COUNTRY RISK PROFILE
UZBEKISTAN

TA-9878 REG: Developing a Disaster Risk Transfer Facility in the Central Asia Regional Economic Cooperation Region

April 2022

About this document

TA-9878 REG: Developing a Disaster Risk Transfer Facility in the Central Asia Regional Economic Cooperation Region aims at developing regional disaster risk financing solutions for CAREC member states. It provides high-level disaster risk profiles for all CAREC member states for earthquake, flood, and infectious disease risk. The TA will then design and pilot a bespoke regional disaster risk transfer facility. This is to support CAREC member states in their management of disaster risk.

The disaster risk profiles collate information on flood, earthquake and infectious disease exposure, hazards, physical and social vulnerability, coping capacity, historical losses and impacts, and risk analysis for all CAREC member states. Much of this information is being collated on a regionally consistent basis for the first time. This includes cutting-edge flood, earthquake, and infectious disease modeling.

The profiles are logically structured:

i. **Risk analysis:** results from risk modeling;
ii. **Historical losses and impacts:** data collected from national and international databases;
iii. **Hazard:** physical processes which cause floods, earthquakes and infectious disease outbreaks;
iv. **Exposure:** characteristics of livelihoods and economic value at risk and;
v. **Vulnerability:** socio-economic vulnerability and coping capacity;

These profiles are accompanied by a separate technical note which details the data and methodologies used, and discusses appropriate limitations.

Contents

List of abbreviations

AAL	Average Annual Loss
AALR	Average Annual Loss Ratio
ADB	Asian Development Bank
ADM	Administrative Boundary
AAPA	Average Annual Number of People Affected
CAREC	Central Asia Regional Economic Cooperation
COVID-19	Coronavirus disease
CCHF	Crimean-Congo Hemorrhagic Fever
DRF	Disaster Risk Financing
EP	Exceedance Probability
EMS	Emergency Management System
GEM	Global Earthquake Model Foundation
IPCC	Intergovernmental Panel on Climate Change
IDPs	Internally displaced persons
JBA	Jeremy Benn Associates
RCP	Representative Concentration Pathway
TA	Technical Assistance

Currency

Currency Unit	United States Dollar/s ($)

List of figures and tables

Profile summary

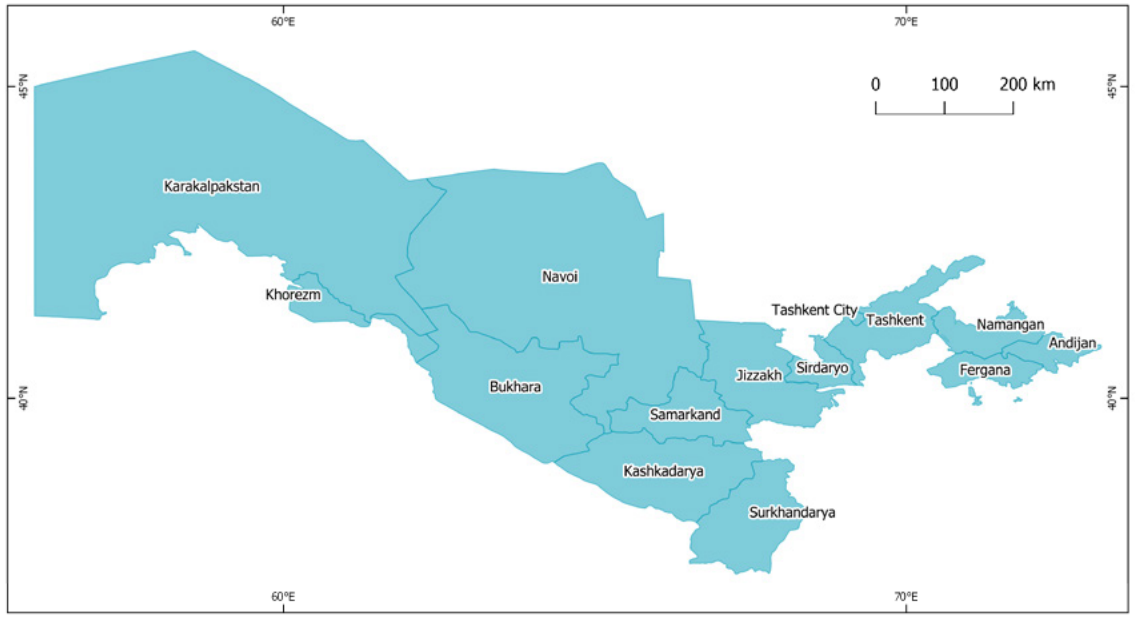
Uzbekistan is a landlocked country at the heart of Central Asia. It is bordered on the north and northwest by Kazakhstan, on the east and southeast by Kyrgyz Republic and Tajikistan, on the southwest by Turkmenistan, and on the south by Afghanistan. Agriculture is the mainstay of the Uzbek economy, though trade and services are increasingly important.

Although less than 15% of the territory of Uzbekistan is subject to a critically high seismic risk, more than half of the population live in those areas[1] with concentrations in the northeast Tashkent region and in the southwest Bukhara region. These regions also generate about 65.5% of country's gross domestic product.[2] Tashkent, the capital of Uzbekistan, is among the nine largest cities in Central Asia and the Caucasus. It ranks first in terms of the exposure and susceptibility to seismic hazard, with approximately 7.4% of the country's 33.5 million population living in the city.

Nationally, average annual loss due to earthquakes is estimated at $214.3 million. There is a heavy concentration of expected losses in the east of the country with Andijan having the highest AAL at $68.6 million, followed by Namangan and Fergana at $50.7 million and $31.9 million, respectively. The west of Uzbekistan, including the regions Karakalpakstan and Navoi, have relatively far smaller average annual loss figures from seismic risk.

A low frequency, high impact earthquake at the 100-year return period could cause $3.6 billion of loss in Uzbekistan which is approximately 5.96% of the country's nominal gross domestic product. Total average annual fatalities across the country are estimated at 92 with Andijan having the highest number 28, followed by Namangan and Fergana at 24 and 11, respectively.

Figure 1: Regions of Uzbekistan



[1] *World Bank Group. Europe and Central Asia - Country risk profiles for floods and earthquakes (English). Washington, D.C. Available online: http://documents.worldbank.org/curated/en/958801481798204368/Europe-and-Central-Asia-Country-risk-profiles-for-floods-and-earthquakes*

[2] *UNISDR, World Bank, CAREC. (2009). Central Asia and Caucasus Disaster Risk Management Initiative (CAC DRMI).*

Box 1: Key facts

GDP: 57,921,000,000 (2019) | **Population: 33,580,000 (2019)**

1 IN 100 YEAR FLOOD ECONOMIC LOSS	1 IN 100 YEAR EARTHQUAKE LOSS	AVERAGE ANNUAL LOSS FLOOD	AVERAGE ANNUAL LOSS EARTHQUAKE
$2,800,000,000	**$3,600,000,000**	**$395,600,000**	**$214,300,000**

AVERAGE ANNUAL PEOPLE AFFECTED FLOOD	AVERAGE ANNUAL PEOPLE AFFECTED EARTHQUAKE	AVERAGE ANNUAL PEOPLE AFFECTED INFECTIOUS DISEASE
220,000	**160,314**	**350,516**

EVENT FREQUENCY WHERE FLOOD LOSS EXCEEDS EXISTING COVER	EVENT FREQUENCY WHERE EARTHQUAKE LOSS EXCEEDS EXISTING COVER
1 IN 2	**1 IN 10**

The average annual loss from floods in Uzbekistan is $395.6 million per year. Loss is higher in provinces in the west and the far east of the country. In the west, average annual loss is $65.2 million in Karakalpakstan and $55.7 million in Khorezm; in the east, average annual loss is $60.7 million in Andijan and $47.2 million in Namangan. Average annual fatalities from floods in the country are 219 with highest levels in provinces in the west, south and east. Direct flood loss is modelled at around $2.8 billion at the 100-year return period, which is almost 2.8% of the country's nominal GDP.

Historic events further illustrate the damaging nature of natural hazards in Uzbekistan. The country is generally prone to earthquakes, drought, flooding, mudslides, and landslides. Among the worst earthquakes in the last two centuries were the 1823 earthquake in Fergana and the 1889 and 1902 quakes in Andijan. In 1966, a devastating earthquake occurred in Tashkent leaving more than 300,000 people homeless and necessitating mass reconstruction of the city.

Uzbekistan is exposed to respiratory infectious disease outbreaks (COVID-19 is one example), with a very low risk to other pathogens. Respiratory pathogens present the possibility of infections and deaths, a risk which applies to many countries. A 1-in-100-year respiratory disease event could see over 12 million people infected.

Much of Uzbekistan is arid and will continue to be so in the future. Despite potential increases in some seasonal mean precipitation, increases in maximum and minimum temperatures and the number of heat waves will exacerbate evapotranspiration over the already arid regions of the country. Potential small increases of 10 to 20% are projected for areas in the east of the country under the climate change scenario analysis, while larger increases of 20 to 60% are projected for parts of the west. Most annual precipitation increases are likely to happen in spring (April to June) and summer (July to September) with little to no change projected in other seasons.

There are important opportunities to improve the disaster risk financing arrangements in Uzbekistan. Insurance penetration is low; existing risk retention mechanisms are only enough to cover 1 in 2-year (flood) or 1 in 10-year (earthquake) events if the intent is to cover all losses, or 1 in 5-year (flood) or 1 in 20-year (earthquake) events if the intent is to cover emergency response costs. It is estimated that around $79m is available for response to disaster events in Uzbekistan. However, most of this funding is not earmarked for disaster events and some of the funding can only be used for road reconstruction.

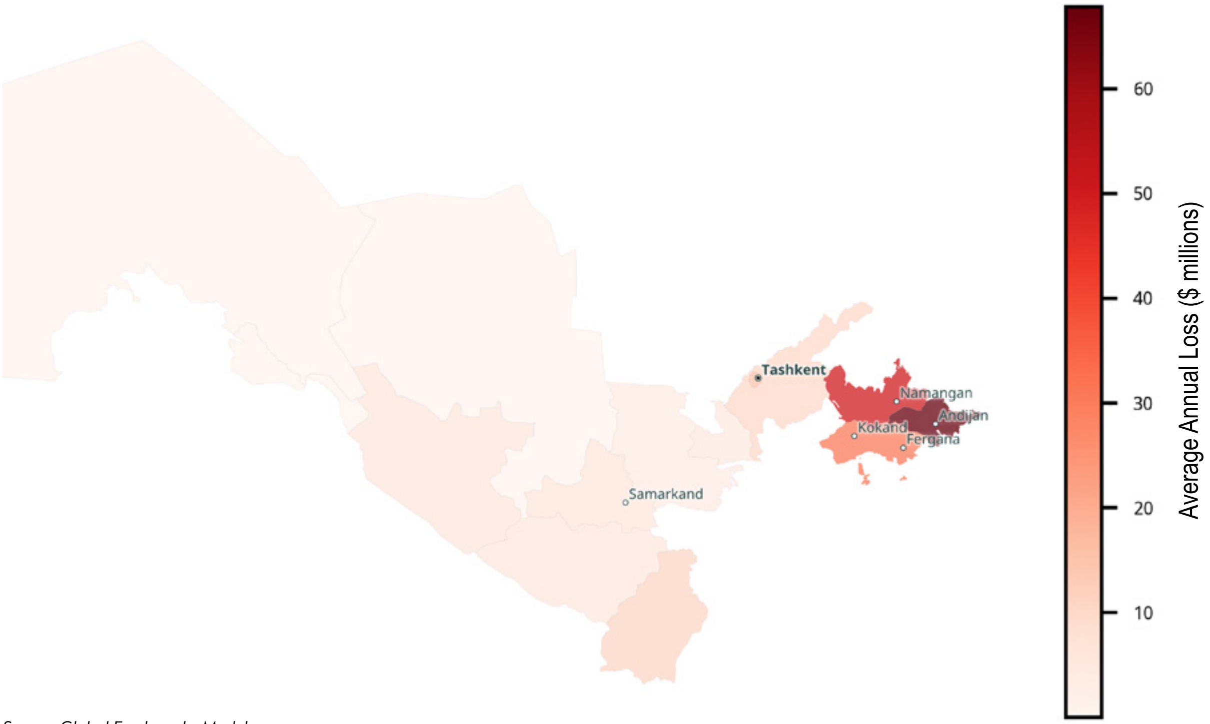
Risk analysis

The extent and geographic pattern of earthquake, flooding, and infectious disease across Uzbekistan is revealed through probabilistic modeling. Such modeling helps illustrate how natural phenomena interact with areas of high concentrations of population and assets to cause economic loss and damage.

Earthquake Risk

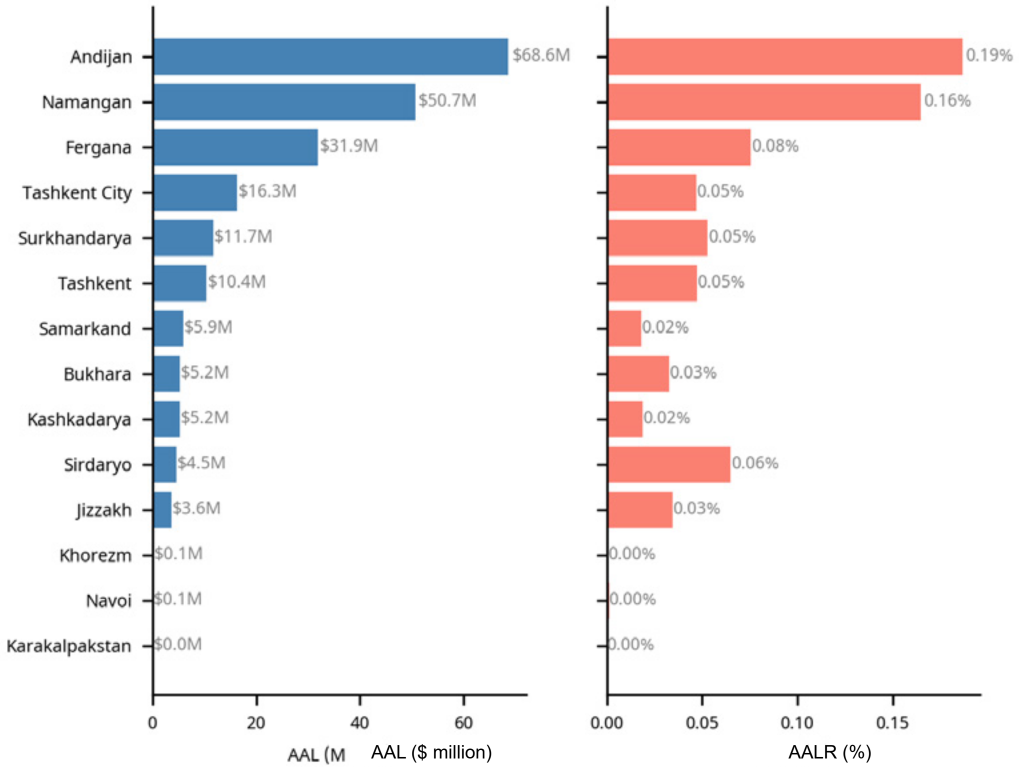
Average annual loss due to earthquakes in Uzbekistan is estimated at $214.3 million. As shown in Figure 2, there is a heavy concentration of modelled losses in the east of the country. Andijan has the highest AAL at $68.6 million, followed by Namangan and Fergana at $50.7 million and $31.9 million respectively. The west of Uzbekistan, including the regions Karakalpakstan and Navoi, has far smaller average annual loss figures from seismic risk.

