

Adopted for information by the Decision of the Regional Forum – Meeting of the Heads of Emergency Authorities of Central Asian countries, Protocol, 5 November 2021, Tashkent (Uzbekistan)

THE REGIONAL DISASTER RISK PROFILE OF CENTRAL ASIAN COUNTRIES

PART 1: BACKGROUND

Central Asian region is the Republic of Kazakhstan, Kyrgyz Republic, Republic of Tajikistan, Turkmenistan, Republic of Uzbekistan. The area occupied by the region is about 4 million square kilometers, and the total population is more than 75 million people. The population density in the region is only 18 people per square kilometer.

From a geographic point of view, Central Asia is an extremely vast sub-region, including powerful mountain systems such as the Tien Shan, and large deserts and steppe regions. The largest rivers in this region are Amu Darya and Syrdarya. The largest reservoirs include the Caspian Sea, the Aral Sea and Lake Balkhash, which are part of the West Central Asian indoor basin.

The landlocked position of Central Asia within the Euro-Asian continent defines its sharply continental climate with a small amount of unevenly distributed rainfall. The region is characterized by a large amplitude of daytime and seasonal temperatures, with high solar radiation and relatively low humidity.

Large differences in geographic location and altitude from 0 to 7,500 m above sea level explain the diversity of the microclimate.

The mountains are located in the east and southeast and are the center of the formation of water resources and their flow. Although the area often suffers from wet winds, most of the moisture is absorbed by the mountains and little rainfall remains for the rest of the basin.

The temperature drops are quite significant - from -40 ° C to + 40 ° C. The amount of precipitation in lowlands and valleys is 80-200 mm per year, precipitation falls mainly in winter and spring. At the same time, 300-400 mm of precipitation falls in the foothills, and 600-800 mm on the southern and southwestern sides of the mountain ranges.

The region possesses many valuable natural resources, primarily large reserves of hydrocarbon raw materials, has a powerful mining, fuel and energy and chemical industries, as well as due to the presence of a wide transport and communication network, the countries of the region use their full potential as transit states.

The socio-economic development of the region from time immemorial has been dependent on water and land resources. Agriculture plays a significant role in the economy of Central Asia. The leading place belongs to agriculture.

Rapid population growth and the development of agricultural irrigation over the past 40 years have significantly increased the demand for land and water in the region. At the same time, more than 46% of population live in cities.

Country	Square thousand km 2	Population mln.	Population density (per km 2)	Annual population growth%	Urban population%
Kazakhstan	2 724.9	18.3	6.8	1,3	58.4
Kyrgyzstan	199.9	6.3	31.5	1.7	34.1
Tajikistan	142.6	9.1	45.5	2.5	44
Turkmenistan	488.1	5.9	12	1,3	48.7
Uzbekistan	447.4	35	73.6	1.5	49.5

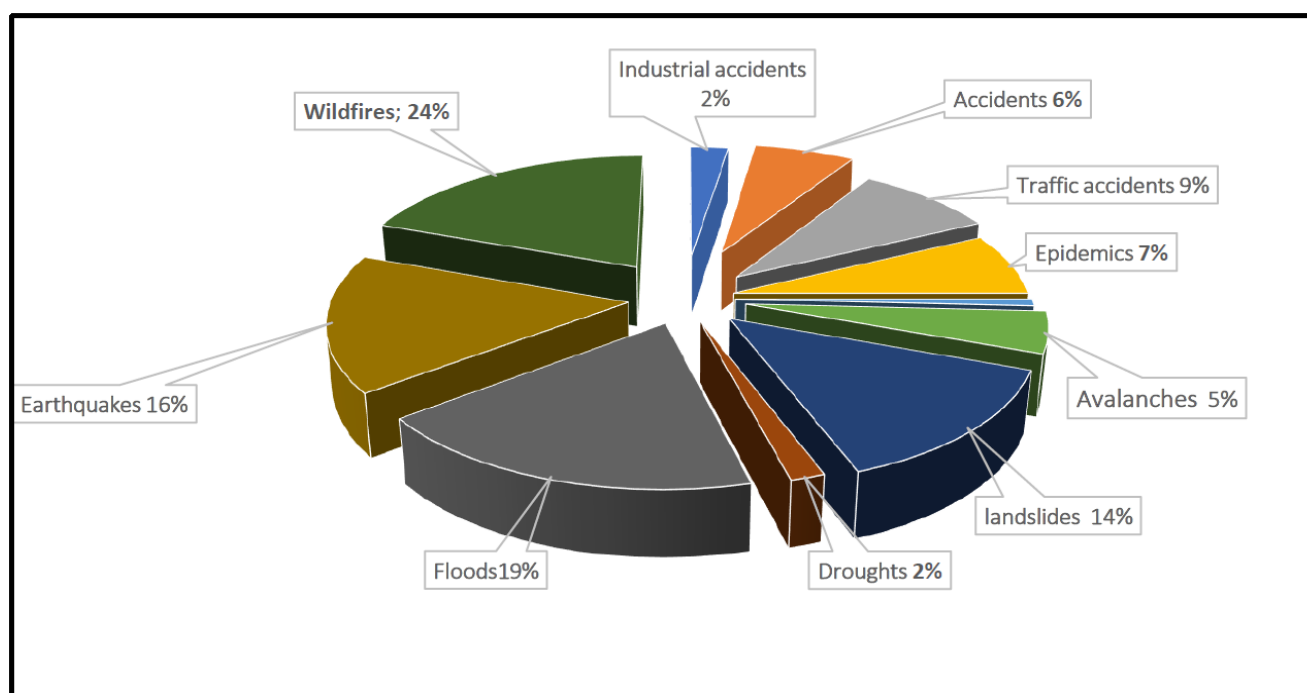
Total by region	4 002,9	72, 5	18.1	1.6	46.9
------------------------	----------------	--------------	-------------	------------	-------------

