SITUATION OVERVIEW

Climate Change in Afghanistan - What is known?

September 2025 | Afghanistan

1. Context & Rationale

Climate change is a global phenomenon, yet its impacts differ strongly by location. Different regions are getting either wetter or drier, temperature increases may differ by orders of magnitude, with natural hazards uniquely linked to local conditions.[1] Understanding these changes is essential to reducing disaster risks, adapting to adverse climate changes, but also leveraging potential gains. This report seeks to improve accessibility of existing research on climate change in Afghanistan to facilitate climate mainstreaming in the humanitarian and basic needs sectors.

The report begins with an overview of the specific climatic changes expected in Afghanistan, as well as their variations across the country. The next section focuses on humanitarian and basic needs impacts, helping aid actors to anticipate shifting needs, as well as identifying new opportunities arising from climate change. Thereafter, vulnerable populations, which may require additional assistance, are briefly discussed. Community perspectives and existing adaptation strategies are reviewed in order to facilitate program design. In the final section, conclusions are offered and research gaps are highlighted.

Key Messages

- Temperatures in Afghanistan have been rising rapidly, exceeding global rates. This is increasing heat stress, which is the leading cause of weather-related deaths globally.
- Higher temperatures increase evapotranspiration, linked to increased risks of agricultural drought, increased water demand, and reduced water supply. Next to crop failures, recurring droughts contribute to long-term depletion of water resources. At least in the short-term, water from glacier melt may compensate for this.
- Precipitation trends are uncertain, but most predictions show no changes. However, temperatures will shift snow to rainfall. Alongside earlier and more rapid snowmelt and glacier melt, this increases the risk of spring flooding.
- Substantial research gaps persist. Historic climate data is incomplete, limiting researchers' abilities to model climate changes. Additionally, there is a lack of data capturing community perceptions, adaptive capacities, coping strategies, and priorities.

2. Methodology Overview

This situation overview is based on secondary data. It is a non-systematic scoping literature review, with the aim of identifying literature that speaks to climate change in Afghanistan. Additionally, geospatial data was used for mapping purposes.

The focus of the literature review was on academic journal articles (56 articles included), which were primarily identified through Google Scholar using search terms such as "climate change Afghanistan" but also searches for specific dimensions of climate change as relate to drought, flooding, glaciers, river flow, and such. Note that REACH relies primarily on open access sources, and so the synthesis will necessarily exclude key articles.

Grey literature, such as UN documents, humanitarian reports, working papers, and similar (23 sources included) complemented these academic articles. It contributes dimensions such as population perceptions of climate change.

Limitations include:

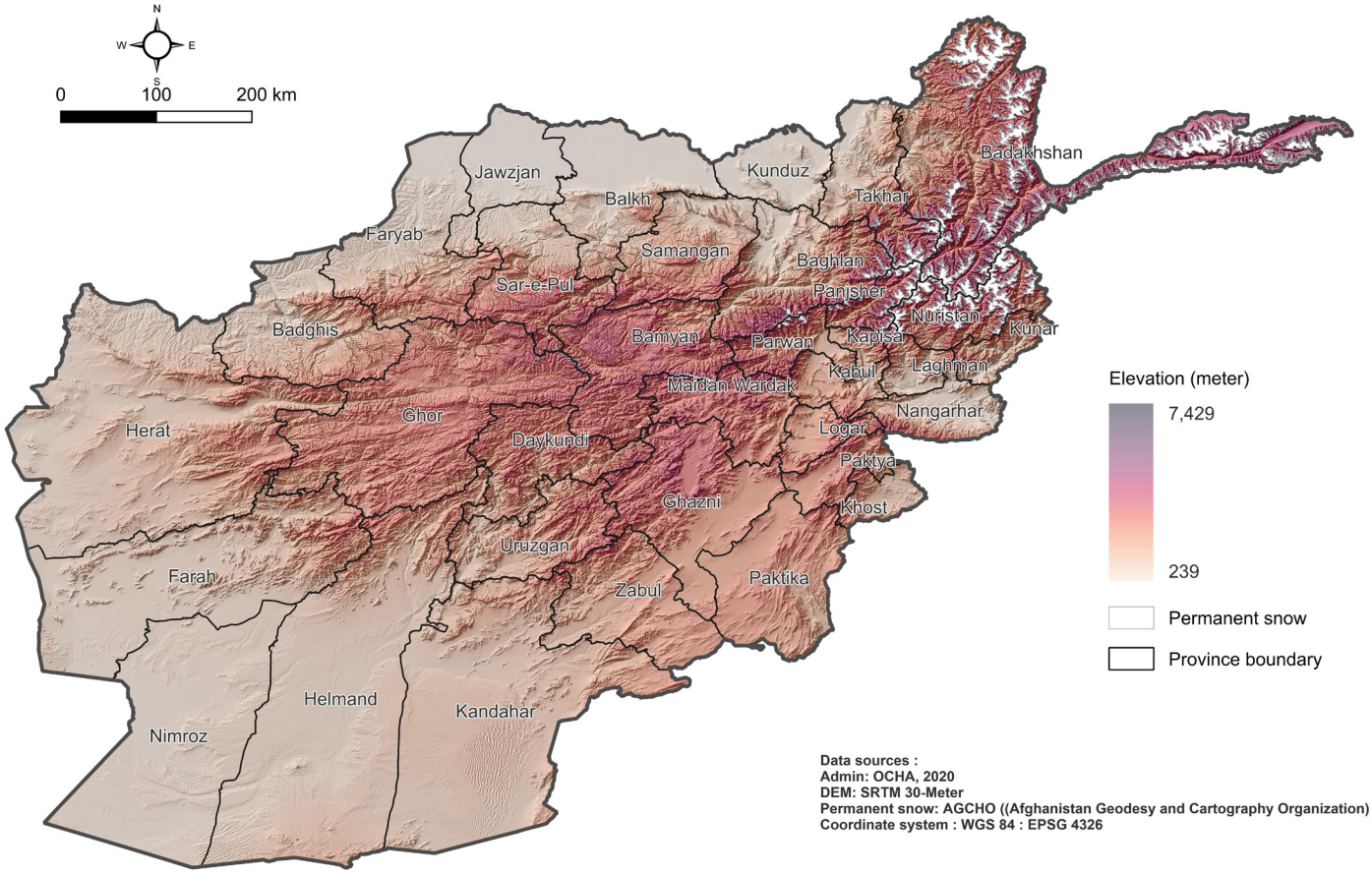
- Reliance on open-access sources, which may exclude relevant literature.
- Due to recurring and persistent conflict, substantial gaps in historical data exist and have limited research.
- No systematic methodology was employed for this literature review, due to which biases may have been introduced and key research may have been omitted.

