Climate Risk Profile Somalia

Summary for policymakers

This paper summarises **projected climate parameters** and **related impacts on different sectors** in Somalia until 2080 under different climate change scenarios provided by the IPCC (called Representative Concentration Pathways, RCPs).[i] RCP2.6 represents the low emissions scenario in line with the Paris Agreement; RCP6.0 represents a medium to high emissions scenario.

For high-quality **quantitative climate change impact data for the analysis of climate-related security risks**, we draw on the methodology developed by the AGRICA[ii] project applied to the data and modelling work by the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP) at the Potsdam Institute for Climate Impact research (PIK). ISIMIP provides a framework to assess past, current and future climate changes and related impacts under different climate change scenarios in a comprehensive and consistent way. It synthesises the results of various global and regional impact models to better understand how climate change affects different sectors such as water, agriculture and health and how impacts in different sectors interact and amplify each other.[iii] The simulations from the Somalia climate risk profile are based on the output data of different global models.[iv]

Main findings

Uncertainties are an integral part of climate change projections. They arise from a variety of factors, including natural variabilities, uncertainties in GHG emissions scenarios and differences in the models used. Consequently, no future climate change projection comes without some level of uncertainty. The levels of uncertainties, however, differ either in range or in direction of impact.

High-certainty projections

For Somalia, **the projections for temperature rise have the highest certainty**. Somalia already records **some of the highest mean annual temperatures** worldwide.[iv] Hot conditions prevail throughout the year, in particular in the southwest near the border to Ethiopia, where annual mean temperatures surpass 29 °C.

Depending on the climate change scenario, **temperature in Somalia is projected to very likely rise** between **1.4 - 1.9 °C by 2030, 1.5 - 2.3 °C by 2050 and 1.4 - 3.4 °C by 2080** compared to pre-industrial levels, with coastal regions being less affected than the rest of the country. The annual number of very hot days (days with daily maximum temperature above 35° C) is projected to rise very strongly and with high certainty all over Somalia. Central Somalia will be particularly affected.

High exposure and limited adaptation capacities make Somalia highly vulnerable to the effects of climate change. Rising temperatures and the strong increase in very hot days will very likely result in **a higher exposure to heatwaves** in Somalia. **Heat-related mortality will very likely rise** to between 2.7 and 3.3 deaths per 100 000 people/year until 2030, reaching between 3.6 and 11.4 deaths per 100 000 people/year until 2080, depending on the emissions scenario.

The exposure of the Somalian GDP to heatwaves is very likely to strongly increase under both GHG scenarios. Median model projections for RCP2.6 show an increase from 8.3% in 2000 to 17.1% in 2030, 19.4% in 2050 and 22.7% in 2080, whereas under RCP6.0, exposure is projected to reach 19.0% by 2030 and 23.7% by 2050 and 2080.

In addition, sea level is projected to rise with high certainty under both future emissions scenarios. The median climate models project a sea level rise of 12 cm until 2030, 20 cm until 2050 and 36 cm until 2080 under RCP2.6. Under RCP6.0, the sea level is projected to rise by 11 cm until 2030, 21 cm until 2050 and 42 cm until 2080, according to the multi-model median. The projected sea level rise threatens the livelihoods of coastal communities, particularly in southern Somalia. This includes the countries' capital Mogadishu, and may cause saline intrusion in coastal waterways and groundwater reservoirs, rendering water unusable.[vi]

Lower-certainty projections

For the following areas and sectors, climate projections are much less certain and therefore, the results need to be interpreted with great caution.

Precipitation: Overall, precipitation over Somalia will very likely increase in the long run (until 2080). However, the models show quite some variance in their projections in particular in how strong and reliable this trend will be. What the models agree on is that there will very likely be high inter-annual variability in the amount of precipitation, meaning **that there will be both, wetter and drier years.** Future projections regarding **heavy precipitation events are also highly uncertain,** as the underlying models project very different changes.

Water availability: Projections of water availability in Somalia **are highly uncertain under both GHG emissions scenarios**. Without considering population growth, models show a slight increase in line with future precipitation projections. **Considering projected population growth, overall per capita water availability can be expected to half by 2080** under both emission scenarios, though uncertainty around current and projected available water volumes is extremely high. **Based on this data, it is most prudent to plan for increasing uncertainty in regard to future water availability**.

Agricultural yields: Somalia's economy is dominated by the agricultural sector, which contributed 60.2% to the country's GDP in 2013. In 2019, **80% of the population were employed in the agricultural sector**. **Projections for crop yields of the main crops grown in Somalia show high uncertainties with cowpeas being the exception,** as cowpeas yields demonstrate a positive trend. Rice yields are projected to rise although the level of increase is highly uncertain. Future projections of millet, sorghum and maize show high inter-annual variability and no clear trend in yields can be derived.

Ecosystems: While there is a **high model agreement for the projections of species richness in northern and southern Somalia, the model agreement for central Somalia is very low.** Models project an overall increase in species richness in the mountainous northern Somalia. However, in **most other parts of the country, the number of species will decrease**. Model agreement on changes in tree cover is very low, implying high uncertainty of future changes. Hence, no reliable information can be drawn from the projections on tree cover.

River floods: Although the projections indicate the future exposure of major roads and urban areas to flooding to be rather small, **no reliable estimations on the future impacts of river floods can be made.**

References

[i] The information in the summary are drawn from the more comprehensive Somalia Climate Risk Profile.

[ii] AGRICA is a project implemented by PIK in cooperation with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ).

[iii] Frieler, K. et al. (2017). Assessing the Impacts of 1.5°C Global Warming – Simulation Protocol of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP2b). Geoscientific Model Development, 10, 4321–4345.

[iv] The simulations are based on the output data of:

- 4 Global Climate Models (GCMs) that simulate the physical, chemical and biological dynamics of the climate system.
- 6 Global Hydrological Models (GHMs) that simulate the hydrological cycle at the land surface of continental-scale river basins.
- 3 Global Gridded Crop Models (GGCMs) that simulate crop growth at the grid scale for a selected number of crops.
- 3 Global Vegetation Models (GVMs) that simulate the dynamics of terrestrial vegetation and soil as well as the associated carbon pools and fluxes.
- 2 Global Species Distribution Models (GSDMs) that simulate species distribution based on known locations of a species and information on environmental conditions.
- 1 Temperature Related Mortality Model (TRMM) that simulates excess mortality attributable to high or low temperatures.

Further information on the models underlying the analysis presented in this profile is available in the Climate Risk Profile – Supplemental Information sheet.

[v] Hadden, R. L., The Geology of Somalia: A Selected Bibliography of Somalian Geology, Geography and Earth Science, revised edn (Topographic Engineering Center, US Army Corps of Engineers: Feb. 2007).

[vi] El-Shahat, S., El-Zafarany, A. M., El Seoud, T.A. & Ghoniem, S. A., "Vulnerability assessment of African coasts to sea level rise using GIS and remote sensing" Environment, Development and Sustainability, vol. 23, pp. 2827-2845, 2021.

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