COUNTRY RISK PROFILE
KYRGYZ REPUBLIC

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

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CAREC
Central Asia Regional Economic Cooperation Program

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
DRR	Disaster Risk Reduction
EP	Exceedance Probability
GEM	Global Earthquake Model Foundation
IPCC	Intergovernmental Panel on Climate Change
JBA	Jeremy Benn Associates
NEMA	National Emergency Management Agency
PRC	People's Republic of China
RCP	Representative Concentration Pathway
TA	Technical Assistance

Currency

Currency Unit	United States Dollar/s ($)

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Profile summary

The Kyrgyz Republic is a landlocked mountainous country bordered by Kazakhstan to the north, Uzbekistan to the west and southwest, Tajikistan to the southwest and the People's Republic of China (PRC) to the east. It is farther from the ocean than any other country in the world. The mountain ranges of the Tian Shan system cover most of Kyrgyz Republic. Most settlements and agriculture are in the lowlands, which make up only one seventh of the country's area and are found in the north and west of the country.

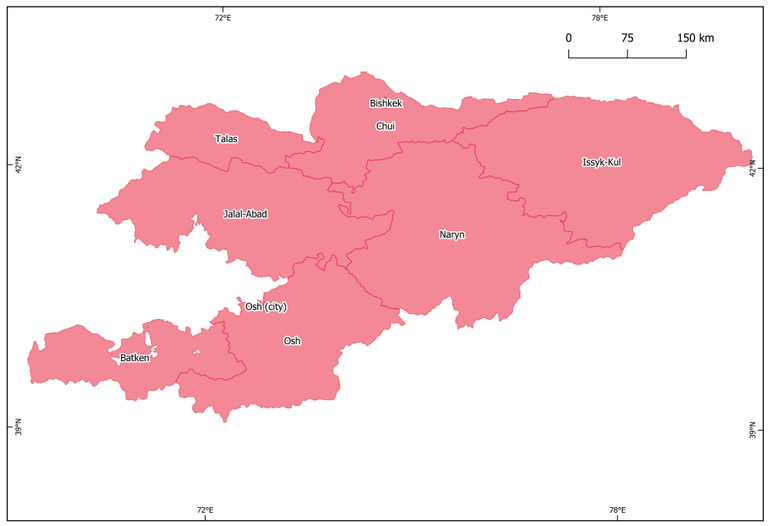
Earthquakes, flooding, and mudflows along mountain rivers triggered by heavy rainfall and/or rapid snowmelt are key hazards in Kyrgyz Republic. Earthquakes have caused greater economic damage than flooding in the past three decades; however, floods, mudslides and landslides have been the most frequent types of events in the past two decades.

The Kyrgyz Republic faces substantial and similar risks from both earthquake and floods on a yearly basis. The average annual modelled loss associated with flood is over $73 million and earthquake is $72 million, which together yield an aggregate annual average loss of nearly $146 million. Kyrgyz Republic's aggregate loss as a percentage of gross national income is the highest among all countries in the CAREC region.

For a low-frequency high-severity 100-year return period, both earthquake and flood are modelled to show significant combined risk of over $1.8 billion. An earthquake event could cause $1.16 billion of loss, which is approximately 18.26% of the country's nominal gross domestic product, and a similar flood event would be around $680 million, around 8% of GDP.

The region of Osh in the southwest part of the country has the highest average annual loss (AAL) from earthquake in the country at $17.1 million. Meanwhile, the Chui province in the north has the highest AAL from flood at $41.8 million, making up 57% of the average annual damage from floods across the whole country.

Figure 1: Regions of Kyrgyz Republic



Box 1: Key facts

GDP: 8,869,700,000 (2020) | **Population: 6,524,000 (2020)**

1 IN 100 YEAR FLOOD ECONOMIC LOSS **$680,000,000**	1 IN 100 YEAR EARTHQUAKE LOSS **$1,160,000,000**	AVERAGE ANNUAL LOSS FLOOD **$73,300,000**	AVERAGE ANNUAL LOSS EARTHQUAKE **$72,400,000**
AVERAGE ANNUAL PEOPLE AFFECTED FLOOD **27,000**	AVERAGE ANNUAL PEOPLE AFFECTED EARTHQUAKE **38,089**	AVERAGE ANNUAL PEOPLE AFFECTED INFECTIOUS DISEASE **67,080**	
EVENT FREQUENCY WHERE FLOOD LOSS EXCEEDS EXISTING COVER **1 IN 5**	EVENT FREQUENCY WHERE EARTHQUAKE LOSS EXCEEDS EXISTING COVER **1 IN 10**		

The pandemic modelling for the Kyrgyz Republic highlights that respiratory pathogens account for most of the epidemic risk with a 1 in 100-year risk of an event impacting over 2.3 million people.

Historic events illustrate the damaging nature of both earthquake and flood events in the country. The most devastating recent flood occurred in 1998 on the Kurgart river. As a result of a river dam breach, 1,199 houses were destroyed and an estimated $134 million in direct damages were incurred. In August 1992, an earthquake affecting the area from the Kazakh steppes to North Pamir in the south resulted in severe destruction at about $237 million in 2019 prices.

Climate change scenario analysis suggests that annual mean precipitation is not likely to change much for all regions north of Osh. North-eastern parts of Osh could experience up to a doubling of mean annual precipitation when compared with the reference period while southern regions could receive up to 20% more. The projected increases in mean annual precipitation are largely due to potential increases in seasonal means from April to June. Osh and the capital city Bishkek are projected to have significant intensification, with what used to be the 1 in 100-year events becoming the 1 in 50-year events by the 2050s.

Disaster response costs are met through the budgets of local governments and the Ministry of Emergency Situations. Reports suggest that around $60m of funding may be accessed for immediate response. Longer term disaster recovery and reconstruction are covered by budgets of line ministries or local governments or through a request to the Ministry of Finance.

The current risk retention and risk transfer instruments in the Kyrgyz Republic are insufficient for the disaster risk that the country faces. While efforts have been made to increase insurance penetration, coverage remains low and government reserve funds would be exhausted by a 1 in 5-year flood or 1 in 10-year earthquake event (both with or without the inclusion of indirect losses).

CHAPTER 1

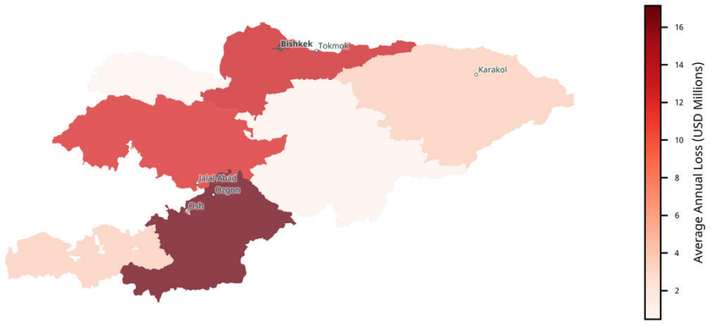
Risk analysis

The extent and geographic pattern of earthquake, flooding, and infectious disease across Kyrgyz Republic are 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

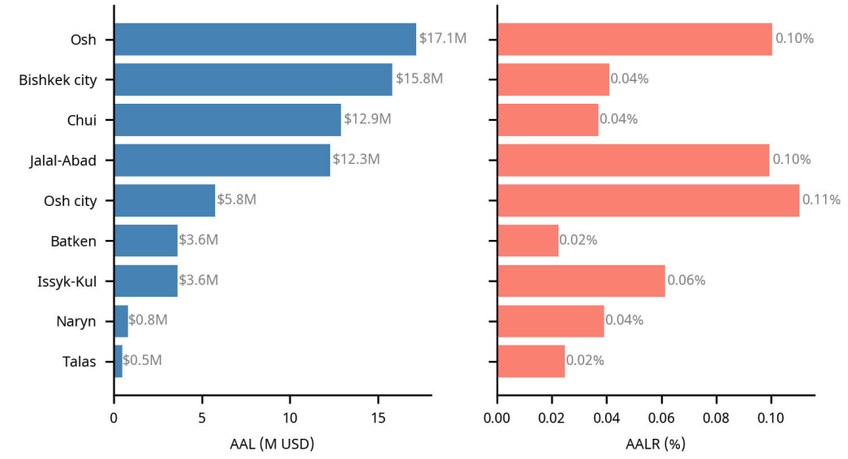
Average annual loss (AAL) due to earthquakes in Kyrgyz Republic is estimated at $72.4 million. Figure 2 shows Osh has the highest AAL in the country at $17.1 million, followed by Bishkek and Chui at $15.8 million and $12.9 million respectively. Talas and Naryn have the lowest AAL in the country.

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



Source: Global Earthquake Model

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

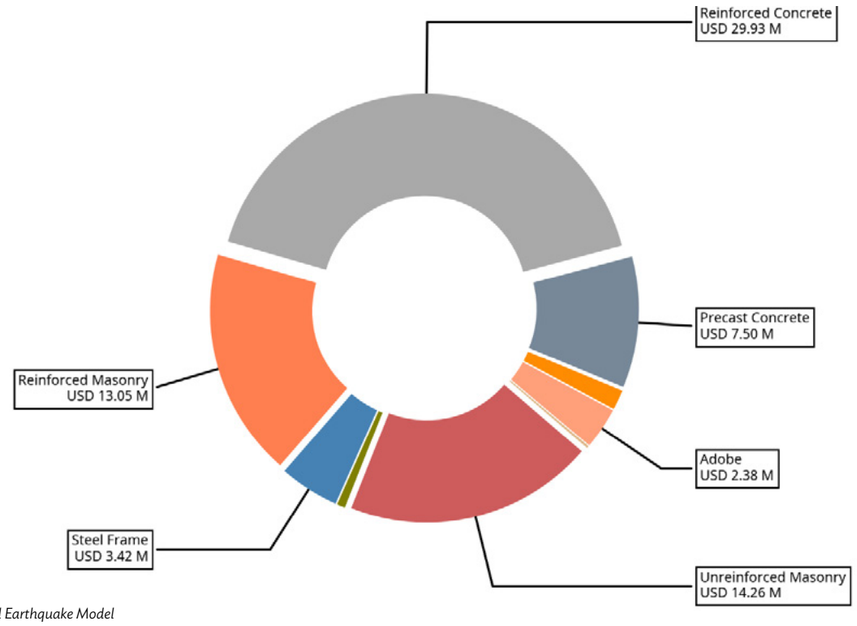


Source: Global Earthquake Model

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 compares the AAL (left) and the AALR (right) for each region of Kyrgyz Republic. AALR is expressed as a percentage of the total replacement value of buildings in the respective regions. Osh City, Jalal-Abad and Osh have the highest AALR rations in the country.

