Climate Centre

Region-level | Climate fact sheet

Central Asia

1. Region overview

Central Asia is a landlocked region that extends from Russia in the north to Afghanistan and Iran in the south, the Caspian Sea in the west and China in the east. The region consists of five countries which were former Soviet republics: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan (Encyclopedia Britannica 2018). The combined size of these countries is 4,003,451 square kilometres (km^2) (1,545,741 square miles (sq m)) and the largest water body in this region is the Caspian Sea, which is bordered by Kazakhstan and Turkmenistan.

According to latest statistics, Central Asia has a total population of approximately 72 million people: Kazakhstan (18 million people), Kyrgyzstan (6 million people), Tajikistan (9 million people), Turkmenistan (6 million people) and Uzbekistan (33 million). In 2019, the population density was 72,960,000 or 17.43 people per km^2 (45.1 people per sq m) (World Bank 2019a).

The region is diverse, ranging from upper-middle to low-income countries that have strategic importance due to their strategic location and natural resources (World Bank n.d.). The nominal gross domestic product (GDP) for the region is approximately 300 billion US dollars (2019), while the GDP per capita is approximately 4,000 US dollars (2019). The economic and poverty conditions vary widely across this region. While less than 5 per cent of the population in Kazakhstan, Kyrgyzstan and Tajikistan live under the poverty threshold of 1.90 US dollars per day, Turkmenistan and Uzbekistan have more than 40 per cent of their populations living below poverty threshold (International Monetary Fund (IMF) 2019). Since gaining independence in the 1990s, all five countries are implementing structural reforms to transition from state-controlled economies to market-led economies and improve competitiveness. Kazakhstan is the overall leader in modernizing the industrial sector and reducing the share of agriculture in its GDP; it is also the only country (of the five) to be included in the International Institute for Management Development (IMD) World Competitiveness rankings (IMD 2019; IMD 2020). Between 2005 and 2013, each of the five countries, except Tajikistan, experienced a decrease in agriculture and an increase in industry activity. The fastest growth in industry was observed in Turkmenistan, whereas the services sector progressed most in the four other countries (Mukhitdinova 2015).

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1.1 Climate

Central Asia falls within the arid and semi-arid zones consisting of desert, grassland, rangeland and woodland.

Countries within Central Asia have high climatic contrasts. Generally, across the region, winters are moderate to cool, with mean temperatures ranging from -3°C to 20°C, while summers are warm to hot, with mean temperatures ranging from 20°C to 40°C. Winter temperatures can drop as low as -45°C and go as high as 50°C in the summer (World Bank 2016). Precipitation also varies across the region; annual average precipitation in Tajikistan is 500 millimetres (mm) and in Uzbekistan it is 250mm (USAID 2018). For example, Kyrgyzstan is part of a moderate climate zone, receiving heavy rainfall. With 70 per cent of its land above 2,000 metres (m) in elevation, overall, the country is highly drought-prone (Gupta *et al.* 2009). In contrast, neighbouring Tajikistan is in the subtropical and semi-arid zones, with half of the country sitting at elevations above 3,000 m; while 80 per cent of Turkmenistan is flat desert (United States Agency for International Development (USAID) 2018). Precipitation frequently causes floods and mudflows across the region, and droughts are also relatively common (United Nations Environment Programme (UNEP) 2017).