Figure 2: Average annual loss ($ million) - earthquake



Source: Global Earthquake Model

Figure 3: Breakdown of earthquake average annual loss and loss ratio by region

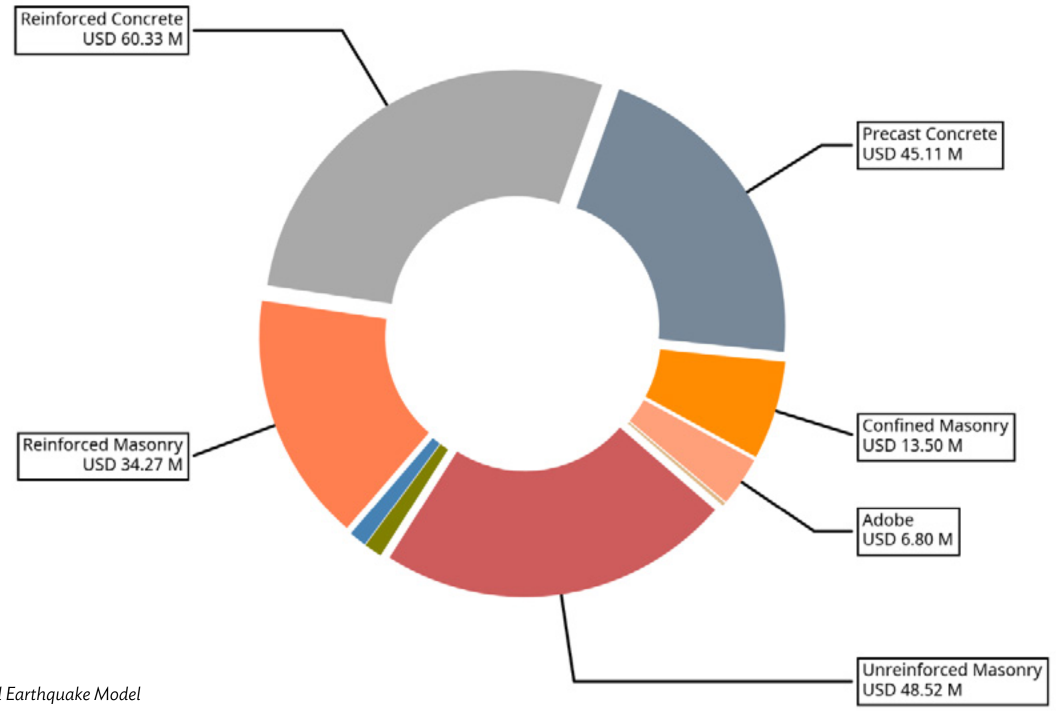


Source: Global Earthquake Model

The average annual loss ratio (AALR) in each region is the AAL for the region normalized by the total exposed value of buildings in that region. The AALR represents the proportion of the replacement value of the building stock that is expected to be lost due to damage. As a normalized risk metric, the AALR enables comparison of the relative risk across the different regions of the country.

Figure 3 shows the AAL (left) and AALR (right) of each region in Uzbekistan. AALR is expressed as a percentage of the total replacement value of buildings in the respective regions. Looking at the relative risk, Andijan is the region with the highest AALR, followed by Namangan.

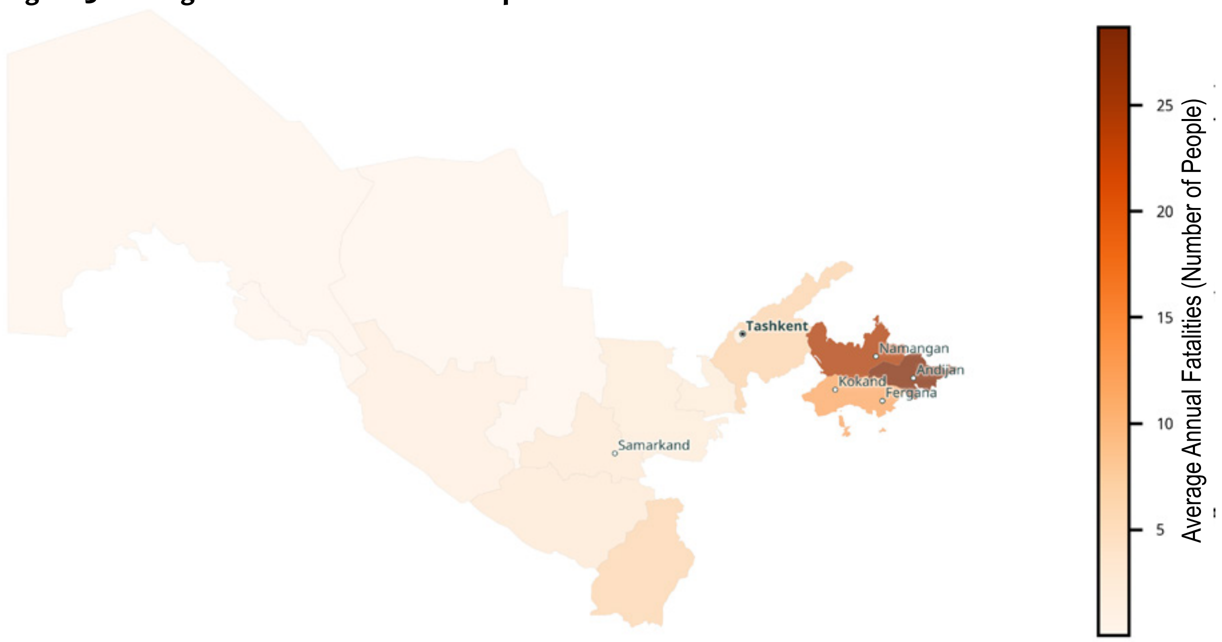
Figure 4: Average annual loss by asset types - earthquakes



Source: Global Earthquake Model

Figure 4 shows the average annual loss by asset construction types. Reinforced concrete structures contribute the most to the overall average annual loss in economic terms at $60.3 million, followed by unreinforced masonry structures and precast concrete with AAL of $48.5 million and $45.1 million, respectively.

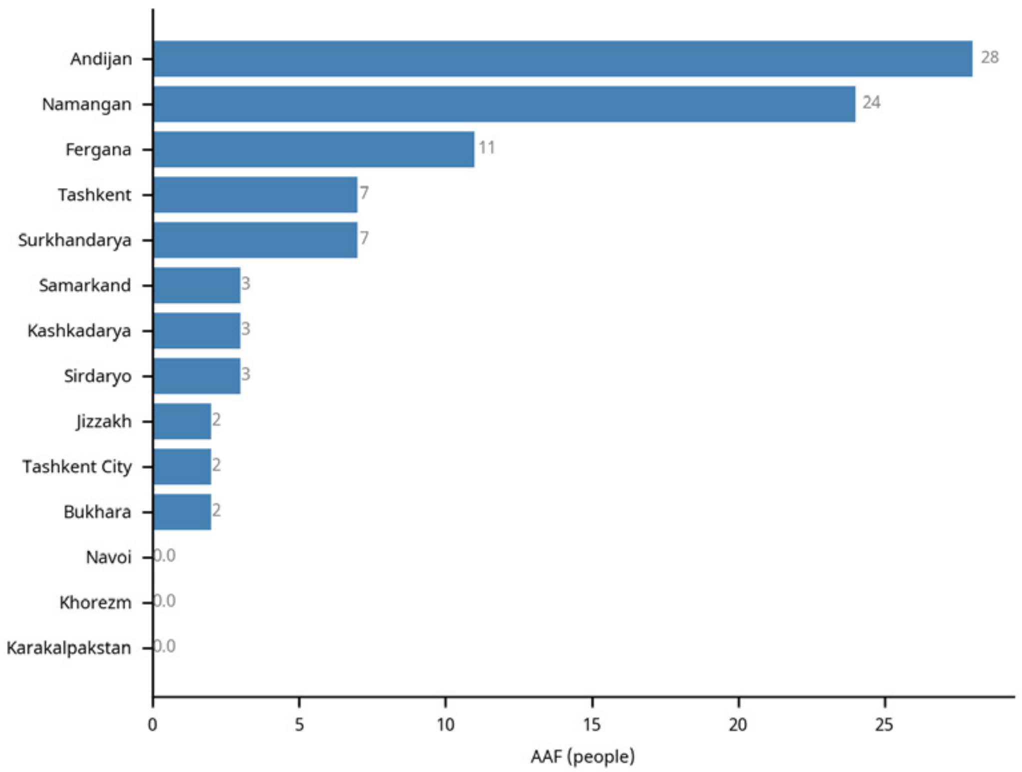
Figure 5: Average annual fatalities - earthquake



Source: Global Earthquake Model

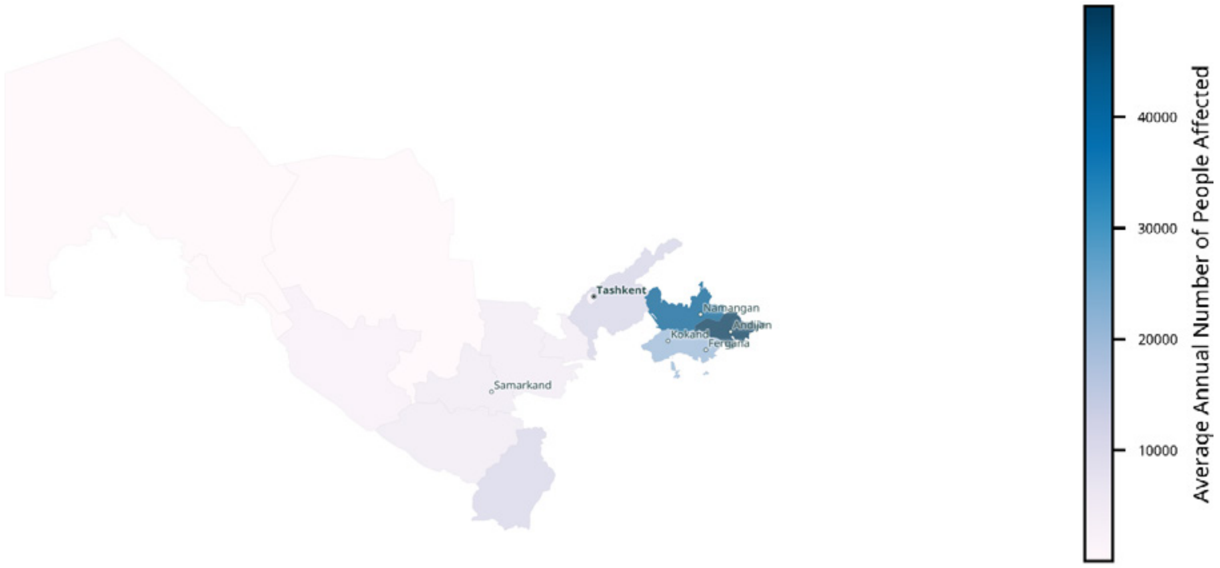
Figure 5 and Figure 6 show the Average Annual Fatalities (AAF) due to earthquakes by region in Uzbekistan. Total fatalities across the country are estimated at 92 with Andijan having the highest AAF in the country at 28, followed by Namangan and Fergana at 24 and 11, respectively.

Figure 6: Breakdown of earthquake average annual fatalities by region



Source: Global Earthquake Model

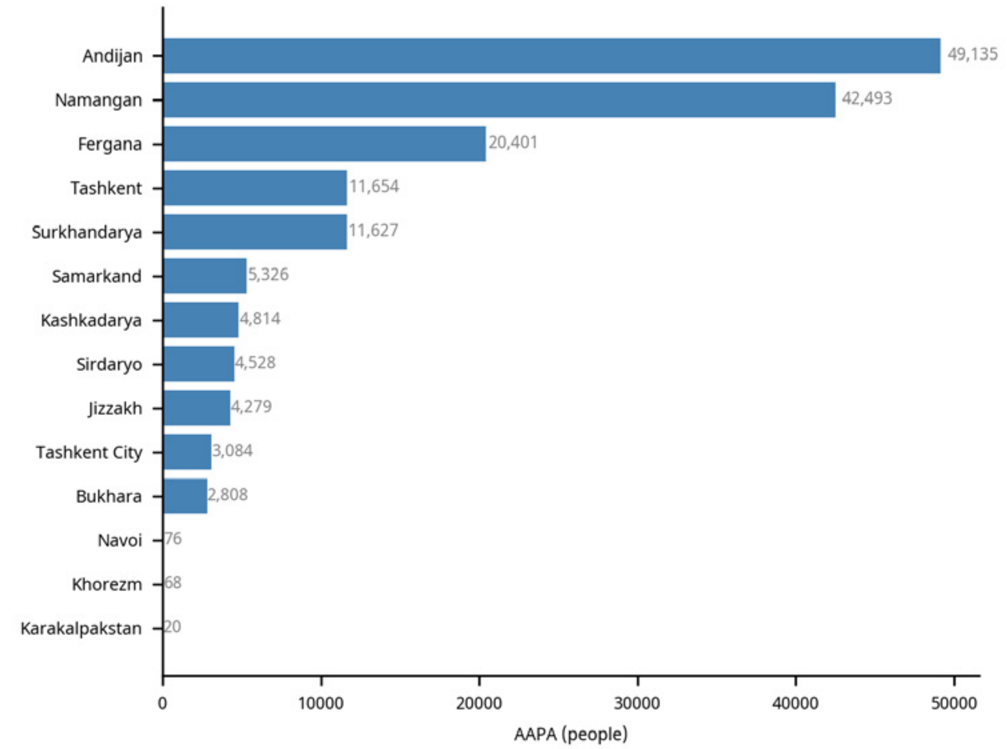
Figure 7: Average number of people affected – earthquake



Source: JBA Risk Management

For the purposes of this report, the number of people affected by earthquakes is defined as the population that can be expected to witness earthquake-caused ground shaking of Modified Mercalli Intensity (MMI) VI or higher (corresponding to strong shaking, capable of causing slight damage or higher). An estimated 160,314 people are expected to be affected by earthquakes on an average annual basis in Uzbekistan. As seen in Figure 7 and Figure 8, Andijan again has the highest average annual number of people affected in the country at 49,135, followed by Namangan and Fergana at 42,493 and 20,401, respectively.