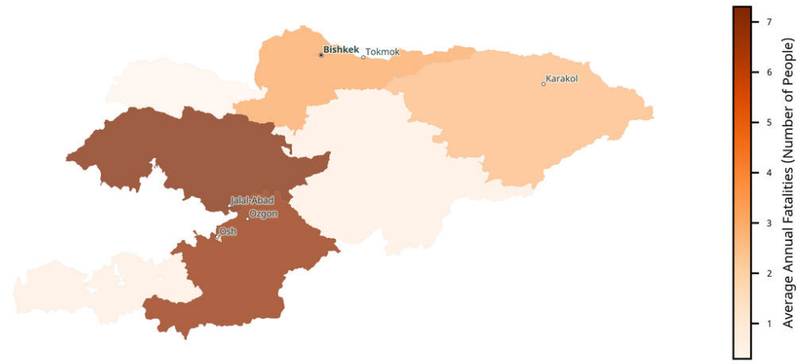
Figure 4: Average annual loss by asset types - earthquakes



Source: Global Earthquake Model

Figure 4 shows the disaggregation of the AAL due to earthquakes by primary building construction type. Reinforced concrete structures contribute the most to the overall average annual loss in economic terms at $29.9 million, followed by unreinforced masonry structures with an aggregate AAL of $14.3 million.

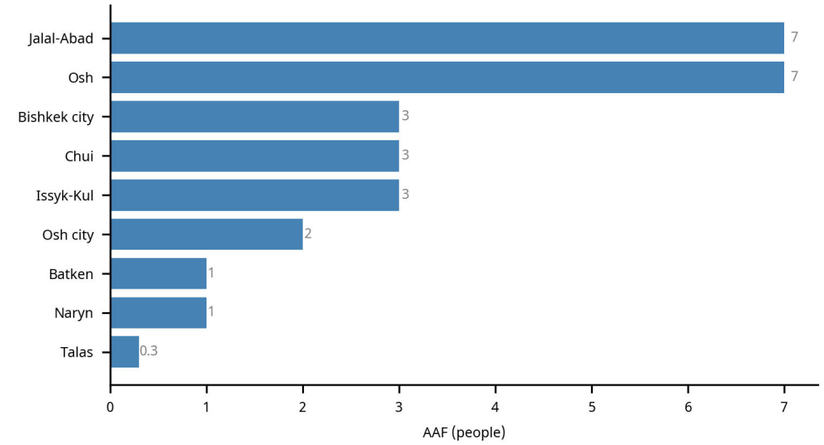
Figure 5: Average annual fatalities - earthquake



Source: Global Earthquake Model

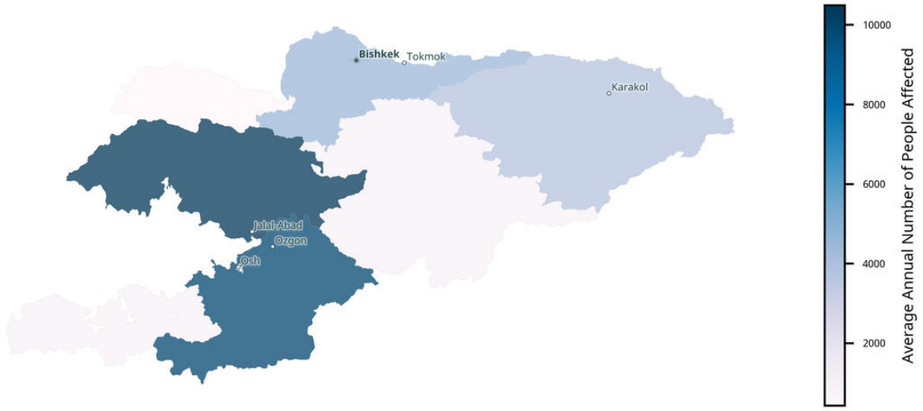
Figure 5 and Figure 6 show average annual fatalities due to earthquakes across the regions. In total 27 deaths are estimated in Kyrgyz Republic with Jalal-Abad and Osh having the highest AAF in the country at 7, followed by Bishkek, Chui and Issyk-Kul.

Figure 6: Breakdown of earthquake average annual fatalities by region



Source: Global Earthquake Model

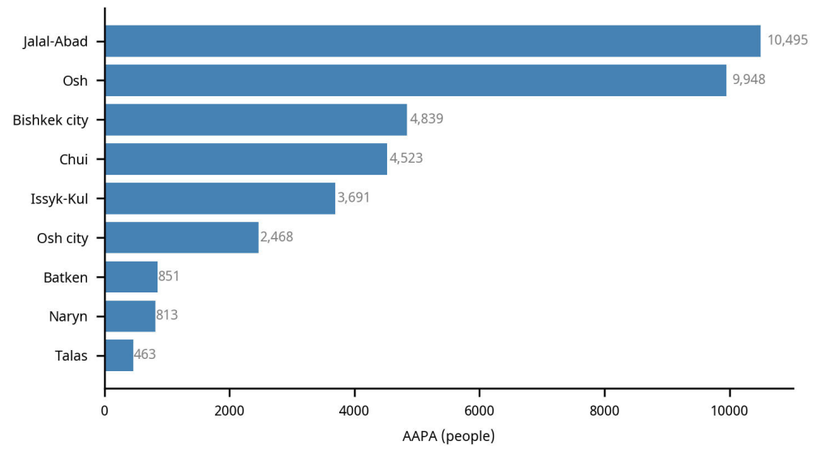
Figure 7: Average number of people affected – earthquake



Source: Global Earthquake Model

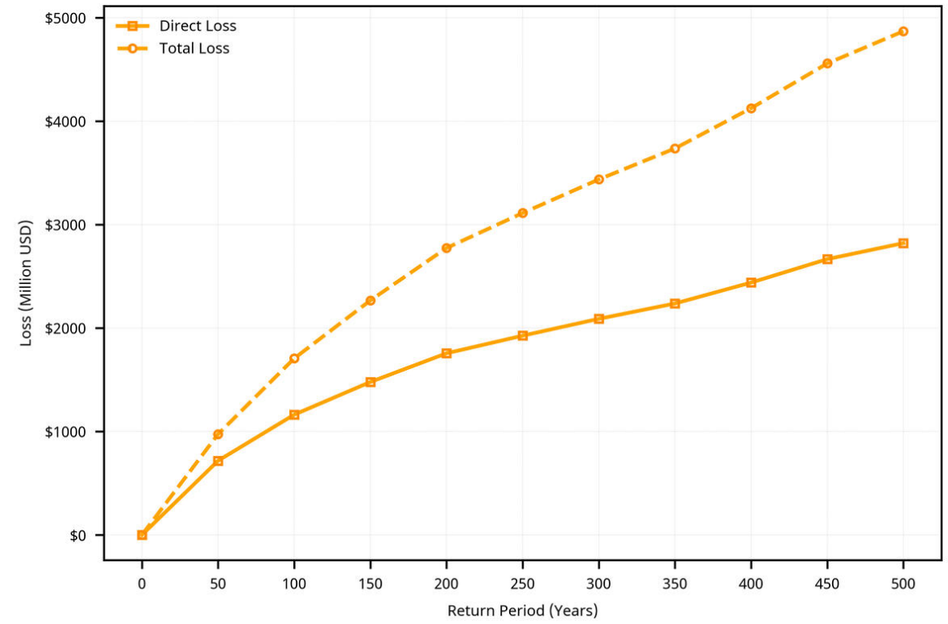
For the purposes of this report, the number of people affected by earthquakes is defined as the population that can be expected to witness earthquake-caused ground shaking of Modified Mercalli Intensity (MMI) VI or higher (corresponding to strong shaking, capable of causing slight damage or higher). An estimated 38,089 people are expected to be affected by earthquakes on an average annual basis in Kyrgyz Republic. Figure 7 and Figure 8 show that Jalal-Abad has the highest average annual number of people affected in the country at 10,495, followed by Osh and Bishkek city at 9,948 and 4,839, respectively.

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



Source: Global Earthquake Model

Figure 9: Exceedance probability curves – earthquake



Source: Global Earthquake Model

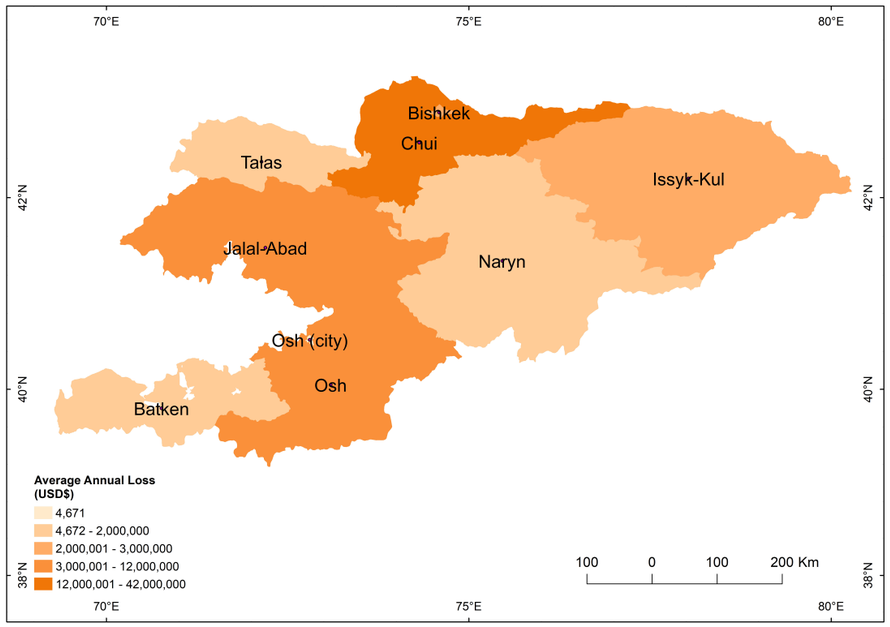
The exceedance probability (EP) curves for earthquake for the Kyrgyz Republic are shown in Figure 9. The EP curve shows the loss from all events in any given year. Curves are modeled for both direct and total loss. Direct loss displays the modeled loss to residential, industrial and commercial assets.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

Direct loss increases from $717.3 million for the 50-year return period, to $2.8 billion for the 500-year return period. The EP curve for direct loss shows that earthquake damage is modelled at $1.16 billion at the 100-year return period for the Kyrgyz Republic, which is approximately 15.56% of the country's nominal GDP.