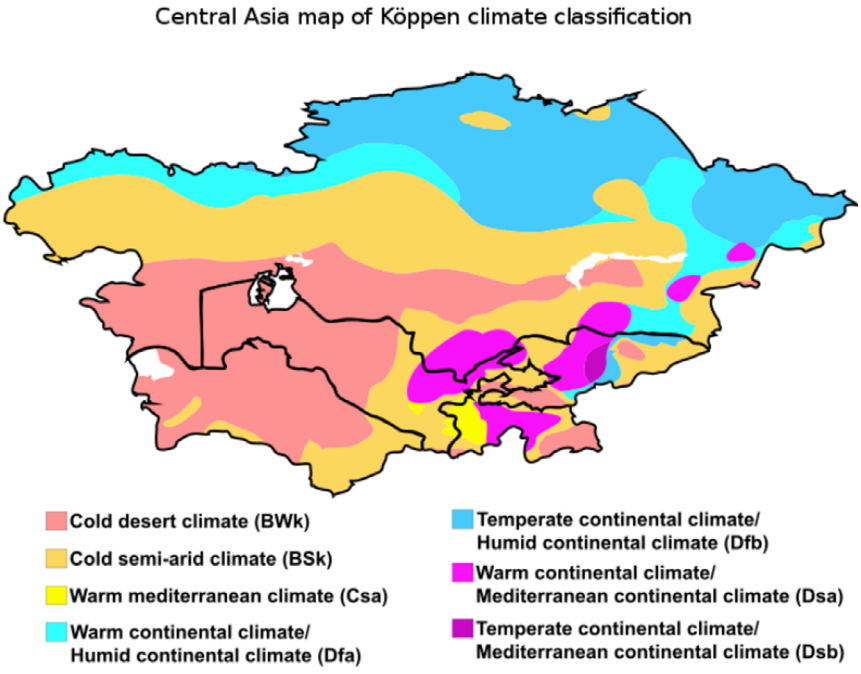

Figure 2 Köppen-Geiger climate classification of Central Asia. Source: Beck *et al.* 2018

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1.2 Climate change

Historical Climate

Temperature

The average annual temperature increase in 1901–2016 was 5.78°C in Kazakhstan, 2.13°C in Kyrgyzstan, 3.30°C in Tajikistan, 15.07°C in Turkmenistan and 12.21°C in Uzbekistan (World Bank 2021a). Warming trends in the region are accelerating. While average annual temperatures increased by 0.12°C per decade in 1901–2013, this figure has increased up to 0.45°C per decade over the past 30 years (Hu *et al.* 2014). Winter months experienced the highest increase in temperatures (USAID 2018).

Heatwaves increased 1.3 times in frequency since the 1960s and intensity and duration increased most in the west of the region (Yu *et al.* 2020).

Precipitation and water

Precipitation trends varied significantly across the region in the past 30 years, with an increase in total annual precipitation of about 4–7 per cent in Uzbekistan and Kyrgyzstan, slight decreases in Turkmenistan and no clear trend in Kazakhstan or Tajikistan (World Bank n.d.).

Over the past century, increasing temperatures have caused a significant decrease in mountain snow packs as well as in the Tien Shan glaciers in Kazakhstan and Kyrgyzstan (World Bank 2013). As a result of warmer winters, overall warming and deposits of black carbon on glaciers, glacial melt is accelerating in the region – with already a third of glacial area lost since 1930. This is causing earlier onset of spring flows and higher risk of summer drought (Sorg *et al.* 2012).

Projected climate

Temperature

Projected annual mean temperatures are variable across the region. According to the Representative Concentration Pathway (RCP) 8.5 ensemble, mean annual temperature in 2040–2059 will rise by 2.75°C in Kazakhstan, 2.55°C in Kyrgyzstan, 2.65°C in Tajikistan, 2.27°C in Turkmenistan and 2.37°C in Uzbekistan (World Bank 2021a).

Under the high global emission scenarios (RCP 8.5 ensemble), the south of the Central Asian region may see warm spells up to 90–150 days of the year by the end of the century. For more moderate climate change scenarios, heat events are more localized and would affect 20-30 per cent of the summer months (Reyer *et al.* 2017).

Increasing temperatures will increase evapotranspiration in the area, subsequently causing a higher incidence of drought and drier than usual conditions (Hu *et al.* 2014).

Precipitation and water

Projected changes in precipitation are variable across the region and highly uncertain. According to the RCP 8.5 ensemble, annual precipitation from 2040–2059 will rise by 20.69mm in Kazakhstan, 31.58mm in Kyrgyzstan, 16.35mm in Tajikistan, 3.11mm in Turkmenistan and 4.32mm in Uzbekistan (World Bank n.d.). By 2085, precipitation in November to April will see a significant increase, especially in Kyrgyzstan with (up to 50 per cent more precipitation) and Uzbekistan (up to 85 per cent more precipitation) (World Bank n.d.).