Table 1. Overview of Central Asian countries¹

¹Кавказ и Центральная Азия Субнациональный ИНФОРМ индекс риска 2021

PART 2: KEY INDICATORS FOR REGIONAL PROFILE OF DISASTER RISK

Central Asian region is prone to almost all types of emergencies of natural, man-made, ecological, biological and social nature.



Picture. 1 Percentage distribution of registered disasters in CA region.^[2]

Date	Disaster type	Affected population	Economic damage (USD million)
3/01/1911	Kemin earthquake, Kazakhstan	450	20
5/10/1948	Ashgabat earthquake, Turkmenistan	176,000	6 000
04/26/1966	Tashkent earthquake, Uzbekistan	100,000	300
13/10/1985	Earthquake Tajikistan	8080	200
05/25/1992	Flooding in Tajikistan	63,500	300
08/19/1992	Jalalabad earthquake Kyrgyzstan	86806	130
8/05/1993	Flood in the area of Dushanbe, Tajikistan	75357	149
/ 06/2000	Drought in Central Asia	3,600,000	107

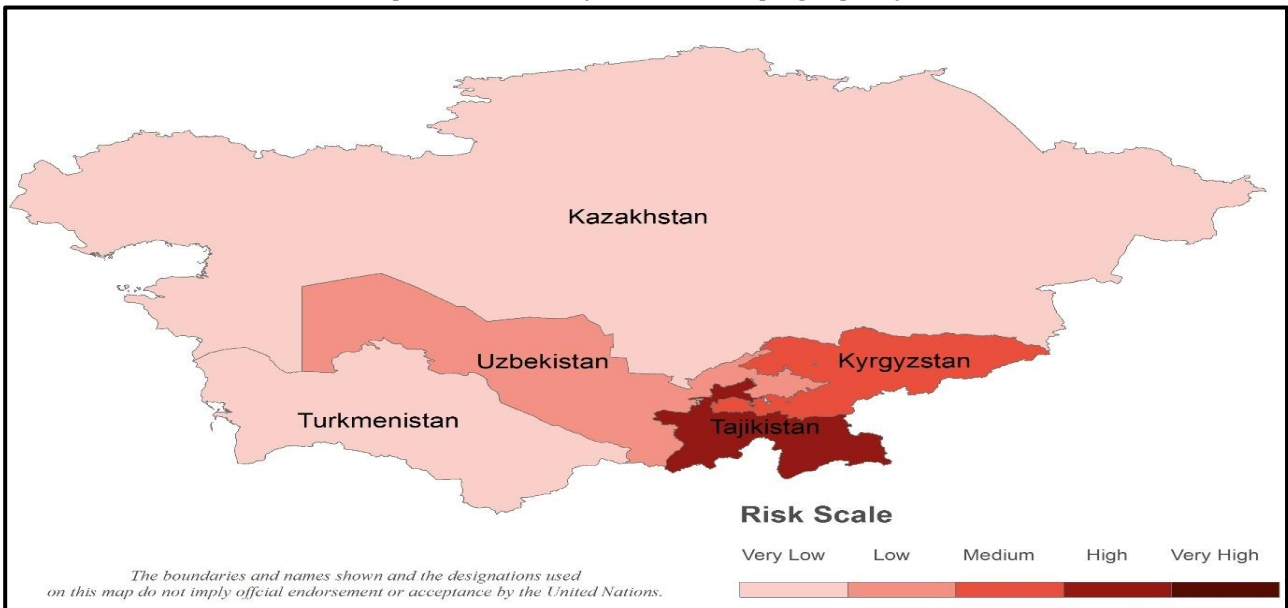
Major disasters in Central Asia for 120 years³

² Caucasus and Central Asia Subnational INFORM Risk Index 2021

The region is most characterized by vast territories with high seismic activity, with probable *strong earthquakes of 7-8-9 and more on MSK-64 and magnitudes 5-8 on the Richter scale, mudflows, floods, landslides, avalanches, flooding, hurricane winds and even tornadoes, desertification, dust storms, prolonged and torrential rains, hail, snowfalls and blizzards, droughts, frosts, extreme temperatures, destruction of artificial reservoirs, the presence of nuclear and chemical waste storage facilities, enterprises with toxic and highly toxic substances, hazardous waste and technological processes, environmental, man-made industrial and transport accidents, explosions, dam breaks and emissions of hazardous substances, large fires, epidemics, massive infectious diseases of people and animals, damage to agricultural plants by diseases, weeds and pests.*

According to sub-national risk index INFORM for 2021 Tajikistan is in the high risk class for the Central Asian countries, followed by Kyrgyzstan in the class of average risk, Uzbekistan in the class of low-risk and Kazakhstan with Turkmenistan in the class very low risk.