Flood risk

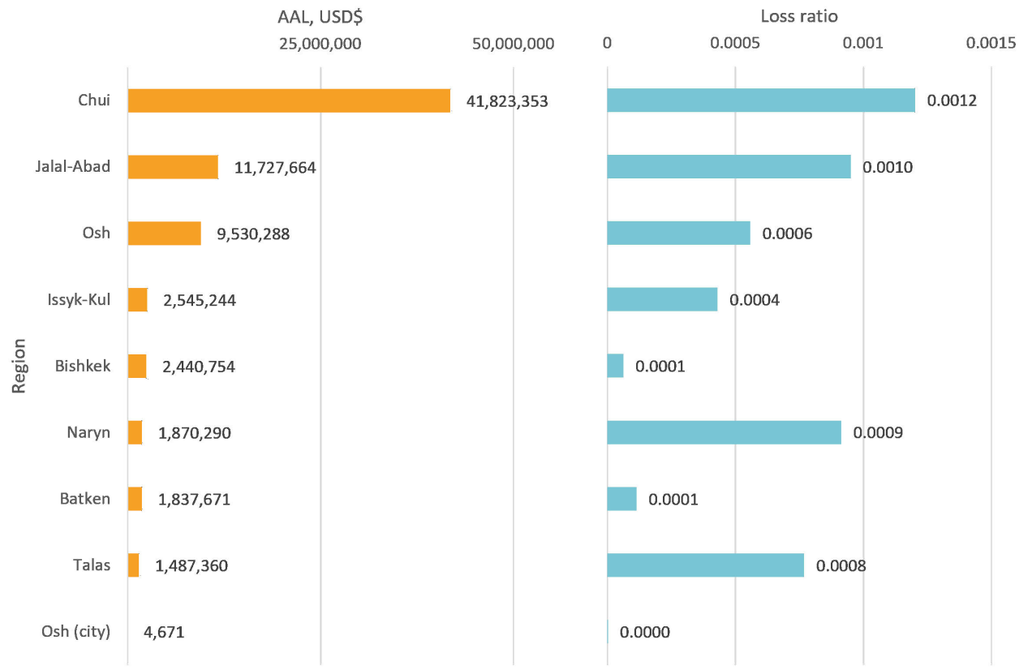
Average annual loss from floods totals $73.3 million in the Kyrgyz Republic. As displayed in Figure 10, damage is particularly large in the Chui province at $41.8 million, which accounts for 57% of the average annual damage from floods across the country. Figure 11 shows the greatest damage ratio is also in Chui, a province that contains the Chu river basin and has the second highest economic exposure in Kyrgyz Republic. In Jalal-Abad and Osh provinces, the average annual damage is $11.7 and $9.5 million, respectively.

Figure 10: Average annual loss – flood



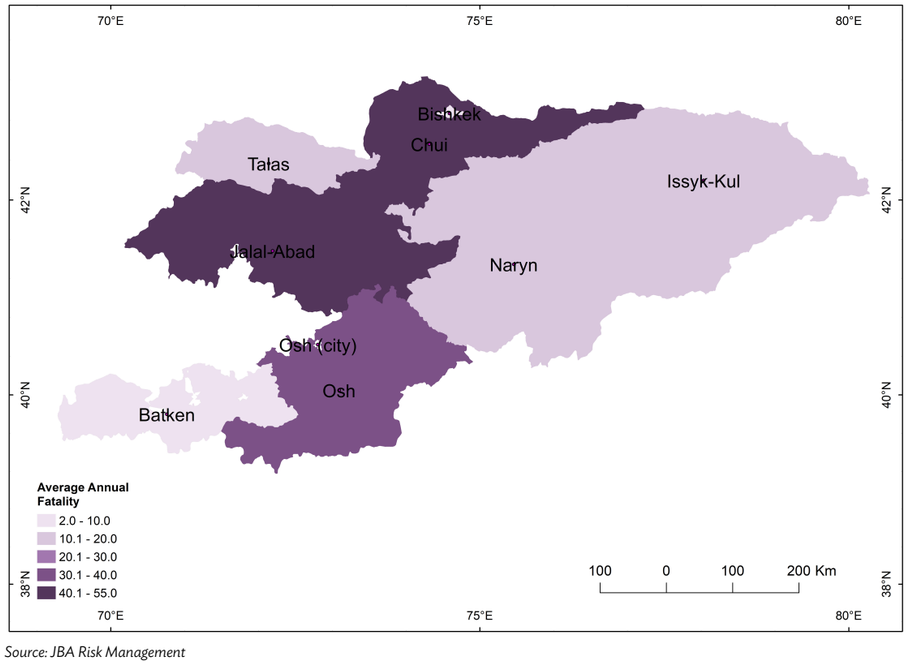
Source: JBA Risk Management

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



Source: JBA Risk Management

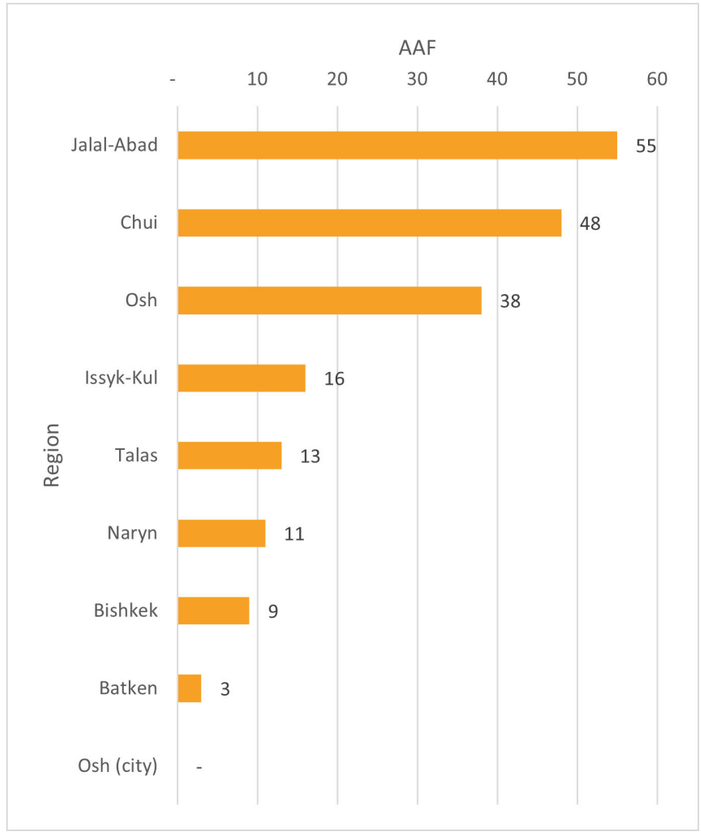
Figure 12: Average annual fatalities – flood



Source: JBA Risk Management

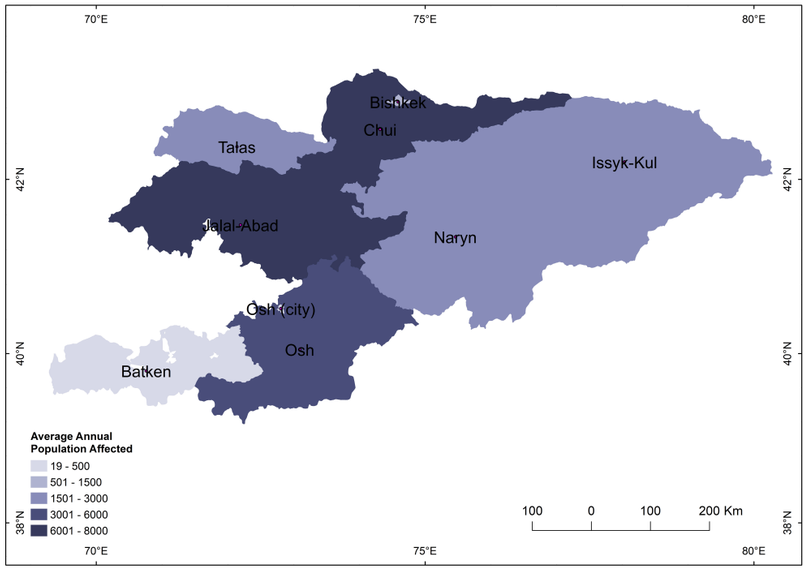
The average annual number of fatalities from floods is 193 in Kyrgyz Republic. Figure 12 and Figure 13 show that 73% of average annual fatalities occur in the Jalal-Abad, Chui and Osh regions, with Jalal-Abad having the greatest number of average annual fatalities at 55. These regions contain 50% of the country's population and the two longest rivers in the country, the Naryn and Chu Rivers. Annual mean precipitation is also highest in Jalal-Abad and Osh where historical flash floods have been recorded.

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



Source: JBA Risk Management

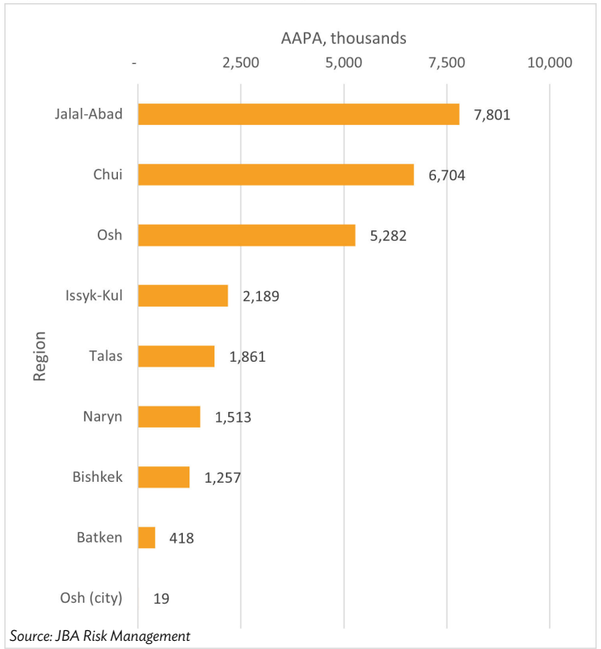
Figure 14: Average annual people affected – flood