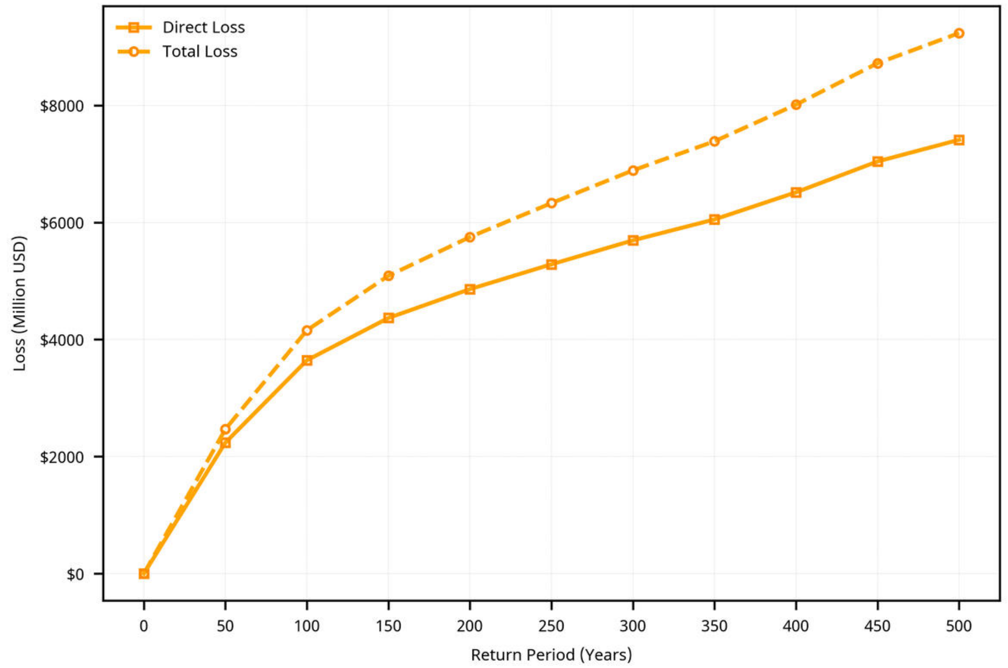
Figure 8: Breakdown of earthquake average annual number of people affected by region



Source: Global Earthquake Model

Risk analysis

Figure 9: Exceedance probability curves – earthquakes



Source: Global Earthquake Model

The exceedance probability (EP) curves for earthquake for Uzbekistan are shown in Figure 9. The EP curve shows the total loss from all events in any given year. Curves are modeled for both direct and total loss. Direct loss displays the modeled loss to residential, industrial and commercial assets. Total loss accounts for secondary impacts from the onset of disaster events, accounting for the reconstruction time.

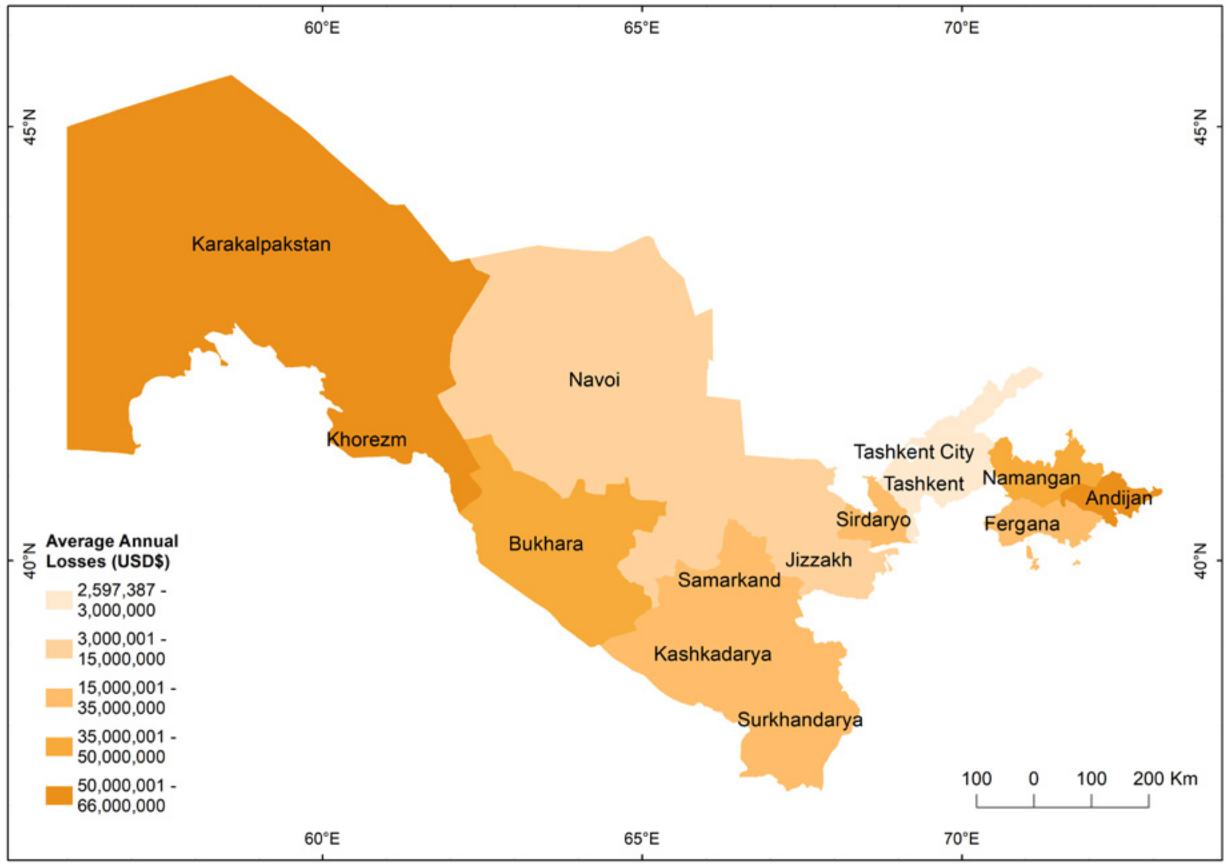
Direct loss increases from $2.2 billion for the 50-year return period to $7.4 billion for the 500-year return period. Earthquake damage at the 100-year return period is modelled at $3.6 billion, which is approximately 5.96% of the country's nominal GDP. Total loss is over $4 billion at the 100-year return period and grows to nearly $10 billion at the 500-year return period.

Flood Risk

The average annual loss from floods in Uzbekistan is $395.6 million per year. Figure 10 shows that damage is higher in provinces in the west and the far east of the country.

In the west, average annual loss is $65.2 million in Karakalpakstan and $55.7 million in Khorezm; in the east, average annual loss is $60.7 million in Andijan and $47.2 million in Namangan. Economic exposure is distributed throughout Uzbekistan, although, as seen in Figure 11, the largest damage ratios are in Karakalpakstan and Khorezm. Here, the Amu Darya River flows through populated regions, where it brings flood risk along the southwest border of Turkmenistan. In the northeast, the Syr Darya and its tributaries flow east to west through provinces including Andijan and Namangan.