3. The Changing Climate in Afghanistan

Afghanistan's geography is dominated by the Hindu Kush Mountains, reaching up to almost 7,500 m on the far eastern border to Pakistan (see map 1). The high elevation areas in the far northeast have a polar tundra climate. By contrast, the southwest has an average elevation of 900 m with a hot arid desert climate.[1,2] Between these extremes are the Central Highlands, the majority of which lie at 2,000 to 3,000 m elevation. They are classified as cold, with dry summers which may be either cold, warm, or hot.[3]

Central, western, and southern Afghanistan is dominated by agro-pastoral livelihoods zones (see map 2). This includes nomad livestock herders (Kuchi), which migrate to the Central Highlands during the summer months while spending the winters in the warmer southern areas. Irrigated agriculture is also present, centred around major rivers. By contrast, northern and eastern Afghanistan sees substantially more rainfall. Here, rainfed agriculture is commonly practiced, alongside irrigated agriculture and agro-pastoralism.

Map 1: Topography of Afghanistan



a. Meteorological trends

Temperatures

Temperatures in Afghanistan have been increasing rapidly[4–9] – more rapidly than the global average[4,8,10] – and are projected to continue rising due to climate change.[4,5,8,11] Trends in annual temperatures, based on a combination of historical data and modelling by the European Centre for Medium-Range Weather Forecasts (ECMWF), are shown in figure 1.[12]

Due to conflict, there are large gaps in meteorological records for Afghanistan, leading to uncertainties in estimates of temperature changes.[a] However, a widely cited estimate by the National Environmental Protection Agency (NEPA) and UN Environment (UNEP) indicated that mean annual temperature increased by 1.8°C between 1950 and 2010.[13] Substantial spatial differences exist. The greatest increases in mean temperatures were recorded in the south and west, areas that are already experiencing some of the highest temperatures in Afghanistan.[4,7,14] These areas primarily see agro-pastoral livelihoods.

Future projections indicate that temperatures will continue to rise towards the middle and end of the century, with higher global emissions leading to substantially higher temperature increases in Afghanistan. NEPA and UNEP projected by 2050 a 1.5°C warming under the lowest emissions scenario (RCP 2.6), up to 2°C under the highest emissions scenario (RCP 8.5 "business as usual"), compared to the 1986-2005 period.[13] Depending on the emissions scenarios, temperatures may either stabilise, or warming may accelerate. Figures 2 and 3 show projected mean annual temperatures for Afghanistan.[15] Under the

[a] Aich et al report monthly weather data to have been available for 7 stations only, for varying periods between 1958-1988. Data from the 1970s onwards was reported to be scarce due to conflict and government policies.[4]

Figure 1: Annual average temperature trends for Afghanistan, based on historical data and modelling[12]

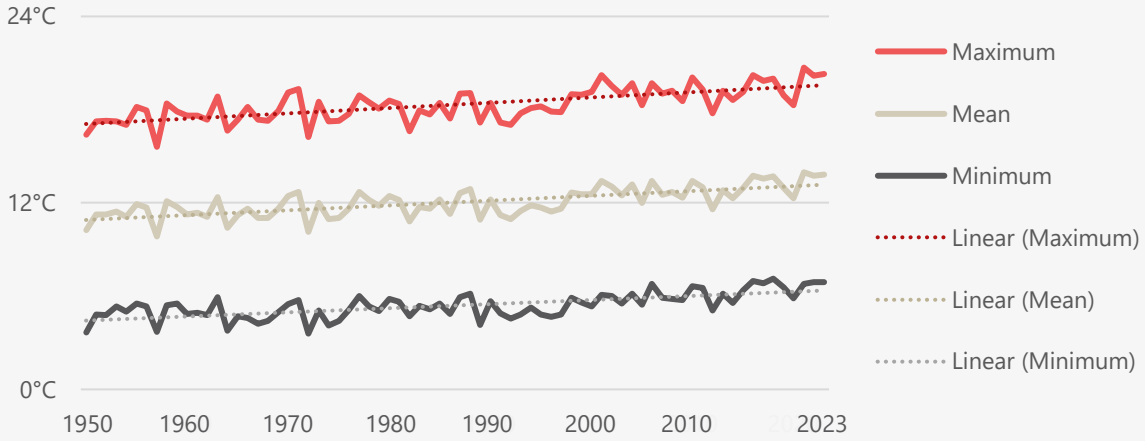


Figure 1 shows clear trends in annual averages. Not shown here are temperature extremes.

The coldest day across Afghanistan in a year (minimum of daily minimums) has similarly warmed, from around -15.9°C in 1950-1970, to -14.9°C in 2004-2023. The hottest day increased from 34.8°C to 36.2°C in the same period.

lowest emissions scenario (RCP 2.6), shown in figure 2, temperatures increase until the 2040s and then stabilise at a level around 1.5°C higher than the 1995-2014 average. Under the highest emissions scenario (RCP 8.5), shown in figure 3, temperatures continue to rise until 2080-2099, reaching levels almost 6°C higher than in 1995-2014.

This is substantially higher than the global average of 3.7°C.[8] Temperature trends are largely consistent across Afghanistan, though with larger increases registered in higher elevation areas.[4,15]

Figure 2: Mean annual temperature projections under optimistic emissions scenario (RCP 2.6)[13]

Explainer: These figures show box plots. Each dot represents the temperature projection from a specific climate model for a specific 20-year period. The horizontal lines in the middle of the boxes show the median model projection. The boxes themselves capture the middle half of model projections (i.e. the 25th up to the 75th percentiles). Larger boxes suggest greater uncertainty in predictions.

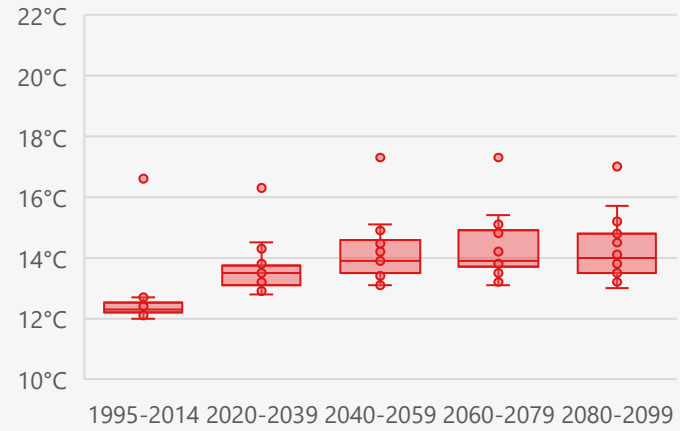


Figure 2 suggests increasing temperatures in the first half of the 21st century and subsequent stabilisation. The median projection is 1.6°C higher for 2080-99 than 1995-2014. The outliers are from the taiesm1 model.

