COUNTRY RISK PROFILE
AZERBAIJAN

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

March 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;

This report is structured based on the division of economic regions of Azerbaijan prior to 7 July 2021. 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

Azerbaijan sits at the juncture between Europe and Asia in the Caucasus region, with 10 million people living across 10 economic regions. Oil and gas extraction provide the foundations for sustained economic growth. However, earthquakes and flooding present moderate to high risks in some regions of Azerbaijan.

The Absheron and Aran regions have the greatest value-at-risk, reflecting a concentration of population and economic activity. The remaining areas of Azerbaijan have relatively lower values exposed, primarily due to lower population density and urbanization.

Azerbaijan is exposed to high levels of seismicactivity. Average annual loss (AAL) due to earthquakes in Azerbaijan is estimated at $71.4 million. Absheron, including the capital Baku, has the highest AAL in the country at $20.7 million, followed by Aran and Ganja-Qazakh at $16.8 million and $11.8 million respectively. A low frequency, high impact earthquake (1-in-100-year) could cause $964 million of damage nationally. The average annual number of people affected by earthquakes is 237,280, with fatalities averaging 48. Absheron and Aran account for around half of these values.

Flood risk is also high, with the AAL modeled at $58 million. The greatest damage is modeled in Aran at almost $24 million. Despite frequent flood events, the country has the lowest average annual fatalities and people affected across all CAREC member states. The low flood risk in Baku is unique across the region. Many capital cities are exposed to flood risk, but Baku is instead situated on the Caspian Sea and is hardly at risk.

Box 1: Key facts

GDP: 48,047,000,000 (2019) **Population: 10,023,320 (2019)**

1 IN 100 YEAR FLOOD ECONOMIC LOSS	1 IN 100 YEAR EARTHQUAKE LOSS	AVERAGE ANNUAL LOSS FLOOD	AVERAGE ANNUAL LOSS EARTHQUAKE
$550,000,000	**$964,000,000**	**$58,300,000**	**$71,400,000**

AVERAGE ANNUAL PEOPLE AFFECTED FLOOD	AVERAGE ANNUAL PEOPLE AFFECTED EARTHQUAKE	AVERAGE ANNUAL PEOPLE AFFECTED INFECTIOUS DISEASE
39,599	**237,280**	**102,251**

EVENT FREQUENCY WHERE FLOOD LOSS EXCEEDS EXISTING COVER	EVENT FREQUENCY WHERE EARTHQUAKE LOSS EXCEEDS EXISTING COVER
1 IN 25	**1 IN 20**

However, historic events illustrate the damaging nature of flooding. Flooding in 2010, estimated as a 1-in-20-year event, caused over $400m of damage. Between 1990 and 2019, recurrent flooding affected an estimated 1.68 to 1.85 million people (17% of the population). Earthquake events tend to be less frequent but potentially highly damaging. The most recent impactful earthquake was in 2000, causing over 30 deaths and almost $15 million in damage. The 2000 earthquake affected Baku and the surrounding region.

Climate change scenario analysis projects a significant increase, up to 80% in some regions, in annual precipitation by the 2050s. Extreme events are also projected to increase across the country, particularly in Absheron, Kalbajar, eastern Aran and Shirvan. The potential for more intense rainfall events, when coupled with warmer temperatures leading to faster snowmelt during the spring and summer, could drive increased flooding and landslide risk in the more mountainous regions.

Azerbaijan is also exposed to respiratory outbreaks, with a very low background risk to other pathogens. Respiratory pathogens present the possibility of infections and deaths, a risk which applies to many countries. COVID-19 is one example of a respiratory infectious disease outbreak. A 1-in-100-year respiratory disease event could see over 3.5 million people infected, a sizeable proportion of the population.

In contrast to many other states in the CAREC region, Azerbaijan is in a relatively robust financial position to respond to the implications of disaster events. The disaster response funds are relatively well capitalized, whilst a robust macroeconomic context and a small but growing property insurance market further strengthen financial resilience. In particular, whereas many other CAREC member states would struggle to meet the emergency response costs associated with all but the most frequent events, Azerbaijan's reserve funds seem well placed to meet these costs for the more frequent events.

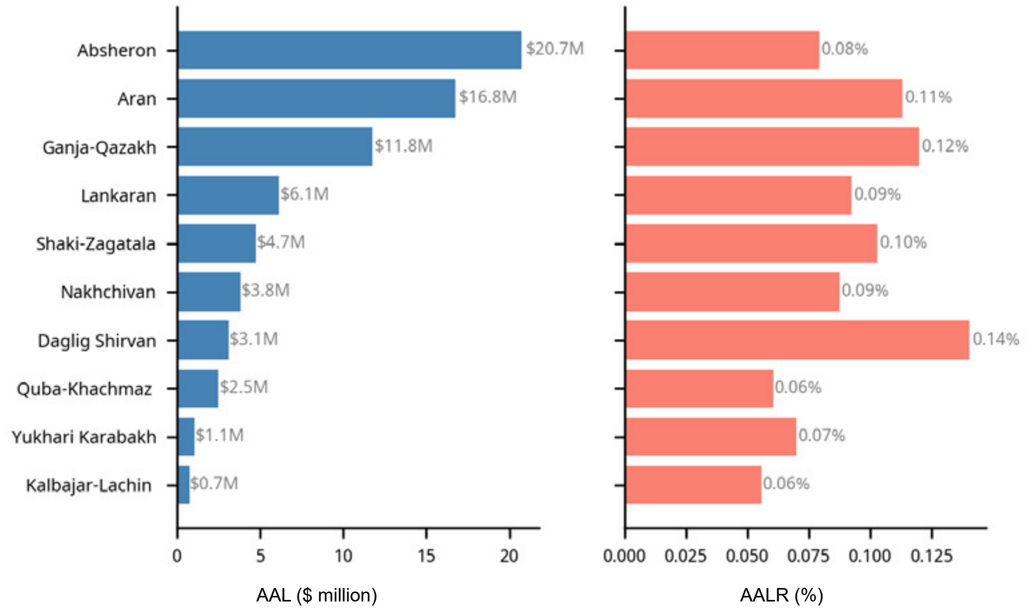
Risk analysis

The extent and geographic pattern of earthquake, flooding, and infectious disease across Azerbaijan 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 Azerbaijan is estimated at $71.4 million. Absheron, including the capital Baku, has the highest AAL in the country at $20.7 million, followed by Aran and Ganja-Qazakh at $16.8 million and $11.8 million respectively. Kalbajar-Lachin and Yukhari Karabakh have the lowest AAL in the country.

Figure 1: 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.

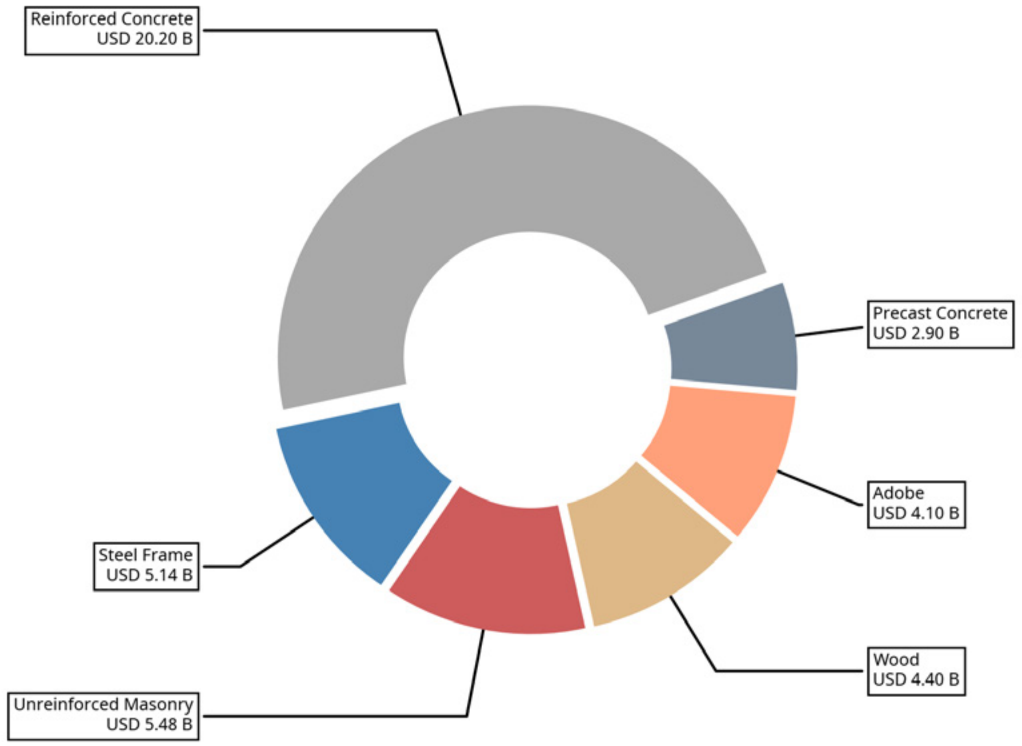
Figure 1 compares the AAL for the different regions of Azerbaijan (left) and also shows the AALR for each region, expressed as a percentage of the total replacement value of buildings in the respective regions. In absolute terms, the concentration of risk in Absheron and Aran stands out, though losses in

Ganja-Qazakh are also significant. The much lower level of losses across much of the country is also clear. Looking at the relative risk, Daglig-Shirvan is the region with the highest AALR, followed by Aran and Ganja-Qazakh.