The region's glaciers are projected to melt by roughly 50–90 per cent by 2100 (IPCC 2014).

The region is expected to experience a higher frequency of rainfall along with an increased concentration of these events (Hu *et al.* 2014).

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2.Humanitarian sectors and climate change

2.1 Water and habitat

Central Asia consists of several major transboundary river basins and closed lake systems, of which the most well-known are the Caspian Sea and Aral Sea. The competition between the energy, agriculture and industrial sectors for water resources, combined with climate change uncertainty are a major challenge in Central Asia (Yapiyev *et al.* 2017). From rapid glacier melt to increasing aridity, when it comes to water and habitat concerns, Central Asia is a region of extremes. Water resource sharing has been challenging for the five countries ever since the Soviet Union's dissolution due to uneven distribution of resources (Allouche 2007; Sievers 2013). Climate change is expected to exacerbate this challenge as the availability of water for the environment, sanitation and hygiene, irrigation, energy generation and other economic activities becomes stressed (Xenarios *et al.* 2019; Yapiyev *et al.* 2017).

Glacier and snowpack melt contribute 80 per cent of Central Asia's river runoff. Acceleration and changing patterns of glacier melt has been one of the major contributors to water and habitat loss. Approximately 30 per cent of the region's glaciers have melted in the past century and projected future loss ranges from roughly 50–90 per cent by 2100 (IPCC 2014). River-flow in spring and summer – critical months for agriculture – is expected to decrease, due to snowfall being replaced by rainfall as temperatures increase. This will lead to an increased river flow in the winter and decreased flow in the summer when it is more needed for agriculture (Radchenko *et al.* 2017). Communities will be at risk of flooding in the short-term and more extensive drought in the future as a result of glacier melt (Lipton 2019).

Many rivers in Central Asia are transboundary and fed by mountain and glacial snowmelt in the spring and summer. Due to climate change, river flows could increase then severely decrease in the longer-term, potentially impacting regional stability, security and politics (National Snow and Ice Data Center (NSIDC) 2017). The transboundary Chu and Talas rivers, for example, act as central resources for agricultural irrigation hydropower in both Kazakhstan and Kyrgyzstan. The Syr Darya and Amu Darya rivers also serve as a source of irrigation, feeding 70 million people and supplying 90 per cent of the energy, before draining into the Aral Sea in southern Kazakhstan and western Uzbekistan. In Turkmenistan, 97 per cent of crops are irrigated; and drought is a major cause of economic losses in the area, causing approximately 800 million US dollars of losses in 2000 and 2001 (Lipton 2019). An increase in population and economic activity will likely cause increased pressure on these limited water resources (USAID 2014).

As a landlocked sea, the Caspian Sea has a heightened vulnerability to sea level fluctuations driven by imbalances between precipitation, runoff and evaporation. Following a sharp rise in sea level from 1977 to the early 1990s, the height of the Caspian Sea has steadily declined due to increasing evaporation as air temperatures warm under a changing climate (Chen *et al.* 2017).

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2.2 Economic security

Agriculture plays a central role in Central Asia's economy, the sector relies heavily on irrigation to produce its primary crops: cereals, cotton, fruit and vegetables. Climate-stressors affect the water supply of the region which is critical to agricultural productivity, eventually leading to economic and agricultural losses. In 2019, the agriculture and livestock sector's contribution to GDP was 4.5 per cent in Kazakhstan (World Bank Group 2021b), 14.6 per cent in Kyrgyzstan (Central Intelligence Agency (CIA) 2019), 23 per cent in Tajikistan (World Bank Group 2019b), 12.7 per cent in Turkmenistan (IMF 2019) and 17.9 per cent in Uzbekistan (CIA 2021).

Climate does not affect each crop the same way in each country. Despite some crops having more favourable conditions for growth, in general the region is likely to face reduced crop production and, consequently, adversely affected food security by 2050. Food prices are likely to increase as a result, making people more vulnerable to hunger (Food and Agriculture Organization of the United Nations (FAO) 2016).