Figure 3: Mean annual temperature projections under "business as usual" scenario (RCP 8.5)[13]

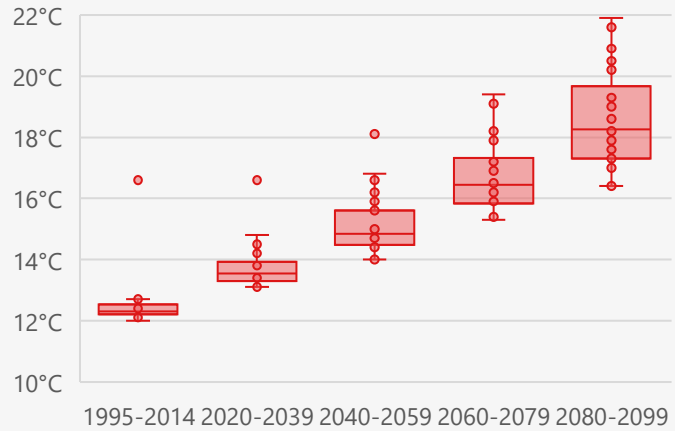


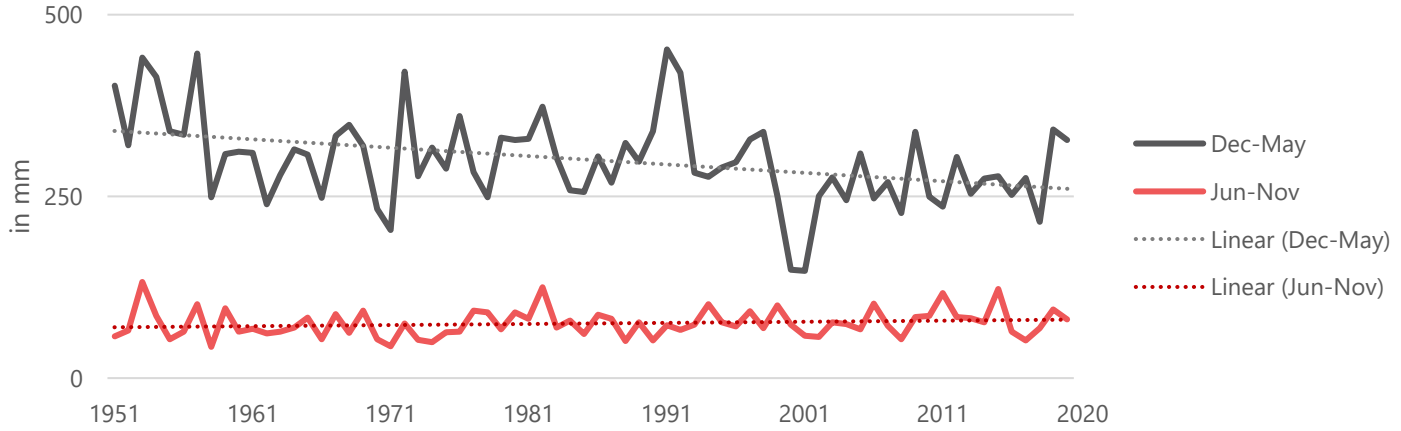
Figure 3 suggests increasing temperatures across the 21st century. The median prediction is 5.8°C higher in 2080-99 than in 1995-2014. The further into the future, the greater the variation between predictions, suggesting greater uncertainty. The outliers are from the taiesm1 model.

Precipitation

While temperature trends are clear, precipitation trends are far more variable. Most studies find that across Afghanistan, precipitation in spring has decreased somewhat, but this has been compensated by increases in summer and autumn rainfall.[4,5,8,9,16] These historical estimates are affected by the same lack of meteorological observations that have impacted temperature estimates. Historical trends are shown in figure 4.[12]

Uncertainty for future projections is even greater. Figures 5 and 6 show projections for the optimistic (RCP 2.6) and business as usual (RCP 8.5) emissions scenarios.[15] They show large variations in model projections, with some projecting major increases in precipitation. Median projections however suggest no changes in precipitation. Projections differ strongly by region. For instance, four out of five reviewed papers on the Kabul River Basin suggest future increases in precipitation.[16–20] By contrast, estimates for western or southwestern Afghanistan, which are already the driest areas of Afghanistan, suggest decreases.[7,8]

Figure 4: Cumulative precipitation trends for Afghanistan, based on historical data and modelling[12]



Note that even if precipitation levels remain stable, increasing temperatures are likely to have a drying effect due to higher evapotranspiration rates (i.e. loss of water from the soil and plants), leading to reduced soil moisture and agricultural drought,[21] as well as evaporation of surface water,[22] glacier melt,[23] and other dynamics. Further, reduced rainfall in spring may adversely impact water availability for rainfed winter crops.

b. Hydrological changes

Snowfall and Glaciers

Increasing temperatures are expected to cause a shift from snowfall to rainfall[24,25] and accelerate glacier melt.[23] This has major repercussions for Afghanistan, where around 80% of water resources benefit from snow and glacier melt.[26]

While research on glaciers in Afghanistan is scarce, it is estimated that over 13% of glacier area was lost between 1990-2015, at a rate of 5.3% loss per decade.[a,26] This indicates more rapid melt than the global average.[46] In the near-term, this increases water availability as more meltwater is available, a phenomenon called "glacial subsidy". However, once glaciers have retreated too far, this effect will be reversed.[26] Additionally, glacier melt causes increased formation of glacial lakes, in which meltwater fills up depressions left by melted glaciers, or else is naturally dammed by ice or debris. When these glacial lakes burst, they can cause devastating flooding; see section 3.c.[23,27,28]

Information on snowfall and snowcover is scarcely available. What is clear is that increasing temperatures are causing more precipitation in winter to fall as rain, causing earlier snowmelt, and declines in snow cover.[24] One study from the Panjshir sub-basin of Kabul River Basin for instance suggests that under the high emissions scenario, 12% of snow cover area by mid-century, as compared to the 2009-2015 baseline.[17]

River Flow

The dynamics of river flow are highly dependent on local conditions. For an overview of river basins in Afghanistan, see map 2. For instance, Sust catchment in the heavily

