WEATHERING RISK

South Caucasus Climate Impact Profile

Summary for policymakers

The South Caucasus region (Armenia, Azerbaijan and Georgia) is particularly vulnerable to the impacts of climate change. This profile provides an overview of climate trends for near-term (2020–39) and medium-term (2040–59) time periods across the region under the higher-emission SSP3-7.0 scenario with regional conflicts and lower-emission SSP1-2.6 scenario with greater international collaboration, and their impacts across different sectors. Temperature and precipitation patterns across the region vary greatly depending on elevation and season. At lower elevations, both annual and monthly temperatures tend to be warmer, while higher elevations experience cooler temperatures. Precipitation generally decreases from west to east and with lower elevation. Over the last 50 years, mean temperatures have been increasing across all three countries, while observed precipitation across the region has experienced substantial interannual variation.

Climate Trends

Temperature

Mean annual and seasonal temperatures are projected to increase significantly by mid-century, rising at uneven rates across the region. Under the SSP3-7.0 scenario, Armenia sees the greatest national mean temperature increase. Under the SSP1-2.6 scenario, mean temperature rises are slightly higher in the near term but much less by mid-century. Significant temperature increases across the South Caucasus are on average expected to shift the typical climates of many subnational regions towards those currently found at lower and relatively warmer elevations, resulting in widespread changes to local climate conditions by mid-century – even if emissions are kept relatively low. The highest combined heat risks[1] under both scenarios appear in Azerbaijan's lowland plains and Caspian coast during July and August, expanding across the Kura-Aras Lowland by mid-century. Very high heat risk remains largely confined to Armenia's Ararat Valley, while in Georgia such risks are limited to Kvemo Kartli, Kakheti and the coast under SSP1-2.6, but spread throughout the Kolkheti Plain under SSP3-7.0. Mountainous regions in Armenia and Georgia face major increases in maximum daytime temperatures above 25°C under SSP3-7.0, with higher elevations seeing sharp declines in frost days.

Precipitation

Under SSP1-2.6, average annual national precipitation may slightly increase by mid-century, while SSP3-7.0 projects substantial decreases. By mid-century, SSP1-2.6 shows the largest annual precipitation rise in Azerbaijan (best estimate: +13.65 mm, range: -30.44 mm to +46.68 mm possible). In contrast, SSP3-7.0 predicts annual decreases with relatively stronger model agreement, indicating higher overall certainty (best estimate: -26.25 mm in Georgia, -21.60 mm in Armenia and -12.78 mm in Azerbaijan), though the range of possible outcomes are generally wider, as detailed in text. Under SSP3-7.0, the greatest seasonal declines are expected along the Black Sea coast by mid-century. Armenia and Azerbaijan, which are already drier than Georgia, are projected to experience significant seasonal percentage declines from historical averages over this timeframe and scenario. Under SSP1-2.6, the largest five-day precipitation events are projected to increase most in western Georgia, southern Armenia and western Azerbaijan. Despite overall declines under SSP3-7.0, precipitation intensity is expected to rise seasonally in some areas by mid-century. The frequency of the largest five-day precipitation events at 50-year and 100-year intervals is also projected to increase in northern Armenia and the Ararat Valley by mid-century.

Floods and Droughts

The three South Caucasus countries simultaneously face high flood and moderate-to-extreme water stress risks due to rising temperatures affecting alpine glaciers and snowpack, changes in precipitation patterns and soil moisture, growing water demand, and reduced transboundary river flows. In the longer term, depleted glacial reserves will lower runoff and change seasonal flood patterns, which vary regionally. By mid-century, 100-year riverine flood events with inundation levels greater than 1 m increase significantly under a high-emission scenario, with associated risk levels expanding across lower and middle segments of many of the region's major rivers and tributaries. Intense precipitation continues to pose flood risks, threatening settlements and infrastructure, while higher temperatures and less summer precipitation increase drought risks regionwide under both scenarios. By mid-century, SSP3-7.0 projections indicate reduced summer precipitation in the Kura-Aras Basin, increasing the risk of water shortages and hydrological droughts that could lead to conflicts over water use.