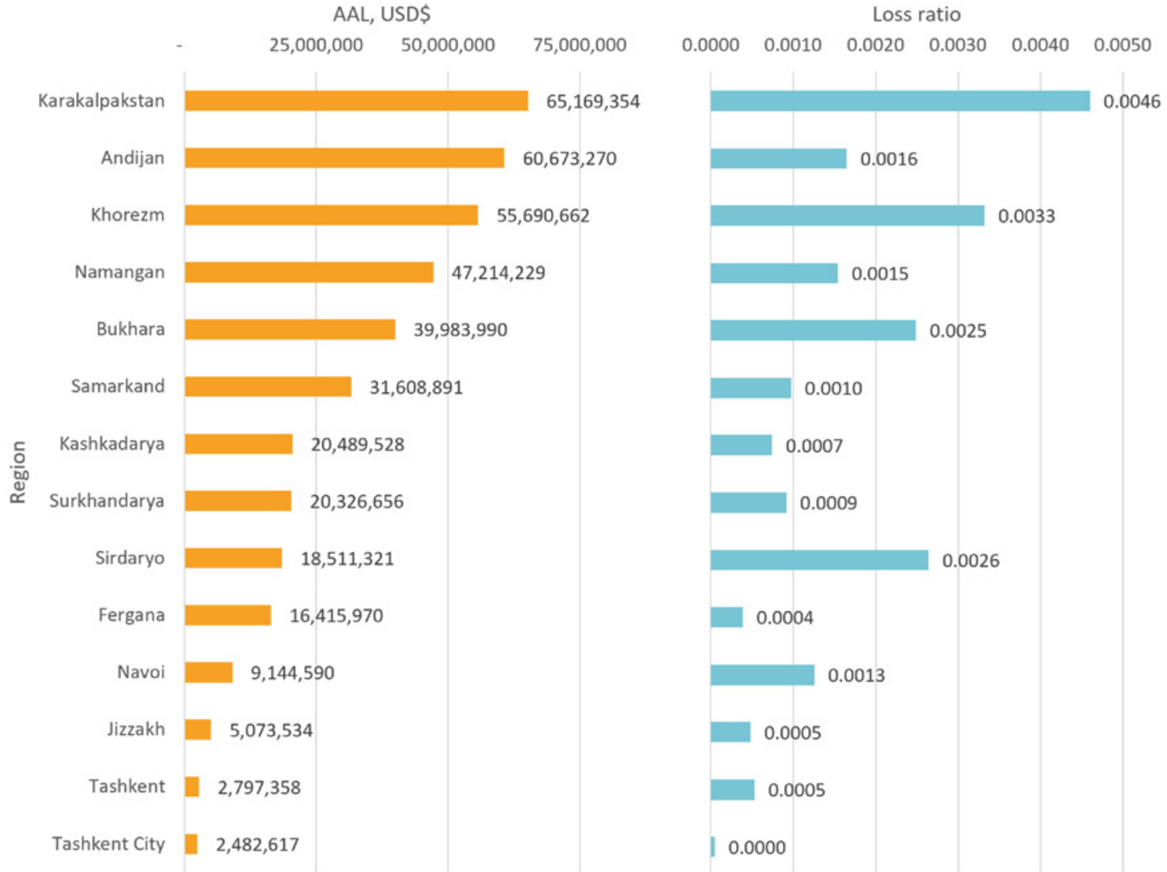
Figure 10: Average annual loss – flood



Source: JBA Risk Management

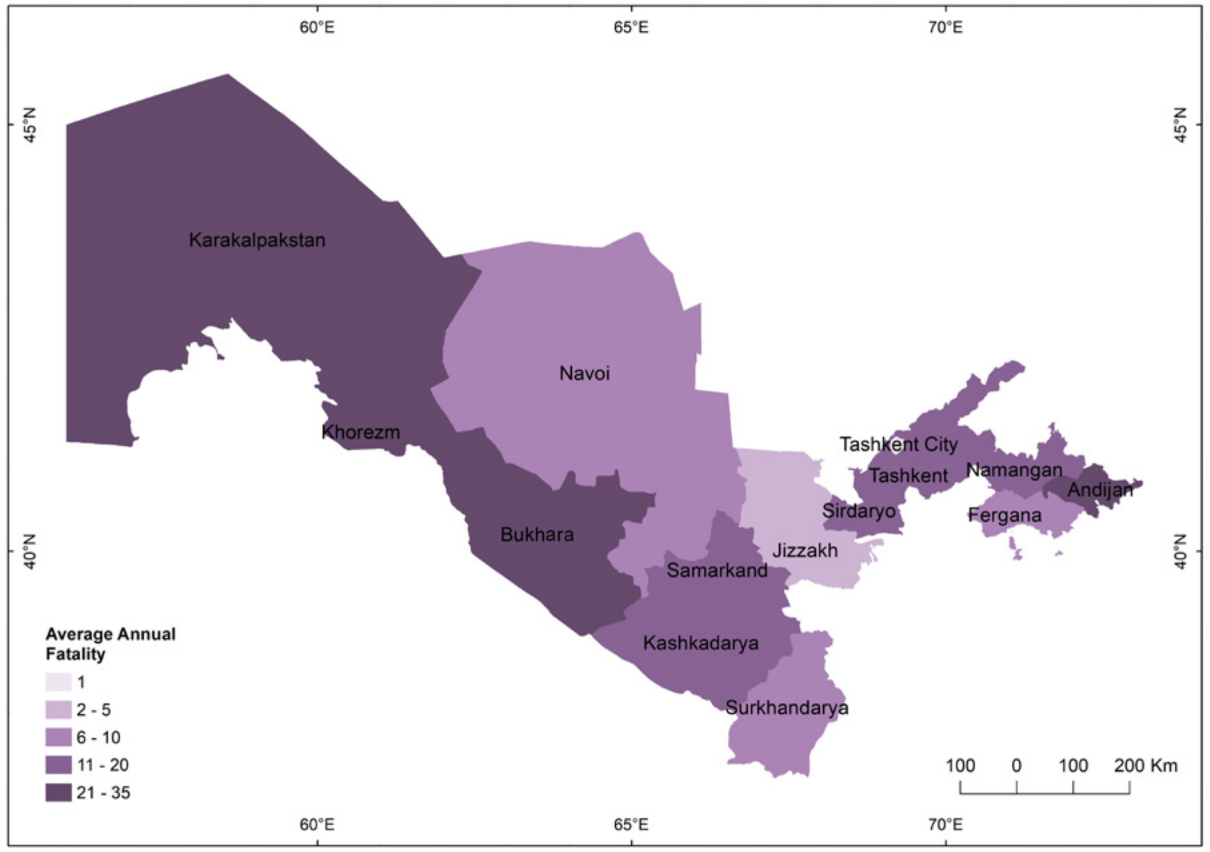
Source: JBA Risk Management

Figure 11: Breakdown of flood average annual loss and loss ratio by region



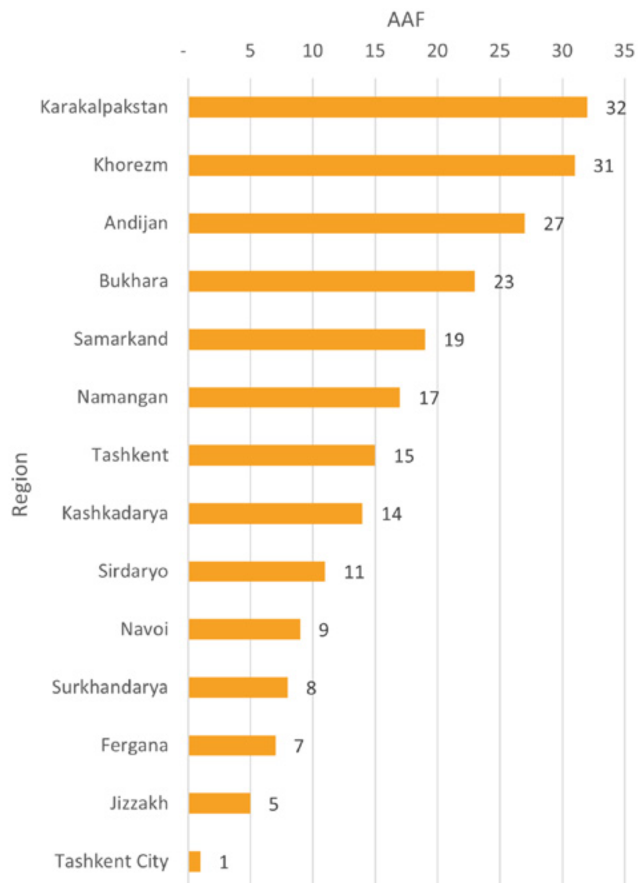
Source: JBA Risk Management

Figure 12: Average annual fatalities – flood



Source: JBA Risk Management

Figure 13: : Breakdown of flood average annual fatalities by region

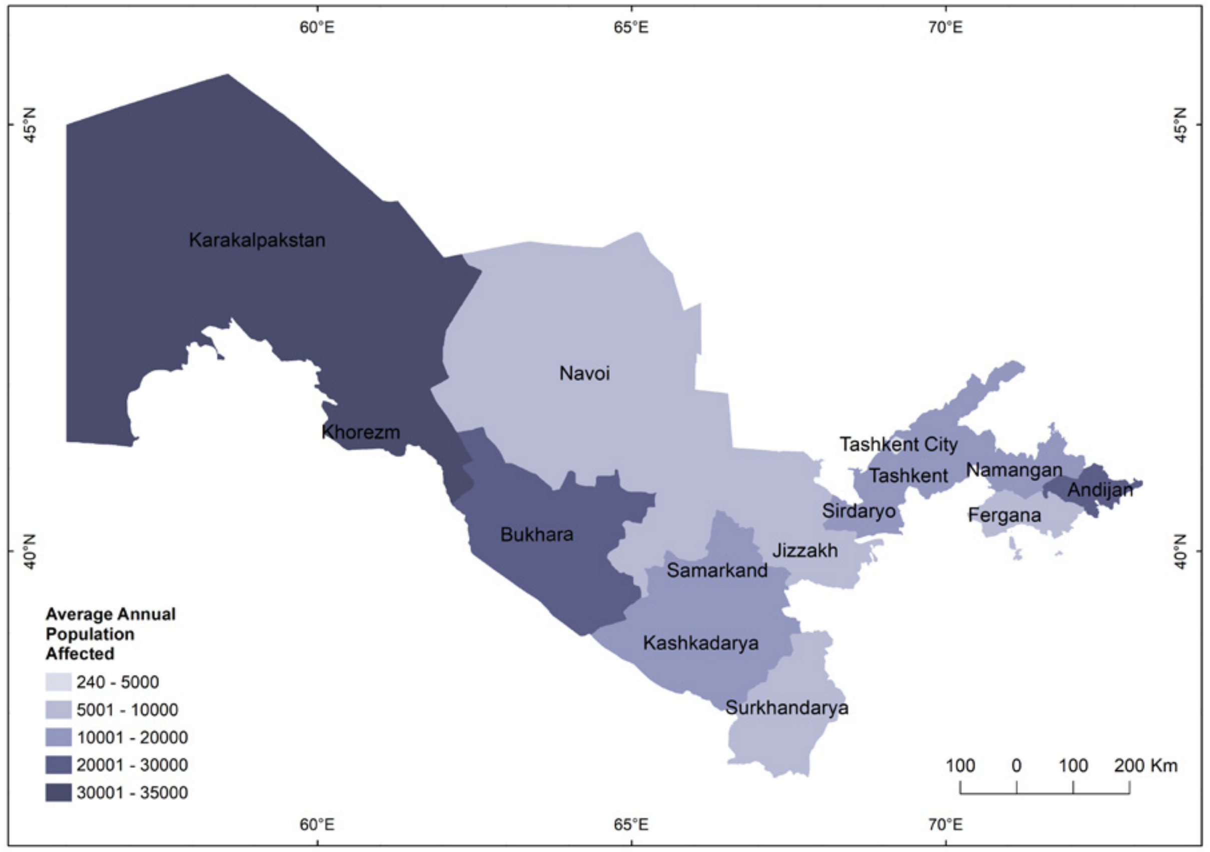


Average annual fatalities from floods are 219 in Uzbekistan. Figure 12 and Figure 13 show that fatalities are higher in provinces in the west, south and east of the country than in the centre and the north.

The largest number of fatalities are in the west of the country in Karakalpakstan and Khorezm, where there are on average 32 and 31 fatalities, respectively, every year. In these provinces, the Amu Darya River flows through populated cities including Urgench and Nukus. Average annual fatalities in Andijan, found in eastern Uzbekistan, are also high at 27 since provinces in the east are densely populated and have large cities along the Syr Darya River.

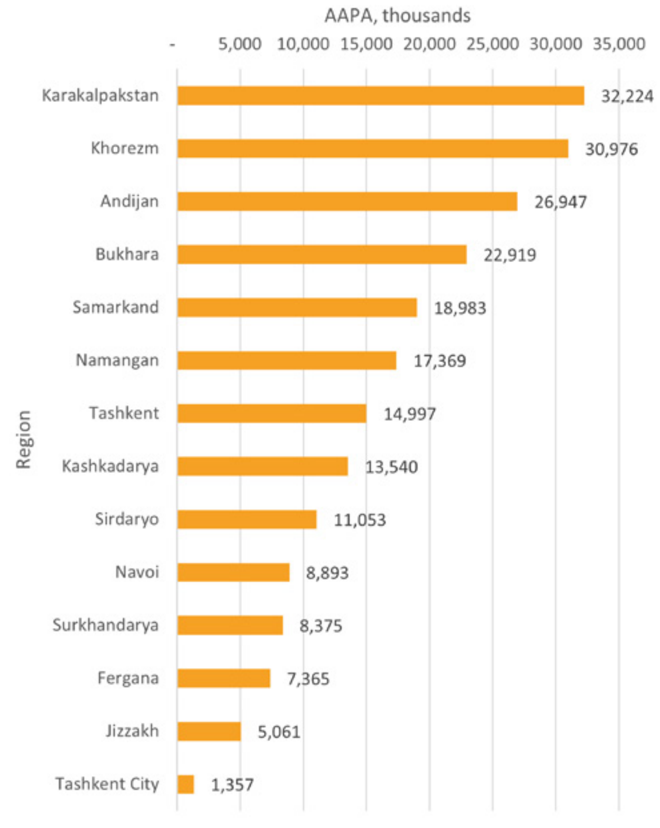
Average annual fatalities are also notable in south-central Uzbekistan, namely in Bukhara and Samarkand, where there are an average of 23 and 19 fatalities, respectively, per year. The Zeravshan River flows from east to west through these provinces, where some of the most populous cities in the country are located within the Zeravshan River valley.

Figure 14: Average annual people affected – flood



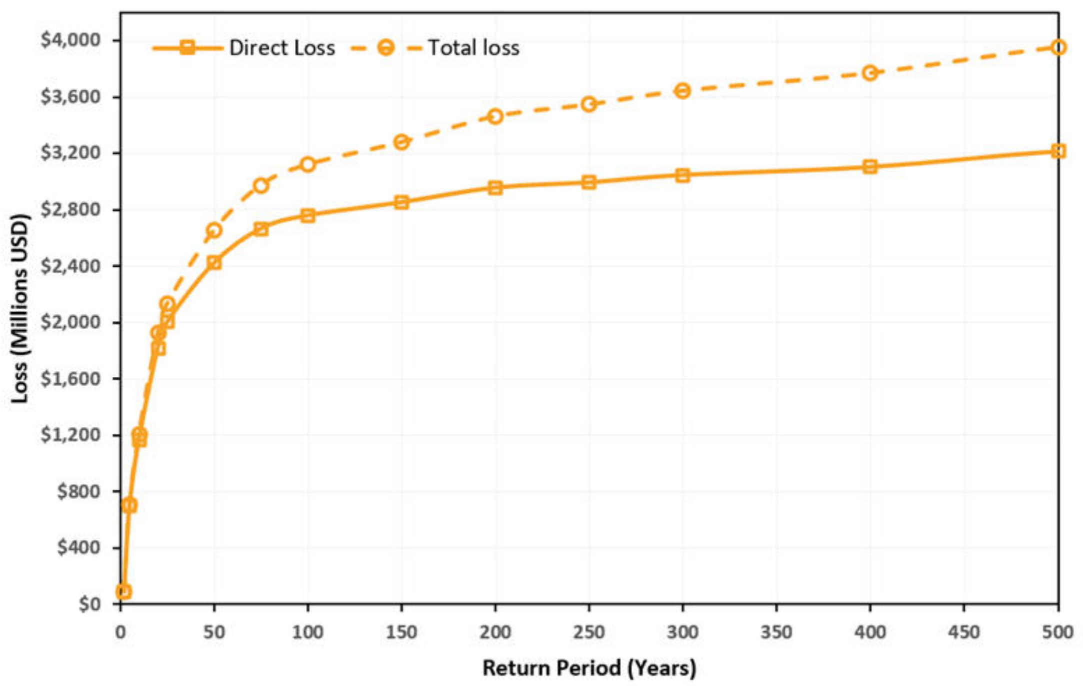
Source: JBA Risk Management

Figure 15: Breakdown of flood average annual number of people affected by region



The average number of people affected by floods in Uzbekistan is 220,000. The breakdown of average annual number of people affected by flood (as shown in Figures 14 and Figure 15) shows that there are bigger numbers in provinces in the south, west, and towards the far east. The highest number of people affected by floods is in the western provinces of Karakalpakstan and Khorezm, where over 30,000 people are affected per province per year. The number of people affected by floods also exceeds 20,000 every year in Andijan in the east and in Bukhara in the south-west.

Figure 16: Exceedance probability curves – floods

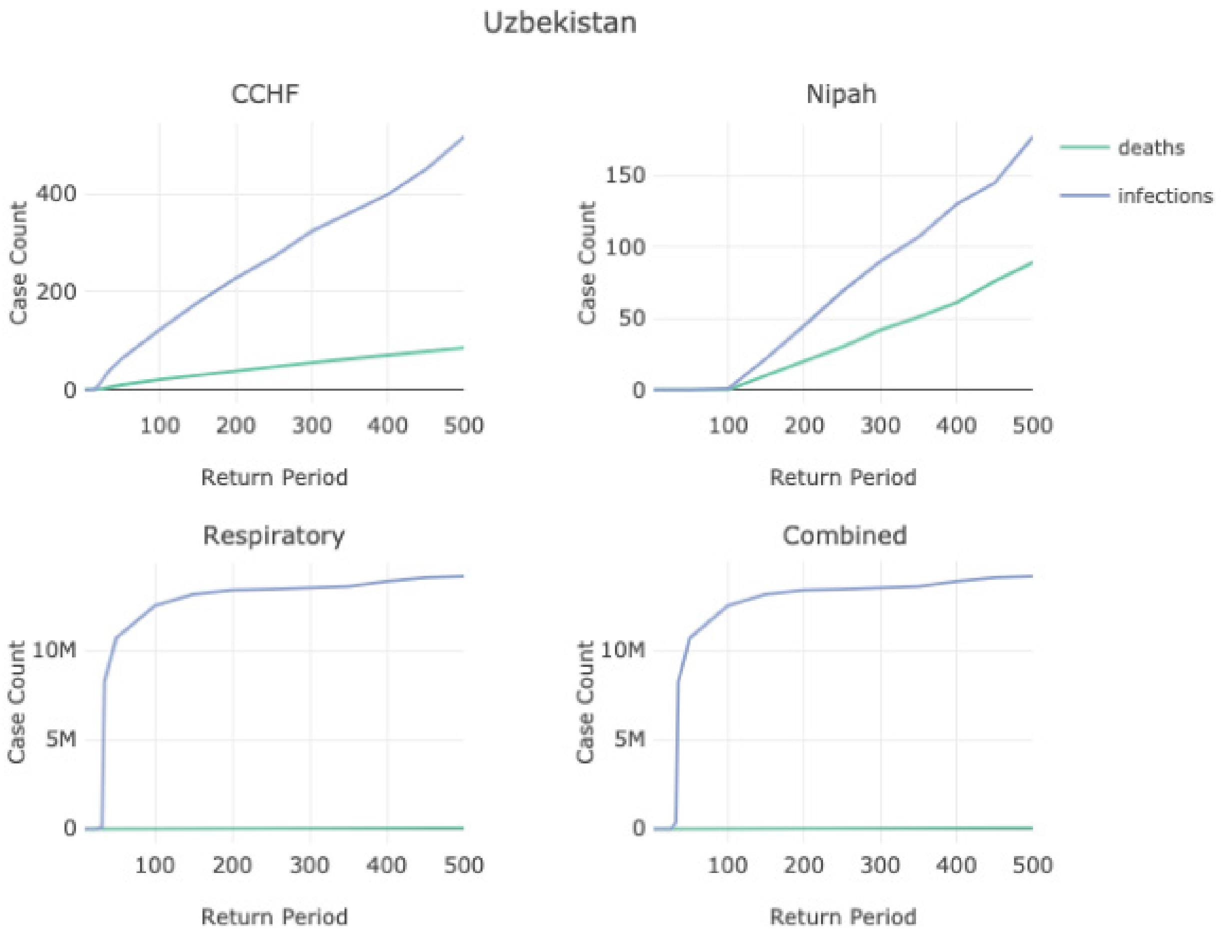


Source: JBA Risk Management.

The exceedance probability curves for Uzbekistan show direct loss and total loss from all flood events in any given year for the given return periods. Loss increases most significantly between the 2 and 50-year return periods, which indicates susceptibility to flood events in these return periods. At the 100-year return period direct loss is modelled at around $2.8 billion, which is almost 2.8% of the country's nominal GDP. Direct loss increases at a slower rate above the 50-year return period and reaches $3.2 billion at the 500-year return period. At around the 70-year return period total loss starts to increase more rapidly than direct loss. Total loss is modelled at $3.1 billion for the 100-year return period and grows to nearly $4 billion at the 500-year return period.

Infectious disease

Figure 17: Exceedance probability curves – pandemic, including Crimean-Congo haemorrhagic fever (CCHF), Nipah virus infection, respiratory viruses and combined (all pathogens)



Source: Metabiota

The modelled exceedance probability (EP) curves include only those infections and deaths which are in excess of the regularly occurring annual baseline. For the included respiratory diseases such as pandemic influenza and novel coronaviruses, this baseline will be zero. For diseases such as Crimean-Congo Haemorrhagic Fever (CCHF), which is endemic in some CAREC countries, the baseline will be higher than zero. Box 2 highlights the pathogens modelled as part of this analysis.

The pathogen EP curves for Uzbekistan highlighted in Figure 17 show that respiratory pathogens account for most epidemic risk. The respiratory pathogens EP curve climbs rapidly and steeply. This is because respiratory pathogens tend to be highly transmissible and cause very large pandemics when they occur (COVID-19 and pandemic influenza are notable examples).

CCHF and Nipah virus have much lower transmission leading to much smaller outbreaks which is consistent with what is shown in the EP curves: a few cases showing up at higher return periods. Table 1 provides the average annual loss numbers on people impacted and fatalities.

Box 2: Pathogens modelled

- Respiratory: a range of novel respiratory pathogens are included such as pandemic influenza, emergent coronaviruses (Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS)). This does not include endemic pathogens such as measles. A re-emergence of SARS-CoV-1 or a new SARS coronavirus are included.
- Crimean-Congo haemorrhagic fever is caused by a tick virus is transmitted by tick bites or through contact with infected animal blood or tissues. Symptoms include fever, muscle ache and pain, dizziness, nausea, vomiting, diarrhoea, sleepiness, and depression. The case fatality rate is estimated between 10-40%. Some medicines seem to be effective[3]
- Nipah virus is a zoonotic virus (it is transmitted from animals to humans) ; it is also transmitted through food or people. It can cause a range of illnesses, from asymptomatic infection to severe respiratory illness and fatal encephalitis. The case fatality rate is estimated between 40-75% and there is currently no treatment or vaccine available.[4]

Table 1: Average annual losses - pandemic, including Crimean-Congo haemorrhagic fever, Nipah virus infection, respiratory viruses and combined (all pathogens)

Pathogen	Average Annual Loss - Infections	Average Annual Loss - Deaths
Combined	350,516	720
Respiratory	350,389	661
Nipah	118	58
CCHF	11	1

Source: Metabiota

[3] https://www.who.int/news-room/fact-sheets/detail/crimean-congo-haemorrhagic-fever
[4] https://www.who.int/news-room/fact-sheets/detail/nipah-virus

Historical losses and impacts

Uzbekistan is generally prone to earthquakes, drought, flooding, mudslides, and landslides. However, historical data on fatalities, numbers of people affected and economic losses from droughts, earthquakes, and floods is limited.