Figure 2 shows the disaggregation of the AAL due to earthquakes by primary construction type.In terms of the total exposed value by structural type, reinforced concrete structures with an exposed value of $20.2 billion make up the largest fraction (47.9%) of the total exposed value. This is followed by unreinforced masonry structures ($5.5 billion, or 13.0%) and steel frame structures ($5.1 billion, or 12.2%).

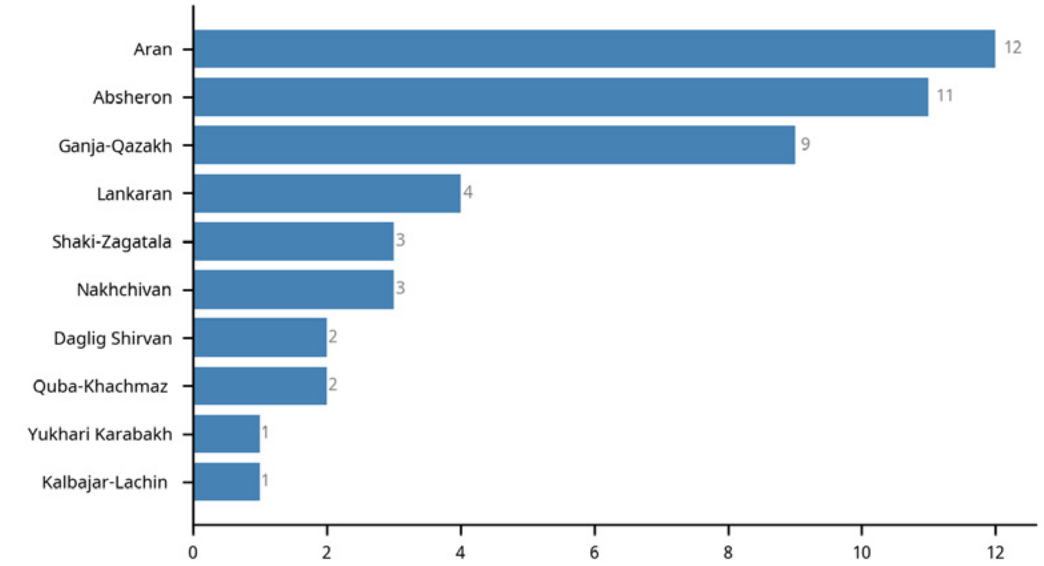
REINFORCED CONCRETE, ADOBE AND UNREINFORCED MASONRY ARE THE MAIN CONSTRUCTION TYPES IN AZERBAIJAN

Figure 2: Average annual loss by asset types - earthquakes



Source: Global Earthquake Model

Figure 3: Breakdown of earthquake average annual fatalities by region

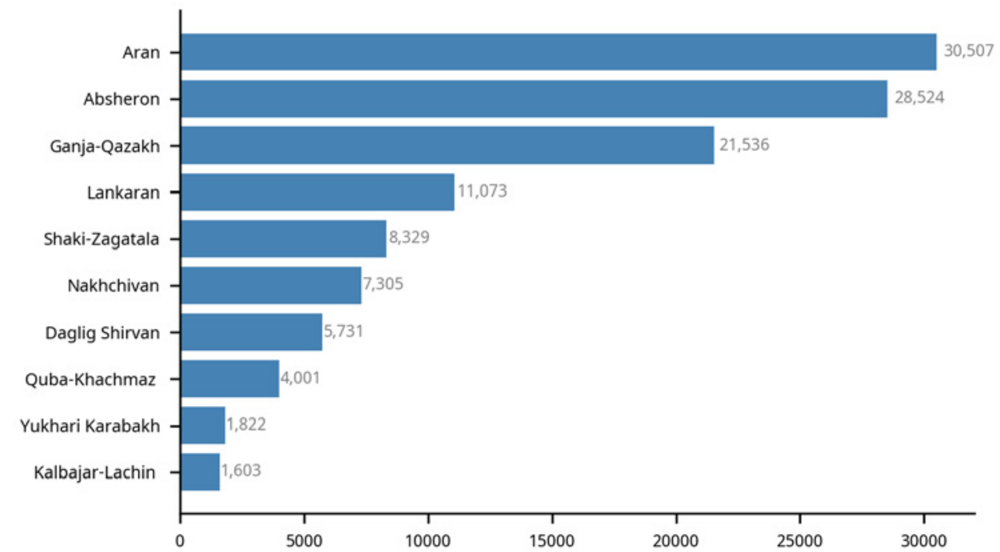


Source: Global Earthquake Model

Average annual fatalities (AAF) due to earthquakes are estimated at 48 in Azerbaijan. The regional distribution as shown in Figure 3 is similar to that of the average annual economic loss.

Aran and Absheron have the highest AAF in the country at 12 and 11 respectively. In per-capita terms, the Daglig-Shirvan region is highest, again highlighting the increased vulnerability in this region.

Figure 4: Breakdown of earthquake average annual number of people affected by region

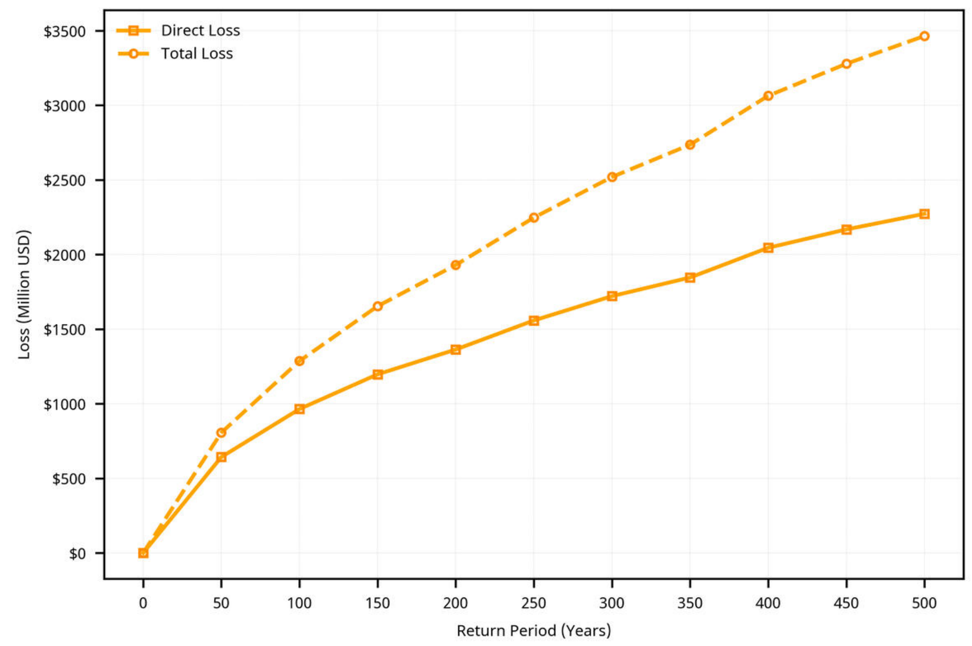


Source: Global Earthquake Model

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).

120,432 people are estimated to be affected by earthquakes on an average annual basis in Azerbaijan. Aran has the highest average annual number of people affected in the country at 30,507, followed by Absheron and Ganja-Qazakh at 28,524 and 21,536 respectively. This is shown in Figure 4.

Figure 5: Exceedance probability curves – earthquakes



Source: JBA Risk Management

The exceedance probability curve shows the total loss from all events in any given year. Curves are modeled for both direct and total losses. Figure 5 shows the EP curve for direct and total loss from earthquakes in Azerbaijan.

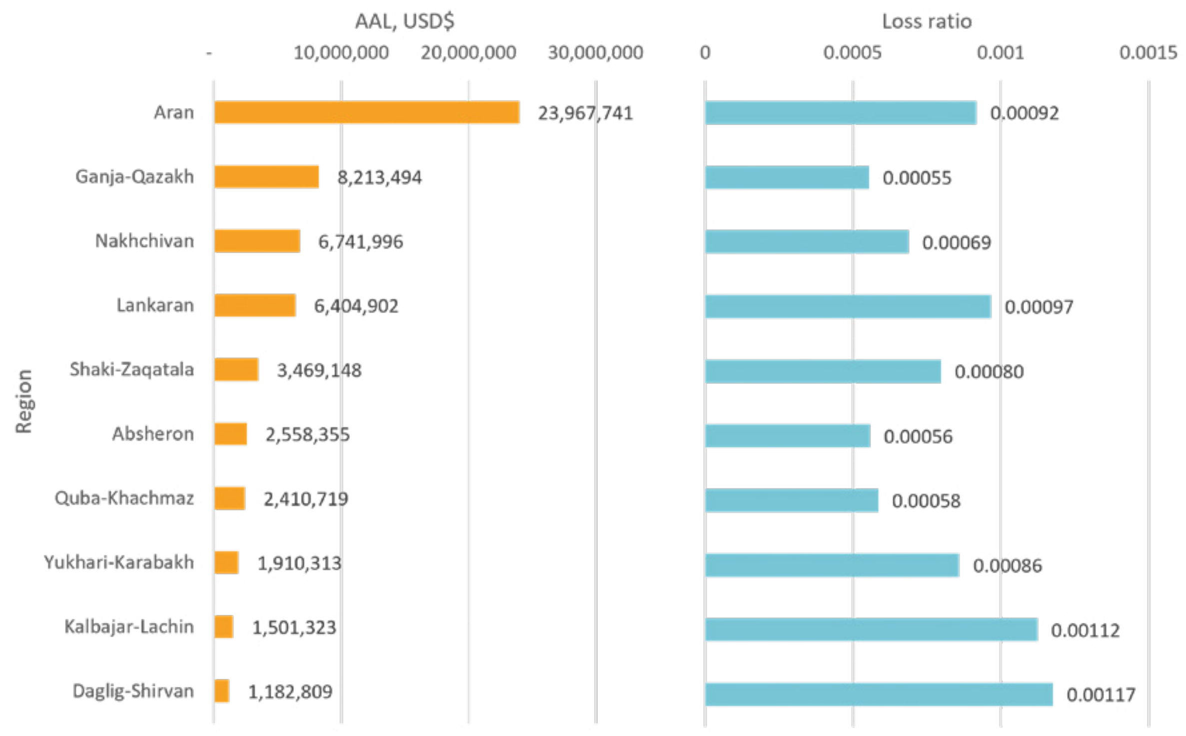
Direct loss increases from $642 million for the 50-year return period, to $2.3 billion for the 500-year return period. The EP curve for direct loss shows that earthquake loss is modelled at $964 million at the 100-year return period for Azerbaijan, which is approximately 1.61% of the country's nominal GDP. The 100-year return period for total loss is nearly $1.3 billion, with the gap between direct and total loss - the indirect loss - growing further as event severity increases. The longer reconstruction time assumed for these events is a key driver of additional loss.