Coastal Zone and Sea-Level Change

Georgia's Black Sea coastline, which is vital for trade and ecosystem services, is at significant risk from sea level rise, especially under SSP3-7.0, with many coastal locations facing a best-estimate sea level rise of 21 cm by mid-century and 60 cm likely by end-of-century (range of possible outcomes provided in text). Due to vertical land motion, the coastal town of Poti could experience even higher sea level rise than the rest of the Black Sea coastline (best estimate: 41 cm by mid-century and 1.03 m by end-of-century, with the range of possible outcomes provided in text). In contrast, the Caspian Sea is expected to experience declining water levels under both scenarios, threatening coastal infrastructure, food security and local economies.

Projected Sectoral Impacts

Human Health

Climate-related health risks – including heat stress, and vector, food and water-borne diseases – are likely to worsen over the near and medium term, and disproportionately affect the most vulnerable population groups. Under SSP3-7.0, high-to-extreme heat risks are projected in the near term for Tbilisi, Georgia's Kolkheti Plain and eastern valleys, as well as Aran, Ganja-Gazakh, the Absheron Peninsula and other lowlands in Azerbaijan. By mid-century, these risks are expected to extend further into Guba-Khachmaz, Yukhari Garabakh and the Ararat Valley. Risks of vector-borne diseases – including tularemia, Crimean-Congo hemorrhagic fever, tick-borne encephalitis, anthrax and leptospirosis – are projected to increase, with the highest risk projected for Tbilisi and Yerevan.

Food and Agriculture

Rising temperatures and shifting precipitation patterns in the South Caucasus are increasing extreme heat risks, water demand and scarcity, leading to reduced overall crop yields and threatening food security across the region, particularly for vulnerable rural populations. In addition, livestock production – a significant component of GDP in both Armenia and Georgia – is adversely affected, undermining local livelihoods, particularly in mountainous rural areas. By mid-century under SSP3-7.0, most watershed basins across the region will experience moderately high or extreme water stress, intensifying droughts, desertification and competition for water.

Critical Infrastructure and Economy

Economic activities and infrastructure in the South Caucasus are increasingly threatened by climate impacts such as extreme temperatures, droughts and flooding, which also heighten geological hazards such as landslides and mudslides. While warmer winters are expected to bring annual net energy savings due to reduced heating needs across all three countries by mid-century under SSP3-7.0, climate impacts continue to threaten critical infrastructure, for example, by straining vital hydropower capacity given lower summer precipitation yet increased cooling demand. Increasing risks from climate-driven landslides and mudslides place additional pressure on east-west rail services, and strategic oil and gas pipelines between Europe and Asia – particularly in Georgia – which could threaten energy security beyond the region.

Human Displacement

Climate-related impacts compound high levels of internal displacement in the South Caucasus resulting from years of episodic conflict and violence, leaving many households in need of additional social, economic and psychological support, and increasing the vulnerability of internally displaced persons (IDPs) living in inadequate housing, with limited services and restricted livelihood opportunities. These populations face heightened risks of flooding, droughts and resource degradation, which threaten both their safety and economic stability. Regions with the highest number of IDPs include Central Aran, Karabakh, Absheron-Khizi, Baku and much of Georgia. Due to conflicts in various areas (e.g., South Ossetia, Abkhazia and Nagorno-Karabakh), many people live in protracted displacement. Floods and geological hazards pose the greatest climate risks, with regions such as Inguri, Lower Rioni and the Kura-Aras Lowland facing increasing flood threats, while mudslide and landslide risks are rising in western Georgia, Shaki-Zaqatala, and mountainous areas of Armenia and Azerbaijan.

Ecosystems

The Caucasus Ecoregion is a global biodiversity hotspot, but both terrestrial and aquatic ecosystems in the South Caucasus are increasingly threatened by rising temperatures, droughts, wildfires and floods, with many sensitive landscapes lacking adequate protection, especially across political borders. The region's rich biodiversity – including globally unique plant species and extensive forests – faces threats such as shifting forest composition, expanding desertification, and the loss of high mountain and endemic habitats. These climate impacts are particularly acute for species that are unable to migrate to more suitable areas, highlighting the urgent need for stronger transboundary conservation and biodiversity protection efforts.

I Combined heat risk refers to the cumulative threat posed by high temperatures, frequent and prolonged heatwaves, and their associated impacts on human health, agriculture and critical infrastructure.