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POLICY BRIEF

Climate Change and Migration in North Africa: Projections, Impacts, and Implications for Adaptation

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Introduction

Climate change and its effects on natural and human systems are increasingly becoming a critical global issue. Climate change refers to a long-term change of climate "which is attributed directly or indirectly to human activity that alter the composition of the global atmosphere"[1]. Global projections show that larger changes will occur in the decades ahead and that impacts of climate hazards will get worse in the coming decades[2]. No country is exempt from the effects of climate change; but low- and middle-income countries are projected to be affected the most[3]. The fingerprints of climate change in these countries are already being seen in the increasing frequency and severity of sudden (e.g., weather anomalies, floods, etc.), and slow-onset climate-related hazards (e.g. temperature trends, sea level rise, desertification, etc.).

North Africa[4] is among the world's most susceptible regions to the impacts of climate change, due to the region's high exposure and low adaptive capacity. In addition, the region is one of the driest and most water-scarce regions worldwide, depends heavily on climate-sensitive agriculture, and have a significant share of its economic activities concentrated in coastal areas prone to flooding. Projections reveal that North Africa's climate in the future will become drier, hotter and greatly variable, which threatens to worsen livelihoods, health, food and water scarcity, infrastructure, and built environments. Specially, climate change is expected to interact with other environmental, demographic, and socioeconomic challenges in the region, making attribution difficult to detangle and subsequently derailing national efforts to achieve the sustainable development goals.

A consensus among migration scholars has emerged: climate variability affects migration and the direction of the relationship is context-specific[5]. That is, migration presents an adaptive strategy that can help people manage climate risks and cope with environmental changes that

[1] IPCC, 2018. Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.

[2] IPCC, 2022a. Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

[3] IPCC, 2022b: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, NY, USA.

[4] North Africa is defined in this policy brief as consisting of Algeria, Egypt, Libya, Morocco, Sudan, and Tunisia.

[5] Hoffmann, R., Dimitrova, A., Muttarak, R., Crespo Cuaresma, J. and Peisker, J., 2020. A meta-analysis of country-level studies on environmental change and migration. Nature Climate Change, 10(10), 904-912.

affect their lives and livelihoods[6]. From a scientific research perspective, the extant literature on North Africa is insufficient to fully document the impacts of climate change and their links to migration. Data limitations on both the population and environment side have led to conclusions being heavily skewed towards other regions with abundant migration data and on aspects of climate change that are easily measured. Similarly, investigations of migration driven by climate hazards such as drought and rising sea level have been overshadowed by studies on precipitation and temperature anomalies, despite that the former can have quite diverse implications on migration, which is attributable to both their varied effects on the economy and infrastructure. Thus, the research portfolio on climate change and migration in North Africa widely fails to match the severity of their projected impact.

This policy brief takes a regional perspective based on a rapid review of the extant literature to cascading climate risks and their links with migration in North Africa. Understanding the climate-migration nexus in the context of North Africa is a cornerstone for taking informed decisions and developing strategies to mitigate the adverse impact of climate change, including potential human mobility.

Projections of climate change in North Africa

In recent decades, North Africa has become a climate change hot spot, with three closely interconnected climatic hazards being the most common: rising temperatures, increasing droughts and rainfall variation, and rising sea levels. The severity of the impacts of these hazards is attributive to the socioeconomic and ecological particularity of the region. Since 1970s, rising temperatures and warming trends have been observed, while the region's mean temperatures increased between 0.2°C and 0.4°C per decade, almost twice the global average[7]. In particular, the magnitude and spatial extent of heatwaves have increased across the region and are projected to become more frequent and intense even at 1.5°C of global warming. Increasing droughts and rainfall variation represent another major climate risk in the region, which despite having been always a prominent and recurrent challenge, is projected to further decrease water availability, especially under the existing overexploitation of the region's groundwater, and to compound the effects of rising temperatures. A third major climate risk resulting from global warming is sea level rise, while North African coasts extending along Egypt, Libya, and Tunisia are exposed to conspicuous coastal flooding and shoreline retreats, with projections, for example, showing that, Tunisian and Egyptian are 70% more vulnerable than other coasts in the eastern Mediterranean countries to the impacts of rising sea levels, causing detrimental effects on economic activities and critical infrastructure of the region[8].