Flood Risk

Modeled losses from flooding are highest in a band running across a north-west to south-east axis of the country. National AAL totals $58 million, with the greatest loss modeled in Aran at almost $24 million. This region has the greatest economic exposure at $26 billion, which accounts for 35% of the country's total exposure. Aran is typified by low relief and contains the Mtkvari and Aras Rivers, which drain areas of higher precipitation in the Greater Caucasus and Lesser Caucasus mountains. In Ganja-Qazakh, Nakhchivan and Lankaran, average annual loss exceeds $5 million, where economic exposure is greater than $5 billion.

Average annual indirect damage (AAID) is $5.7 million for Azerbaijan. The greatest AAID exceeds $2.4 million in Aran, while AAID is between $640-825,000 in Ganja-Qazakh, Nakhchivan and Lankaran.

Figure 6: Breakdown of flood average annual loss and loss ratio by region

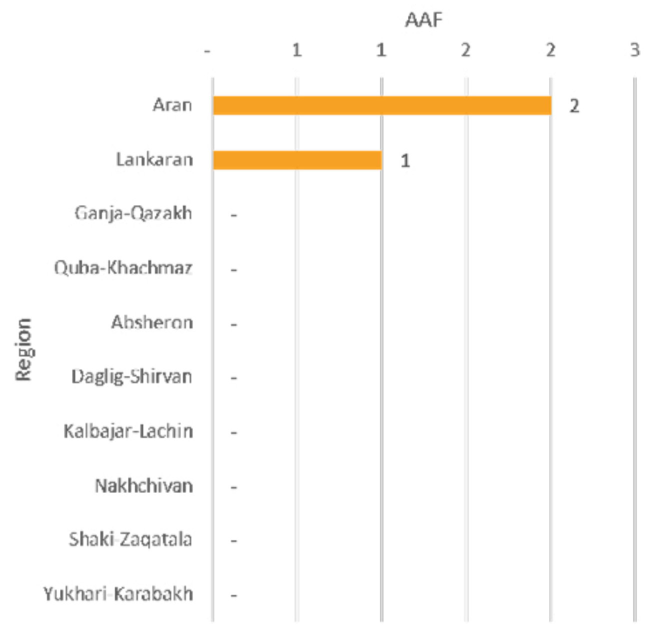


Source: JBA Risk Management

It is notable that the greatest loss ratio is seen in Daglig-Shirvan, a region characterized by several large towns located on rivers draining from the Caucasus Mountain range. This indicates the higher vulnerability to flood risk. Baku in Absheron is equally notable for exhibiting low risk.

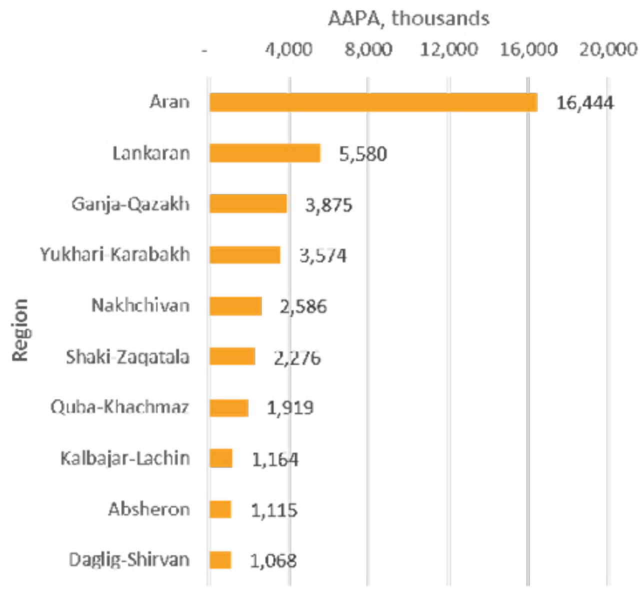
DESPITE HAVING THE LOWEST TOTAL AVERAGE ANNUAL LOSSES, DAGLIG-SHIRVAN HAS THE HIGHEST LOSS RATION BY REGION

Figure 7: Average annual fatalities by region



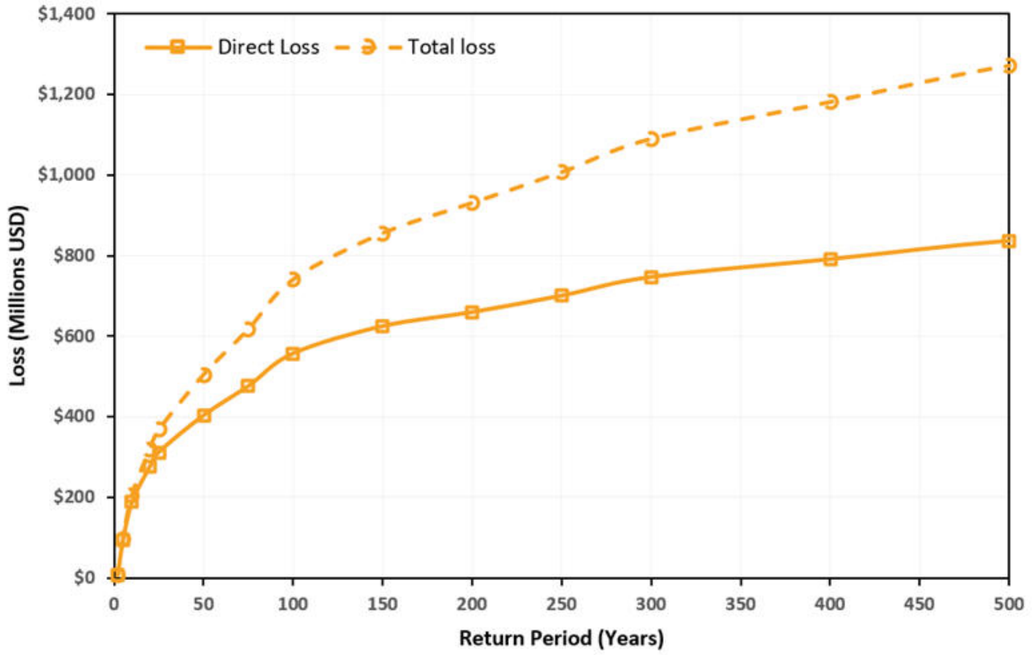
Azerbaijan has the lowest average annual fatalities from flood across all CAREC countries. Figure 7 shows, somewhat unusually, that the only average annual fatalities modeled are in Aran and Lankaran. Even then, the numbers are very low. This is despite Aran being the second most populated region in the country and containing the largest rivers in Azerbaijan, the Mtkvari and Aras Rivers. These rivers flow southeast through populous areas in southeast Aran towards the Caspian Sea but for much of its length through this region the Mtkvari River is well defended.

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



Average annual people affected by flood is 39,599 across Azerbaijan. At the regional level, Figure 8 shows that over 40% or people affected are located in Aran, which has an AAPA of 16,444. This is relative to Aran's population, of around 2 million, and their close proximity to the Mtkvari and Aras Rivers. AAPA exceeds 3,000 in Lankaran, Ganja-Qazakh and Yukhari Karabakh. Despite the largest regional population of over 3 million, Absheron has a lower number, due to lower annual precipitation and comparably smaller river catchments.

Figure 9: Exceedance probability curves – floods



Source: JBA Risk Management.

The exceedance probability curve shows the total losses from all events in any given year. Loss increases most significantly between the 2 and 50-year return periods. The EP curve in Figure 9 shows that the flood loss accumulates at an order of magnitude lower than earthquake. The curve for direct loss shows that flood loss is modeled at just over $550 million at the 100-year return period, which is just over 1.1% of the country's nominal GDP. Direct loss grows at a slower rate after the 150-year return period, reaching over $830 million at the 500-year return period. At the more frequent return periods, the total loss mirrors direct loss due to the expected fast reconstruction time and small knock-on effects. In this instance, the physical damage to buildings is greater than the additional indirect damage. The 1 in 75-year return period is the event where total loss is modeled to grow faster than direct loss and reaches nearly $1.3 billion at the 1 in 500-year return period.