Source: JBA Risk Management

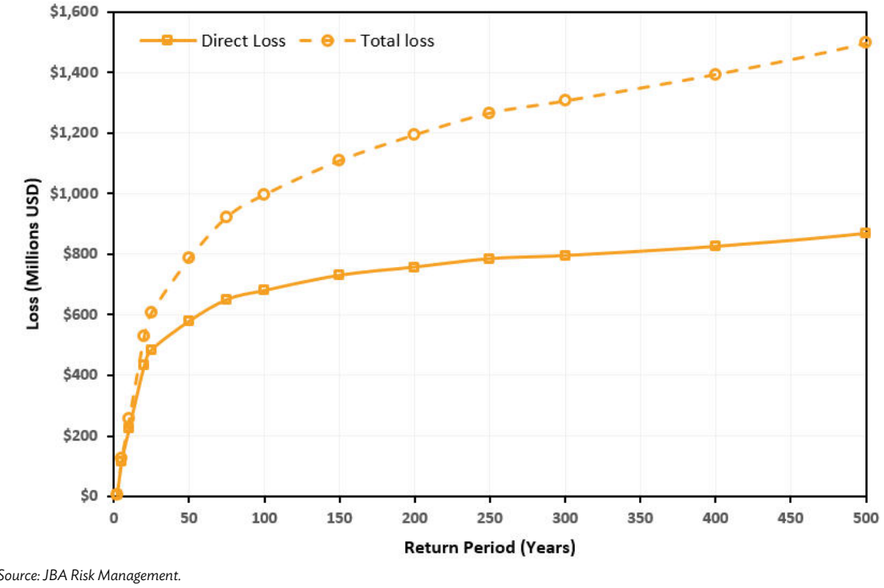
The average annual number of people affected by floods is around 27,000 in Kyrgyz Republic. Figure 14 and Figure 15 show that the distribution of people affected within the country is consistent with that of fatalities, with the greatest number affected in Jalal-Abad at 7,801. In total, 73% of people affected are located within the Jalal-Abad, Chui and Osh regions, which are areas with larger populations and higher mean annual precipitation.

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



Source: JBA Risk Management

Figure 16: Exceedance probability curves – floods



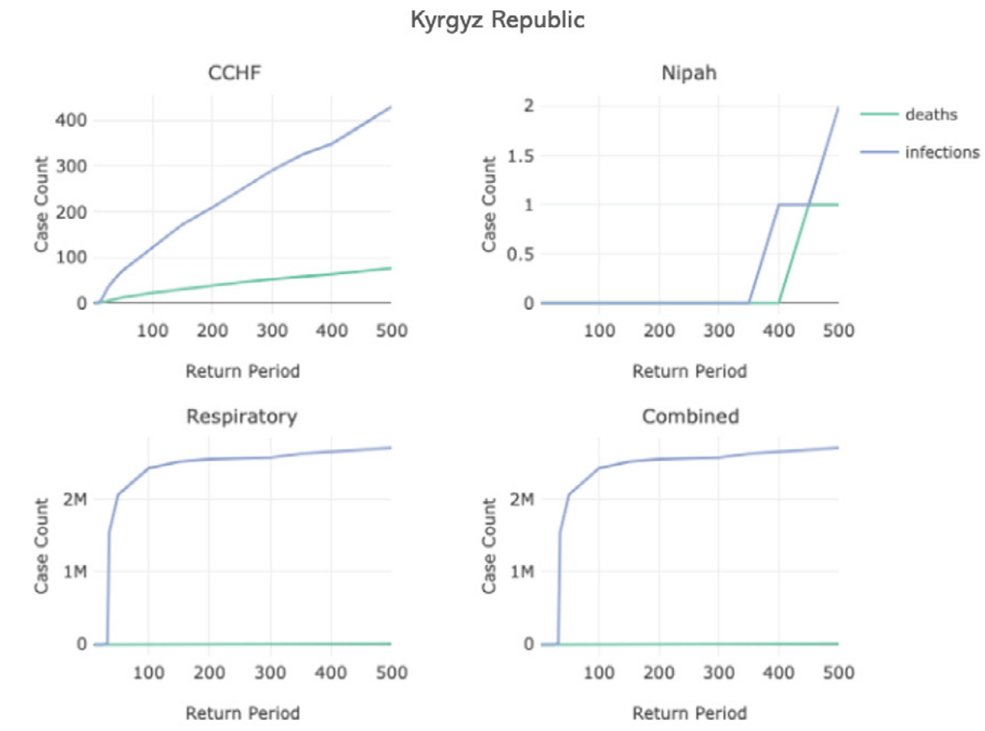
Source: JBA Risk Management.

The exceedance probability curves for Kyrgyz Republic shown in Figure 16 give the direct and total loss from all flood events in any given year for the given return periods. Loss increases most significantly between the 2 and 25-year return periods, which indicates susceptibility to floods at these return periods. Direct loss at the 100-year return period from flood is modelled at $680 million, which is around 8% of the country's nominal GDP.

Loss increases at a slowing rate between the 150-year and 300-year return periods before increasing at a slightly greater rate after the 400-year return period. Total loss continues to increase at a faster rate than direct loss from the 25-year return period. At the 100-year return period, total loss is expected to be over $996 million.

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
**Note that the graph for CCHF was omitted due to low risk in this country.*

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	67,080	128
Respiratory	67,073	126
Nipah	7	1
CCHF	<1	<1

Source: Metabiota

The modeled exceedance probability (EP) curves include only those infections and deaths that are in excess of the regularly occurring annual baseline. For the included respiratory diseases like pandemic influenza and novel coronaviruses, this baseline will be zero, but for diseases like 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 the Kyrgyz Republic as shown in Figure 17 highlight that respiratory pathogens account for most of the 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). On the other hand, 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 AAL numbers on people impacted and fatalities.

Box 2: Pathogens

- 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 and 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.[1]
- 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.[2]

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

CHAPTER 2

Historical losses and impacts

In 2018, the Kyrgyz Republic classified several natural hazards which could contribute to disaster events. Earthquakes, flooding and mudflows along mountain rivers triggered by heavy rainfall and/or rapid snowmelt, are some of the hazards for which disaster risk reduction is a priority. Earthquakes caused greater economic damage than flooding in the past three decades (Table 2). However, floods, mudslides and landslides have been the most frequent types of events in the past two decades.[3] In addition to the flood impacts reported in Table 2, landslides caused 273 deaths and an estimated $64.2 millionin damage since 1990.[4]

The Kyrgyz Civil Protection Act of May 24, 2018, No. 54 specifies the approach and authorized agency for the collection, processing and transmission of information on the scale and nature of a disaster event. The Civil Protection Commissions follows the "Methodological Guide for the Assessment of Damages, Damages and Needs from Emergency in the Kyrgyz Republic" for the assessment of material damage from disaster events. The guide specifies indicators, such as the nature of the emergency, the scale of damages, and the number of people affected, which are required for national statistical reporting and are aligned with the Sendai Framework. Data are mostly available since the late 1990s.

The Kygyrz Republic is highly susceptible to disaster events such as avalanches, droughts, earthquakes, floods and landslides. Spring flooding occurs three to four times every year and affects most of the country's territory. The nature of these events, driven by intense, localised rainfall, means that fatalities and economic impacts are lower than in some other CAREC countries.

The most devastating recent flood occurred in 1998 on the Kurgart river. As a result of a river dam breach, 1,199 houses were destroyed and an estimated $134 million in direct damage was incurred. In June 2005, a flood in the region of Ozgen killed 3 people, affected 2,050 others and caused an economic loss of $2.66 million. From 1990 to 2009, there were 952 occurrences of floods and mudslides reported.[5]

Table 2:Total impacts from floods, earthquakes and droughts, 1990 – 2019

	Fatalities	Number of people affected	Total damage ($ million; constant 2019)
Flood	18 – 130	21,623 – 29,845	19.6
Earthquake	132 – 153	176,063	309.5
Drought	-	2,000,000	-

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.

[3] *Ministry of Emergency Situations of the Kyrgyz Republic (2020) Monitoring, forecasting of dangerous processes and phenomena in the territory of the Kyrgyz Republic (http://ru.mes.kg/2020/02/19/kniga-za-2020g/)*
[4] *Centre for Research on the Epidemiology of Disasters – CRED. EM-DAT. (https://www.emdat.be/)*
[5] *https://www.preventionweb.net/files/14436_14436INDEPTHREVIEWOFDRRINKRfinal1.pdf (original sources: Central Asian Institute of Applied Geosciences and EM-DAT)*

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

Year	Location	Total damage ($ millions; constant 2019)	Fatalities	Number of people affected
Floods				
2012	Osh, Batken, Jalal-Abad, Naryn provinces	8.5	8	11,000
1998	Jalal-Abad, Osh provinces	3.8	92	7,728 – 14,000
2005	Nookat, Ozgon, Kara-Suu, Kara-Kulja, Alay districts (Osh province), Suzak, Bazar-Korgon districts (Jalal-Abad province), Batken province	3.5	3	2,050 – 4,000
2007	Jalal-Abad, Osh provinces	0.2	0	845
Earthquakes				
1992	Dshalal-Abad, Naryn, Talas regions (Near Kyrgyz Republic/Chinese Border)	236.9	75	86,806
1992	Burgandi-Nookat (Osh, Djalalabad districts)	56.5	4	50,000
2015	Chong-Alay, Alay, Kara-Suu, Kara-Kulja, Aravan districts (Osh province)	12.9	-	16,780
1997	Ak-Tala district (Naryn region)	3.2	-	1,230
1970	Sarakmysh	-	2	40,000
1978	Zhalansh-Tyup	-	-	-
2006	Kochkor district (Naryn region)	-	-	-

Source: EM-DAT with validation from other sources including Asian Disaster Reduction Center (ADRC), ReliefWeb, IFRC and UN OCHA for floods; National Geophysical Data Center / World Data Service (NGDC/WDS): NCEI/WDS Global Significant Earthquake Database. NOAA National Centers for Environmental Information, Center for Emergency Situations and Disaster Risk Reduction

In August 1992, the most devastating earthquake in recent years affected the country's territory from the Kazakh steppes to North Pamir in the south. The area of maximum concussions covered the southern and northern slopes of the Suusamyr Ridge, Suusamyr, Aramzinskaya, Ketman-Thoebukuyu and Talasa Basin. The earthquake resulted in severe destruction of 16,056 houses, 22 schools, 19 hospitals, power lines, and roads. The total damage has been estimated at about $237 million in 2019 prices (Table 3).

Prior to the COVID-19 outbreak, the Kyrgyz Republic had no significant historic pandemic events since 1990 (Table 4).

