http://www.eea.europa.eu

World Bank Development Indicators: http://data.worldbank.org/data-catalog/world-development-indicators

Convention on Biological Diversity (CBD), national reports: https://www.cbd.int/reports

Convention on the Conservation of Migratory Species (CMS), national reports: http://www.cms.int/en/documents/national-reports

FLERMONECA Project website: http://www.flermoneca.org