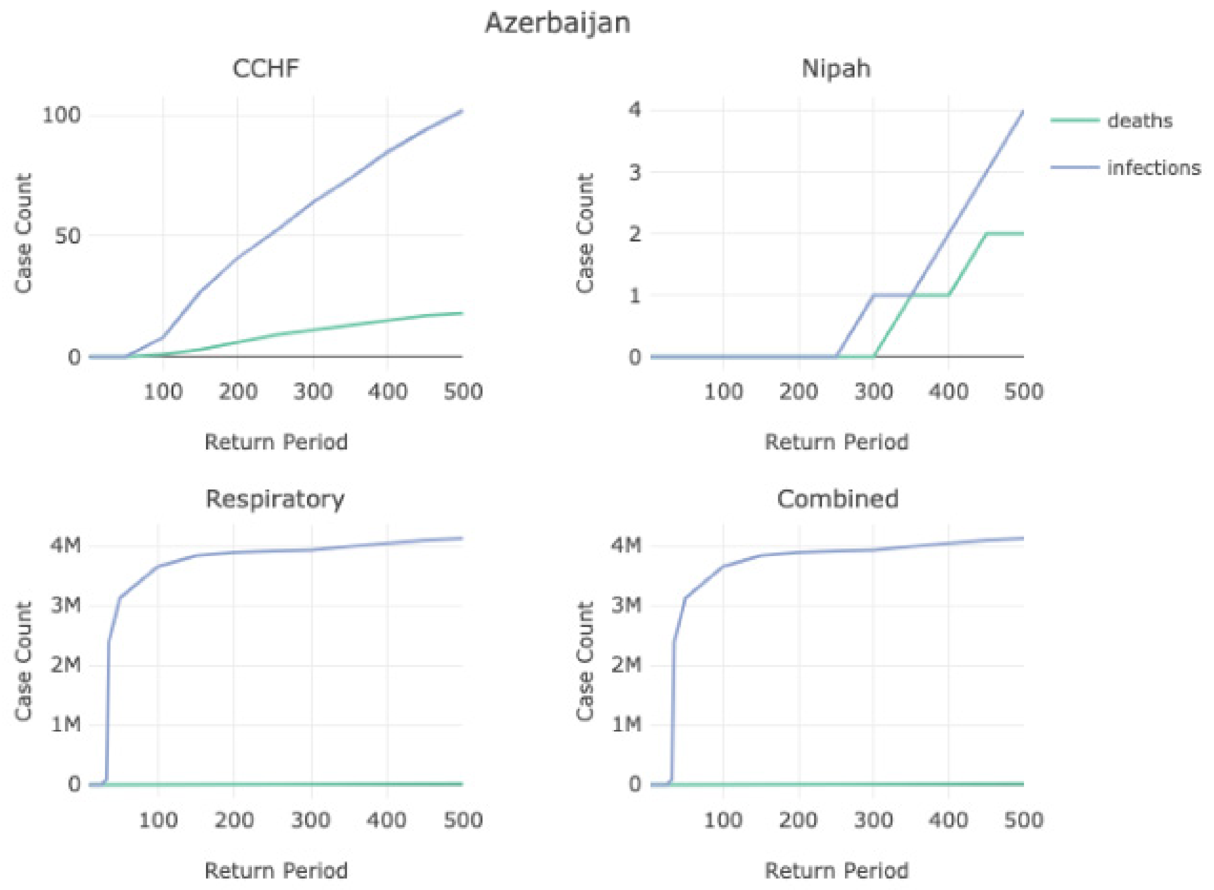
Infectious disease

The modeled exceedance probability 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 Hemorrhagic 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 Azerbaijan highlight that respiratory pathogens account for the majority of epidemic risk. The respiratory pathogens EP curve climbs rapidly and steeply. This is due to the fact that respiratory pathogens tend to be highly transmissible and cause very large pandemics when they occur; COVID-19 and pandemic influenza are notable examples.

Alternatively, 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. Figure 10 shows the exceedance probability curves for these pathogens for Azerbaijan. Table 1 shows the AAL numbers on people impacted and fatalities.

Figure 10: Exceedance probability curves – pandemic, including Crimean-Congo haemorrhagic fever (CCHF), Nipah virus infection, respiratory viruses and combined (all pathogens)



Source: Metabiota

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	102,251	197
Respiratory	102,249	197
Nipah	1	<1
CCHF	1	<1

Source: Metabiota

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[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

Historical losses and impacts

Azerbaijan is frequently affected by floods and earthquakes. Floods have been particularly impactful in the past two decades, affecting an estimated 1.68 to 1.85 million people – around 17% to 18% of the country's 2019 population – between 1990 and 2019.

The estimated damage from floods for the same period ranges from 612.4 millon to 904.5 million USD in 2019 prices (Table 2). These figures are based on recorded figures across reputable databases, and is likely an underestimate of experienced loss and damage.

The 2010 floods in Azerbaijan were the most detrimental in recent history, with 70,012 hectares of land inundated and at least 5000 houses partially or completely destroyed. Total economic loss was estimated at $469 million.[3] The event affected around 70,000 people and resulted in 40 deaths (Table 3). The 2010 flood event has an estimated return period of 20-years.

In May 2003, heavy rainfall combined with snowmelt led to flooding and triggered landslides, affecting the districts of Sabirabad, Salyan and Neftchala in southeastern Azerbaijan in particular. The flooding impacted many households and agriculture[4], caused over $70 million in damage, and affected about 30,000 to 40,000 people.

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

	Fatalities	Number of people affected	Total damage ($ million; constant 2019)
Flood	19-56	1,682,800 - 1,848,800	612.4 - 904.5
Earthquake	34	734,971	22.5
Drought	-	-	148.5

Source: EEM-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] Axundov, A., van der Ruyt, M., Sultanov Sawr, R. (2012) Management of water resources in Azerbaijan. Baku: Ministry of Emergency Situations of the Republic of Azerbaijan, State Agency for Water Resources (https://unece.org/fileadmin/DAM/env/water/npd/Management_of_waters_Water_Agency_Arif_Akhundov.pdf). Adjusted for 2019 prices.
[4] ReliefWeb (2003) Azerbaijan Floods – Information Bulletin No.2 https://reliefweb.int/report/azerbaijan/azerbaijan-floods-information-bulletin-n-2

Flooding in August 1997 damaged property, infrastructure and agriculture, resulting in losses of at least $25 million.[5] Flooding in the previous month damaged the Mingechevir hydroelectric power station. In 1995, a series of floods in Azerbaijan affected over 1.65 million people and resulted in total damages between $27 million and $30 million.[6,7]

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

Year	Location	Total damage ($ millions; constant 2019)	Fatalities	Number of people affected
Floods				
2010	Sabirabad, Imishli, Beilagan, Agdjabedi, Hajigabul, Salyan, Zardab, Kyurdamir, Shirvan Neftchala, districts (Aran province), Terter district (Yukhari Karabakh province)	469	40	70,000
2003	Siazan district (Quba-Khachmaz province), Ismailli, Gobustan, Shamakhi districts (Daglig-Shirvan province), Neftchala, Salyan, Sabirabad, Imishli, Zardab, Kyurdamir, Ali Bayramli districts (Aran province)	76.4		30,000 - 40,000
1997	Tovuz, Khanlar, Sheki, Kakh, Belokan, Zakatali, Goranboy, Qakh, Ismailly, Kuradamir, Saibadad districts	39.8	11	75,000
1995	Agjabedi, Astara, Agdash, Beilagan, Barda, Gakh, Gabala, Goba, Gekchay, Korandoy, Ismayilli, Lenkoban, Lrik, Shaki, Yardimli districts	11.2		1,650,000
1995	Lenkoban, Astara districts	9.2		2,800
1995	Deveci, Hhyzi, Siazan regions	6.7	5	6,000
2000	Denisovskiy, Zhitikara, Taran, Qostanay districts (Kustanayskaya province)	2.2	1	2,500
Earthquakes				
2000	Absheron, Baku, Sumgayit districts (Absheron province)	14.8	31	3,294
1999	Agdash, Geokchai, Udzhar	7.7	1	9,168
1902	Shemakha		86	17,540
1998	Lenkoran, Lerik, Astara, Massali, Yardimili districts		1	700,010
2018	Shaki-Zaqatala		1	
2012	Balaken, Gakh, Zagatala districts (Shaki-Zaqatala province)			15,550
2012	Zagatala, Gakh districts (Shaki-Zaqatala province)			6,949

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

[5] ReliefWeb (1997) Azerbaijan Floods Situation Report No.3 https://reliefweb.int/report/azerbaijan/azerbaijan-floods-situation-report-no3
[6] Dartmouth Flood Observatory (1995) https://floodobservatory.colorado.edu/Archives/index.html
[7] World Bank GFDRR Disaster Risk Country Profiles – Azerbaijan (2015) https://www.gfdrr.org/sites/default/files/Azerbaijan.pdf

The most impactful earthquake event in recent history affected Baku and its surrounding areas in 2000, causing over 30 deaths and almost $15 million in damage. The epicenter of the 2000 earthquake was located about 35 km south of Baku in the Caspian Sea.[8] In addition to the immediate deaths from falling debris and heart attacks, further fatalities occurred in the following day and weeks from an 'explosion caused by natural gas leaking from a valve damaged in the main shocks'[9], and the collapse of a building that was partially damaged by the initial earthquake.[10]

Earlier recorded earthquake events which resulted in high numbers of fatalities include the 1902 earthquake in Shemakha (86 deaths, 17,540 people affected), in 1667 also in Shemakha (80,000), and in 1139 in Gyzndzha (230,000 deaths).[11]

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

Table 4: Notable infectious disease outbreaks, 1990-2021

Pathogen	Date first case reported	Total cases	Total deaths	Location of origin
2019 Novel Coronavirus (2019-nCoV)	2/29/20	45,295	4,973*	PRC

*Source: Metabiota's infectious disease database *as of 1/7/21*

[8] *Babayev, G., Ismail-Zadeh, A., & Mouël, J. L. L. (2010). Scenario-based earthquake hazard and risk assessment for Baku (Azerbaijan). Natural Hazards and Earth System Sciences, 10(12), 2697-2712.*
[9] *National Geophysical Data Center / World Data Service (NGDC/WDS) (2020) NCEI/WDS Global Significant Earthquake Database. NOAA National Centers for Environmental Information (https://www.ncei.noaa.gov/access/metadata/landing-page/bin/iso?id=gov.noaa.ngdc.mgg.hazards:G012153)*
[10] *Babayev, G., Ismail-Zadeh, A., & Mouël, J. L. L. (2010). Scenario-based earthquake hazard and risk assessment for Baku (Azerbaijan). Natural Hazards and Earth System Sciences, 10(12), 2697-2712.*
[11] *National Geophysical Data Center / World Data Service (NGDC/WDS) (2020) NCEI/WDS Global Significant Earthquake Database. NOAA National Centers for Environmental Information (https://www.ncei.noaa.gov/access/metadata/landing-page/bin/iso?id=gov.noaa.ngdc.mgg.hazards:G012153)*

CHAPTER 3

Hazard

The distinct landscape of Azerbaijan brings a varying hazard profile across the country. The mountainous north is prone to flash flooding and landslides, whilst the central lowlands are more exposed to riverine flooding. Seismic activity runs through the country in distinct belts.