Landslides have been estimated to account for 10-12% of the total damage caused by natural hazard related disasters.[5] Annually, about 22 flash floods and mudflows occur in the republic.[6] In 1998, a glacier lake outburst flood (GLOF) claimed the lives of more than 100 residents of the Uzbek village of Shakhimardan.[7] In February–March 2005, another major flood along the Syr Darya River caused significant damage to crops and village settlements.[8] In 2018, mudflows damaged 200 households in the Kashkadarya region and washed away 12 bridges.[9] In May 2020, heavy rain induced overflow of the Sardoba Reservoir Dam, affecting more than 70,000 people in the Sirdaryo region.[10]

As seen in Table 2, Uzbekistan also suffers from droughts, which evidently have the greatest impact on the country's agriculture. Due to the geographic location and the climate of Uzbekistan, significant areas of the republic are subject to meteorological and agricultural drought. In years of severe droughts and low rainfall, water supply is reduced by 20-30%.[11]

Table 2:Total impacts from floods, earthquakes and droughts, 1900 – 2019

	Fatalities	Number of people affected	Total damage ($ million; constant 2019)
Flood		1,500	
Earthquake	22 - 23	50,000	-
Drought	-	600,000	74.2

Source: EM-DAT with validation from other sources including Swiss Re, ReliefWeb, World Bank for floods; National Geophysical Data Center / World Data Service (NGDC/WDS): NCEI/WDS Global Significant Earthquake Database. NOAA National Centers for Environmental Information.

[5] *The World Bank and Global Facility for Disaster Reduction and Recovery. (2020). Disaster Property Insurance in Uzbekistan. Overview and Recommendations.*
[6] *Centre of Hydrometeorological Service under the Cabinet of Ministers of the Republic of Uzbekistan (2009), Second National Communication of the Republic of Uzbekistan under the United Nations Framework Convention on Climate Change; cited in: UNDP (2011). Natural Disaster Risks in Central Asia: A Synthesis.*
[7] *World Bank, Lake Sarez Mitigation Project (2000). Available online: http://documents.worldbank.org/curated/en/900431468778506744/pdf/multi-page.pdf*
[8] *UNISDR, World Bank, CAREC. (2009). Central Asia and Caucasus Disaster Risk Management Initiative (CAC DRMI)*
[9] Информационное агентство *REGNUM*. В Узбекистане селевые потоки повредили более *200* домов. *2018. Available online: https://regnum.ru/news/2415468.html*
[10] *ADRC Disaster Information (2020) Uzbekistan: Flood: 2020/05/01. Accessed June 2020 at: https://www.adrc.asia/view_disaster_en.php?NationCode=860&Lang=en&Key=2382*
[11] *The State Committee of the Republic of Uzbekistan on Statistics, 2021. The number of urban and rural population by region.*

Table 3: The most impactful flood and earthquake events in Uzbekistan, 1900 – 2019

Year	Location	Total damage ($ millions; constant 2019)	Fatalities	Number of people affected
Floods				
2005	Boymurod area (Kanimekh District district, Navoiy province), Qoshquduq area (Nurata District district, Navoiy province)			1,500
Earthquakes				
1984	Gazli	12.3		
1902	Andijan		4,880	
2011	Fergana province		13 – 14	
1992	Andijan region			50,000
1966	Tashkent City			
1976	Gazli	6.0 – 6.7		

Source: EM-DAT; National Geophysical Data Center / World Data Service (NGDC/WDS): NCEI/WDS Global Significant Earthquake Database. NOAA National Centers for Environmental Information.

Uzbekistan's location in zone of high seismic activity makes the country vulnerable to frequent earthquakes. Among the worst earthquakes in the last two centuries were the 1823 earthquake in Fergana and the 1889 and 1902 quakes in Andijan. Tashkent is in an especially active zone. It endured several severe quakes in the 19th century and suffered massive damage during the 1996 earthquake. The largest event is the 1984 Gazli earthquake with magnitude 6.97 followed by three earthquakes with magnitudes between 6.0 and 6.7 in 1976. Table 3 shows the most significant flood event since 1900 occurred in the central region of Navoiy with 1,500 people impacted.

Uzbekistan has experienced two significant infectious diseases outbreaks since 1957 as shown in Table 4. Prior to the COVID-19 outbreak, the largest event in the country was the 1957 influenza pandemic which saw nearly 77,000 cases.

Table 4: Notable infectious disease outbreaks, 1990-2021

Pathogen	Date first case reported	Date last case reported	Total cases	Total deaths	Location of origin
Pandemic Influenza	9/1/57	11/30/57	76,980	NA	Hong Kong
2019 Novel Coronavirus (2019-nCoV)	3/17/20	10/20/20	63,737	533	PRC

Source: Metabiota's infectious disease database

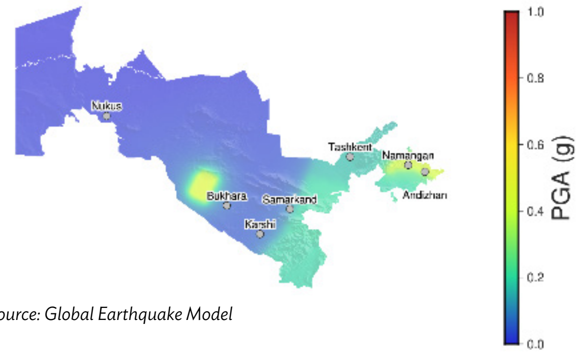
Hazard

The physical environment of Uzbekistan is diverse. It ranges from flat, desert topography which makes up almost 80 percent of the country's territory to mountain peaks reaching about 4,500 meters above sea level. The west of the country is particularly exposed to seismic risk, whereas flood risk is more evenly spread across the east, west and south of the country.

Seismic hazard

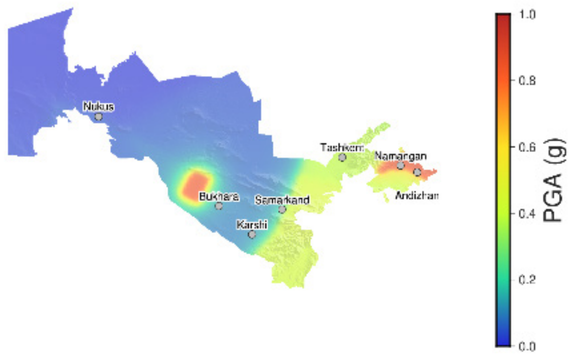
Earthquakes provide the greater risk to a high impact event in Uzbekistan. There are several seismically active zones in the country. Seismicity is found primarily in the east and central areas and approximately south of the city of Urgench[12] as highlighted in Figure 18 and Figure 19. The capital city Tashkent sits above the Karzhantau fault system.

Figure 18: Seismic hazard map for peak ground acceleration (PGA) with a 10% probability of exceedance in 50 years



Source: Global Earthquake Model

Figure 19: Seismic hazard map for PGA with a 2% probability of exceedance in 50 years.



The highest values of the peak ground acceleration with a 10% probability of exceedance in 50 years (PGA10%50yr) on reference site conditions (Vs30 of 800 m/s) is higher than 0.5g and concentrated in the proximity of the epicentral area of the Gazli earthquake. The second area of relatively high hazard is close to Samarkand with values below between 0.2 and 0.3g. The hazard in Tashkent is 0.16g; if we decrease the probability of occurrence to 2% the hazard in the capital city increases to 0.38g.

[12] *ISC-GEM catalogue (version 7.0 - see http://www.isc.ac.uk/iscgem/)*

Map of hydrological catchment areas

Exposure to flooding can be assessed via hydrological accumulation zones (HAZ). HAZ polygons represent the natural watercourse boundaries as a means of modelling the flow of water. The HAZ polygons for Uzbekistan shown in Figure 20 display the structure of the hydrological basins across the country. The country is general dry with large areas of flat terrain. In the east, the rivers drain higher ground.

Figure 20: Hydrological catchments used for flood modelling

Source: JBA Risk Management

Flood hazard map for pluvial and fluvial flooding

Flood modelling estimates losses and impacts on the basis of flood maps for river (fluvial) and surface water (pluvial) flooding generated at 30 metre spatial resolution. These maps use observed river and rainfall data to generate extreme rainfall and river flow volumes. Maps are generated for different return periods. The 1 in 200-year return period river flood map shows in Figure 21 highlights the main rivers of Uzbekistan. This event severity is often used for planning purposes as a plausible extreme event.

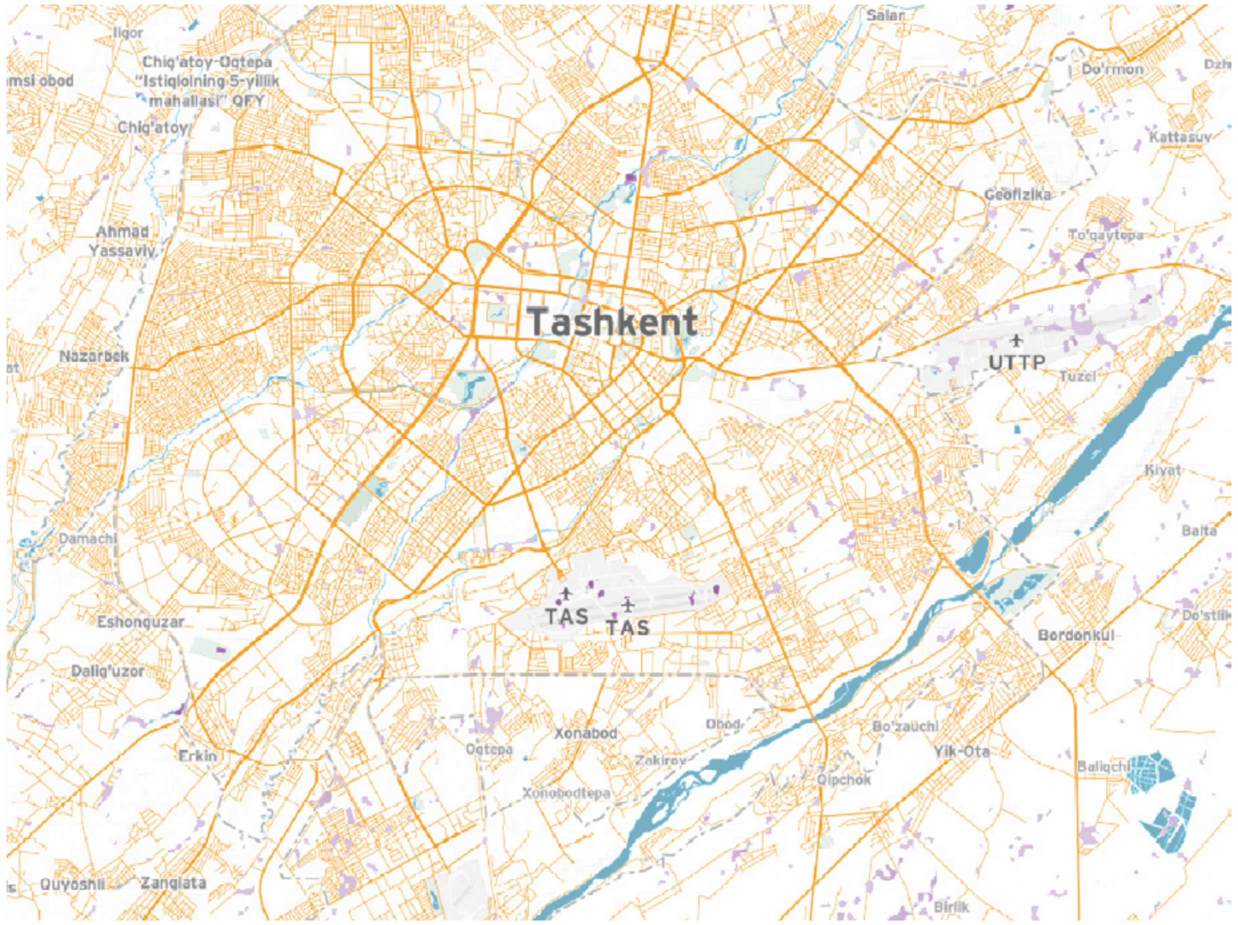
Two main rivers, Amu Darya to the southwest and Syr Darya to the northeast, , form the major river basins of Uzbekistan. The Amu Darya brings flood risk to Termez in the far south and a large population area around Urgench and Nukus near the south western border with Turkmenistan. The river then flows through a large area of low lying sparsely populated land south of the Aral Sea. The Syr Darya River flows into Aydar Lake in the north. In the east, the Chirchiq River runs just south of Tashkent.

The surface water flood map of Tashkent in Figure 22 shows small areas of risk around the airports and some flood risk associated with drainage running through the centre of the city.

Figure 21: Map of river (fluvial) flooding (areas in blue) at the 200-year return period level

Source: JBA Risk Management

Figure 22: Map of surface water (pluvial) flooding (areas in purple) at the 200-year return period level for the Tashkent region



Source: JBA Risk Management

Climate conditions

Historic climate

Uzbekistan's climate is determined by its location in the middle of Central Asia and by the Tian Shan Range on its southeast border. It has a continental climate (cold winters and hot summers) in the north and a subtropical climate in the south.[13] Precipitation is not evenly distributed; as shown in Figure 23 and Figure 24, the mountainous areas receive an annual average precipitation of ~800mm while parts of the northwest and central deserts receive less than 100mm.[14] Much of the precipitation falls during the winter and spring months. At higher elevations, rain-on-snow events can trigger flooding and mud flows along rivers in the valley areas; the risk of such events is highest in the spring (March-May). Fergana Valley accounts for 44% of all mud flows recorded in the country between 1900-2013.

There are no statistically significant annual precipitation trends yet apparent for most of the country (for the period of 1950 to 2015), though there are some slight decreasing trends in some south-central areas particularly in Bukhara and Kashkadarya provinces.[16,9] These slight downward trends could be within natural climate variability.

While there are no clear precipitation signals, Uzbekistan has been warming significantly in the past few decades. Warming is most pronounced in summer and autumn in the earlier periods. From 1938 to 2002, the country experienced an average warming of 0.27°C per decade[12]. Some of the warming in urban areas can be attributed more to local urban heat island effects than climate change. However, a warming signal is detected across the country even where there are no cities. The rate of warming has accelerated, with warming of up to 0.52°C per decade observed around Tashkent and Samarkand between 1991-2016[17].

Warming in winter and early spring has also started to accelerate since 1991. This warming increases the chance of more rain-on-snow events in spring and potentially late winter in the future due to climate change. Independent of any precipitation changes, these warming trends could lead to a greater risk of spring flooding and mudflows.