The INFORM subnational risk index for this region combines 62 different indicators that measure three dimensions of risk: hazard and impact, vulnerability and lack of coping capacity.



Picture. 2 Average values of the risk index for CA countries ⁴



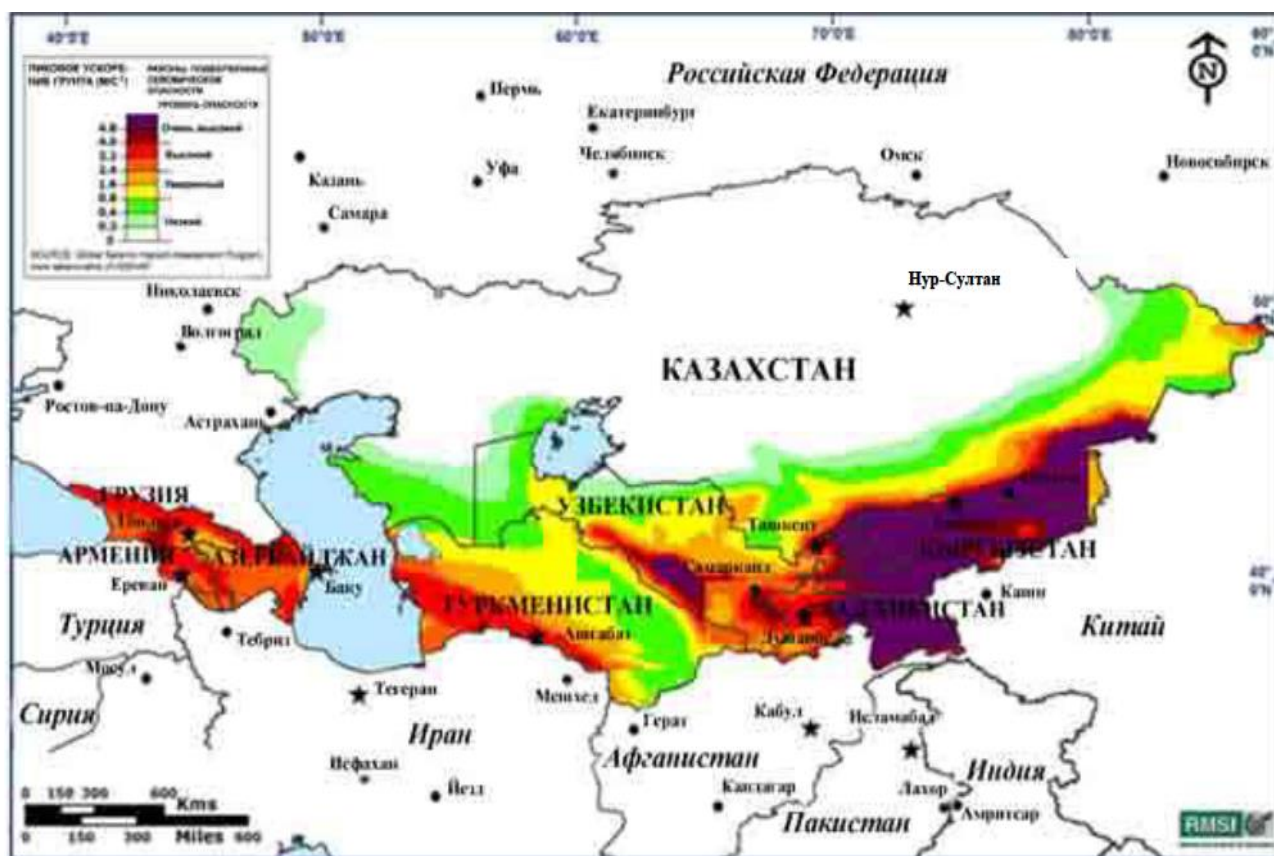
2.1. NATURAL RISKS

2.1.1. Earthquakes

Earthquakes represent by almost all major indicators the predominant disaster risk factor in Central Asia, especially in cities and densely populated areas.

The housing, services, finance, industry and commerce sectors are most affected by earthquakes, and they are primarily concentrated in cities and towns.

Seismological services in most countries in the region record about 3,000 tremors of varying intensity annually.