Table 4: Notable infectious disease outbreaks, 1990-2021

Pathogen	Date first case reported	Date last case reported	Total cases	Total deaths	Location of origin
2019 Novel Coronavirus (2019-nCoV)	3/20/20	10/20/20	52,910	1,496	PRC

Source: Metabiota's infectious disease database

CHAPTER 3

Hazard

Since 1900, the Kyrgyz Republic territory has experienced twenty earthquakes of magnitudes larger than 6.0, one of which was magnitude 8 and three were of magnitudes between 7 and 8. The largest earthquake occurred in 1911 near the northern border with Kazakhstan and close to Almaty. The 1911 Kebin earthquake was the last earthquake of a sequence of M6.5+ earthquakes that lasted for about 30 years and involved a vast area of the Tian Shan. This sequence also included the 1889 Chilik 8.3 earthquake (the magnitude, in this case, is based on macroseismic observations), the largest earthquake observed in this area in historical times.

Seismic hazard

As shown in Figure 18 and Figure 19, 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) reach 0.5g and are located in the northern part of the country at the border with Kazakhstan, and in the Fergana range in the west of the country at the border with Uzbekistan. The lowest values of PGA10%50yr are in an area south of the Songköl lake and in the northwest close to the Kazakhstan border.

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

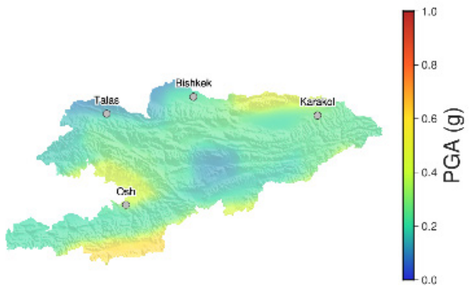
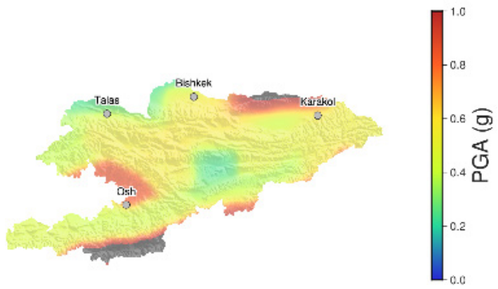


Figure 19: Seismic hazard map for PGA with a 2% probability of exceedance in 50 years.



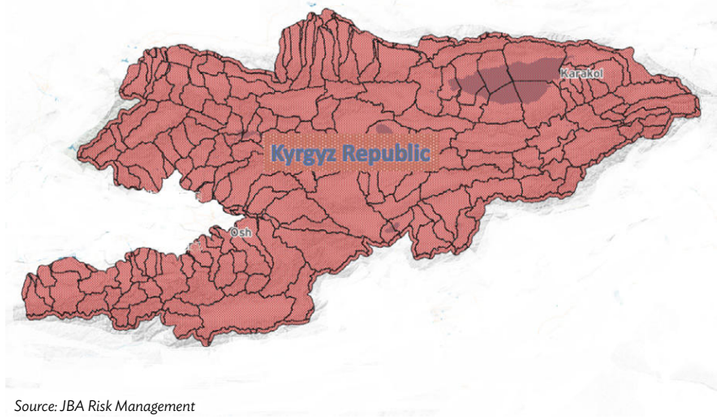
Source: Global Earthquake Model

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 Kyrgyz Republic, as provided in Figure 20, show the structure of the hydrological basins across the country.

The hydrology of the Kyrgyz Republic is strongly influenced by the Tian Shan mountains running east to west through the south of the country and parallel, lower mountains to the north of the country. Between these is the Naryn river, running east to west, draining much of central Kyrgyz Republic. The results is short, narrow catchments in the north and northwest, south and southwest, draining the mountains, with the broader Naryn valley in the centre of the country. The river network of the Kyrgyz Republic is a closed drainage system, meaning that none of it reaches the sea.

Figure 20: Hydrological catchments used for flood modelling



Source: JBA Risk Management

Flood hazard map for pluvial and fluvial flooding

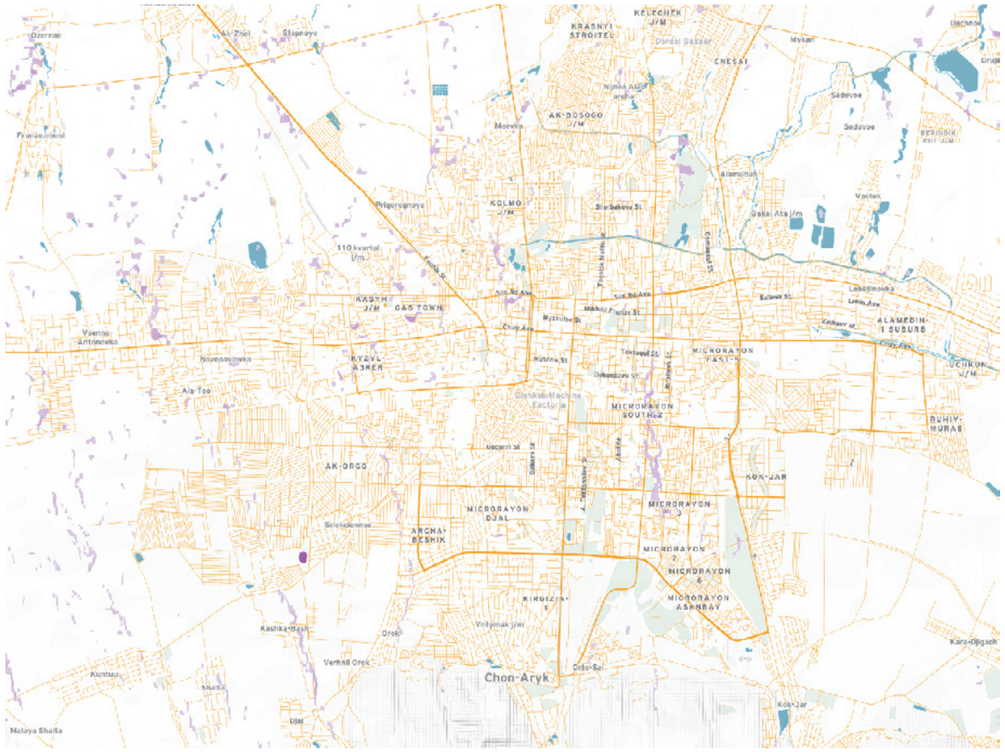
Flood modelling estimates losses and impacts based on flood maps for river (fluvial) and surface water (pluvial) flooding generated at 30-metre spatial resolution. These maps use observed river and rainfall data to generate extreme rainfall and river flow volumes. Maps are generated for different return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

The Kyrgyz Republic is farther from the sea than any other country in the world. It has about 2,000 lakes with a total surface area of 7,000 square kilometres with three main lakes: Lake Issyk, Songgri Lake, and Sarechelek Lake. The Syr Darya River, one of the two major transboundary rivers crossing several Central Asian countries, originates in the high reaches of the Tian Shan as the Naryn River and flows west through the country to join the Kara Darya River in Uzbekistan.

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 Bishkek region



Source: JBA Risk Management

The flood map of Bishkek in Figure 22 shows some significant areas at risk of surface water flooding, shown in purple, from north to south through the centre of the city. Additional areas on the north-western edges of the city are also susceptible to damage.

Climate conditions: historic climate

The Kyrgyz Republic has approximately four climate zones[6] shaped by two high mountain ranges, the Pamirs and Tian Shan; the Tian Shan cover around 80% of the country. High altitude permanent snow fields and glaciers are extensive at elevations above 3500m, with average summer temperatures rarely exceeding 7°C. Mid-mountain (elevations between ~900-2200m) and alpine belts (~2200 to 3500m) experience greater temperature and precipitation variation. Populations are concentrated in the valley-foothill zones below the mid-mountains, with some of these experiencing subtropical climates and minimal frost.

Snowfall accumulation and water storage in the montane glaciers and snow fields are critical for water supply and reservoir management, including for hydropower, flood management and irrigation. Much of the annual precipitation in the high mountain reaches falls during the late winter to spring months of February to April/May depending on the elevation. Some reaches such as the Aksu River Basin receive more precipitation in the summer than in the winter.[7] Precipitation totals decrease toward the eastern parts of the country as shown in Figure 23 and Figure 24. Slight precipitation increases have been seen during the summer in some of the more northern reaches of the Tian Shan; however, no statistically significant trends have been seen in other areas.[8]

Figure 23: Annual mean precipitation between 1951-2007

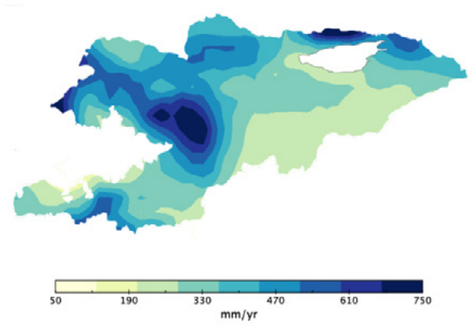
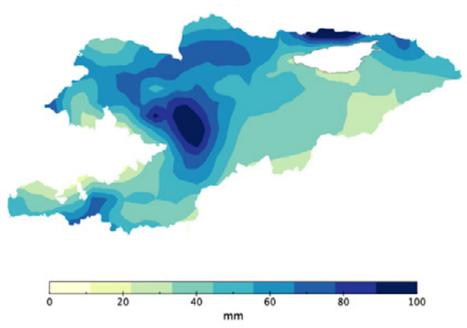


Figure 24: April-June (primary flood season) mean precipitation between 1956-1995



Note: the precipitation scales are different between the annual and seasonal means.
Source: analysis using APHRODITE[9] Russian domain precipitation dataset. The period 1956-1995 was used as the historical period against which to compare future climate projections

[6] *Kretova, Z. (2020) Assessment of Climate Change in the Kyrgyz Republic. IFAD project: Livestock and Market Development.*
[7] *Krysanova, V., M. Wortmann, et al. (2015) 'Analysis of current trends in climate parameters, river discharge and glaciers in the Aksu River basin (Central Asia)'. Hydrological Sciences Journal: doi.10.1080/02626667.2014.925559*
[8] *Government of the Kyrgyz Republic (2016) Third National Communication of the Kyrgyz Republic under the UN Framework Convention on Climate Change. Bishkek.*
[9] *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:10.11.75/BAMS-D-11-00122.1*

Statistically significant warming of temperatures in the winter (October to March) is discernible across the Tian Shan, with an average increase of 0.3°C per decade since 1990.[10] Warming temperatures in all seasons, including the summer where temperatures increases are slower, contribute to shrinking glaciers and reduced snow cover across the Tian Shan and Pamirs in Kyrgyz Republic.[11,12,13,14] The rates of glacier retreat vary across different ranges but all glaciers are shrinking and beginning to impact river flows and hydrologies.