Figure 23: Annual mean precipitation between 1951-2007

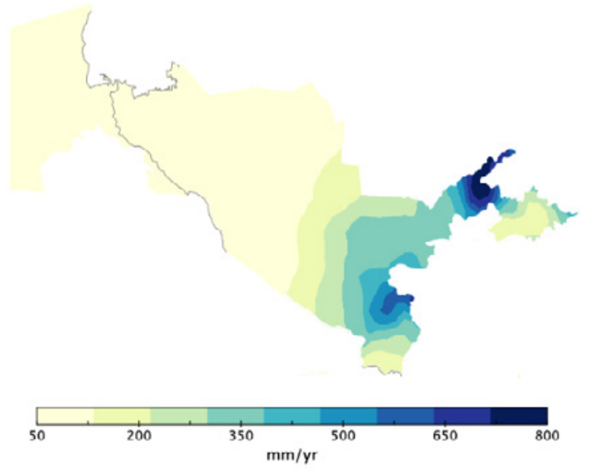
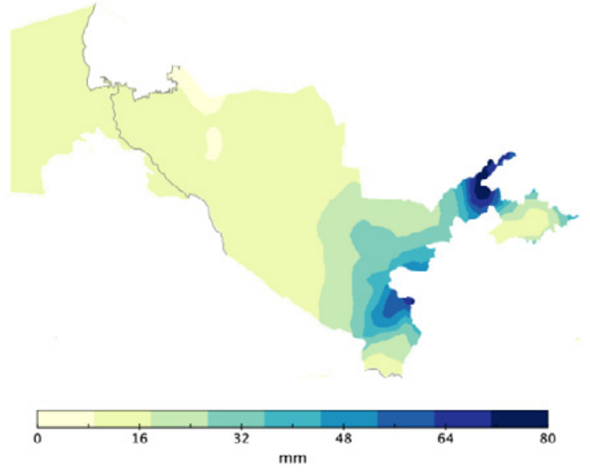


Figure 24: April-June (primary flood season) mean precipitation between 1956-1995



Note: the precipitation scales are different between the annual and seasonal means.
Source: ODI analysis using APHRODITE[15] Russia domain precipitation dataset.

[13] *Uzhydromet (2016) Third National Communication of the Republic of Uzbekistan under the UN Framework Convention on Climate Change. Republic of Uzbekistan: Tashkent.*
Kholmatjanov, B., Y. Petrov, T. Khujanazarov, N. Sulaymonova, F. Abdikulov and K. Tanaka (2020) 'Analysis of Temperature Change in Uzbekistan and the Regional Atmospheric Circulation of Middle Asia during 1961-2016', MPDI Climate 8(101): doi:10.3390/cli8090101
Khaydarov, M. and L. Gerlitz (2019) 'Climate variability and change over Uzbekistan - an analysis based on resolution CHELSA data', Central Asian Journal of Water Research 5(2): 1-19.
[14] *Bubenko, I., S. Zhakenova, et al. (2020) Climate change in Uzbekistan: Illustrated summary. CAREC and the World Bank Group.*
[15] *Yatagai, A., K. Kamiguchi, et al. (2012) 'APHRODITE: Constructing a long-term daily gridded precipitation dataset for Asia based on a dense network of rain gauges'. BAMS: doi: 10.1175/BAMS-D-11-00122.1*
[16] *Khaydarov, M. and L. Gerlitz (2019) 'Climate variability and change over Uzbekistan - an analysis based on high resolution CHELSA data', Central Asian Journal of Water Research doi:10.29258/CAJWR/2019-R1.v5-2/1-19.eng*

[17] *Kholmatjanov, B., Y. Petrov, et al. (2020) 'Analysis of temperature change in Uzbekistan and the regional atmospheric circulation of Middle Asia during 1961-2010'. Climate: doi:10.3390/cli8090101.*

Future precipitation projections

Two Regional Climate Model-Global Climate Model (RCM-GCM) simulations from the Coordinated Regional Climate Downscaling Experiment (CORDEX) Central Asia domain were used to examine climate change impacts on precipitation. Two Representative Concentration Pathways (RCP4.5 and RCP8.5) were selected; these respectively represent a medium and high (business-as-usual) emissions pathway. The RCMs were bias corrected before precipitation projection analysis of how conditions could shift between the 2050s (2031-2070) and a historical reference period of 1956-1995.[18] The multi-model mean information was used to examine yearly and seasonal changes under RCP4.5 and RCP8.5.

Precipitation extremes from each model and RCP were individually used to calculate future precipitation intensities (shown in Table 5), which are relevant to estimating future flood risk. Box 3 describes the methodology behind the future climate calculations. The area-averaged annual maximum rainfalls for 24-hr duration for each province was extracted and analysed for different return periods (2, 5, 10, 20, 50, 100, 500-, 1000-, 5000- and 10000- year events).

The multi-model projections indicate that annual mean precipitation by the 2050s could slightly increase (10 to 20%) for areas west of Jizzakh, Kashkadarya and Samarkand provinces in comparison with means from 1956-1995 under RCP4.5. Potential small increases (10 to 20%) are

Figure 25: RCP 4.5 2050 April-June precipitation percentage change

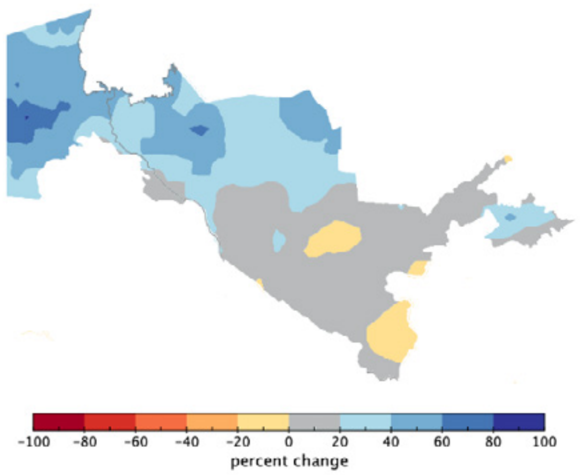
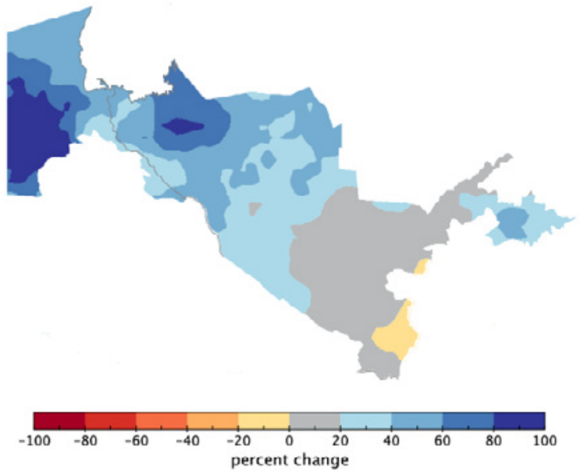


Figure 26: RCP 8.5 2050 April-June precipitation percentage change



Source: Bias corrected multi-model projections from CORDEX Central Asia domain

projected for much of the country under RCP8.5, with larger increases (20 to 60%) projected for parts of Bukhara, Navoiy and Karakalpakstan regions. Most annual precipitation increases as shown in Figure 25 and Figure 26 are attributable to projected increases in spring (April to June) and summer (July to September) mean precipitation. Little to no change is projected in other seasons. These projections are comparable with those other studies using a larger set of climate models, which indicate possible increases as well under RCP8.5. However, there is uncertainty in the precipitation projections.

Furthermore, despite the potential increases in some seasonal mean precipitation, increases in maximum and minimum temperatures and the number of heat waves will exacerbate evapotranspiration, particularly over the already arid regions of the country.

Much of Uzbekistan is arid and will continue to be so in the future. Nonetheless, short-duration (24-hour or less) or multi-day extreme precipitation events can contribute to flooding.

[18] *The historical reference period of 1956-1995 was used over the standard 30-yr period 1961-1990 because climate over Central Asia is modulated by the Atlantic Multidecadal Oscillation and this reference period is long enough to cover two phases of the AMO, among other multidecadal climate processes. The 2050s (period 2031-2070) were chosen for the flood model (and climate modeling) as a more policy relevant period than the more distant 2070s, and a climate change signal is detectable.*

Potential increases in short-duration extreme precipitation intensities by the 2050s are not consistent across the country by RCPs. The Kashkadarya, Surkhandarya and Sirdaryo regions might experience slight decreases in the intensities of 24-hour extreme events under both RCPs, whereas Andijan, Bukhara and Fergana are projected to have little change under RCP4.5 only. The remaining regions could experience more intense precipitation extremes under both RCP4.5 and RCP8.5. For example, the Karakalpakstan region, which has experienced heavy rainfall-induced flooding in the past, could see what was once about the 1 in 250-yr rainfall event becoming the 1 in 50-yr event. The Tashkent region and city could experience more intense 24-hr duration events, though increases are larger for RCP8.5 than RCP4.5 (see Table 5).

Table 5: Tashkent 24-hr duration extreme precipitation intensity (mm/hr)

Return period	1951-2007	2050s	
	Historical	RCP4.5	RCP8.5
20-year	1.71	1.93 (1.87, 1.99)	2.03 (2.00, 2.06)
100-year	2.23	2.37 (2.29, 2.46)	2.48 (2.44, 2.53)
200-year	2.46	2.55 (2.47, 2.64)	2.68 (2.63, 2.72)
500-year	2.75	2.80 (2.71, 2.90)	2.93 (2.87, 2.99)

Source: ODI
Projected changes in 24-hr duration extreme precipitation intensities in Tashkent for 2031-2070 (the 2050s) as compared to historical 24-hr intensities for different return periods. The table shows the median of the multi-model ensemble and the 25th and 75th percentiles in brackets.

Box 3: Future climate methodology

Climate change impacts on precipitation were examined by use of Regional Climate Models. Two Representative Concentration Pathways (RCPs) were selected: RCP 4.5 as a medium emissions pathway and RCP 8.5 as a high (business-as-usual) pathway.

Multi-model projections simulated how precipitation could differ in the 2050s compared to the historical reference period of 1956-1995.

Precipitation projections were made to examine how conditions could differ in the 2050s to the historical reference period of 1956-1995. This reference period accounts for two phases of the Atlantic Multidecadal Oscillation, which modulates climate over Central Asia. The 2050s were chosen as a policy relevant period where a climate change signal is detectable.

CHAPTER 4

Exposure

Uzbekistan is the most populated country in Central Asia. The western part of the country, including the Fergana region, is among the most densely populated parts of Central Asia. Strong economic growth in Uzbekistan over the last decade has been largely due to the development of more capital-intensive sectors of the economy, particularly the fuel and energy sectors, and is associated with access to natural resources including substantial reserves of natural gas, oil, and coal.

Table 6 provides a summary of population totals, distributions and trends. The country's population is currently growing at a steady pace around 1.9% per year, although projections suggest that growth rate is slowing. Roughly half of the population of Uzbekistan live in urban areas; while that population is also growing steadily, the share of those living in urban areas has declined slowly since 2010. The south and east regions have significant centres of population, while the central and western deserts are more sparsely populated.

Table 6: Population totals, distribution and trends (all data from 2020)

Population (thousands)	33,580.65
Population growth date (%/year)	1.9
Share of population living in urban areas (%)	50
Urbanisation rate (%/year)	1.8
% of total population age 0-14	29
% of total population age 15-64	67
% of total population ages 65 and above	5

Source: World Bank Open Data

According to the State's Committee of the Republic of Uzbekistan on Statistics quarterly Report (Jan-Dec 2020), agriculture, forestry and fisheries; construction; and service saw positive growth by the end of 2020; meanwhile, the share of industry decreased. In 2019, compared to 2018, significant shifts were noted in the structure of GDP, characterized by a decrease in the share of agriculture, forestry and fisheries and an increase in the share of industry. At the end of 2020, agriculture, forestry and fisheries reflected growth due to an increase in crop production and livestock production.[19] Table 7 provides a summary of key economic indicators.

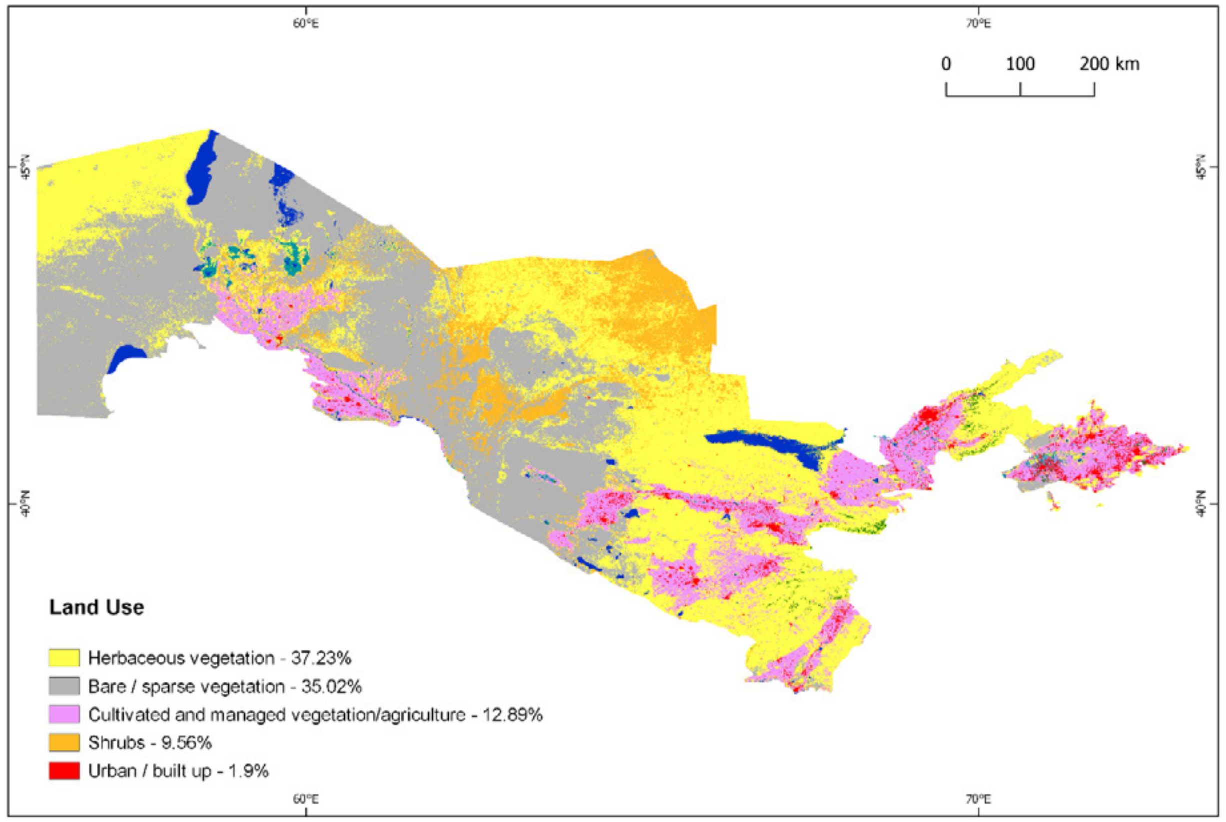
[19] *The State Committee of the Republic of Uzbekistan on Statistics, 2020. Socio-economic situation of the Republic of Uzbekistan. Quarterly Report. Available online: https://stat.uz/en/?preview=1&option=com_dropfiles&format=&task=frontfile.download&catid=325&id=1424&Itemid=1000000000000*

Table 7: Key economic indicators (data from 2019, if *from 2020)

GDP (million USD, current)	57,921.29
GDP per capita (USD, current)	1,724.80
Country / territory economic composition	Country / territory economic composition
Agriculture, forestry and fishing, value added (% of GDP)	25.5
Employment in agriculture (% of total employment) (modelled ILO estimate)	23*
Industry (including construction, value added (% of GDP)	33.2
Employment in industry (% of total employment) (modelled ILO estimate)	30*
Services, value added (% of GDP)	32.2
Employment in services (% of total employment) (modelled ILO estimate)	47*

Source: Bureau of National Statistics of the Agency for Strategic Planning and Reforms (Republic of Kazakhstan), World Bank Open Data, ADB Key Indicators Database

Figure 27: Land use in Uzbekistan



Source: UZGIP Institute, accessed March 2021 (https://uzgip.uz/projects/8/)

The topography of Uzbekistan is evident from the land use map in Figure 27 and population density map in Figure 28. Primary land use is along the eastern half of the country with cultivated land mirroring the main population densities.