Picture. 4 Map of seismic threat for CA region ⁶

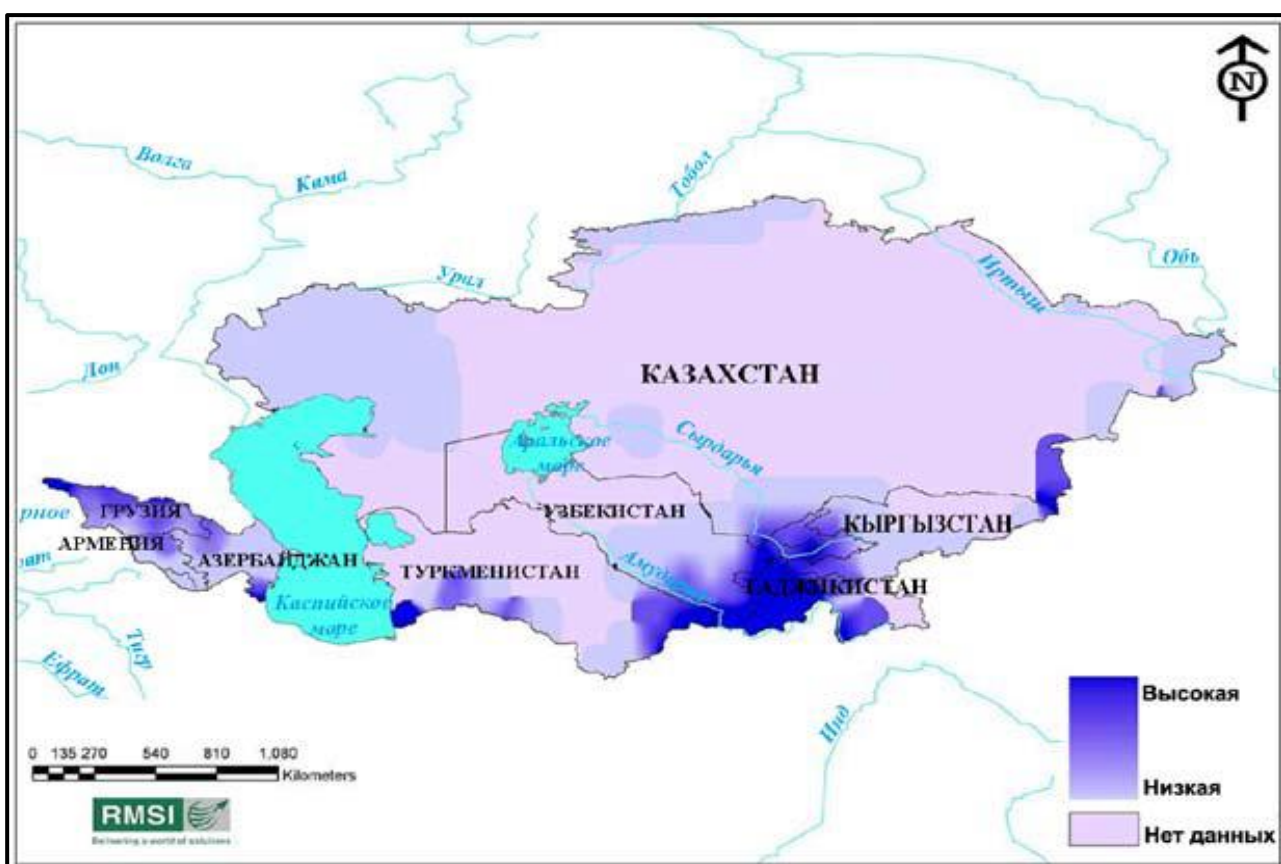
The secondary effects of earthquakes can be quite devastating. Seismic activity can trigger or accelerate other threats, including landslides, landfalls, mudflows, soil liquefaction, glacial lake formation and flooding.

Most of them (floods and mudflows due to dam failures, outbursts of alpine lakes and spills of toxic substances) can have serious transboundary consequences.

There is a lot of convincing evidence of the destructive force of earthquakes and the secondary factors provoked by them, for example: landslides, mudflows and debris flows became the main cause of deaths during earthquakes that occurred in Kazakhstan (Almaty, 1887, 1889 and 1911), Kyrgyzstan (Jalalabad, 1992.), Tajikistan (Khoyeet, 1949, Gissar, 1989), Turkmenistan (1948) and Uzbekistan (Tashkent, 1966).

2.1.2. Flooding, floods and mudflows

The threat of mudflows, flooding and floods is the second most important threat in CA region. The region has a mountainous relief and its territory is crossed by several hundreds of large and small rivers and their tributaries. Floods on these rivers are often accompanied by large mudflows.



Picture. 5 Flood hazard map in CA⁷

Floods, flooding and mudflows are the most frequent disasters caused by natural hazards in Central Asia, especially in the basins of the region's largest rivers, the Amu Darya and Syr Darya, and they cause significant damage to housing, infrastructure and agriculture, mainly in rural areas.

Although the total amount of water resources remains fairly stable, the annual and seasonal hydrological variability in these river basins has become more pronounced. Since 2005, the number of years with a high-water level has increased by 1.2-1.4 times, and with an excessively high-water level - by 2.0-2.5 times.

In recent decades, there has been an increase in the number of mudflows, the frequency of their recurrence is directly related to the cycles of rainy and dry years.