Flooding in Kyrgyz Republic occurs predominantly in the late spring and early summer because of snow melt. Sudden temperature increases, especially when accompanied by heavy rainfall events, can lead to flash flooding and mud floods. Heavy rains in Naryn, Osh, Jalal-Abad and Batken regions triggered destructive mud floods and flash flooding in April 2012 after a winter in which snowfalls exceeded averages.

[10] *Siegfried, T., T. Bernauer, et al. (2011) 'Will climate change exacerbate water stress in Central Asia?'. Climatic Change: doi.10.1007/s10584-011-0253-z*
[11] *Chevallier, P., B. Pouyaud, et al. (2012) 'Trends for snow cover and river flows in the Pamirs (Central Asia)'. Hydrology and Earth System Sciences Discussions: doi.10.5194/hessd-9-29-2012*
[12] *Dedieu, J., A. Lessard-Fontaine, et al. (2014) 'Shifting mountain snow patterns in a changing climate from remote sensing retrieval'. Science of the Total Environment: doi.10.1016/scitotenv.2014.04.078*
[13] *Osmonov, A., T. Bolch, et al. (2013) 'Glacier characteristics and changes in the Sary-Jaz River Basin (Central Tien Shan, Kyrgyzstan) - 1990-2010'. Remote Sensing Letters: https://doi.org/10.1080/2150704X.2013.789146*
[14] *Sorg, A., M. Huss, et al. (2014) 'The days of plenty might soon be over in glacierized Central Asian catchments'. Environmental Research Letters: doi.10.1088/1748-9326/9/10/104018*

Climate conditions: future precipitation projections

Precipitation extremes from each model/RCP combination were individually used to calculate future precipitation intensities, which are relevant to estimating future flood risk. Box 3 describes the methodology behind the future climate calculations. The area-averaged March to October annual maximum rainfalls over a 24-hr duration for each province were extracted and analysed for different return periods (2, 5, 10, 20, 50, 100, 200, 500-, 1000-, 1500-, 5000- and 10000-year events).

According to the multi-model projections under both RCP4.5 and RCP8.5, annual mean precipitation is not likely to change much for all regions north of Osh. Southern regions in general could receive up to 20% more precipitation when compared with the reference period. North-eastern parts of Osh could experience up to a doubling of mean annual precipitation. The projected increases in mean annual precipitation are largely due to potential increases in seasonal means from April to June as shown in Figure 25 and Figure 26. Simulations using RCP4.5 project slight drying (-10 to -20% change) over northern Osh and large portions of Jalal-Abad and Naryn during the winter months of January to March, and few changes over much the rest of the country. Under RCP8.5 however, winter precipitation is projected to increase from 10 to 40% over a swath of the northeast spanning Chui to Issyk-Kul and parts of Jalal-Abad.

Projected shifts in 24-hr precipitation extremes are not uniform across the country. Under RCP4.5, Issyk-Kul and Naryn could experience slightly decreasing intensities, particularly for seldom events like the 1 in 100-yr or rarer; only Issyk-Kul is projected to have slight decreases under RCP8.5. The rest of the regions and independent cities could experience more intense 24-hr rainfall events for most return periods under both RCPs. Jalal-Abad and Osh are projected to have the greatest intensification, with what used to be the 1 in 100-year events becoming the 1 in 50-year events by the 2050s. Possible shifts to Bishkek's precipitation extremes are displayed in Table 5.

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

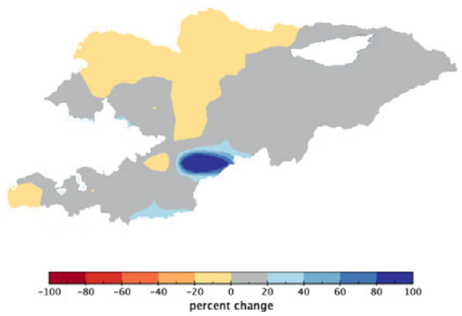
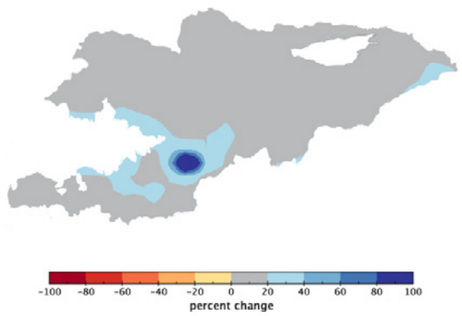


Figure 26: RCP 8.5 2050 April-June precipitation percentage change



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

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

Return period	1951-2007	2050s	
	Historical	RCP4.5	RCP8.5
20-year	1.06	1.31 (1.26, 1.36)	1.37 (1.33, 1.40)
100-year	1.33	1.62 (1.54, 1.69)	1.67 (1.62, 1.72)
200-year	1.44	1.75 (1.66, 1.83)	1.79 (1.75, 1.85)
500-year	1.59	1.92 (1.82, 2.02)	1.97 (1.91, 2.03)

Source: ODI

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

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. 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.

Further information on the approach is detailed in the Technical Documentation.

CHAPTER 4

Exposure

Kyrgyz Republic is a mountainous country in the landlocked eastern part of Central Asia. The country borders Kazakhstan in the north, Uzbekistan to the west, Tajikistan to the south-west and PRC to the east. Kyrgyz Republic has an area of 199,900 square kilometres, and has a population of 6.524 million people as of 2020 (Table 6).

Urbanisation rates in Kyrgyz Republic are lower than many of its neighbours. Approximately 36% of its population live in urban areas,[15] with around two-thirds of them living in the capital Bishkek. Population growth and urbanisation have contributed to an increase in the frequency and severity of losses triggered by natural hazards in the past two decades.

The Kyrgyz Republic is a lower middle-income country with rich natural resources such as minerals. Its arable land, pasture and forests contribute to the country's potential for the expansion of agriculture. Currently, agriculture makes up about 12 % of GDP and absorbs one fifth of total employment in the country. The service sector, which makes up around half of both GDP and total employment, is the largest in the Kyrgyz Republic (Table 7).

The Kyrgyz Republic is heavily dependent on remittances (27% of GDP) and gold exports (9% of GDP), leading to a relatively high vulnerability to external shocks.[16] The country's economy, particularly its water, agriculture, energy, and infrastructure sectors, is also exposed to negative impacts from weather and climate extremes.[17,18] Agriculture is especially vulnerable to droughts and frosts.

Table 6: Population totals, distribution and trends (data from 2019, if *from 2020)

Population (thousands)	6.524*
Population growth date (%/year)	2.1
Share of population living in urban areas (%)	37
Urbanisation rate (%/year)	2.8
% of total population age 0-14	33
% of total population age 15-64	63
% of total population ages 65 and above	5

Source: National Statistical Committee of the Kyrgyz Republic and World Bank Open Data

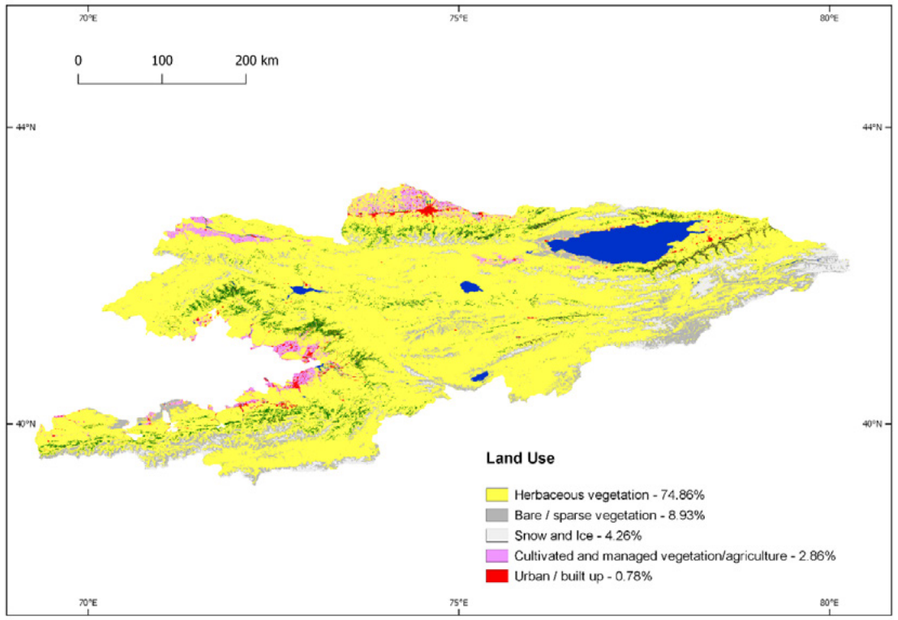
Table 7: Key economic indicators (data from 2019, if *from 2020)

GDP (million USD, current)	8,869.7*
GDP per capita (USD, current)	1,188*
Agriculture, forestry and fishing, value added (% of GDP)	12.1
Employment in agriculture (% of total employment) (modelled ILO estimate)	20*
Industry (including construction, value added (% of GDP))	27.6
Employment in industry (% of total employment) (modelled ILO estimate)	25*
Services, value added (% of GDP)	50.2
Employment in services (% of total employment) (modelled ILO estimate)	55*

Source: National Statistical Committee of the Kyrgyz Republic and World Bank Open Data

[15] *Umaraliev et al. (2020)*
[16] *World Bank (n.d.) The World Bank in the Kyrgyz Republic (https://www.worldbank.org/en/country/kyrgyzrepublic/overview)*
[17] *TThe World Bank Group and Asian Development Bank (2021) Climate Risk Profile: Kyrgyz Republic (https://www.adb.org/sites/default/files/publication/706596/climate-risk-country-profile-kyrgyz-republic.pdf)*
[18] *Kyrgyz Republic (2016). Third National Communication to the UNFCCC (https://unfccc.int/sites/default/files/resource/NC3_Kyrgyzstan_English_24Jan2017_0.pdf)*