Wheat and cotton are the primary and most widely produced agricultural commodities in Central Asia. Kazakhstan is a major producer and supplier of wheat for the region and Uzbekistan is one of the largest producers and suppliers of cotton. Both agricultural commodities are highly threatened under climate change and are already vulnerable to climate variability such as ENSO (El Nino) (USAID 2018; World Bank 2018). While higher temperatures may speed up crop growth in some colder regions, other areas may see sterilization of crops due to heat impacts – especially for irrigated wheat in south Central Asia and the rainfed spring wheat crops (Sommer *et al.* 2013). Furthermore, increasing evaporation is driving salinization of soils in irrigated areas which drastically reduces yields (Sommer *et al.* 2012).

An increase in agricultural pests, diseases and outbreaks of locusts are also expected to affect agricultural produce (Food and Agriculture Organization of the United Nations (FAO) 2016). Water-intensive crops such as rice and cotton are also threatened due to decreases and changes in water availability. Initiatives like the promotion of cherries have been taken to diversify the region's agriculture portfolio in order to reduce climate change impacts on the sector (Pawlowski 2012). Other measures include shifting cultivation calendars and growing more heat-tolerant wheat types (Sommer *et al.* 2013).

Already part of the arid and semi-arid climatic zones, droughts are expected to be a major challenge in the region as the climate continues to change. Kazakhstan is currently the most affected by drought: up to 66 per cent of total land is affected, which may lead to a reduction of 37 per cent in the grain harvest by 2030 and 48 per cent by 2050 (World Bank 2016). Up to half of Kyrgyzstan's land is already affected by drought and this is expected to expand to areas of Uzbekistan and Turkmenistan (UNDP 2017).

Climate variability and change is also expected to impact livestock production and the traditional agropastoral systems in Central Asia. Water shortages and heat stress will likely add biological strain on animals, affecting growth and reproduction while increasing the incidence of infectious diseases. Desertification is expected to reduce grazing land and pastures which already face overgrazing (Sutton *et al.* 2009).

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Lead times on natural disasters can provide early warning and give people the opportunity to prepare for what's to come; for example, farmers can adjust their crop cycle according to the seasonal forecast and evacuation protocols can be initiated before flooding or mudslides take place. This can also help reduce the number of people internally displaced by natural hazards (USAID 2014).

2.3 Health

Two major challenges in the Central Asian region – especially in Tajikistan and parts of Kyrgyzstan – are poverty and food insecurity (United Nations Framework Convention on Climate Change (UNFCCC) 2017). Sixty per cent of the region's population lives in rural areas and depends heavily on agriculture as a means of livelihood (World Bank Group 2021c). Climate change outcomes such as floods, droughts and desertification negatively affect agriculture and livestock causing crop failures, a decrease in food security and significant impacts on human health and nutrition, especially those affected by tuberculosis and HIV/AIDS (Sutton *et al.* 2009).

Extreme events such as droughts and heatwaves can increase mortality and morbidity, especially amongst the most vulnerable populations: children, women and older people, especially those above 65 years of age, and people with pre-existing medical conditions (Singh *et al.* 2019). Simultaneously, an increase in the frequency and intensity of storms can worsen floods and mudflow events which can result in injury and death, limit access to healthcare services due to infrastructural damage to roads and hospitals, and decrease access to electricity and clean water (USAID 2018).

Despite significant progress, access to clean water is a major challenge. Across Central Asia, it is estimated that 22 million people do not have access to clean drinking water. In Kyrgyzstan, despite adopting ambitious programmes to provide safe drinking water, the government is only able to provide it to 53 per cent of the rural population. In Tajikistan approximately 52 per cent of the total population does not have access to clean drinking water, and in Uzbekistan only 31 per cent of the rural population has access to safe drinking water (World Bank 2017a).