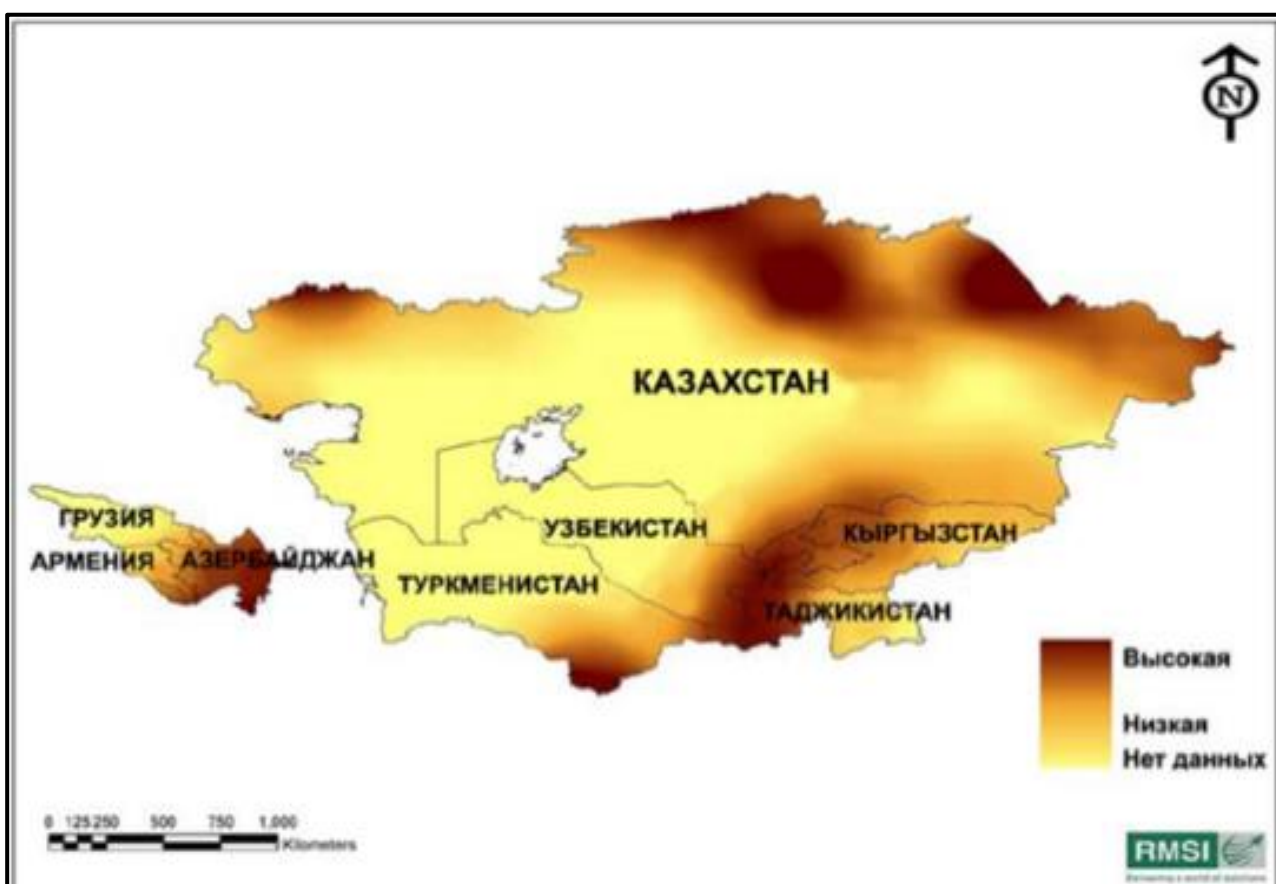
There are thousands of lakes and artificial reservoirs in the mountains of Central Asia. When their natural and artificial dams are damaged as the result of intensive melting of snow, outburst of glacial lakes, mudflows and floods occur, which often leads to damage to settlements and infrastructure in the regions lying below. The large volume of water release from the breakthrough of dams of glacial lakes and large reservoir results floods and mudflows, often leading to large-scale and transboundary emergencies.

2.1.3. Droughts

Droughts are the next most important threat in CA region. Droughts on various scales occur almost every year. A severe meteorological drought (rainfall deficit of 50% or more) occurs in the foothills about three times a century, while a moderate drought (seasonal rainfall deficit of 20-25%) occurs at intervals of three to four years. In desert and semi-desert regions, droughts are more frequent (deficit of precipitation of 50% or more every 10 years; deficit of 20% every five years).

A severe meteorological drought struck Central Asia in 2000-2001, when most countries experienced a 30-70% rainfall deficit combined with above average temperatures. As a result of the 2000 drought, in Central and Southeast Asia and the Caucasus, about 60 million people were affected and very large economic losses were caused.

The effects of drought are being felt more strongly in rural areas. The socio-economic vulnerability of the region to drought is mainly related to rural development, agriculture and water management.