Figure 27: Land use in the Kyrgyz Republic



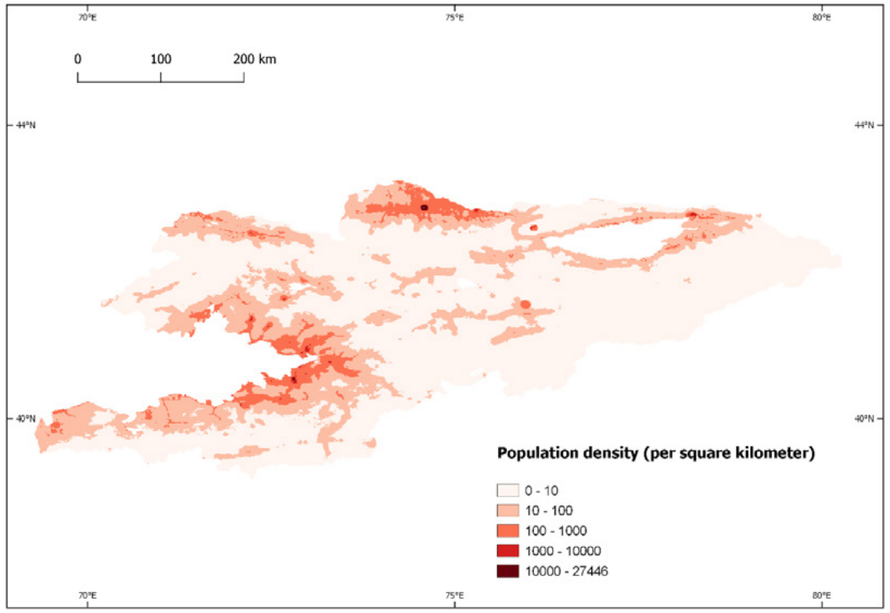
Source: FAO GlobCover

In 2020, political turmoil and the COVID-19 pandemic led to a contraction of real GDP by 8.6% and an increase in the government deficit. These and an exchange rate depreciation contributed to an increase in public debt to 68% of GDP by the end of 2020.[19]

More than 56% of land in the Kyrgyz Republic is technically classified as agricultural but limited land is suitable for growing crops. Over 90 % of the country is 1,000 metres or more above sea level, and 40 % is above 3,000 metres, including 4% which is permanent snow and ice. The majority of land is suitable for livestock production and much of it is located relatively far from areas of year-round rural residence. Kyrgyz Republic's forests cover about 4 % of the country's total land area. As shown in Figure 27, urban areas are concentrated around the capital, Bishkek, in the north of the country and around the borders with Uzbekistan.

[19] *World Bank (n.d.) The World Bank in the Kyrgyz Republic (https://www.worldbank.org/en/country/kyrgyzrepublic/overview)*

Figure 28: Population density map



Source: WorldPop

As seen in Figure 28, the majority of Kyrgyz Republic's 6.5 million people live in the key areas on the northern border area with Kazakhstan and in the fertile Fergana valley on the Uzbekistan border. However, much of the population in Kyrgyz Republic lives in rural areas, and only 35.6% of people live in major cities or their surrounding metropolitan area. Bishkek, the capital, is by far the largest city with the second-largest city, Osh, in the southern portion of the country, the only other city with a population over 200,000.

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

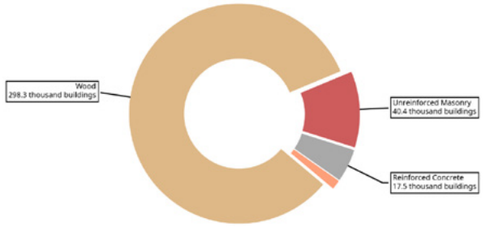
Asset replacement cost (billion $)	
Residential buildings	35.9
Commercial buildings	16.2
Industrial buildings	82.1
Total buildings	**134.1**

Source: Global Earthquake Model database for residential, commercial and industrial buildings.

As shown in Table 8, industrial buildings are the dominant asset type in the Kyrgyz Republic, with a replacement cost value at $82.1 billion. Residential buildings are valued at $35.9 billion and commercial buildings at $16.2 billion.

Since 1991 the housing sector has undergone major restructuring including the State's withdrawal from direct housing provision, decentralization of the housing functions to local government, mass housing privatization and the increased involvement of the private sector in housing construction. By 1994 over 90% of the housing stock had been privatized. The reforms in housing have been followed by a sharp decrease in housing construction, as well as an erosion of housing and utility services.

Figure 29: Breakdown of different building types



Source: Global Earthquake Model

As seen Figure 29, adobe structures with an estimated total of 300,856 buildings make up the largest fraction (39.3%) of the total building stock. This is followed by reinforced concrete structures (197,603 buildings, or 25.8%) and reinforced masonry structures (116,162 buildings, or 15.2%).

The Kyrgyz residential building stock is dominated by low- and middle-rise structures with low seismic resistance. Especially in rural areas, the most dwellings are earthen and adobe constructions hosting usually one family. Multi-family constructions include unreinforced and reinforced masonry up to 5 stories.[20]

Figure 30: Asset replacement cost

Source: Global Earthquake Model

Asset replacement costs by region are shown in Figure 30. The northern regions surrounding Bishkek have the highest concentration of asset replacement costs followed by the regions bordering Uzbekistan.

There is a much lower concentration of economic assets by value in the north west and east of the country which are mountainous, rural areas with sparse development.

[20] *Pittore, M., Parolai, S. (2016): Report on residential exposure and seismic vulnerability in Kyrgyzstan, (Scientific Technical Report ; 16/03), Potsdam : GFZ German Research Center for Geosciences.*

CHAPTER 5

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 so 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

The Kyrgyz Republic is a low middle-income country. Its socio-economic vulnerability indicators have been improving since the early 1990s. Life expectancy has increased from a gendered-mean of 66.3 years in 1990 to 71.5 years in 2019, and mean years of schooling has increased from 8.6 years in 1990 to 11.1 years in 2019.[21] The Kyrgyz Republic has about halved the share of its population living under the national poverty line from 40% in 2006 to 20% in 2019 (Table 9). Across the country, there are large differences in poverty rates which range from about 33% in Batken to about 12% in Bishkek city. Nonetheless, GNI per capita in 2017 PPP$ has decreased to $4,864 as compared with $5,142 in 1990.[22]

Table 9: Socio-economic vulnerability indicators

Poverty headcount ratio at national poverty lines (% of population)	20.1 (2019)
Human Capital Index	0.6 (2020)
GINI index	27.1 (2018)
Gender Inequality index	0.38 (2018)
Household size	4.2 (2019)
Age dependency ratio (% of working age population)	59 (2019)
Unemployment rate	6.6 (2020)
General government gross debt (% of GDP)	54.818 (2018)
Under five child mortality (per 1000 live births)	18 (2019)
Life expectancy at birth (female)	76 (2018)
Life expectancy at birth (male)	67 (2018)
% of population using at least basic sanitation services	97 (2017)
% of population using at least basic drinking water services	87 (2017)

Source: National Statistical Committee of the Kyrgyz Republic; World Bank Open Data; United Nations Population Division; UNDP; IMF World Economic Outlook Database

[21] *UNDP (2020) The Next Frontier: Human Development and the Anthropocene. Briefing note for countries on the 2020 Human Development Report: Kyrgyzstan. (http://hdr.undp.org/sites/default/files/Country-Profiles/KGZ.pdf)*
[22] *UNDP (2020).*

While the country is making progress on improving development under the Sustainable Development Goals, challenges remain. Several studies have linked higher levels of poverty with greater vulnerability to natural hazard related disasters and climate change in the Kyrgyz Republic[23]. Flash flooding and landslides are most likely to affect women and poorer rural dwellers as they tend to live and work in subsistence production areas.[24] Rural populations living in the remote, mountainous areas are particularly vulnerable due to reduced access to healthcare facilities, reliable transportation and communication networks.[25] High levels of reliance on agriculture for subsistence and labour income among the poorest population quintile also mean that this group is disproportionately impacted by droughts, which may increase in intensity and frequency as a result of climate change. It has been estimated that the poorest population quintile in the Kyrgyz Republic is about twice as likely to be exposed to drought than other groups.[26]

Gendered differences in access to information, education and employment opportunities contribute to disaster vulnerability and make women more susceptible to economic fluctuations. Income inequalities are stark –GNI per capita is $2,971 for women as compared to $6,798 for men in 2019 and only 44.8% of women participate in the formal labour market.[27] Nearly 47% of women rely on farming for their incomes and remittances are the primary income source for 27% of women.[28] These differences in access to employment, income and basic resources have been further highlighted by the COVID-19 pandemic. A 2020 UN Women survey of wealth and other measures of wellbeing indicate that 88% of women who rely on remittances were affected by decreased remittances. Women with and without children anticipate difficulties in paying for rent and in accessing food and water. Some 20% of Kyrgyz women, particularly rural ones upon which the burden of fetching water predominantly falls, reported difficulty securing water supplies as compared to just 4% of men.

The government adopted a National Strategy for Gender Equality in 2020 but actions toward gender equality are not well articulated in its Economic Strategy 2040.[29] There are recommendations that the country align economic objectives with SDG targets on gender equality and ensure that gender equality targets are incorporated into all its SDGs.

[23] *The World Bank Group and Asian Development Bank (2021) Climate Risk Profile: Kyrgyz Republic (https://www.adb.org/sites/default/files/publication/706596/climate-risk-country-profile-kyrgyz-republic.pdf)*
[24] *Ibid., citing WBG Climate Change Knowledge Portal (CCKP 2021). Kyrgyzstan. Climate Data. Projections. (https://climateknowledgeportal.worldbank.org/country/kyrgyzstan/climate-data-projections)*
[25] *Umaraliev, R., Moura, R., Havenith, H.B., Almeida, F. and Nizamiev, A. (2020) 'Disaster risk in Central Asia: Socio-economic vulnerability context and pilot-study of multi-risk assessment in a remote mountain area of the Kyrgyz Republic' European Journal of Engineering Research and Science 5(3): http://dx.doi.org/10.24018/ejers.2020.5.3.1772*
[26] *Winsemius, H. C., Jongman, B., Veldkamp, T. I. E., Hallegatte, S., Bangalore, M., & Ward, P. J. (2018). Disaster risk, climate change, and poverty: assessing the global exposure of poor people to floods and droughts. Environment and Development Economics, 23(3), 328–348. (https://doi.org/10.1017/S1355770X17000444)*
[27] *UNDP (2020).*
[28] *Ross, J. and Taylor, K. [eds] (2020) The Impact of COVID-19 on Women's and Men's Lives and Livelihoods in Europe and Central Asia: Preliminary Results from a Rapid Gender Assessment. UN Women. (https://www.preventionweb.net/files/74028_theimpactofcovid19onwomensandmensli.pdf)*
[29] *United Nations Kyrgyz Republic (2019) A Report on Kyrgyzstan's Progress on Sustainable Development Goals: A Review of Mainstreaming, Acceleration and Policy Support for Achieving Progress on Sustainable Development Goals. (https://kyrgyzstan.un.org/sites/default/files/2019-09/MAPS%20Report_ENG_Final_15May2019.pdf)*

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. Table 10 provides an overview of key coping indicators in Kyrgyz Republic.