Figure 5: Mean annual precipication projections under optimistic scenario (RCP 2.6)[13]
from various models, by projection period

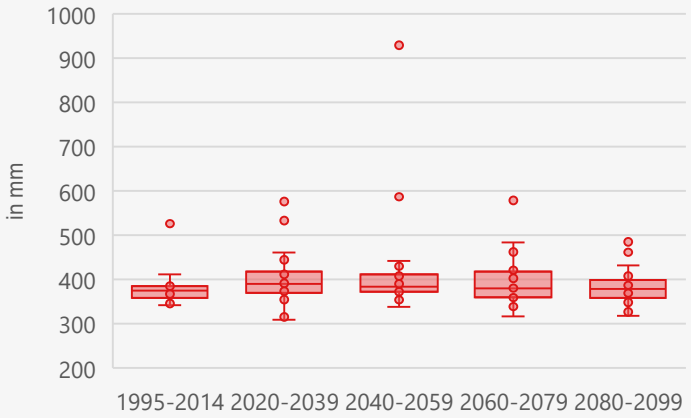


Figure 5 suggests stable precipitation levels across the 21st century. The outlier in the 2040-2059 period is from the access-cm2 model.

Fig 6: Mean annual precipication projections under "business as usual" scenario (RCP 8.5)[13]
from various models, by projection period

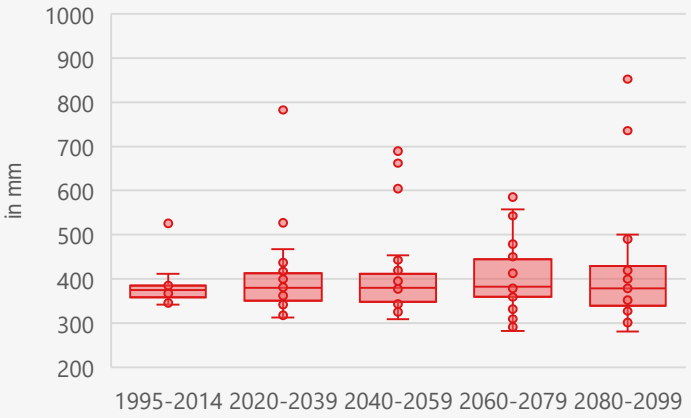
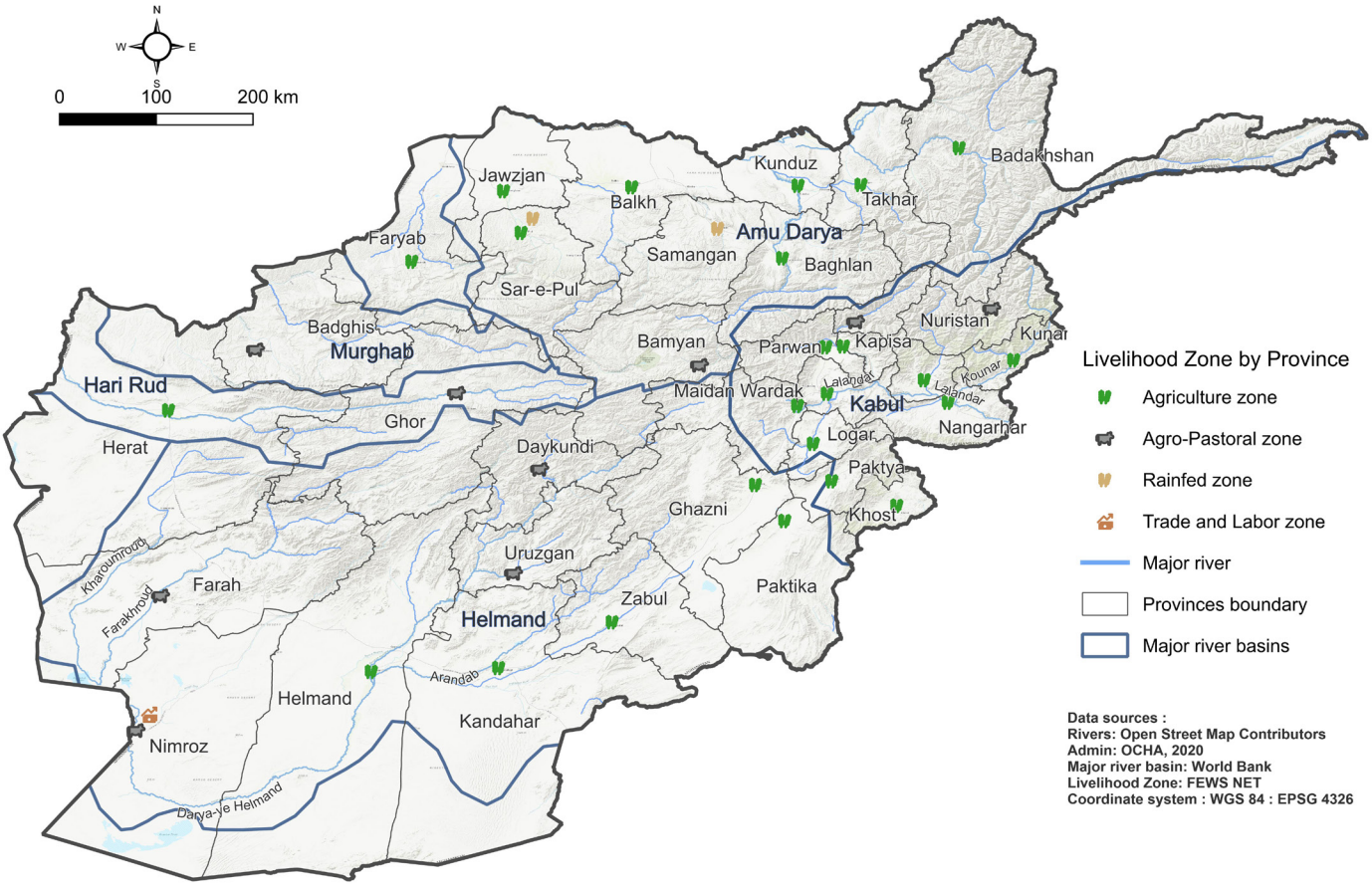


Figure 6 suggests stable precipiation levels across the 21st century, though with major variations between models. This suggests substantial uncertainty. Outliers are from various different models.

[a] Based on a rate of 0.54% loss per year.