Seismic hazard

Azerbaijan combines several tectonic regions including the Lesser and the Greater Caucasus, the Caspian Basin Earthquake and the Kur depression. Earthquake activity in Azerbaijan is significant. On average, the country experiences about 5 earthquakes of magnitude 5.5 or larger per year. The eastern part of the country is affected by seismicity occurring at intermediate depths greater than 35 km. In the west of the country, the earthquakes are shallower and more common in proximity to the borders with Georgia and Armenia. In November 2000, two earthquakes of magnitude 6.6 and 6.8 at depths of about 35 km occurred at a short distance from the capital city. These were the largest instrumental earthquakes observed in Azerbaijan.

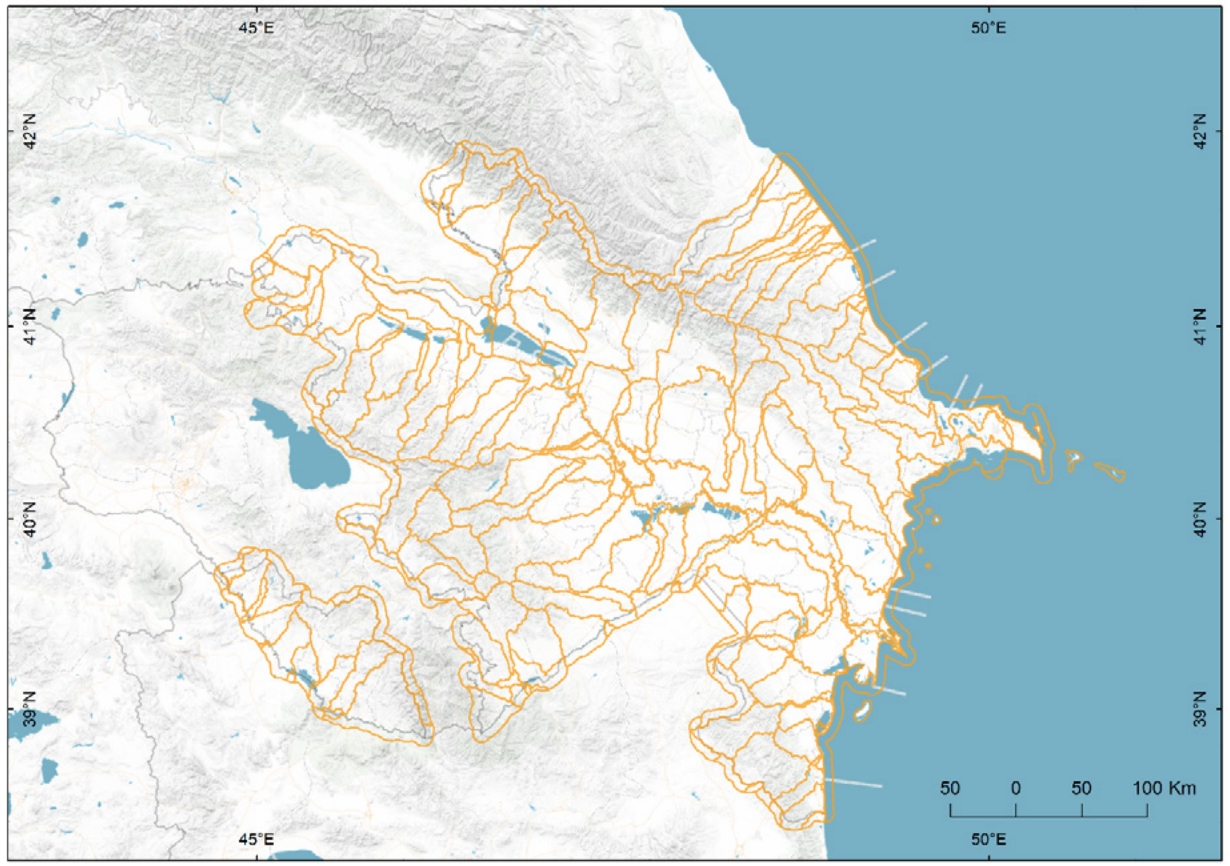
Fault systems across a west-northwest / east southeast distribution control most of the seismic hazard pattern in Azerbaijan. The maximum values of peak ground acceleration (PGA) with a 10% probability of exceedance in 50 years are in the range between 0.5 and 0.6g and located in the west of the country. Near Baku, the PGA with a 10% probability of exceedance in 50 years is within the interval between 0.2 and 0.3g.

Map of hydrological catchment areas

Three physical features dominate the landscape: the Caspian Sea in the east, the Greater Caucasus range in the north, and vast flatlands in the center. The country's highest peak, Bazardyuze Dagi (4,485 m), is part of the Greater Caucasus range. Eight main rivers flow down from the Caucasus ranges into the central Kura-Aras Lowlands, including the country's longest river, Kur (1,515 km), and its tributary, Aras. The confluence then drains into the Caspian Sea a short distance downstream.

Exposure to flooding can be assessed via hydrological accumulation zones (HAZ). HAZ polygons represent the natural watercourse boundaries as a means of modeling the flow of water. The HAZ polygons for Azerbaijan, shown in Figure 11, highlight the short, narrow valleys draining the northern side of the Caucasus mountains directly into the Caspian Sea. The relatively large areas in central and southern Azerbaijan, mainly aligned southwest to northeast, are associated with rivers draining into the broad valley of the Mtkvari River, which flows northwest to southeast from Georgia to the Caspian Sea. These valleys include rivers draining the southern end of the Lower Caucasus range.

Figure 11: Hydrological catchments used for flood modelling



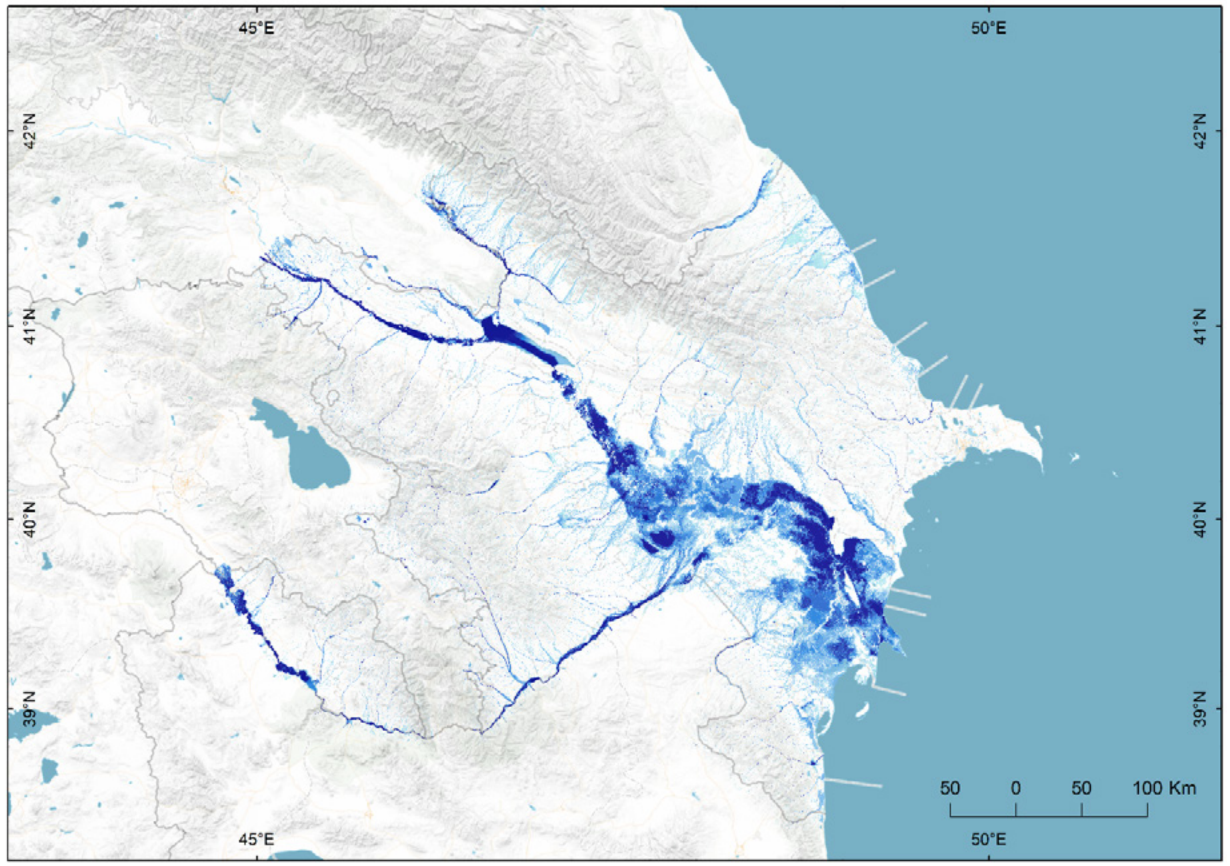
Source: JBA Risk Management

Flood hazard map for pluvial and fluvial flooding

Flood modeling estimates losses and impacts on the basis of flood maps for river (fluvial) and surface water (pluvial) flooding generated at 30-meter 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 12 highlights the main rivers of Azerbaijan. This event severity is often used for planning purposes as a plausible extreme event.