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[6] Abu Hatab, A., Amuakwa-Mensah, F. and Lagerkvist, C.J., 2022. Who moves and who gains from internal migration in Egypt? Evidence from two waves of a labor market panel survey. Habitat International, 124, 102573.

[7] IPCC, 2022a. Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

[8] Hinkel, J., Brown, S., Exner, L., Nicholls, R.J., Vafeidis, A.T. and Kebede, A.S., 2012. Sea-level rise impacts on Africa and the effects of mitigation and adaptation: an application of DIVA. Regional Environmental Change, 12(1), 207-224.

Climate impacts on local economic bases and their socio-economic consequences

A mixture of localized environmental (e.g. water scarcity and climate aridity) and anthropogenic (e.g. urbanization, and population growth) factors interact with climate change to create more potent and imminent impacts on the "local economic bases" of North Africa. Local economic bases represent "the natural and human resources' foundation based on which activities that provide the core employment, income and livelihoods to the local residents of an area depend". Climate-related risks threaten to add significant pressures on the capacity of the local economic bases of the region to maintain economic growth, provide employment opportunities, and ensure food and nutrition security. For instance, the World Bank projects that climate-related water scarcity challenges will cause reductions in the gross domestic product (GDP) of North Africa ranging from 6% to 14%. Furthermore, some country-level projections argue that a 1-meter sea-level rise would decrease the GDP of Egypt and Tunisia by nearly 6% and 3%[11], respectively.

In particular, climate and related environmental changes present a major threat to food systems in North Africa, which play vital roles in the social and economic landscape of the region by deriving important food and nutritional outcomes, economic growth, employment, and many other essential services. This is attributive to the strong dependence of North Africa's food systems on rain-fed agriculture, as well as the facts that countries of the region are located in semi-arid or arid zones, already face high levels of water stress, and are net food importers. Rising temperatures, and decreasing rainfall and groundwater depletion due to climate change will reduce the duration of the growing seasons, decrease crop productivity, increase pest and disease related losses, causing enormous adverse effects on livelihoods and food security. Some studies argue that a 1% increase in winter temperatures would decrease agricultural production in the region by 1.12%[12]. At the country level, evidence show that decreasing rainfall in Morocco during 2018 and 2019 reduced cereal production by over 30% compared to the average of the preceding five years, and that increasing intensity and frequency of drought in Egypt and Sudan would significantly increase poverty and cause major socio-economic and political consequences[13].

Climate related hazards and extreme events act also as a risk multiplier that could threaten human health, deteriorate poverty and amplify inequalities. While coastal zones are the hub for economic and human activities in the region, rising sea level is expected to adversely

[9] Mulligan, G.F., 2008. A new shortcut method for estimating economic base multipliers. Regional Science Policy and Practice, 1(1), 67-84.

[10] World Bank, 2016. High and Dry: Climate Change, Water, and the Economy. Washington, DC: World Bank.

[11] World Bank, 2014. Turn Down the Heat: Confronting the New Climate Normal. Washington, DC: World Bank

[12] Alboghdady, M. and El-Hendawy, S.E., 2016. Economic impacts of climate change and variability on agricultural production in the Middle East and North Africa region. International Journal of Climate Change Strategies and Management.

[13] WMO, 2019. State of the Climate in Africa 2019. World Meteorological Organization (WMO), Geneva.

hit the tourism sector, a major sector for employment in the region, and affect housing and business infrastructure, leading to large economic loss, unemployment and population movements. In this respect, the economic damage resulting from rising sea level for the cities of Tunis, Alexandria, and Casablanca is estimated at over US$1 billion each during the next two decades[14]. Climate change will also have serious health effects on the population across North Africa, especially the elderly, the poor and the chronically ill, either directly through rising temperatures and drought, or indirectly through atmospheric pollution or challenges relating to access to quality food and water. For instance, a recent study has shown that warmer temperatures would increase climate suitability for insect pest growth and survival, increase the transmission of food- and water-borne diseases, and further intensify the challenge of managing their public health effects[15]. By and large, the poor and marginalized social and demographic groups in North Africa are particularly vulnerable to the consequences of climate variability and extremes. It is for example projected that nearly 6 million inhabitants in the Nile delta basin in Egypt will be affected by a 1-meter sea level rise, who will mostly belong to poor households[16]. Gender differences in relation to the impacts of climate hazards have been documented, where women are regarded more vulnerable than men and expected to lose their social networks and social capital, since they are more reliant on natural resources for their livelihoods and wellbeing and since they lack opportunities to fulfil their adaptive capacity. Intra-household differences in vulnerability to climate change based on age are also well documented with children and the elderly are likely to be affected the most, which raises concerns about climate justice and the risk of suffering intergenerational poverty cycles.