Map 2: Rivers and Livelihoods in Afghanistan



glaciated Wakhan corridor is projected to see increased streamflow due to increased glacier melt. By contrast, the Bamiyan catchment, which has less than 1% glacier cover, is projected to see declining water levels due to local declines in precipitation.[26] In some cases, the impacts on streamflow depend on the section of the river analysed. For instance, Kunduz River, which begins in the Hindu Kush mountains but then flows through the lowlands of Baghlan, has seen upstream increases in streamflow due to higher temperatures leading to stronger glacier melt; meanwhile, increased evapotranspiration due to higher temperatures and lower precipitation levels have caused strong decreases in streamflow in the lowlands.[29]

Several studies have looked at Kabul River basin as it houses the largest population relative to Afghanistan's four other river basins. River flows are generally projected to increase under several emissions scenarios due to increased snowmelt and glacier melt. However, the earlier and more rapid snowmelt is expected to shift peak stream flow towards spring and to increase the risk of flooding; see section 3.c.[19,30,31]

Groundwater

Most research on groundwater has focused on Kabul due to the rapid draw-down of water levels. It is estimated that groundwater extraction in Kabul exceeds natural recharge around two to six-fold. As a result, groundwater levels dropped by 12 meters between 2005 and 2020, with the rate of groundwater decline accelerating considerably from 2011 onwards.[32] At the same time, water quality has been declining, with increasing levels of contamination with E. coli (indicating contamination with faecal matter) which appears to correlate with rates of waterborne diseases in different areas of Kabul, as well as high rates of nitrate.[33] The primary cause of this appears to be rapid urbanisation.[26] However, shifts in winter precipitation from snowfall to rainfall have been associated with reduced groundwater recharge,[25] possibly contributing to falling groundwater levels in Kabul.

12m drop in groundwater levels in Kabul between 2005 - 2020[32]

76% of groundwater samples in Kabul exceeded WHO thresholds for nitrate, with risk of brain and organ damage[33]

E-Coli in groundwater in Kabul suggests faecal contamintation, with risk of waterborne diseases[33]

Groundwater outside of Kabul has received less attention, and data is lacking.[26] Remote sensing gravity data shows declining water storage across most of the country, particularly in central Afghanistan.[7] Smaller-scale primary data collections confirm locally declining groundwater levels, for instance in Herat[34] and Kandahar.[35]

c. Natural Hazards

Flooding

Floods are the most frequent natural hazard in Afghanistan, with almost 30,000 flooding events having occured in the year up to 4 September 2025.[36,38] Two types of flooding commonly occur: flash floods due to heavy rainfall events, and gradual floods due to

snowmelt and glacier melt.[37] Regarding flash floods, there is some evidence of increasing intensity across areas of Afghanistan.[8] However, other research suggests a substantial decline in heavy precipitation events at the country level, though with relatively smaller increases in Eastern Afghanistan. For meltwater-related floods, research generally suggests an increasing frequency and intensity due to faster snowmelt and increased glacier melt.[23,30,31]

A third type of flooding that is likely to become an increasing problem are glacial lake outburst floods, which result from natural dams of glacial lakes bursting. These are particularly dangerous as they can abruptly release large volumes of water and may carry debris that can cause additional damage.[23] Increasing sizes of glacial lakes in the Amu Darya river basin in northern Afghanistan have already been observed, increasing the risk of such floods occurring.[8]

459 people died during floods in Afghanistan in 2024

170,000 people were affected by floods in Afghanistan in 2024

In 2024, an unusually severe flooding year, 170,000 people were estimated to have been affected, including 459 killed. Baghlan province in the northeast, Faryab in the north, and Ghor in central Afghanistan were particularly affected. Substantially fewer people have been affected in 2025, with 61 fatalities between 1 January and 27 August 2025.[38]

Drought

Various types of droughts exist, and several of them are expected to become more frequent and severe due to climate change in Afghanistan. For instance, meteorological droughts due to reductions in spring rainfall and increasing evaporation are expected to become more common in the northwest, centre, and northeast.[4,8] This is backed by the Standard Precipitation Evapotranspiration Index (SPEI), which measures the difference between precipitation and evapotranspiration.[39] The SPEI has been declining across most of Afghanistan, with up to 0.5 standard deviations decline in the northeast between the 1950s and 2010,[4,26] indicating increasingly dry conditions and increased risk of drought.

Reduced snowfall can contribute to hydrological drought, in which water availability in streams and lakes is reduced.[8] This contributed to the devastating 1999-2001 drought as the lack of snow and early snowmelt meant that little water for irrigation was available during the summer, leading to widespread crop failures.[37] It can also contribute to agricultural drought due to reduced soil moisture, meaning that less water is available for plants, as rainfall runs off before it can trickle through the soil. The same effect means that groundwater recharge is reduced.[25] Combined with increasing groundwater demand due to population growth and other developments, this contributes to declining groundwater levels.

As a consequence of meteorological and hydrological drought, agricultural droughts are frequent in Afghanistan. They are visible through reduced vegetation health,[40] which leads to declines in crop yields and reduced availability of fodder for livestock.

Note that next to the immediate impacts, recurring droughts can deplete water resources, leading to long-term reductions in water supply.[5]

As summer 2025, Afghanistan is facing a severe drought.[41] The country experienced low rainfall early in the agricultural season (late 2024), with dry and hot conditions in spring substantially impacting crop development and contributing to low levels of snow availability.[42] As a result, agricultural drought levels are high and exceed the previous 2018 and 2021 droughts, affecting both crop harvests and livestock.[41] Early onset and heavy monsoon rains since May 2025 have provided some relief, particularly in southern, southeastern, and eastern areas. However, monsoon rains also pose increased flood risks.[43]

Heatwaves

Heatwaves have received less attention in Afghanistan than flooding and droughts, despite their potential to substantially increase loss of life. Globally, heat stress is the leading cause of weather-related deaths, causing around 489,000 fatalities each year.[44]

One paper found that the Heatwave Magnitude Index (HWMI) indicates that the magnitude and duration of heatwaves strongly increased in Afghanistan during the study period spanning from 1951 and 2010, particularly in the hot and dry south-western areas.[4] Climate change is expected to substantially exacerbate these impacts.[45] The risks are highest at lower altitudes, though the health impacts are expected to be somewhat mitigated in Afghanistan by lower humidity levels.[8]

4. Impacts of Afghanistan's Climate Change on the Population

a. Domestic water access

Afghanistan theoretically has sufficient water resources to meet the needs of its population.[1] At 1,180 m^3 of renewable freshwater resources per capita, there is more than twice as much freshwater relative to the population in Afghanistan as in Uzbekistan.[2] However, there are large gaps between theoretically available resources and households' ability to access these resources. In the summer of 2024, over half of households in Afghanistan had insufficient access to domestic or drinking water in the month prior to data collection.[3]