The map shows the extensive footprint of the Mktvari River running northwest to southeast through the country, joining at Sabirabad with the Aras River that runs northeast from the border with Iran. The lower Mktvari valley shows a broad area at risk of flooding, including the cities of Shirvan and Neftchala at the river delta with the Caspian Sea. In the north of the country, the main area of flooding is associated with the Reka Samur River on the border with the Russian Federation, but very few urban areas are at risk in this region. Rivers draining from the Caucasus also pose a risk of flooding to Khachmaz and surrounding towns and villages.

Figure 12: Map of river (fluvial) flooding (areas in blue) at the 200-year return period level



Source: JBA Risk Management

Figure 13: Map of surface water (pluvial) flooding (areas in purple) at the 200-year return period level for the Baku region

Source: JBA Risk Management

The detailed flood map of Baku shows that flood risk is limited to small pockets of surface water flooding, especially in northern and eastern suburbs. There are no major rivers in the city. The only areas of water in Figure 13 are lakes, which are not shown as presenting any flood risk.

FLOOD RISK IN BAKU IS LIMITED TO SMALL POCKETS OF SURFACE WATER FLOODING

Climate conditions

Historic climate
The climate in Azerbaijan varies from subtropical and dry in central and eastern regions, to subtropical and humid in the southeast. The Greater Caucasus Range in the north and the Caspian Sea on the east and the central lowlands are important influences. The spatial distribution of precipitation is governed by topography - maximum precipitation zones in the north (Sahdag and Bazardüzü) and the southern lowland areas of Lankaran with minimums in eastern Absheron (less than 200 to 350 mm/yr)[12],[13] Precipitation falls predominantly in the winter and spring months, with considerable interannual and interdecadal variability.

A number of changes in Azerbaijan's climates have been observed over the period 1961-2014. Average annual temperatures have been increasing at all elevations[14], with temperature increases most notable after 2007 at a country-average warming rate of 0.7°C per decade. Changes in long-term average annual rainfalls are less clear and less spatially coherent. Some areas, such as Ganja-Qazakh, Nakhchivan and Kura-Araks have experienced recent decreases (1991-2010) in annual precipitation.[15 16 17] In others, decreasing precipitation in winter and summer is evident. The period of observation is too short to establish a statistically significant decreasing trend.

At the same time however, there has been an increase in the frequency of some extreme rainfall events and associated flooding, as well as increasing droughts. The high mountain areas of Nakhchivan and the southern edges of the Greater Caucasus are particularly prone to flooding.

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, as shown in Table 5, which is 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 analyzed for different return periods (2, 5, 10, 20, 50, 100, 500-, 1000-, 5000- and 10000-year events).

[12] Yunesi, M. (2014) 'Climate precipitation of Azerbaijan Republic', Geographical Research Quarterly, http://georesearch.ir/article-1-315-en.html
[13] 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
[14] Makhmudov, R. (2016) 'Regional climate changes and runoff in Azerbaijan'. Russian Meteorology and Hydrology 41(9): 635-639.
[15] Mammadov, A., R. Rajabov and N. Hasanova (2018) 'Causes of periodical rainfall distribution and long-term forecast of precipitation for Lankaran, Azerbaijan'. Meteorology, Hydrology and Water Management 6(2).
[16] USAID (2017) Climate change risk in Azerbaijan: Country risk profile.
[17] Ministry of Ecology and Natural Resources (2015) Third National Communication to the United Nations Framework Convention on Climate Change, Republic of Azerbaijan.
[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.

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

Return period	1951-2007	2050s	
	Historical	RCP4.5	RCP8.5
20-year	1.42	1.52 (1.44, 1.61)	1.49 (1.30, 1.69)
100-year	1.93	2.04 (1.91, 2.16)	2.97 (2.51, 3.42)
200-year	2.15	2.25 (2.10, 2.40)	3.30 (2.78, 3.81)
500-year	2.44	2.54 (2.37, 2.72)	3.73 (3.14, 4.32)

Source: ODI
Projected changes in 24-hr duration extreme precipitation intensities in Baku 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 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. 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.

Further information on the approach is detailed in the Technical Documentation

Annual mean precipitation increases are projected to increase by the 2050s, when compared with annual means from 1956-1995, for Ashberon and parts of Quba-Khachmaz, Shaki-Zagatala, Aran and Lankaran under RCP8.5 only. Under RCP8.5, Lankaran and Quba-Khachmaz could experience annual mean precipitation increases of the range 40 to 80%. Annual mean precipitation is not projected to change much under RCP4.5, except for potential mild drying of −10 to −20% along the western portions of Ganja-Qazakh and Kalbajar-Lachin. The majority proportion of the RCP8.5 annual precipitation increases in the multi-model mean are due to projected increases in the April-June period; smaller increases (10 to 20%) were also projected under RCP4.5 for similar regions for the same period.

Extreme 24-hr duration precipitation events of all return periods are projected to increase across the country by the 2050s for both RCPs. Multi-model projections – particularly under RCP8.5 - indicate that extreme intensities could increase more for Absheron, Kalbajar, the eastern part of Aran and Mountainous Shirvan. The potential for more intense extreme rainfall events, particularly coupled with warmer temperatures leading to faster snowmelt during the spring and summer, could contribute to flooding and landslide risk in more mountainous regions.

Exposure

Azerbaijan's economy had its best performance since 2014 with a 2.2% growth in 2019. Recent growth has been driven by oil and gas exports. According to Asian Development Outlook (ADO) 2021 forecasts, the economy will have a negative growth rate of -4.3% in 2020, largely due to the impacts of COVID-19, before returning to 1.9% growth in 2021.[19] Azerbaijan is anticipated to be less affected than other CAREC member states.

The rate of urbanization has been accelerating, with over half of Azerbaijan's population living in urban areas in 2019 (Table 6). The urbanization trends are concentrating the numbers of the population exposed to climatic events in smaller areas.

Table 6: Population totals, distribution and trends (all data from 2019)

Population (thousands)	10023.32
Population growth date (%/year)	0.8
Share of population living in urban areas (%)	56
Urbanisation rate (%/year)	1.5
% of total population age 0-14	23
% of total population age 15-64	70
% of total population ages 65 and above	6

Source: World Bank Open Data

Collectively more than 85% of the country's GDP is generated by industry (48.7%) and services (37.4%). Half of the population works in the services sector and 36% in agriculture (Table 7).

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

GDP (million USD, current)	48047.65
GDP per capita (USD, current)	4793.6
Country / territory economic composition	Country / territory economic composition
Agriculture, forestry and fishing, value added (% of GDP)	5.7
Employment in agriculture (% of total employment) (modelled ILO estimate)	36*
Industry (including construction, value added (% of GDP)	48.7
Employment in industry (% of total employment) (modelled ILO estimate)	15*
Services, value added (% of GDP)	37.4
Employment in services (% of total employment) (modelled ILO estimate)	50*

Source: World Bank Open Data

[19] Asian Devleopment Outlook 2021 - https://www.adb.org/publications/asian-development-outlook-2021

Strategic priorities for the country, laid out in "Azerbaijan 2030: National Priorities for Socio-Economic Development" and "Strategic Road Maps on national economy and main sectors of economy", include the development of the non-oil sector, and growth of foreign direct investment. These are identified as important to help meet commitments arising from "Transforming our world: the 2030 Agenda for Sustainable Development" of the United Nations.[20] The Ministry of Finance's 2017-2020 Strategic Plan similarly targets the oil and gas industry, heavy industry and machinery, agriculture, housing and utilities, entrepreneurship, tourism, education, telecommunications and information technology, logistics and trade. Since 2012, only limited diversification away from an oil and gas dependence has been achieved. Oil and gas remain essential to the economy and global oil prices are closely linked to the economic performance.