With increasing climate impacts, access to clean water is expected to further decrease - causing more people to be at risk of water-borne diseases such has hepatitis A, typhoid and diarrhoeal diseases (Subramanian *et al.* 2017). Historically, water and vector-borne diseases such as malaria had been eradicated from the region in 1960–1970; however, they resurged in the 1990s (World Health Organization (WHO) 2002). According to the RCP 8.5 ensemble, Central Asia is expected to become more suitable for the lifecycle completion of the yellow fever mosquito (Aedes Aegypti). This is due to climate variability and change causing an increase in temperatures and precipitation. The mosquito is expected to spread in large areas of northern and eastern Kazakhstan, central Kyrgyzstan and Tajikistan, and some areas of Turkmenistan bordering Afghanistan (Iwamura *et al.* 2020).

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2.4 Protection

Internal displacement in Central Asia is driven by disasters and conflict. The United Nations High Commissioner for Refugees (UNHCR) estimates that, in 2019, there were approximately 116,600 people who were stateless in the Central Asia region, primarily from Afghanistan. A stateless person is not considered to be a national by any state under the operation of its law. Some stateless people are also refugees; however, not all refugees are stateless, and many people who are stateless have never crossed an international border. In 2019, there were also approximately 4,700 refugees in the Central Asia region (UNHCR 2019).

People who are stateless are acutely vulnerable to changing climate risks. They often cannot access formal identification, formal employment, schools and healthcare, or own a home, or open a bank account. Each of these vulnerabilities raises the risk of negative impacts in the face of climate shocks and stressors. Furthermore, people who are stateless often live in fear of being deported or detained. This can pose a real or perceived barrier when deciding whether or not to evacuate to an emergency shelter before a disaster strike. They are also unlikely to be able to fully access emergency relief and formal social protection systems if they are affected by a disaster (Refugee Studies Centre 2009). However, due to policy reforms across the Central Asian countries, the number of stateless people is declining steadily as more people are granted citizenship (UNHCR 2021).

In 2019, natural hazards, including floods and landslides, displaced approximately 7,100 people in Kazakhstan, 4,700 people in Kyrgyzstan and 5,400 people in Tajikistan (International Federation of Red Cross and Red Crescent Societies (IFRC) 2020). The number of displacements due to disasters is expected to rise due to the increased frequency and intensity of climate-related hazards. Rising temperatures are expected to cause an increase in glacier and snow melt leading to a significant escalation of flooding, landslides and glacial lake outbursts in the region (Ferris 2012). Torrential rains are also a source of flooding and landslides. In 2020, mudslides have already displaced 2,690 people in Tajikistan (IFRC 2020). These issues are not limited to borders, for example, landslides from Kyrgyzstan's Ferghana Valley could also affect people living across the border in Uzbekistan (World Bank 2021a).

Finally, around the world, people in detention frequently have heightened vulnerability to natural disasters due to: spatial marginalization resulting from prison locations on hazard-prone land and/or isolation from emergency evacuation services; limited to no connections to social networks, which are crucial aspects to hazard resilience; and political marginalization, including lack of policies and services to prevent disaster impacts on imprisoned populations (Gaillard and Navizet 2012). These vulnerabilities, coupled with more frequent and intense disasters due to climate change, may leave prison populations in especially precarious positions to hazards such as extreme heat, extreme cold and floods.

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2.5 Policy

All countries in the region have signed on to, and ratified, the 2015 Paris Agreement. Each country has also submitted Intended Nationally Determined Contributions (INDCs), including emissions reduction targets and adaptation targets. Emissions reduction targets focus on energy, industry, land-use and agriculture. For example, Uzbekistan committed to reduce emissions by introducing more efficient energy generating technology, and Tajikistan through reforestation efforts (UNFCCC 2015).

Most Central Asian countries have not replicated their adaptation needs in subsequent Nationally Determined Contributions (NDCs); but have instead referenced other repositories for this information. One exception is Tajikistan whose adaptation priorities are centered on agricultural issues, disaster risk reduction, water resource management, health and ecosystem protection (UNFCCC 2015).

The UNFCCC maintains an NDC registry where each country's official communication can be accessed. All countries are currently working on the next round of submissions for the upcoming UN Conference of the Parties on climate change, drawing from a multi-stakeholder process.

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