There are several concurrent problems. Some of these are:

- Ongoing urbanisation, such as seen in Kabul, has put pressure on local aquifers, contributing to a draw-down of groundwater.[4,5]
- Large geographic differences exist, with upstream water users at times having abundant access while downstream users may face shortages.[4]
- Large temporal differences exist, with high temperatures and low rainfall in summer reducing available resources and increasing water demand. Summer water access has historically been ensured by snowmelt, yet declining snowfall and earlier snowmelt is leading to reduced water availability.[6]

- Adequate management of water resources is complex and lacking in Afghanistan, including due to the impacts of brain drain on available technical expertise, and a lack of financial resources due to the poor economic situation and investment climate. Linked to this, presence of large-scale storage infrastructure such as dams is limited.[6,7]
- Pollution of water resources, including due to poor sanitation systems, has decreased the safety of accessible water.[4]

Climate change is exacerbating these problems by contributing to more extreme seasonality in water availability,[6] reduced groundwater recharge,[6,8] and increasing frequency and severity of droughts,[5,9] leading to reduced freshwater availability.

b. Food security

Climate change can impact food security in a multitude of ways, including through impacts on crop production (supply side) and incomes (demand side). However, research directly linking climate change and food security is lacking.

Existing research focuses on the impacts of natural hazards, showing clear adverse effects on food security. Flooding in Afghanistan has been estimated to marginally reduce calories consumed but strongly increases the probability of nutritional deficits. This includes an around 11% increased risk of iron deficiency, 12-21% increased risk of vitamin A deficiency, and 27-30% increased risk of vitamin C deficiency.[10] Flooding was overall correlated with increased rates of food stress in Afghanistan.[11] Households exposed to various types of natural hazards used more severe coping strategies, reported lower Food Consumption Scores (FCS, indicating reduced dietary diversity), and lower food expenditures.[12]

Outside of extreme events, the impacts of climate change on food security will depend on agricultural productivity and income dynamics; these are discussed below.

c. Agriculture and livestock

Agriculture can both benefit from and be harmed by climate change.

Benefits	Adverse Impacts
Higher minimum temperatures lengthen the growing season, particularly at higher altitudes.[9,32,33]	Higher mean and maximum temperatures increase heat stress.[34,35] They additionally increase evapotranspiration, increasing the risk of agricultural drought.[36]
Increased glacier melt is contributing to improved water availability in glaciated river basins (see section 3.b.), which may benefit irrigated agriculture.	Increased evapotranspiration paired with the shift from snow to rain due to climate change is likely to contribute to drier soils, adversely impacting crops.[6]
Increased CO_2 in the air due to global emissions benefits crop growth.[7]	Increased CO_2 reduces the nutrient contents of crops, causing them to produce more sugars and starches but less protein and fewer vitamins and minerals.[37]

Thus far, these dynamics have balanced differently in various areas of Afghanistan. For instance, some farmers in Bamyan, in the Central Highlands, have reported benefits due to climate change. This is likely due to longer agricultural seasons paired with year-round water availability from snow in the Baba Mountain range. Meanwhile, in Ghazni, in southeastern Afghanistan, farmers primarily reported negative impacts, alongside greater vulnerability to natural hazards.[32]

Households' abilities to cope with agricultural losses depend on the extent of their reliance on agriculture. If households have diversified incomes, they are generally less vulnerable to changes in agricultural production compared to those who exclusively rely on agriculture.[38,39]

Livestock are highly vulnerable to environmental conditions. Years with ample rain in Afghanistan registered rapid increases in livestock numbers due to decreased mortality, increased fertility, and reduced sell-offs.[40] Conversely, droughts have led to major declines. For instance, the WB and ADB estimated that between 1997-2007, half of all livestock in Afghanistan were lost, particularly due to drought.[7] As such, we may expect that increasing drought frequency due to climate change will cause declines in livestock numbers and health.

The negative impacts of drought on livestock is due to reduced pasture productivity.[41] Migratory livestock herders (Kuchi) are somewhat less vulnerable as they are able to move their stock to more productive pastures.[15] However, warming temperatures at higher altitudes encourage early migration to the Central Highlands, contributing to long-standing problems with over-grazing which may lead to further degradation of pastures and their conversion to low-productivity semi-desertic land cover.[42] Conversion of rangelands into rainfed cropland, for instance due to population growth, has reduced available rangelands and is contributing to erosion problems.[42]

Next to pasture issues, climate change is impacting the distribution of vector-borne zoonotic (originating from animals) diseases. This includes distribution of vectors to higher altitudes, and increased pathogen development at higher temperatures. Vector-borne diseases are major contributors to livestock morbidity and mortality.[13]

d. Human health

Climate change directly impacts health and mortality.

Disease prevalence

The spread of vector-borne diseases is expected to change due to climate-related shifts in temperature and water resources. For the Hindu Kush Himalaya region, which includes Afghanistan, this means that vectors will spread to higher altitudes that were previously too cold, while retreating from low-elevation areas that are becoming too hot. Of available research, most focuses on malaria. However, similar trends are anticipated for other endemic diseases, such as dengue fever and Japanese encephalitis.[13–15]

Evidence on the links between climate change and waterborne diseases is lacking in Afghanistan. However, global research indicates that elevated temperatures

increase the risk of bacterial diarrhoea (but not viral diarrhoea), as do extreme rainfall and flooding events. Drought may plausibly increase rates of diarrhoea due to increased water consumption, concentration of pathogens in water due to lower water volume, and reliance on less-safe sources; conversely, it may decrease diarrhoeal rates as dryness may cause pathogens to become inactive, and drying up of water sources may lead to reliance on safer but more expensive sources such as bottled water.[16] Anecdotally, acute watery diarrhoea rates in Afghanistan in the past years have been substantially higher during the hot and dry summer season.[17–19]

Health impacts of climate-driven hazards

Increasing heatwaves are likely to increase heatstroke, which has a high case-fatality rate. Heat also exacerbates conditions such as cardiovascular disease, diabetes, mental ill-health, asthma, and others.[20,21] These impacts are somewhat mitgated by relatively low humidity in the summer.