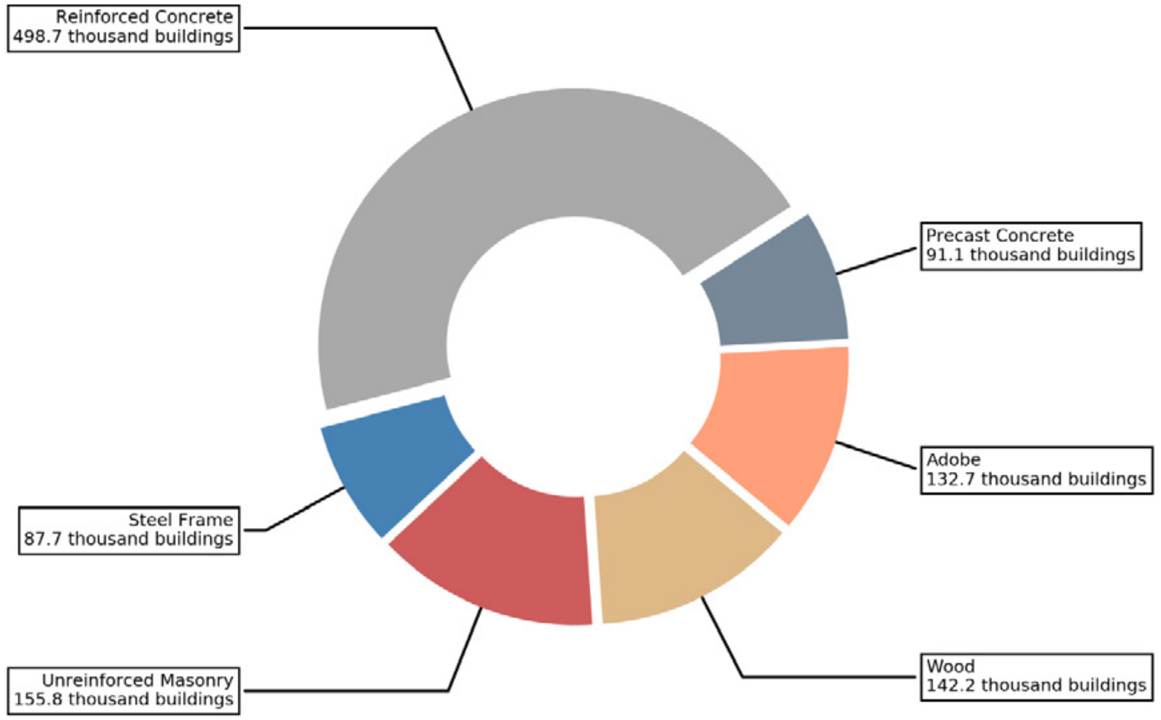
Agricultural production is characterized by many small farms, constituting small plot sizes (1-3ha) and small livestock herding (3-10 animals). About half of the value generated by agriculture is farming livestock, primarily cattle and sheep. Agriculture is considered a critical sector with potential for stimulating non-oil growth, job creation and food security. The Government is 'striving to implement strategies to address these hazards and to help the rural poor achieve lasting improvements in their living standards'.[21] Geographically, agriculture is concentrated in the central and southern parts of the country. Importantly, the national strategy identifies climate change impacts on agriculture and tourism as a growing source of economic risk.[22]

The topography of Azerbaijan is evident in the land use and population pattern. Three zones can be detected: the sparsely populated, mountainous north bordering the Russian Federation; the flat central belt dominated by agricultural production; and the urban, populated areas in the east.

A large proportion of the country is mountainous, explaining the distinct population density pattern. Sharp relief is also a driver of flash flood risk, though there are only pockets of urbanization and value at risk. Between the mountain ranges is flat, arable land under cultivation. By and large however, the exposure and value at risk is concentrated in the far east of the country, in and around Baku on the shores of the Caspian Sea.

[20] *Government of the Republic of Azerbaijan (2012). Development concept "Azerbaijan 2030: National Priorities for Socio-Economic Development". Baku: Government of the Republic of Azerbaijan*
[21] *International Fund for Agricultural Development – IFAD (n.d.) Azerbaijan. Rome: IFAD. (https://www.ifad.org/en/web/operations/country/id/azerbaijan)*
[22] *Baku Research Institute (2020). Azerbaijan 2030: A Vision of the Future. Baku: Baku Research Institute (https://bakuresearchinstitute.org/en/azerbaijan-2030-a-vision-of-the-future/)*

Figure 14: Breakdown of different building types



Source: Global Earthquake Model

The most recent (2019) available figures from the Azerbaijan Statistical Information Service show 1.5 million residential buildings in total, of which 655,200 are in urban areas and 845,300 are in rural areas. The total number of residential dwellings was 2.15 million, of which 1.29 million are in urban areas and 858,700 are in rural areas. The majority of urban inhabitants live in multi-family apartment buildings, whereas most families in rural areas inhabit individual houses.

As shown in Figure 14, reinforced concrete structures with an estimated total of 498,685 buildings make up the largest fraction (45.0%) of the total building stock. This is followed by unreinforced masonry structures (155,818 buildings, or 14.1%) and wood structures (142,178 buildings, or 12.8%).

Historical districts of cities in Azerbaijan contain dwellings constructed before the 1920s, many of which are in poor condition and in need of repair. The 1960s and 1970s witnessed substantial construction activity, accounting for much of the multi-family apartment building stock. These prefabricated multi-family apartment buildings — sometimes referred to as *khrushchevki* — are particularly vulnerable, as the original design life was not expected to exceed twenty-five years and construction standards were often lowered in the interests of construction speed.

After a lull in construction during the 1990s, construction activity increased after 2000, with several co-operative multi-family apartment complexes built in the larger cities. Reinforced concrete moment-frame buildings, along with prefabricated precast concrete buildings make up most of the building stock in urban areas, with unreinforced masonry comprising the older housing stock in historical parts of the cities. Rural construction tends to comprise adobe and wood houses, along with unreinforced masonry. Unreinforced masonry and adobe structures are particularly vulnerable to earthquake damage, as they exhibit non-ductile behavior under seismic loads. The mid-rise concrete multi-family apartment buildings constructed in the post-war period of the 1950s-70s are also highly vulnerable to earthquake damage given that many of them were constructed without proper attention towards seismic design principles and have not been kept in good maintenance.

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

Asset replacement cost (billion $)	
Residential buildings	60.2
Commercial buildings	7.7
Industrial buildings	6.3
Total buildings	74.3

Source: Global Earthquake Model

Table 8 shows the asset replacement costs across building types and regions of Azerbaijan. Following the pattern of urbanization, value-at-risk is concentrated in Absheron including Baku. The extensive agricultural production and associated infrastructure in the central plains of Aran is the second most valuable economic region in terms of exposure to disaster risk. Much of the country is more sparsely populated with low levels of urbanization.

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 agriculture sector, which makes up close to 6% of GDP (Table 7), is highly vulnerable to climate change. Importantly, the majority of Azerbaijan's population depends on the agriculture sector, directly or indirectly.[23] Irrigated crops will be at risk to water shortages, rainfall variability, increased temperatures and a potential increase in climate driven hazards.[24]

Negative impacts from a rise in air temperatures, recurring winds and moisture deficiency, especially in the country's warmest and driest regions, would affect the cotton growing season for example. A decrease in the vegetation period in traditional crop areas would see winter wheat yields decrease by 3-4%, while winter pasture productivity is projected to fall by 2% and spring pasture productivity by 1.2%.[25]

Table 9: Socio-economic vulnerability indicators

Poverty headcount ratio at national poverty lines (% of population)	6.0 (2012)
Human Capital Index	0.6 (2020)
GINI index	26.6 (2005)
Gender Inequality index	0.32 (2018)
Household size	4.5 (2019)
Age dependency ratio (% of working age population)	43 (2019)
Unemployment rate	6 (2020)
General government gross debt (% of GDP)	18.685 (2018)
Under five child mortality (per 1000 live births)	20 (2019)
Life expectancy at birth (female)	75 (2018)
Life expectancy at birth (male)	70 (2018)
% of population using at least basic sanitation services	93 (2017)
% of population using at least basic drinking water services	91 (2017)

Source: World Bank Open Data; United Nations Population Division; UNDP; IMF World Economic Outlook Database

[23] *Ahouissoussi N. et al (2014) 'Reducing the Vulnerability of Azerbaijan's Agricultural Systems to Climate Change : Impact Assessment and Adaptation Options,' World Bank Publications, The World Bank, number 18239, November.*
[24] *USAID (2017) 'Climate Change Risk Profile Azerbaijan', Climate Change Adaptation, Thought Leadership and Assessments (ATLAS) Task Order No. AID-OAA-I-14-00013.*

Tourism in Azerbaijan is also vulnerable to climate change. Although it is an emerging industry, it has increased steadily over the last decade and contributed to over 13% of the GDP in 2019. Climate sensitive tourist activities, such as skiing, enjoying beach resorts, or hiking, could be threatened by reduced snow, mud and landslides and rising sea levels.[26] Table 9 provides a breakdown of key socio-economic vulnerability indicators.

Economic growth, wage increases, public spending in construction and services, and social protection programs are cited as major contributors to the drastic reduction in absolute poverty since the early 2000s.[27] Azerbaijan's official national poverty rate was 5.1% in 2018 and was estimated to fall further in 2019.[28] However, the impacts of COVID-19 are likely to reverse this progress. Azerbaijan has the lowest level of economic inequality (as per GINI coefficient) among CAREC countries. Moreover, relative poverty and perceived inequality are growing concerns, as is the large number of people clustered around the poverty line, leaving them highly vulnerable to unexpected, external shocks.[29]

Vulnerable groups, including internally displaced people (IDPs), children, the elderly, and people with disabilities are disproportionately affected by disaster events. Limited access to information, lack of risk awareness, or lack of information in the local Azeri language in which relevant communications are transmitted are identified as key reasons.[30] Due to the fragile support system, when disaster events strike, vulnerable groups such as elderly living alone, disabled, chronically ill patients and IDPs remain marginalized and continue to rely on support.[31 32] First responders to disaster events may not be trained to deal with different impairments including the visually or hearing impaired, or able to communicate in regional languages such as lezgin. There are no specific provisions to support people with mobility issues when it comes to evacuation procedures after a disaster event.[33]

Recognizing the need for greater inclusion of vulnerable groups in disaster risk reduction, the Ministry of Emergency Situations of the Republic of Azerbaijan and the EUR-OPA Major Hazards Agreement co-organized a workshop on the topic in September 2019. This focused specifically on policy options and practical solutions to address the vulnerability of children, people with disabilities, and migrants, displaced persons, asylum seekers and refugees such as establish a functional inter-ministerial cooperation and coordination group with the Ministry of Emergency Situations to work in consultation with specialised agencies, organisations and vulnerable groups at national, regional and local levels on a national strategy for disaster risk reduction.[34]