Picture. 6 Drought hazard map in CA ⁸

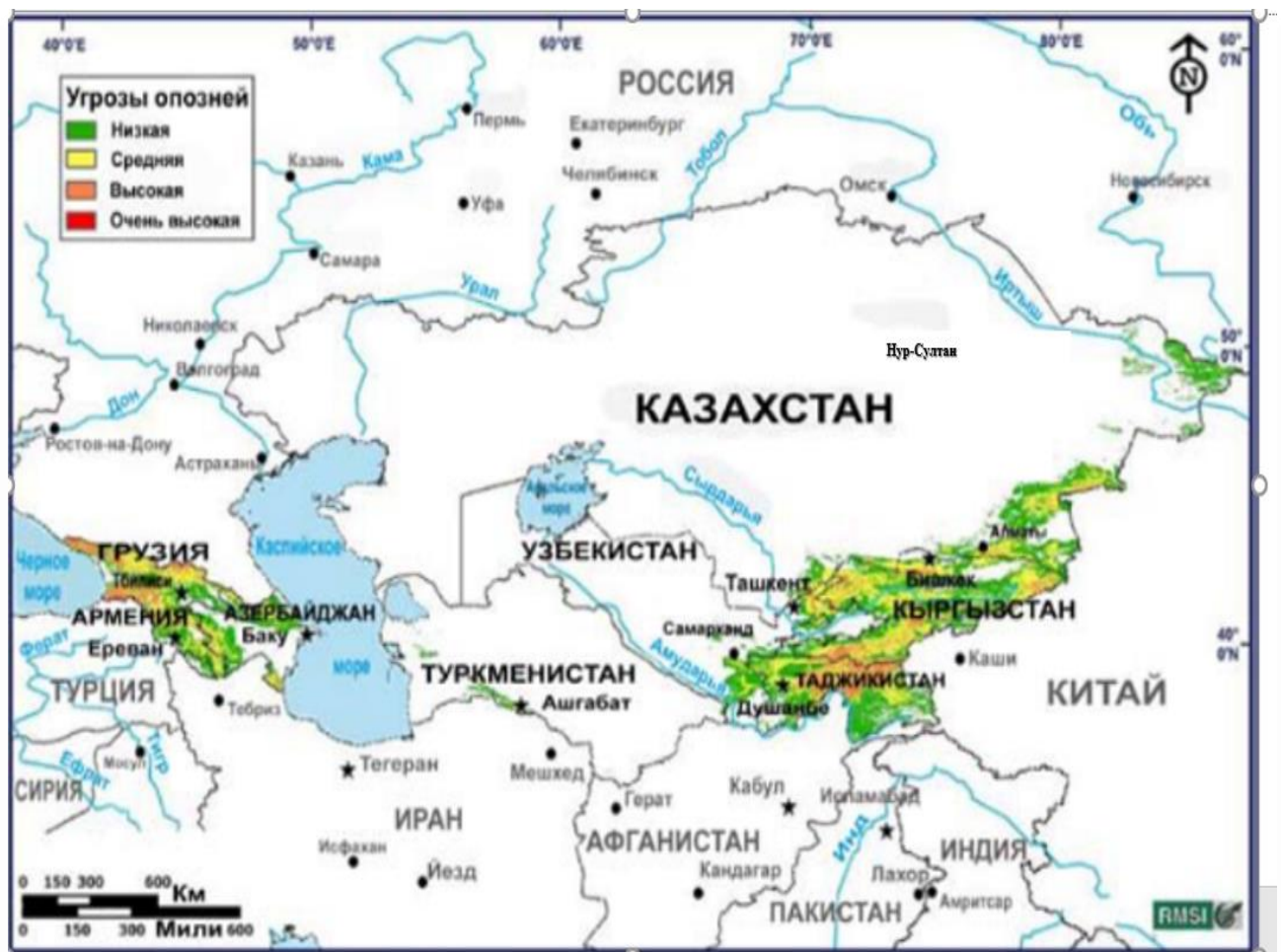
2.1.4. Landslides

Landslides are common in the mountainous regions of Central Asia and are one of the most common natural disaster risks (Figure 8). Moreover, the largest of them are often caused by earthquakes and floods. They are

triggered by an increase in the steepness of slopes, seismic events, meteorological and hydrological anomalies, as well as various anthropogenic processes. Most often, landslides occur in foothill and mountainous areas at an altitude of 1000 to 2400 meters above sea level on slopes of 19 degrees or more.

Landslides mainly affect housing and infrastructure in rural areas. Landslides can also lead to transboundary consequences due to the destruction of tailing dumps, mining dumps and the release of toxic substances contained in them, especially in the Fergana Valley.

[Initiative for Disaster Risk Management in Central Asia and the Caucasus](#)



Picture. 7 Landslide threats map in Central Asia ⁹

2.1.5. Snow avalanches. Landfalls. Rockfalls.

Snow avalanches are particularly dangerous hydrometeorological natural phenomena that pose a danger to humans, structures, transport communications, energy bridges and communication lines.

Modern mountain roads in the Central Asian region are generally poorly planned and poorly designed due to the complexity of the terrain, sparsely populated and scarce government budgets for road construction. This is especially true for the Tien Shan and Pamirs, which cover most of Kyrgyzstan, Tajikistan, with extremely rugged terrain, where many local transport corridors are dirt roads, paths, animal trails and motorcycle routes.

Snow avalanches, landfalls and rockfalls block roads, often leading to emergencies. Cutting roads through mountainous terrain increases rockfalls, especially where the bedrock has natural cracks along which the road is laid. And these dangers exist not only for roads cut into mountain slopes. Roads in valleys in the Pamir and Tien Shan often cross large cones of rock, which periodically collapse over large sections of the road network, blocking them.

2.2. MAN-MADE RISKS

The region is home to many tailings and waste dumps, as well as poorly managed urban dumps, pesticide and hazardous chemical waste storage facilities, which are mostly located in densely populated areas. Some of these facilities are located in border areas, thus posing a risk of transboundary contamination of soil, air and water.

[9 Initiative on Disaster Risk Management in Central Asia and the Caucasus](#)

The water management infrastructure of Central Asia consists of hundreds of reservoirs, dams, irrigation systems and pumping stations, many canals and dozens of hydroelectric complexes for complex purposes. Here is the world's highest rock-fill dam - Nurek, 300 meters high on the river. Vakhsh in Tajikistan, and one of the longest canals in the world - the Karakum Canal with the length of more than 1100 km, through which from the transboundary river. Amu Darya about half of the water used in the country.

Of the more than 1200 dams of the region, 110 are classified as large structures. Many dams are located in the basins of transboundary rivers, such as the Amu Darya, Syrdarya, Ili, Irtysh and are of interstate importance. For the territories of countries located downstream of rivers, the break of any dam can have the most devastating consequences.