Possible increases in natural hazards, notably river flooding, may directly cause injuries and fatalities. Over the past 13 years of monitoring, OCHA registered an average of 172 deaths every year due to floods, as part of almost 400 people who died each year due to monitored natural hazards (incl. earthquakes).[22] The impact of droughts is somewhat more difficult to monitor as they are mediated by impacts on water, food, air quality, livelihoods, and others.[23] Information on dust storms in Afghanistan is lacking, despite ample evidence from other contexts showing substantial health impacts, including increased mortality rates.[24] Major dust storms have been recorded in Afghanistan, particularly the dry south-western areas and the far northeast.[25–31]

e. Migration

Research directly linking climate change and migration in Afghanistan is lacking; however, evidence exists showing the impacts of natural hazards on migration. In 2024 and early 2025, the primary reason for new displacements, as reported by community key informants, related to drought. The direction of movement was from rural towards urban areas.[43] Compared to key informants, households were notably less likely to report drought as the single primary cause of displacement. Drought was the primary push factor for 6% of displaced households in the summer of 2024, with the most common reason having been unemployment or poverty (38%).[3] However, long-term changes in agricultural and livestock productivity as well as climate-related pressure on natural resources may strain rural livelihoods and hence contribute to urbanisation.[44]

f. Conflict

Research suggests several pathways through which climate change exacerbates the risk of conflict:

- Degradation of water and land resources may increase competition over remaining resources, leading to conflict.[4,20,44,45] Isolated violent altercations between communities due to competition over water resources have already been reported.[46]
- The increasing scarcity of productive land resources due to climate change, combined with weak land tenure agreements, can exacerbate conflicts.[44] For instance, conflicts over limited land resources between nomadic and settled populations have been widely reported.[45,47]
- Displacement and urbanisation increase pressure on services and resources, which is exacerbated by the impacts of climate change. This may cause tensions between displaced and host communities.[44] Reports for instance indicate that returnees and foreigners have been blamed for water scarcity in some communities.[1]
- Loss of livelihoods or land due to climate change may facilitate recruitment into armed groups as affected populations attempt to secure an income.[56]
- Increasing competition over transboundary water resources in light of increasing demand and declining resources may cause conflict with neighbouring countries. Tensions are already being observed, exacerbated by the lack of international water sharing agreements.[44,48–50]

g. Hydropower

There is a lack of information on the impacts of climate change on hydropower in Afghanistan, which is of concern as hydropower is the country's primary locally produced source of electricity.[51] Impacts will differ by location and the type of hydropower infrastructure. For glaciated river basins, glacier melt may increase hydropower generation in the medium term.[52,53] However, earlier snowmelt is expected to increase peak spring river flow, but decrease summer flows. This will particularly impact small hydropower facilities that do not have water reservoirs, or only have small reservoirs, and so are dependent on a stable flow of water. With lower flows, they are set to produce less electricity in summer.[15,52,54] This is concerning as increased temperatures mean that electricity demand for residential and business cooling systems will increase,[7] which will accelerate summer electricity demand. However, research from the Kabul River suggests that water storage in reservoirs and optimal regulation of hydropower dams can compensate for up to 10% decrease in mean and minimum stream flows,[55] such that climate adaptation in the hydropower sector is likely feasible.

5. Vulnerabilities and Opportunities

a. Vulnerable groups

Poverty

Poor households are expected to be more exposed to climate change due to their livelihoods often relying on agriculture and heavy manual labour.[1,2] This is concerning as heat stress can erode people's abilities to carry out physical labour outdoors.[1] Concerns also exist about impacts on agricultural productivity (see section 4.d.), while natural hazards can shift pastoralists into poverty traps if their livestock are lost.[3] These populations often do not have access to alternative livelihoods[2] or rely on high-risk alternatives such as mining, limiting their ability

to cope.[2] Globally, poor populations also tend to live and work in more hazardous environments, such as in flooding zones or along steep slopes, which are more affected by extreme events.[2]

Poorer households lack resources for adaptation. They may be unable to afford water storage, irrigation infrastructure, or indoor cooling.[1,3] They may also lack access to information on climate change and climate adaptation.[2,4] This is of particular concern in Afghanistan, where only 37% of the population was literate in 2021,[5] and less than 18% were estimated to have had internet access in 2023.[6]

Gender

Due to the social position of women in Afghanistan, they may face additional climate vulnerabilities. For instance, women and girls are often responsible for collecting water, food, and firewood. If climate change adversely affects the availability of these resources, women and girls may have to spend more time seeking them out, and travel further, potentially exposing them to protection risks.[7–10] If women are employed, they are proportionately more likely to be pastoralists, especially herding small animals which are more vulnerable to climate change impacts.[8] Restrictions on women's movements mean they are less likely to be able to shelter in sturdier community buildings during natural hazards.[9] These same restrictions on movement inhibit women's integration when displaced, and may reduce their ability to cope if left behind when male household members migrate.[8,10]

Groups with greater nutritional needs

Children and pregnant or lactating women are more vulnerable to malnutrition.[11] Food insecurity contributes to nutrition needs, with food insecurity resulting from reductions in food availability, food quality (see section 4.b.), or households' economic means. Additionally, women's food consumption may be deprioritised, making them more vulnerable to food insecurity.[7]

Other

- Persons with disabilities may have difficulties seeking shelter during natural hazards, and difficulties displacing in the aftermath.[9]
- Displaced persons are likely to reside in less robust shelters, making them more vulnerable to natural hazards.[7]
- Returnees may face multiple displacements if their areas of origin are adversely affected by climate change or natural hazards.[7]
- Anecdotal evidence suggests that weather-related losses in agricultural productivity have caused reductions in child education as expenditures for survival are prioritised, as well as increased child labour and early marriage.[25]

b. Community perceptions

Research on Afghans' perceptions of climate change has primarily focused on farmers, and particularly on farmers in the Central Highlands. This group reported observing changes to the local climate, which generally included increased temperatures and decreased precipitation.[12–15] Perceptions of whether these changes were positive or negative for agriculture diverged, though with the majority reporting adverse impacts.[12,14,15] Note that the Central Highlands are climatically and geographically different from other regions of Afghanistan, such that these reports are unlikely to represent the situation for the entire country.

One report looking at the general population finds that understanding of climate change in Afghanistan is most developed in areas with higher literacy rates. However, the population generally, and regardless of literacy, has observed increasing frequencies of climate hazards, reduced productivity of agricultural land, and reduced water availability. The consequences have included weakened community bonds and social isolation due to financial problems resulting from agricultural losses and increased costs of living, as well as migration.[8]

c. Adaptation and coping

Abundant literature shows that Afghans are already adapting to climate change.