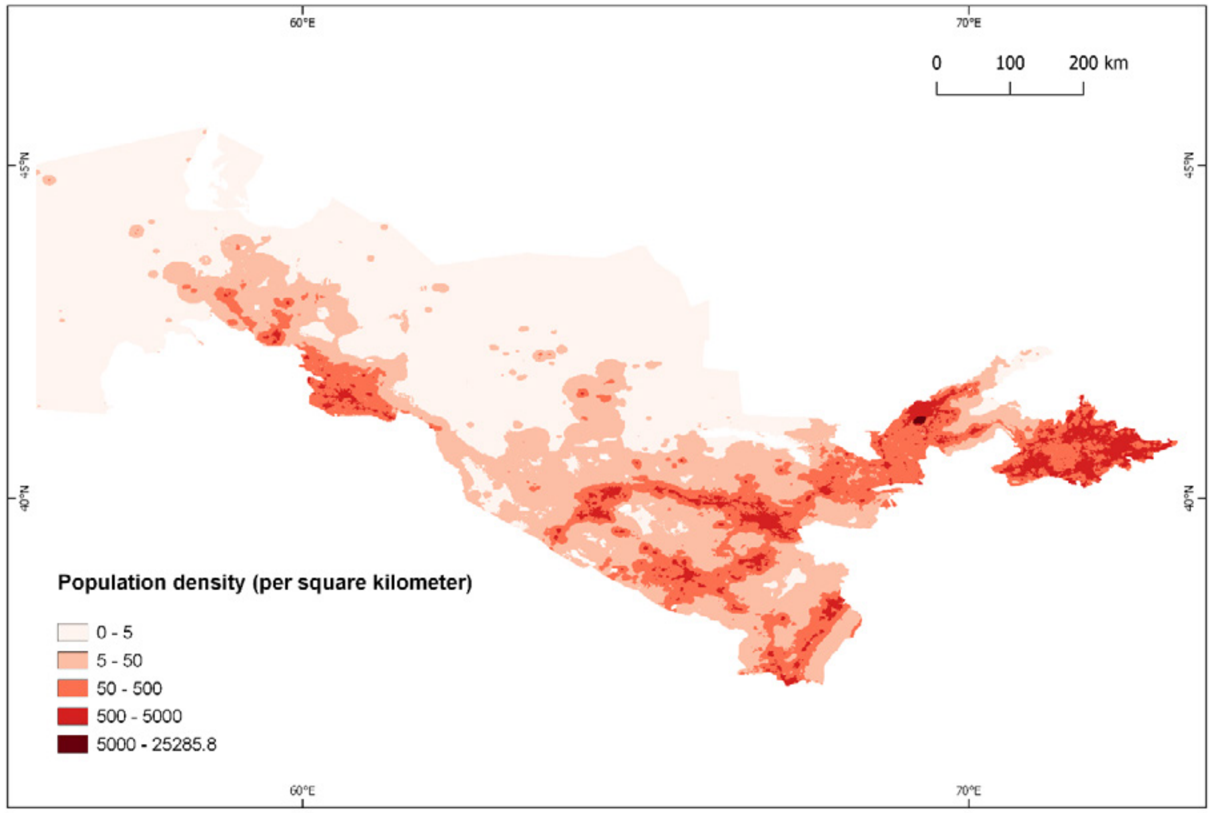
About 90,000 km^2 of the country's territory is mountainous, with high susceptibility to landslides.[20] Annually, about 22 flash floods and mudflows occur in the republic, which mainly originate on the slopes of the Chirchik and Akhangaran river valleys and on the Surkhandarya river. About 12% of the territory of the republic and about 16% of its population are at high risk.[21]

In 2019, agricultural land as a share of land area for Uzbekistan was approximately 59% falling gradually from around 64% in 1999. The lowlands in the west have a thin natural cover of sparse vegetation including desert sedge and grass. Forests cover less than 8 percent of Uzbekistan's area. With limited exceptions, land in Uzbekistan cannot be owned privately by individuals or collectives.

An important characteristic of Uzbekistan's population growth is its increased rate in non-urban areas, which is faster than growth rates in urban areas. The government's national development strategy 2017-2021 and Presidential Decree No. 5623 aim to address this and accelerate growth and reduce poverty through improved urbanization and balanced regional development. The government's goal is to increase its urbanization level to 60% by 2030.

Economic opportunities and better living conditions are prompting the people of Uzbekistan to move to larger cities. This migration trend results in unplanned settlements, inadequate basic and social services, and deficient infrastructure in larger cities. It also constrains economic growth and basic services in rural and smaller cities.

Figure 28: Population density map



Source: The State Committee of the Republic of Uzbekistan on Statistics

[20] *The World Bank and Global Facility for Disaster Reduction and Recovery. (2020). Disaster Property Insurance in Uzbekistan. Overview and Recommendations.*
[21] *Centre of Hydrometeorological Service under the Cabinet of Ministers of the Republic of Uzbekistan (2009), Second National Communication of the Republic of Uzbekistan under the United Nations Framework Convention on Climate Change; cited in: UNDP (2011). Natural Disaster Risks in Central Asia: A Synthesis.*

Table 8: Asset replacement cost (billion USD) for residential, commercial and industrial buildings

Asset replacement cost (billion $)	
Residential buildings	253.1
Commercial buildings	55.5
Industrial buildings	12.0
Total buildings	**320.5**

Source: Global Earthquake Model database.

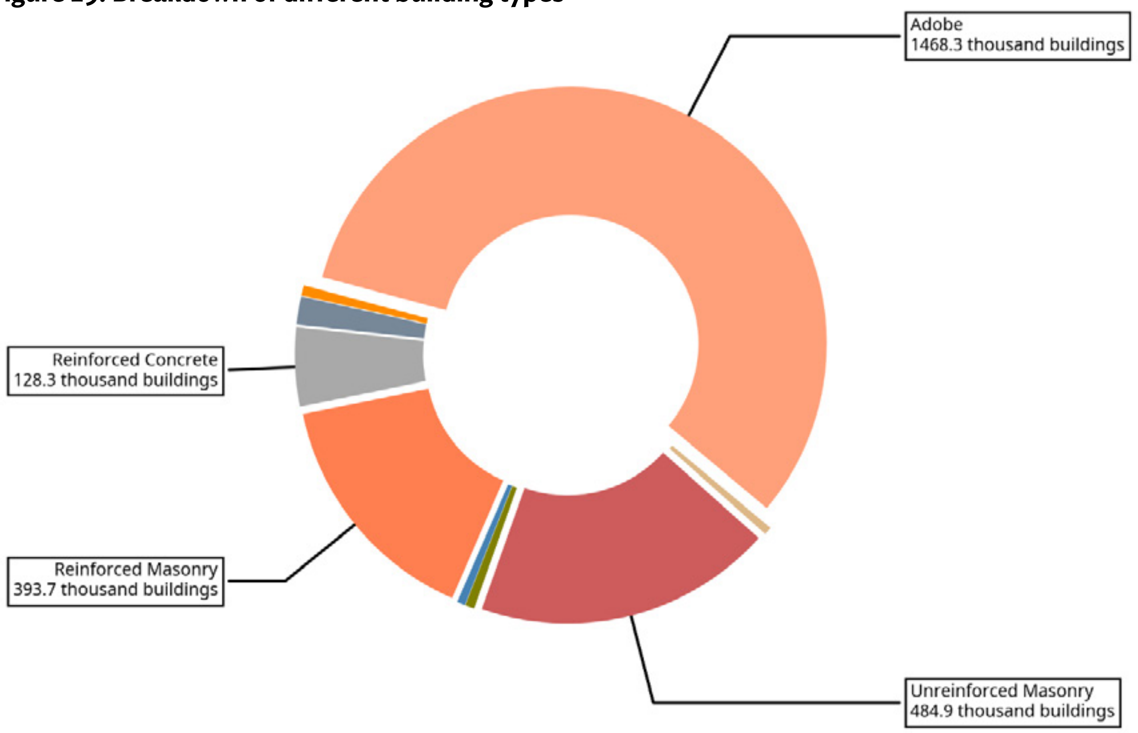
As shown in Table 8, residential buildings are Uzbekistan's dominant asset type which are valued at $253.1 billion. Commercial buildings total $55.5 billion in replacement costs and industrial buildings total $12 billion.

Detached houses predominate residential building stock and represent about 70 per cent of total dwellings across the country. Although apartment buildings make up a small share of dwellings, a significant number of people live in multi-family housing. Apartment buildings are primarily built from reinforced concrete and brick. Given the high seismicity of the country, regulations restrict the height of buildings to four or five. A small number of high-rise buildings have been built in Tashkent through special projects. Around 60% of housing stock was built between 1971 and 2006, with large parts of Tashkent rebuilt in 1996 following a large earthquake event.

Adobe structures with an estimated total of 1,468,268 buildings make up the largest fraction (57.0%) of the total building stock, as seen in Figure 29. This is followed by unreinforced masonry structures (484,851 buildings, or 18.8%) and reinforced masonry structures (393,671 buildings, or 15.3%).

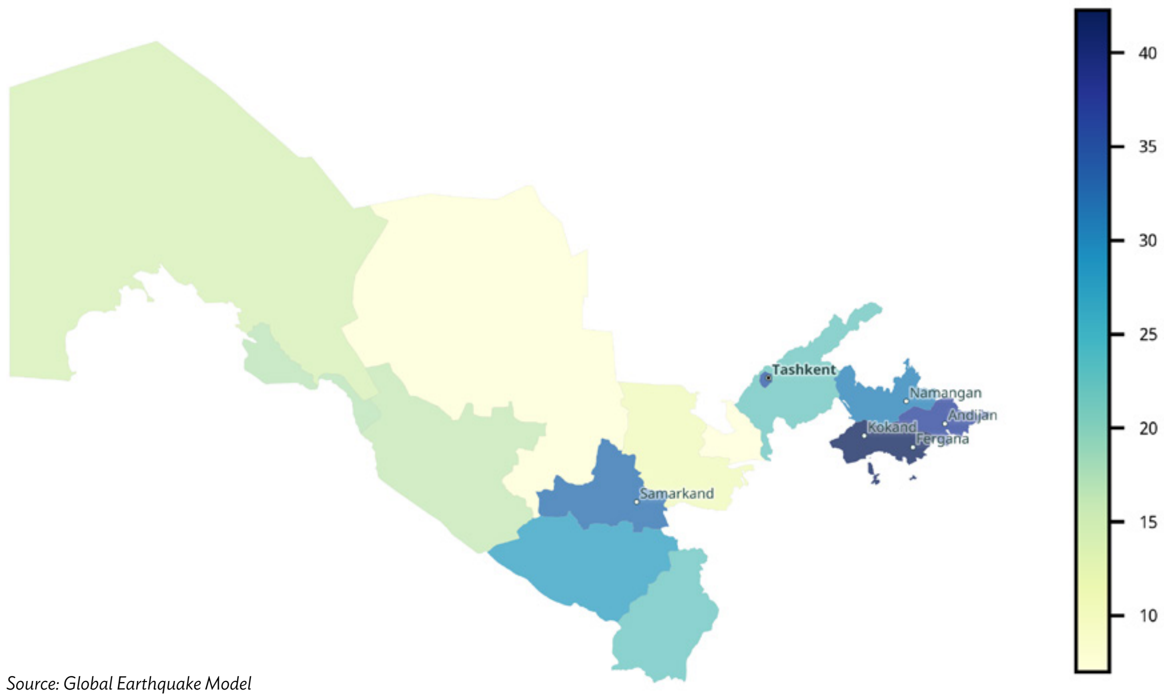
Asset replacement costs by region are shown in Figure 30. The eastern regions have a high concentration of asset replacement costs alongside Samarkand and the southern areas. There is a much lower concentration of economic assets by value in the north and west of the country which are mountainous, rural areas with sparse development.

Figure 29: Breakdown of different building types



Source: Global Earthquake Model

Figure 30: Asset replacement cost (residential, commercial and industrial buildings)



Source: Global Earthquake Model

Vulnerability

The social impacts of hazard events are greatly affected by the structure and organization of societies and economies. Vulnerability can be thought of as one determinant of disaster risk, the other being the natural hazard event. The structure of politics, economics and livelihoods affects vulnerability to disaster events. Policy and investment choices can increase or decrease vulnerability, and therefore determine the overall level of disaster risk. Deliberate policies, such as for disaster risk reduction and finance, can reduce vulnerability. Other forces, such as pattern of urbanisation or decline of ecosystem services, may unintentionally increase vulnerability.

Socio-economic vulnerability

Table 9 provides an overview of socio-economic vulnerability indicators. Agriculture is a vital economic sector in Uzbekistan, yet it is vulnerable to climate change and disaster events. Environmental deterioration, including groundwater salinization and land degradation, is a major concern in the northwest of the country.[22] Food security in Uzbekistan is heavily dependent on irrigated agriculture while Central Asia is critically vulnerable to water scarcity. In addition, the vulnerability of Central Asia to climate change has impact on human health. The Karakalpakstan region, infamous for the Aral Sea environmental catastrophe, experiences frequent dust storms. Due to heavy salinization of the area and the use of pesticides, these salts and toxins are constantly blown back and deposited on surrounding communities. This, as well as contaminated water inevitably sparks airborne diseases, including tuberculosis and cancer.[23]

Table 9: Socio-economic vulnerability indicators

Poverty headcount ratio at national poverty lines (% of population)	14.1 (2013)
Human Capital Index	0.6 (2020)
GINI index	36.7 (2013)
Gender Inequality index	0.30 (2018)
Household size	5.2 (2019)
Age dependency ratio (% of working age population)	50 (2019)
Unemployment rate	6.1 (2020, modelled ILO estimate) 9 (2019)
General government gross debt (% of GDP)	20.433 (2018)
Under five child mortality (per 1000 live births)	17.4 (2019)
Life expectancy at birth (female)	74 (2018)
Life expectancy at birth (male)	69 (2018)
% of population using at least basic sanitation services	100 (2017)
% of population using at least basic drinking water services	98 (2017)

Source: World Bank Open Data; United Nations Population Division; UNDP; IMF World Economic Outlook Database; Ministry of Employment and Labour Relations of the Republic of Uzbekistan

[22] *Aleksandrova, M., Gain, A. and Giupponi, C., 2015. Assessing agricultural systems vulnerability to climate change to inform adaptation planning: an application in Khorezm, Uzbekistan. Mitigation and Adaptation Strategies for Global Change, 21(8), pp.1263-1287.*
[23] *Small, I., van der Meer, J. and Upshur, R., 2001. Acting on an environmental health disaster: the case of the Aral Sea. Environmental Health Perspectives, 109(6), pp.547-549.*

Coping capacity

Coping capacity is the ability of people, organizations and systems, using available skills and resources, to manage adverse conditions, risk, or disaster events. The capacity to cope requires continuing awareness, resources, and good management, both in normal times as well as during disaster events or adverse conditions. Coping capacities contribute to the reduction of disaster risks.