The presence in the region of industrial enterprises, including facilities of the metallurgical, oil and coal mining industries, mining, as well as vehicles, in particular the multiple increase in cars and trucks, has led to a sharp increase in man-made emergencies: transport accidents (disasters), fires, explosions, accidents with release of chemically hazardous chemical substances, sudden collapses of structures, accidents on electrical and energy systems or communal life-supporting systems, accidents at industrial waste treatment facilities, road transport accidents.

2.3. ENVIRONMENTAL RISKS

The most serious environmental risks in the region are associated with inefficient use of water resources, problems in transboundary water resources management, high consumption of energy and natural resources, as well as extensive development of the industrial sector, and water scarcity as the direct consequence of climate change.

Climate change in the region has turned into a real threat to the life and economic activities of people, which is inevitably reflected in the social sphere - a decline in living standards, loss of property, the need to leave their homes, etc.

The exacerbation of degradation of biodiversity, natural habitats and ecosystems due to climate stressors increases the vulnerability of the poor and rural areas, which largely lacks the financial or political capacity to cope with growing challenges.

Over the past 50 years, the rise in temperature has significantly affected the decrease in both snow cover in the mountains and the volume of glaciers. The climate in the region has become noticeably warmer. In all countries, the average annual temperature has risen from 0.10°C to 0.31°C every ten years. This is well above the global trend (0.06°C).

One of the largest in the recent history of global environmental disasters experienced by the countries and population of Central Asia is the tragedy of the Aral Sea, which in terms of its ecological, climatic, socio-economic and humanitarian consequences poses a direct threat to the sustainable development of the region, health, gene pool and the future of the people living in it.

The direct consequence of the drying up of the sea is the dramatic climate change, impacting not only Central Asia, but also other regions. The Aral Sea crisis zone directly covers the territories of Turkmenistan, Kazakhstan and Uzbekistan, as well as indirectly - Tajikistan and Kyrgyzstan.

2.4. BIOLOGICAL AND SOCIAL RISKS

The region is prone to local outbreaks and epidemics of infectious diseases of humans and animals, damage to agricultural plants by diseases, weeds and pests. In some countries of Central Asia, there are minor outbreaks of infectious diseases such as cholera, malaria, anthrax, meningococcal meningitis, measles and others.

The COVID-19 pandemic, which has affected all countries in the region except Turkmenistan, turned out to be the most serious disaster in 2020, and which entails loss of life, harm to human health or the environment, significant material damage and disruption of the living conditions of tens of millions of people.