The Civil Protection Act of 2018 (amended in 2019 and 2020) is the Kyrgyz Republic's primary law specifying priorities for emergency and disaster risk management with a focus on prevention. It also established a Civil Protection Commission to coordinate emergency and disaster risk management activities.[30] A number of institutes are responsible for disaster risk management and have responsibilities divided by hazard type. The Department of Monitoring and Emergency Forecasting of the Ministry of Emergency Situations works with the Earthquake Institute of Seismology at the National Academy of Sciences and other agencies in earthquake management. Kyrgyzhydromet is involved in management of mudflows, landslide, and flooding risk. Civil protection commissions established at lower administrative levels also have the authority to organise and carry out activities.

Table 10: Key coping capacity indicators

Financial inclusion (% of population aged 15+ with access to bank account)	39.9% (female pop: 38.9%) (2017)
Insurance coverage	0.2% (2018)*
Share of population covered by public safety nets	58% (bottom income quintile: 63.5%) (2013)
Internet coverage (% of population using the internet)	38 (2017)
Metabiota Epidemic Preparedness Index score (100 = maximum score, 0 = minimum score)	63 (2019)
Public and private health expenditure (% of GDP)	6.19 (2017)
Number of physicians (per 1,000)	2.2 (2014)
Number of hospital beds (per 1,000)	4.5 (2013)
Government effectiveness (-2.5 to +2.5)	-0.68 (2019)
Corruption Perception Index	30 (2019)

Source: World Bank Open Data; Worldwide Governance Indicators (WGI) Project; Transparency International; Data relevant to national preparedness to detect and respond to epidemics and pandemics from Metabiota's Epidemic Preparedness Index[31]
**Refers to total insurance penetration, rather than just the non-life segment.*

In 2015, the Kyrgyz Republic established a unified approach for state bodies and local governments to forecast (pre-disaster) and assess losses and damages (post-disaster) in its Methodological Guide for Assessing Damage, Loss and Needs for Reconstruction and Recovery from Emergencies.

The Kyrgyz Republic is highly susceptible to natural hazard-related disasters and to climate change. The Government of the Kyrgyz Republic acknowledges the need to address these issues and is making significant efforts in this direction. Measures aimed at addressing climate change are reflected in the Kyrgyz Republic's National Sustainable Development Strategy 2013-2017 and the Kyrgyz Republic's Sustainable Development Programme 2013-2017. In addition, the Kyrgyz Government's Trust program was launched to support the development of projects under the national development strategy for 2018-2022, while the new Kyrgyz Republic's National Development Strategy for 2018-2040 was devised to continue supporting progress against the SDGs.[32]

The main objective of the government is to integrate climate change issues into appropriate social, economic and environmental action and policies. Climate actions in the Kyrgyz Republic are further reflected in the Proposed National-Determined Contributions (NDCs) to the 2015 United Nations Framework Convention on Climate Change (UNFCCC) Agreement, which describes activities until 2050. An inter-agency working group on the development of the National Strategy and Action Plan for Climate Change Adaptation has also been set up. The national strategies and action plans outlined in the UNFCCC's Third National Communication have been endorsed for many sectors.[33]

In order to adapt the ecological and economic systems of the Kyrgyz Republic to the changing climate and to fulfil international obligations under the UNFCCC, the Kyrgyz Government has identified Priority Directions for Climate Change Adaptation in the Kyrgyz Republic until 2017.[34]

In relation to extreme weather events, the following priorities were identified:

1. Improving the monitoring and forecasting of dangerous weather events;
2. Improving early warning systems for people and organizations to prevent loss of life and minimize economic damage;
3. Improving building codes to ensure that infrastructure is resilient to climate hazards;
4. Development of the weather and climate risk insurance system;
5. Develop preventive measures to prepare public, medical and social institutions to work in emergencies to assist populations affected by floods, natural fires, severe frosts or heatwaves, and other climate emergencies.

The Government of the Kyrgyz Republic adopted a strategy for the comprehensive protection of its population and territory from emergencies for 2018-2030.[35] Its priority is to invest in disaster risk mitigation measures to strengthen coping capacity through the following measures:

1. Implementation of measures to prevent emergencies and reduce the level of danger, including in the face of climate change. As part of the task, it is planned to carry out structural work to reduce disaster risk, adapt to climate change and improve the logistics of specialized services.
2. Develop disaster risk insurance and encourage domestic investment in disaster risk reduction. The task envisages the development of a disaster risk insurance system and mechanisms for stimulating investment in the first phase, and the second phase is to develop a social safety net.
3. Increased resilience of social facilities and infrastructure. Improving the resilience of social facilities (education, health, culture, etc.) and disaster infrastructure will be implemented through measures to assess sustainability, reconstruct and repair economically and socially significant facilities.

The strategy's priorities and objectives will be integrated into government plans and other development strategies, plans for their implementation, and development programs and plans for Civic Protection and other industries. The objectives of this strategy and its phased plans will combine and consider the objectives and activities of other strategic and policy documents of various areas of Civil Protection and aspects of disaster risk reduction.

[30] Government of the Kyrgyz Republic (2018) Law of the Kyrgyz Republic dated May 24, 2018 No. 54. About Civil Protection. http://cbd.minjust.gov.kg/act/view/ru-ru/111787?cl=ru-ru
[31] 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).
[32] National strategy Sustainable Development Kyrgyz Republic on period 2013-2017 Years Approved by the Presidential Decree of the Kyrgyz Republic 21 January 2013 Year UP №11, http://cbd.minjust.gov.kg/act/view/ru-ru/61542; Kyrgyz Republic's Transition to Sustainable Development Program for 2013-2017 Approved Resolution Kyrgyz government From 30 April 2013 No 218, http://cbd.minjust.gov.kg/act/view/ru-ru/53067; Decree of the President of the Kyrgyz Republic "On the National Development Strategy of the Kyrgyz Republic for 2018-2040" Bishkek, October 31, 2018 UP No. 221, http://www.stat.kg/ru//ukaz-prezidenta-kyrgyzskoj-respubliki-o-nacionalnoj-strategii-razvitiya-kyrgyzskoj-respubliki-na-2018-2040-gody/; UN Interagency Group Report on Mission MAPS2019 Progress Report for the Sustainable Development Goals in the Kyrgyz Republic. https://kyrgyzstan.un.org/en/15700-report-kyrgyzstans-progress-sustainabledevelopment-goals.
[33] PKR , 2017. Estimated nationally determined contribution. https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Kyrgyzstan/1/Kyrgyzstan%20INDC%20_ENG_%20 final.pdf
[34] decree Kyrgyz GovernmentsOn approving priorities for climate change adaptation in the Kyrgyz Republic" until 2017 October 2, 2013 No. 549, http://cbd.minjust.gov.kg/act/view/ru-ru/94766
[35] Strategy for the comprehensive protection of the population and territory of the Kyrgyz Republic from emergencies for 2018-2030 (Concept) approved by the Government of the Kyrgyz Republic January 29, 2018 No 58, http://cbd.minjust.gov.kg/act/view/ru-ru/11990

Disaster response costs are met through the budgets of local governments and the Ministry of Emergency Situations. Reports suggest that around $60m of funding may be accessed for immediate response. Longer term disaster recovery and reconstruction is covered by budgets of line ministries or local governments or through a request to the Ministry of Finance.[36]

Although the COVID-19 crisis weakened the Kyrgyz Republic economy, IMF modelling suggests that the Kyrgyz Republic's risk of debt distress remains moderate despite the impact of COVID-19 and that the country has space to take on more debt if needed.[37]

[36] *World Bank (2019) Forum on Financial Protection against Natural Disasters in Central Asia: Proceedings. http://documents1.worldbank.org/curated/en/820381574227673469/pdf/Forum-on-Financial-Protection-Against-Natural-Disasters-in-Central-Asia-Proceedings.pdf*

[37] *IMF (2020) Kyrgyz Republic. Request for Purchase under the Rapid Financing Instrument and Disbursement under the Rapid Credit Facility – debt sustainability analysis. https://www.imf.org/external/pubs/ft/dsa/pdf/2020/dsacr2090.pdf*

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 Kyrgyz Republic.

Table 11: Key Protection Gap indicators

AAL as % of GNI[38]	0.44%	
Un-funded AAL, ($m, %)	$81m, 56%	
Average annual human losses from flood and earthquakes	Flood	EQ
	193	27
Event frequency where direct & indirect loss and damage, less (assumed) insured losses, exceed existing ex-ante risk retention	Flood	EQ
	1 in 5	1 in 10
Event frequency where direct damage, less (assumed) insured losses, exceed existing ex-ante risk retention	Flood	EQ
	1 in 5	1 in 10
Event frequency where estimated emergency response costs exceed current risk retention mechanisms	Flood	EQ
	1 in 20	1 in 25
Macro-economic context and ability for sovereign to borrow	Credit rating median with CAREC region. Moderate risk of debt distress	
Ability of individual and households to access resources after an event	Financial inclusion concentrated in capital. Relatively supportive social protection	

Source: Consultant team modelling

The Kyrgyz Republic faces substantial risks from both earthquake and floods. The AAL associated with flood is in excess of $73 million and that associated with earthquake is $72 million yielding an aggregate annual average loss of $146 million. The AAL for direct losses is equivalent to 0.44% of GNI, the highest proportion of any country in the CAREC region.

In total, it is estimated that there is around $60m in reserve funds available to support disaster response. The Kyrgyz Republic has one of the smallest retail non-life insurance markets in the region, both in terms of penetration and density. It is assumed that in Bishkek and Osh City, 8% of AAL might be covered by insurance, falling to 2% in the rest of the country. This is equivalent to 3.1% of total losses in the country being covered. These assumptions suggest that unfunded AAL associated with floods and earthquakes in the Kyrgyz Republic is equal to around $81 million each year. Consistent with this, taking account of expected insurance cover, current risk retention funding would be exhausted by a 1 in 5-year flood or 1 in 10-year earthquake event.

The current risk retention and risk transfer instruments in the Kyrgyz Republic are insufficient for the disaster risk that the country faces. While efforts have been made to increase insurance penetration, coverage remains low. Government reserve funds are not large enough to cover the expected emergency response costs of a 1 in 20-year flood event or 1 in 25-year earthquake event. In the event that such disasters took place, the government's ability to access capital markets in a sustainable way would be limited, making it reliant on concessional funding from international partners.

[38] *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.*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