This includes small and large-scale water management projects. On the small scale, deeper wells are dug, solar water pumps are used, and improvements to water storage are made[16,25] - though exacerbating issues with overextraction. Additionally, traditional strategies such as rainwater harvesting,[10,15] the karez system (underground tunnels used to transport groundwater),[17,18] and snow pits (which collect snow in winter to provide water in summer)[18] continue to be used. On a larger scale, communities have constructed protective walls, dikes, canals, trenches, and other infrastructure to reduce the impacts of flooding and improve water availability.[10,19,25] At the government level, projects such as the construction of the Qush Tepa Canal (reportedly the largest development project in Afghanistan's history) are underway.[20]

Adaptation for agricultural livelihoods stretches from livelihoods diversification[15,21,25] and seasonal migration[15] to expansion of agricultural land[21] and adjustments to farming practices. These adjustments include diversifying crop types,[15] mulching and seeding of cover crops to improve soil moisture,[25] relying on improved seeds,[12] and choosing faster maturing crops.[21] They also include the use of more inputs, such as fertilisers.[12,25]

However, barriers to adaptation are widespread. At the smallest scale, illiteracy, lack of information and awareness, and lack of financial means are limiting factors.[13,22] But even at higher scales, a lack of technical expertise and resources is limiting adaptation.[21,23] This has been exacerbated by the early termination of projects in 2021 following the change in government.[23] When adaptation fails, households fall back on potentially harmful coping strategies. These commonly include borrowing money, migrating for work, selling assets and spending savings, alongside various others. Some key informants have even reported reduced health expenditures, reliance on high risk work, and withdrawing children from school.[10,25]

d. Community priorities

While a lot of reporting includes expert recommendations on how Afghanistan might adapt to its changing climate, little has been written about the priorities of affected populations. Given the widespread awareness of climate change amongst Afghans (see section 5.b.), it seems feasible to draw on their experiences and perspectives when developing climate-adapted interventions. Humanitarian research such as [8] and academic research such as [14] may provide examples of how this work can be conducted.

6. Conclusions and Research Gaps

Decades of conflict have left substantial gaps in Afghanistan's historical climate records. These data gaps have introduced substantial uncertainty into climate trends analyses and future predictions.

Despite these limitations, both historical records and future predictions clearly show that temperatures have been increasing and will continue to do so. Heatwaves become more likely and more severe, water demand increases as evapotranspiration rates rise, snowfall shifts to rainfall, leaving less snowmelt for the drier summer months, and glaciers melt at increasingly rapid rates. With snow melting earlier and faster, and glacier melt increasing, spring floods will become more frequent and severe while summer water flows are set to decline. At the same time, higher temperatures without increased rainfall mean droughts will become more common and more severe.

However, not all predictions are negative. Warmer minimum temperatures mean longer growing seasons at higher elevations. Glacier melt, in the medium term, will increase river flows in glaciated river basins. And overall, most research suggests that precipitation levels are not changing, but rather rainfall is shifting towards the drier summer months, which may be beneficial for summer water availability.

These changes have already and will continue to affect the population. Afghanistan technically has enough water for its population, but a range of factors mean that essential water management is lacking. With increased seasonality of water supplies and increased demand due to higher temperatures, these problems are set to become worse. Increasing agricultural droughts will cause frequent losses in crop yields and livestock, though some of this may be balanced out by the benefits of longer growing seasons, locally increased river flows, and CO_2 fertilisation. Human health will suffer from flooding, heatwaves, and droughts, as well as changes in vector borne diseases such as the movement of malaria vectors to higher altitudes. Migration due to both increasing extreme events and a gradual decline in rural livelihoods, particularly at lower altitudes, is likely. As resources become more limited, conflict becomes more likely at multiple scales: within and between communities, but also geopolitical tensions with neighbouring countries that share transboundary water resources with Afghanistan.

More work is needed to understand how communities are perceiving these changes and how their experiences, knowledge, and priorities can be leveraged for climate adaptation. This work not only respects the agency and competence of affected populations but is likely to be fruitful. This is because existing research shows widespread awareness of climate impacts among Afghans, alongside a long list of adaptation strategies that are already being implemented at all levels of society.

However, this overview indicates several gaps in and opportunities for humanitarian research.

Looking at the natural resource base, expanded monitoring of groundwater levels (including extraction and recharge rates) and quality may help to fill in blind spots, particularly for areas outside of Kabul. This may support in efforts to sustainably manage resources, as well as provide an early warning in case of deteriorating water quality.

Monitoring of river flows may aid with resource management, including ensuring downstream water users receive sufficient water for domestic and agricultural purposes. Accounting for greater seasonal variability in water flows will ensure sustainability in the construction of irrigation systems and hydropower stations. With increasing flood frequencies and intensity, research on river flooding is an essential part of disaster risk reduction.

In terms of agriculture and livestock, many questions remain about the localised impacts of climate change. Further research may help to identify livelihoods opportunities that are emerging due to the changing climate, as well as inform adaptation efforts. This will enable the sustainability and growth of agro-pastoral livelihoods while reducing the risk of migration due to loss of livelihoods. Pastures and rangelands are essential for livestock in Afghanistan; given the losses of these resources over the past decades, research on adequate, climate-adapted management and alternative fodder crop production may help to support pastoral livelihoods and food security.

Climate change impacts on non-agricultural livelihoods are understudied in Afghanistan. This is despite anticipated labour productivity losses due to rising temperatures,[1] increasing likelihood of labour migration, and other factors.

Monitoring changes in the prevalence of vectorborne diseases may benefit preventative health interventions. Similarly, changes in waterborne diseases are expected, such that expanded water quality testing may facilitate timely WASH and health responses. A better understanding of low-tech options for cooling, such as passive indoor cooling, may reduce the risk of heat stress and deaths in light of increasing heat waves.

This brief only provides a short overview of vulnerable groups. In order to adequately prioritise assistance and respond to the specific needs of diverse persons, greater depth of analysis is needed. Additionally, a broader spectrum of vulnerable groups can be included, taking into account how vulnerabilities intersect.

Lastly, climate change impacts differ from community to community, and so do the appropriate adaptation mechanisms. Localised research is needed to better understand these impacts and how the strengths of local persons can inform a more durable and adaptable response to the coming changes.

ABOUT REACH

REACH Initiative facilitates the development of information tools and products that enhance the capacity of aid actors to make evidence-based decisions in emergency, recovery and development contexts. The methodologies used by REACH include primary data collection and in-depth analysis, and all activities are conducted through inter-agency aid coordination mechanisms. REACH is a joint initiative of IMPACT Initiatives, ACTED and the United Nations Institute for Training and Research - Operational Satellite Applications Programme (UNITAR-UNOSAT).

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Section 4. Vulnerable Groups, Community Priorities, and Coping with the Changing Climate

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Section 5. Conclusions and Research Gaps

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