[25] *Gupta S. (2009) 'Central Asia and Caucasus Disaster Risk Management Initiative (CAC DRMI) Risk Assessment for Central Asia and Caucasus Desk Study Review', UNISDR/ The World Bank.*
[26] *USAID (2017) 'Climate Change Risk Profile Azerbaijan', Climate Change Adaptation, Thought Leadership and Assessments (ATLAS) Task Order No. AID-OAA-I-14-00013.*
[27] *ADB – Asian Development Bank (n.d.) Country Partnership Strategy: Azerbaijan, 2014-2018. Poverty analysis (summary). (https://www.adb.org/sites/default/files/linked-documents/cps-aze-2014-2018-pa.pdf)*
[28] *World Bank (2020). 'The World Bank in Azerbaijan'. (https://www.worldbank.org/en/country/azerbaijan/overview#3)*
[29] *ADB – Asian Development Bank (n.d.) Country Partnership Strategy: Azerbaijan, 2014-2018. Poverty analysis (summary). (https://www.adb.org/sites/default/files/linked-documents/cps-aze-2014-2018-pa.pdf)*
[30] *Demir H. S. (2019) 'Report on the Workshop on Human Rights approach in Disasters: Inclusion of Vulnerable Groups in Disaster Risk Reduction'. Ministry of Emergency Situations of the Republic of Azerbaijan/ EUR-OPA Major Hazards Agreement.*
[31] *(2004) 'Azerbaijan Annual Appeal No 01.77', International Federation of Red Cross And Red Crescent Societies.*
[32] *Minority Rights Group International (2018) 'World Directory of Minorities and Indigenous Peoples - Azerbaijan'.*
[33] *Demir H. S. (2019) 'Report on the Workshop on Human Rights approach in Disasters: Inclusion of Vulnerable Groups in Disaster Risk Reduction'. Ministry of Emergency Situations of the Republic of Azerbaijan/ EUR-OPA Major Hazards Agreement.*
[34] *Council of Europe (2019) 'Workshop on Inclusion of Vulnerable Groups in Disaster Risk Reduction' (https://www.coe.int/en/web/europarisks/news-2019/-/asset_publisher/oclobklpNI3q/content/workshop-on-inclusion-of-vulnerable-groups-in-disaster-risk-reduction?_101_INSTANCE_oclobklpNI3q_viewMode=view/)*

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.

The government of Azerbaijan is prioritizing the development of disaster preparedness and risk reduction capacities, moving towards a systemic approach in assessing risks and minimizing socio-economic impacts of disaster events.[35]

The Azerbaijan 2030 Strategy highlights a range of important activities, including the use of social security mechanisms.[36] Table 10 shows a number of key coping capacity indicators for Azerbaijan.

Table 10: Key coping capacity indicators

Financial inclusion (% of population aged 15+ with access to bank account)	65% (bottom income quintile: 72.3%) (2011)
Insurance coverage	0.5% (2019)
Share of population covered by public safety nets	65% (bottom income quintile: 72.3%) (2011)
Internet coverage (% of population using the internet)	80 (2018)
Metabiota Epidemic Preparedness Index score (100 = maximum score, 0 = minimum score)	69 (2019)
Public and private health expenditure (% of GDP)	6.65 (2017)
Number of physicians (per 1,000)	3.4 (2014)
Number of hospital beds (per 1,000)	4.8 (2014)
Government effectiveness (-2.5 to +2.5)	-0.14 (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[37]

[35] *Implementations of Sendai Framework in Azerbaijan ; SECOND VOLUNTARY NATIONAL REVIEW of the Republic of Azerbaijan on the implementation of "Transforming our world: the 2030 Agenda for Sustainable Development"*
[36] *"AZERBAIJAN 2020: LOOK INTO THE FUTURE" CONCEPT OF DEVELOPMENT*
[37] *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).*

The country's laws and regulations incorporate disaster risk reduction and management.[38] The Ministry of Emergency Situations is the main focal point for disaster risk reduction and management in the country, working across disaster prevention, preparedness and response. Regional centers support nationwide implementation. The Ministry is also key in the implementation of the Sendai Framework in Azerbaijan, having established close cooperation with UNDRR. Current and future activities under the framework include the development of an early warning system, reduction of disaster-related casualties and economic losses, disaster risk database improvement and developing the Electronic Regional Risk Atlas.

The Azeri government made several statements on the Sendai Framework and has also included updates on DRR in its SDG reporting. Aside from developing national DRR policy and applying best practice, other government priorities include preparing Sendai progress reports and creating the national platform to improve societal preparedness and damage caused by disaster events. These are also acknowledged to input into financing planning.[39] The country's urban planning and construction law does not specifically reference the Sendai Framework, however provision of safety, including protection from 'fire and hazardous impacts of natural and man-caused character' is established as a basic principle of such activities.

Azerbaijan has two key reserve funds to support response to disasters: the Reserve Fund of the President capitalized with AZN 300M ($176m) in 2019; and the Reserve Fund of the State Budget capitalized with AZN 100m ($59m) in 2019.[40] It has explored a range of sovereign risk transfer solutions with development partners in the past, although these appear to have been put on hold.[41] The ability to respond to disaster events is further supported by a relatively robust fiscal position, with a higher sovereign debt credit rating than most other CAREC member states.

AZERBAIJAN EXPLORED SOVEREIGN RISK TRANSFER IN THE PAST, BUT THESE EFFORTS ARE CURRENTLY ON HOLD

[38] *Republic of Azerbaijan (n.d.) Second voluntary national review of the Republic of Azerbaijan on the implementation of "Transforming our world: the 2030 Agenda for Sustainable Development"*
[39] *Other priorities include: 'To develop an Annual Working Program for its activities, priorities and tasks in compliance with the strategic goals in the field of disaster protection and disaster risk reduction; To support the stakeholders in developing and integrating monitoring systems; To support the development of methodologies for disaster risk analysis, assessment and mapping; To analyze and give opinion to international documents in the field of disaster risk reduction and disaster protection; To organize the development of guidelines for education and training in the field of disaster protection; To organize and support information campaigns for different types of risks and how to react in case of disasters.'*
[40] *The Law of the Republic of Azerbaijan, On the State Budget of Republic of Azerbaijan for 2019, https://www.oilfund.az/storage/uploads/rsoibglmuw.pdf*
[41] *World Bank Disaster Risk Finance and Insurance Program (2016) Sovereign Disaster Risk Finance in Middle Income Countries. http://documents1.worldbank.org/curated/en/978941471933369121/pdf/107922-WP-SECOMiddleIncomeCountriesweb-PUBLIC.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 Azerbaijan.

Table 11: Key Protection Gap indicators

AAL as % of GNI[42]	0.09%	
Un-funded AAL, ($m, %)	AAL covered	
Average annual human losses from flood and earthquakes	Flood	EQ
	3	48
Event frequency where direct & indirect loss and damage, less (assumed) insured losses, exceed existing ex-ante risk retention	Flood	EQ
	1 in 25	1 in 20
Event frequency where direct damage, less (assumed) insured losses, exceed existing ex-ante risk retention	Flood	EQ
	1 in 50	1 in 25
Event frequency where estimated emergency response costs exceed current risk retention mechanisms	Flood	EQ
	> 1 in 200	> 1 in 200
Macro-economic context and ability for sovereign to borrow	Strong with close-to-investment grade credit rating. Medium-term structural challenges.	
Ability of individual and households to access resources after an event	Financial inclusion relatively low and concentrated among higher income groups in Baku. Limited social protection.	

Source: Consultant team modelling

[42] *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.*

The combined direct risk across flood and earthquake is $129 million, rising to $152 million with indirect costs included. The AAL from direct losses is equivalent to 0.09% of 2019 GNI, which is the 10th highest losses as a proportion of GNI in the CAREC region.

Of the direct losses, the base case analysis assumes that 35% of direct flood losses in Absheron and Daglig-Shirvan and 10% of direct flood losses elsewhere in the country might be covered by insurance. This broadly aligns with market reports that suggest that compulsory property insurance had reached 12% of the population by 2012 and allowing for growth thereafter while at the same time considering the fact that not all losses will be covered even when insurance is in place. Applying these percentages to the estimated exposure implies that 19.5% of the total exposure in the country was covered. For earthquake losses, which is not part of compulsory cover, the base case analysis assumes 5% of direct losses in Absheron and Daglig-Shirvan and 1% of losses elsewhere in the country might be covered by insurance.

Azerbaijan is in a relatively robust financial position to respond to the financial implications of disasters. Generally speaking, existing risk retention mechanisms in Azerbaijan are sufficient to cover AAL from flood and earthquake events and/or cover the emergency response costs of more severe events (typically of 1 in 25-year or more severe events). Its disaster response funds are relatively well capitalized, and these are supported by a robust macroeconomic context and a small but growing property insurance market. In particular Azerbaijan's reserve funds seem well placed to meet these costs for all but the most severe events.

However, there are still gaps within its disaster risk financing strategy that could be explored further. As is appropriate under a risk layering strategy, the current reserve funds (risk retention) mechanisms are insufficient to meet the reconstruction costs of more severe events, but there are no other ex-ante mechanisms in place. While the country might be able to rely on its strong fiscal position to rely on borrowing to meet these costs in the short term, this may be less viable as global decarbonization efforts gather pace.

CAREC

Central Asia Regional Economic Cooperation Program