Uzbekistan's Government recognises the country's vulnerability to natural hazards and has taken important steps to manage emergency situations. The 1999 Law on the Protection of the Population and Territories from Natural and Man-Made Emergency Situations[24] is the founding law which aims to prevent the emergence and development of emergencies, reduce losses, and manage emergency situations in Uzbekistan. The two main bodies in management of emergency situations are the Cabinet of Ministers of the Republic of Uzbekistan and the specially authorized Ministry of Emergency Situations of the Republic of Uzbekistan. Their respective responsibilities are summarised in Figure 31.

Figure 31: Responsibilities in the management of emergency situations

Cabinet of Ministers of the Republic of Uzbekistan	Ministry of Emergency Situations of the Republic of Uzbekistan
Ensures creation of state reserves of financial and material resources for management of emergency situations, and determines a procedure for their use;	Develops and takes measures to prevent emergencies, save lives and preserve people's health, protect material and cultural values, and eliminate consequences and reduce damage in emergency situations;
Carries out financial and resource support of forces and means for prevention and management of emergency situations, equipping them with special equipment and other material and technical means;	Organises the development and implementation of targeted programs and research in the field of protecting the population and territories from emergency situations;
Approves the Classification of emergencies and determines a degree of participation of executive authorities in their elimination. Emergency situations are classified according to the reasons (sources) of their occurrence and, depending on the number of affected population, the amount of material damage and extent (zone boundaries). Emergencies are divided into local, republican and transboundary.	Adopts within its competence decisions that are binding on ministries, agencies, enterprises, institutions and organizations, officials and citizens;
Monitors activities of ministries, agencies, local executive authorities in field of protecting the population and territories from emergency situations;	Organises training of command and control bodies, forces and means of protecting the population and territories for actions in emergency situations;
Exercises other powers in accordance with the law.	Manages forces and facilities for liquidation of emergencies, creates control posts, warning and communication systems;
	Organises emergency rescue and other urgent work in emergency situations;
	Carries out state control over the implementation of measures to protect the population and territories from emergency situations;
	Participates in the state examination of projects and decisions on industrial and social facilities;
	Exercises other powers in accordance with the law.

[24] *Law of the Republic of Uzbekistan on the Protection of the Population and Territories from Natural and Man-Made Emergency Situations. (1999). Available online: https://www.lex.uz/docs/68553*

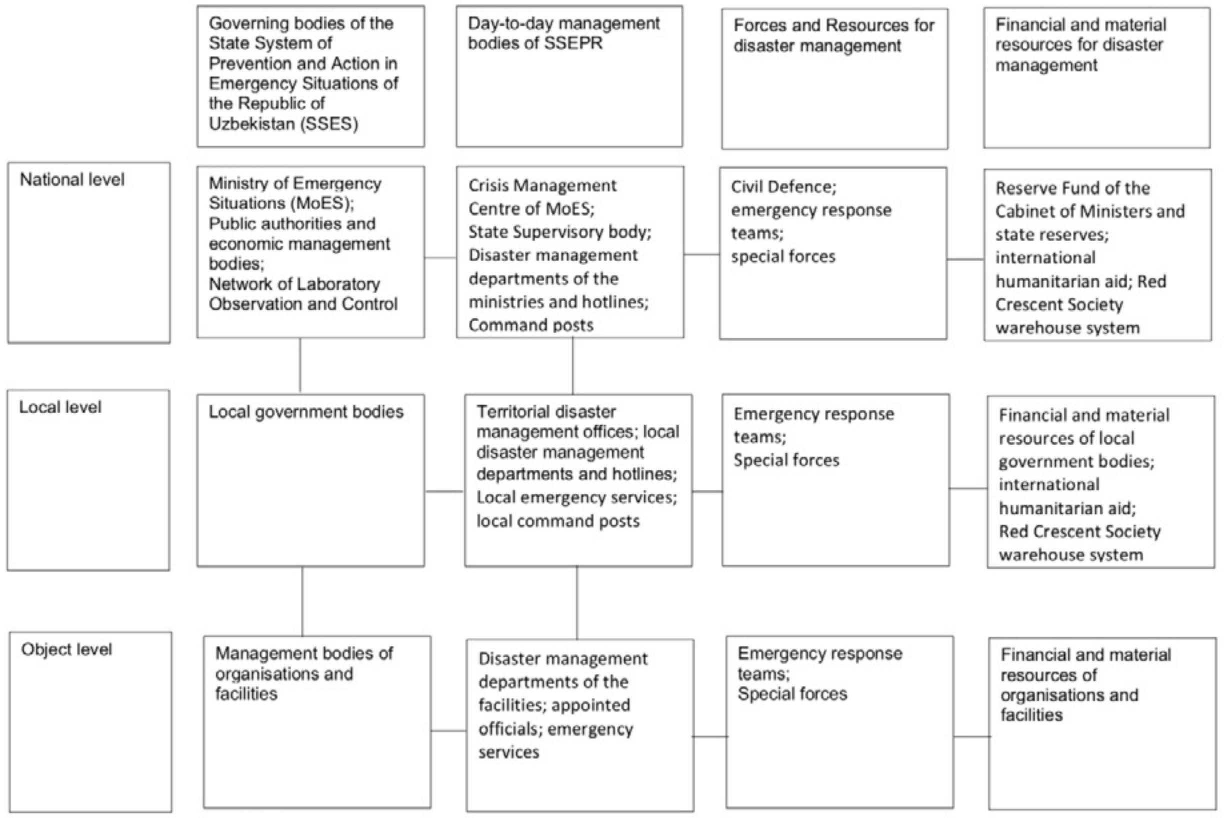
Reserve funds for managing emergency situations are determined by the Cabinet of Ministers, using several means, including:

- means of the reserve fund of the Cabinet of Ministers of the Republic of Uzbekistan and stocks of material resources of the state reserve – charged from the republican budget of the Republic of Uzbekistan;
- departmental reserve of financial and material resources – charged from the functional subsystems of the State System for Emergency Preparedness and Response of the Republic of Uzbekistan;
- reserve of financial and material resources of state authorities on the ground – charged from the budget of the Republic of Karakalpakstan, local budgets of regions and the city of Tashkent;
- organizational reserve of financial and material resources
- humanitarian assistance of international organizations and foreign donors.

To eliminate emergency situations, the system of warehouses and reserves of essential goods of the Red Crescent Society of Uzbekistan can also be used to aid people affected by natural hazards with the organization's consent.

In order to enhance the effectiveness of emergency management in Uzbekistan, the Resolution[25] of the Cabinet of Ministers established the State System of Prevention and Action in Emergency Situations (hereafter the State System), which consists of such government bodies as the Council of Ministers of the Republic of Karakalpakstan; regional, city and municipal administrations; ministries; agencies; enterprises; institutions and organizations. The structure and procedure for functioning of the State System are determined by the Cabinet of Ministers of the Republic of Uzbekistan and outlined in Figure 32.

Figure 32: State management and control over the activities of the State System of Prevention and Action in Emergency Situations of the Republic of Uzbekistan



Source: National Database of Legislation of the Republic of Uzbekistan (2011) Resolution of the Cabinet of Ministers "On further improvement of the State System of Prevention and Action in Emergency Situations."

[25] *Resolution of the Cabinet of Ministers "On further improvement of the State System of Prevention and Action in Emergency Situations." (2011). Accessed March 2021 at: https://lex.uz/acts/1857284#undefined*

The purpose of the State System is to protect the population and the country's territory from emergency situations. It is designed to organize and implement activities in the field of prevention and management of emergency situations, ensuring public safety, protecting the environment and reducing the damage to the economy of the state. The main objectives of the State System include implementation of state policy, normative and legal acts and assessment of potential economic and social consequences. The State System also works in education by developing scientific and technical programs in emergency field. The State System prioritizes international cooperation in the field of protection from emergency situations.

Uzbekistan aims to develop by 2030 a strategy on the protection of the population and the territory of the country from potential disaster events. In addition, the government works on the national action plan to meet the Sendai framework.[26] The focus is on:

- the role of local communities in disaster risk reduction (DRR);
- efficient water resources management;
- incorporation of advanced technology for DRR;
- attraction of private capital for collaborative efforts for prevention of disaster events and reduction of damage;
- use of scientific knowledge for successful DRR strategies;
- implementation of climate adaptation measures.

Furthermore, each year the budget allocates funds to the 'reserve funds of the Cabinet of Ministers' based on the macroeconomic conditions in the country and the state of the budget. This is a non-accruing fund which can be used for 'timely and flawless financing of unexpected expenditure related to economic, social, cultural and other areas. In addition, the National Road Fund has a dedicated reserve fund for the reconstruction of roads after disaster events. In 2018, the total spending of the Fund was $490m, of which $15m (3%) was reserved for the response to disaster events.[27]

In total, the government of Uzbekistan may have access to around $80m following a disaster event. However, most of this funding is not earmarked for disaster events and some of the funding can only be used in relation to road reconstruction. This excludes the departmental reserves discussed above. A recent review concluded that there would be value in developing a comprehensive disaster financing strategy.[28]

[26] *STATEMENT of the delegation of the Republic of Uzbekistan at the Asian Ministerial Conference on Disaster Risk Reduction. UNISDR. (2018) Available at: https://www.unisdr.org/files/globalplatform/amcdrr2018ministerialstatementuzbek.pdf*
[27] *Resolution of the Cabinet of Ministers "On governing the creation, use and restoration of financial and material reserves aimed to eliminate emergency situations." (2019). Available online: https://lex.uz/docs/4203375*
[28] *Ibid.*

Table 10: Key coping capacity indicators

Financial inclusion (% of population aged 15+ with access to bank account)	37.1% (female pop: 36%) (2017)
Insurance coverage	0.3% (2019)
Share of population covered by public safety nets	25% (bottom income quintile: 26.9%) (2018)
Internet coverage (% of population using the internet)	70 (2020)
Metabiota Epidemic Preparedness Index score (100 = maximum score, 0 = minimum score)	64 (2019)
Public and private health expenditure (% of GDP)	5.29 (2018)
Number of physicians (per 1,000)	2.4 (2014)
Number of hospital beds (per 1,000)	4 (2013)
Government effectiveness (-2.5 to +2.5)	-0.51 (2019)
Corruption Perception Index	25 (2019)

Source: World Bank Open Data; Worldwide Governance Indicators (WGI) Project; Transparency International; The Ministry for Development of Information Technologies and Communication of the Republic of Uzbekistan; Data relevant to national preparedness to detect and respond to epidemics and pandemics from Metabiota's Epidemic Preparedness Index[29]

Table 10 provides detail on key coping indicators for Uzbekistan. In terms of ex-post funding arrangements, until the end of 2019, Uzbekistan's fiscal position had been increasingly robust with the overall risk of debt distress being judged as low and the country's debt carrying capacity as strong.[30] However, this is now somewhat threatened as fiscal balance is expected to move into deficit in 2021 due to the COVID-19 crisis.[31]

[29] *Oppenheim, B., Gallivan, M., Madhav, N. K., Brown, N., Serhiyenko, V., Wolfe, N. D., & Ayscue, P. (2019). Assessing global preparedness for the next pandemic: development and application of an Epidemic Preparedness Index. BMJ global health, 4(1).*
[30] *IMF (2020) Republic of Uzbekistan. IMF Country Report No. 20/171. https://www.imf.org/~/media/Files/Publications/CR/2020/English/1UZBEA2020002.ashx*
[31] *https://www.worldbank.org/en/research/brief/fiscal-space*

Protection Gap

The protection gap is traditionally defined as the proportion of losses from disaster events that are not insured. Identifying the level of risk which has not been reduced (through risk reduction investment) or transferred (through risk financing) is to identify the contingent liability that will need to be met in the event of a disaster. This is important for the design of risk management and arrangement of risk financing: identifying the protection gap informs on where financing is most needed. Table 11 provides the details underpinning this assessment for Uzbekistan.

Table 11: Key Protection Gap indicators

AAL as % of GNI[32]	0.24%	
Un-funded AAL, ($m, %)	$512m 84%	
Average annual human losses from flood and earthquakes	Flood	EQ
	219	92
Event frequency where direct & indirect loss and damage, less (assumed) insured losses, exceed existing ex-ante risk retention	Flood	EQ
	1 in 2	1 in 10
Event frequency where direct damage, less (assumed) insured losses, exceed existing ex-ante risk retention	Flood	EQ
	1 in 2	1 in 10
Event frequency where estimated emergency response costs exceed current risk retention mechanisms	Flood	EQ
	1 in 5	1 in 20
Macro-economic context and ability for sovereign to borrow	Moderate – strong but short-term challenges from COVID-19.	
Ability of individual and households to access resources after an event	Declining financial inclusion and limited social assistance	

Source: Consultant team modelling

[32] *GNI data (in current international $) used to take account of the importance of remittances in many parts of the CAREC region. GNI data taken from World Development Indicators. GDP used for Inner Mongolia and Xinjiang where province level GNI data is not available drawing from press reports.*

Both floods and earthquakes are responsible for significant economic costs in Uzbekistan. The AAL associated with floods is $396 million while for earthquakes the equivalent figure is $214 million. The combined annual average direct losses are equivalent to 0.24% of GNI, which is the third highest of any country in the CAREC region.

In total, it is estimated that around $79 million is available for response to disaster events, although most of this funding is not earmarked for disaster events and some of the funding can only be used in relation to road reconstruction. Beyond this, the government would need to make use of budget re-allocation, borrowing or external donor funding.

Non-life insurance penetration rates in Uzbekistan, at 0.3% in 2019, are low compared to other countries in the region.[33] In terms of insured losses, 10% of residential buildings are expected to be covered by property insurance which has earthquake cover as standard; we can assume that 12% of all the losses associated with earthquakes might be covered. Considering that approximately 60% of all premiums are paid by policyholders in Tashkent and that there are different exposures inside and outside of the region, we can assume that 45% of the losses from earthquake in Tashkent are insured, and 6% of the losses outside of the region are insured. Since flood coverage is an optional extra, we can assume that 4.5% and 0.6% of the flood losses inside and outside of Tashkent, respectively, are insured (i.e. 10% of the proportion of earthquake losses which are insured).

The net result of these assumptions is that a significant proportion (around 84%) of the AALis not covered by existing disaster risk financing instruments. Correspondingly, relatively frequent events are enough to exhaust the resources associated with the current disaster risk finance instruments. If the instruments are intended to cover all of the losses associated with disaster events, then a 1 in 2-year flood and a 1 in 10-year earthquake would be sufficient to deplete the current provision (regardless of whether indirect losses might also need to be covered by these instruments). If the instruments are intended to only cover emergency responses costs, then they would be depleted by a 1 in 5-year flood event or a 1 in 20-year earthquake event. This points to an obvious coverage gap for more severe events, which risk transfer instruments typically cover.

[33] *Data taken from Swiss Re Sigma, https://www.swissre.com/institute/research/sigma-research/World-insurance-series.html*

Vulnerability

CAREC
Central Asia Regional Economic Cooperation Program