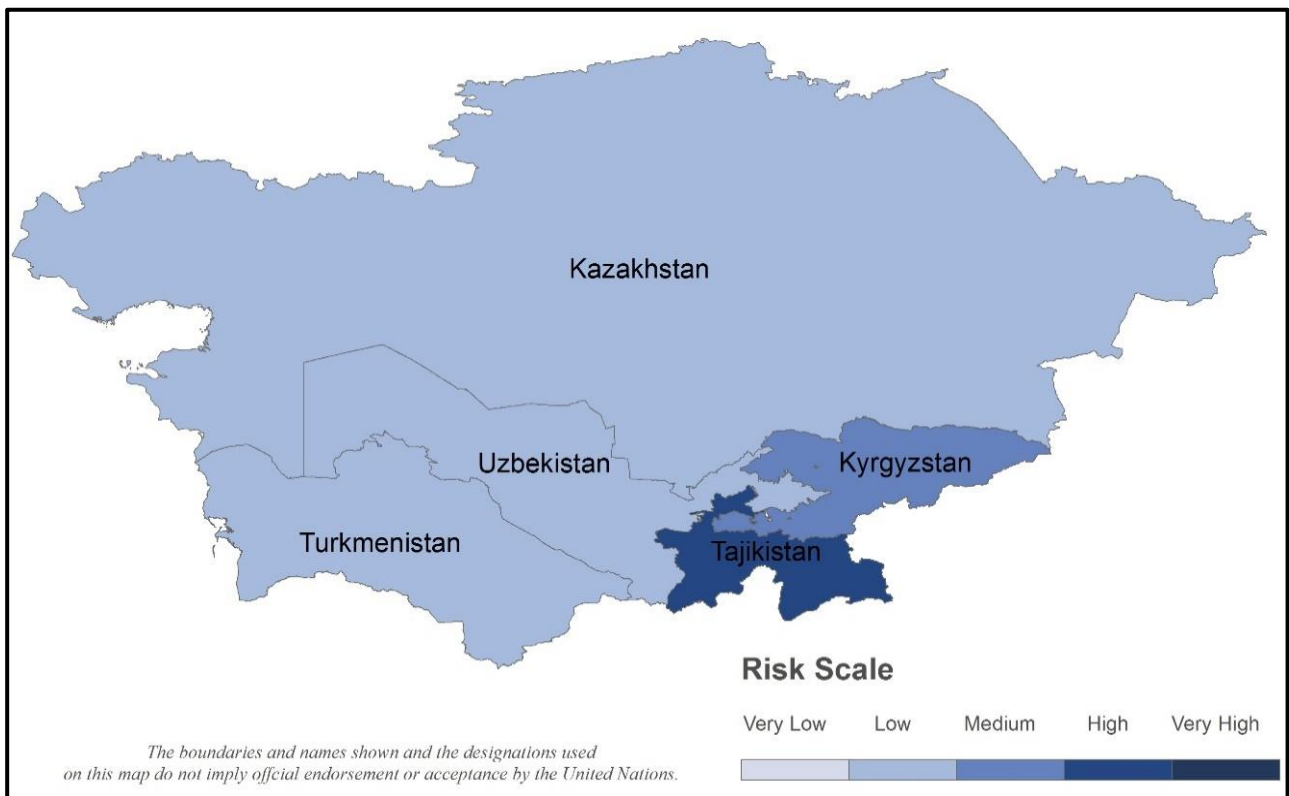
PART 3: VULNERABILITY

The results of the vulnerability assessment show that only Tajikistan is in the higher risk category, while the rest of the countries face a lower risk of vulnerability. The increased risk of vulnerability in Tajikistan is a result of the high risk in the measurement of vulnerable groups (extremely low indicator of food availability), while the risk in socio-economic vulnerability is lower.

The Kyrgyz Republic is at high risk of vulnerability due to a very high dependence on aid (remittances and international aid), which leads to a high value of the socio-economic vulnerability component of the dimension.

On the other hand, Uzbekistan and Turkmenistan are in the zone of medium risk vulnerability due to significant increases in risk in both dimensions of the vulnerability dimension, while the values for Kazakhstan indicate low vulnerability risk.

Vulnerability risk classes at the national level are shown on the map (Figure 8) and the values are presented in the following Table.



Picture. 8 Vulnerability of CA countries ¹⁰

[10 Caucasus and Central Asia Subnational INFORM Risk Index 2021](#)

3.1. Economic vulnerability

Central Asia's economy is highly vulnerable to natural disasters. The World Bank estimates the potential losses of Central Asian countries from 5% to 70% of GDP.

Several factors increase the vulnerability of Central Asian economies to natural disasters. Most countries have specialized, export-dependent economies that are vulnerable to external shocks. This increases the funding gap for the implementation of the DRR package.

According to the assessment of the INFORM subnational model, indicators of development, inequality and dependence on social assistance were taken into account in the category of socio-economic vulnerability. The following population groups were identified as vulnerable - stateless persons, applicants for citizenship, ethnic diversity, groups with various diseases (HIV, tuberculosis, covid-19), children under 5 years of age, food availability and recent shocks (population affected by emergencies for last 3 years).

The region's economy is particularly vulnerable to the meteorological hazards associated with climate change. The climate of the region has become noticeably warmer. In all countries, the average annual temperature rose by 0.10–0.31 °C every ten years above the global trend (0.06 °C).

In general, due to the rise in temperature, aridity has increased. The variability of precipitation has increased both over the years and over the seasons. Heavy showers (15-20 mm or more in 24 hours) became more frequent and irregular.

Industries directly dependent on weather conditions, such as agriculture, in CA countries account for 40% to 60% of GDP. Their importance is compounded by the fact that the majority of the region's population lives in rural areas and, due to the lack of jobs outside the agricultural sector, remains highly dependent on agricultural production for their livelihoods.

In 2020, Central Asian countries, along with the coronavirus, faced a massive locust outbreak - the largest disaster of this magnitude in the last 20 years. Due to favorable weather conditions, the infestation of locusts was encountered by Turkmenistan, Uzbekistan, Kazakhstan and Tajikistan. Locusts, devouring vegetation in their path, destroy crops in the regions. The damage caused by pests, coupled with reduced food production and a downturn in global trade as a result of the coronavirus pandemic, has raised concerns about possible food shortages. According to FAO, a flock of insects in an area of just one square kilometer can hold "approximately 40 million individuals of locusts, which are able to consume per day as much food as they can eat 35 thousand people."

3.2. Structural vulnerability

Structural vulnerability is primarily related to housing stock and infrastructure. A strong earthquake can significantly damage housing and communications.

Infrastructure, especially for water diversion, distribution and storage, remains vulnerable. In all countries, dams and other hydraulic structures built during the Soviet era deteriorated significantly as governments were only able to afford urgent repairs and the defenses on many riverbeds were severely worn out.

Similar to the construction of buildings, for example, a building is considered vulnerable to earthquake shocks if there are no elements in its structure that would withstand the impact of such shocks.

The high degree of vulnerability of the population and territory of the countries of the region from strong earthquakes and their secondary factors is often determined not by the very fact of the threat or occurrence of strong earthquakes, but by the physical condition, seismic stability of residential buildings, public buildings and structures. It is not earthquakes that injure and kill people, but earthquake-resistant buildings and structures that are destroyed as a result of their occurrence. For example, in the region there is a problem with large cities that are located in areas of high seismic hazard and in which catastrophic situations can arise as a result of strong earthquakes. The reason is that in the cities there is a sufficient number of dilapidated, not earthquake-resistant housing, erected in the 40-60s of the last century, both one-story residential buildings and high-rise buildings (stalinka, khrushchevka). In addition, as some experts say, it is possible that some modern high-rise buildings newly erected by individual limited liability companies may also be built with violations of Building code.

Sources:

1	<u>Caucasus and Central Asia-Subnational INFORM 2021</u>
2	<u>World Bank, Europe and Central Asia Country Risk Profiles for Floods and Earthquakes, 2017.html</u>
3	<u>Central Asia and Caucasus Disaster Risk Management Initiative</u>