Climate change and human migration

Human migration has always been an integral part of the social organization of North African societies due to complex multicausal combinations of economic, sociocultural and environmental factors that dictated population movements. Recently, links between climate change and migration have become more evident[17]. That is, the projected varying frequency and increased intensity of climate and natural hazards will affect larger populations by influencing the diversity and capacity of the local economic bases to provide economic services, ensure food security and nutrition, maintain social wellbeing and ensure social justice and gender equality in the local community. This may lead to displacing them more permanently rather than temporarily; since migration – as stipulated by the Neoclassical

[14] World Bank. 2011. North Africa Coastal Cities Address Natural Disasters and Climate Change. Washington, DC. World Bank.

[15] Rayan, R.A., Kamal, M., Tsagkaris, C. and Campbell, L., 2022. Climate Change Impacts on North Africa: Public Health Perspectives. *In Climate Change in the Mediterranean and Middle Eastern Region* (457-471). Springer, Cham.

[16] Hinkel, J., Brown, S., Exner, L., Nicholls, R.J., Vafeidis, A.T. and Kebede, A.S., 2012. Sea-level rise impacts on Africa and the effects of mitigation and adaptation: an application of DIVA. *Regional Environmental Change*, 12(1), 207-224.

[17] Waha, K., Krummenauer, L., Adams, S., Aich, V., Baarsch, F., Coumou, D., Fader, M., Hoff, H., Jobbins, G., Marcus, R. and Mengel, M., 2017. Climate change impacts in the Middle East and Northern Africa (MENA) region and their implications for vulnerable population groups. Regional Environmental Change, 17(6),1623-1638.

economic theory- becomes a rational choice that maximizes the economic welfare and well-being of the migrants and their households. Since 2000, North African countries have witnessed substantial growth in the net population outflow migration, mostly from coastal areas, which were estimated at around 250% in Egypt and 60% Tunisia. In particular, internal migration in North African countries is taking place at unprecedented rates, mostly from rural areas affected by drought episodes that impact agricultural production to the region's major cities. Foreseeably, this trend will continue and accelerate in the next few decades, where climate change and environmental disasters will force more people to migrate and relocate. In 2021, the World Bank[18] projected that by 2050, North Africa would see around 19 million internal climate migrants. In parallel, North Africa will undergo substantial migration pressures from both sub-Saharan African migrants who will move to settle in the region and those who will use North Africa as a migratory corridor to reach Europe.

The relationship between climate change and migration is complex and dynamic, where climate change, on the one hand, triggers migration that becomes a means to help people manage climate risks and cope with environmental changes. On the other hand, trajectories of population dynamics can generate substantial effects on the climate system and accelerate climate and environmental changes. Another dimension of the complexity of the relationship between climate change and migration is related to the subsequent effects on conflict and social unrest. Migration may reduce the likelihood of conflict because it relocates migrants voluntarily in other areas to work, which generates positive spillover effects on their areas of origin by alleviating stress on fragile ecosystems, and through sending back remittances that increases prosperity and development of sending communities. On the flip side, migration can inflame conflict when it increases the pressure on natural resources and communities in the receiving areas, thus leading to social tensions and violent conflict. As a result of such strong interlinks, issues related to climate change and population dynamics in the context of North Africa have increasingly been recognized internationally and nationally as key component of sustainable development in the region.

The way ahead: Recommendations and implications for adaptation

With the information presented and reviewed, the following general recommendations can be made to inform climate change adaptation and migration policymaking in the North Africa region:

[18] Clement, V., Rigaud, K.K., de Sherbinin, A., Jones, B., Adamo, S., Schewe, J., Sadiq, N., and Shabahat, E. 2021. Groundswell Part 2: Acting on Internal Climate Migration. World Bank, Washington.

- North African governments must adopt more holistic approaches to climate change adaptation and mitigation by integrating climate risks in development and macroeconomic planning, and accounting for climate-driven migration in climate adaptation strategies and other relevant frameworks to improve policy coherence.
- Efforts should be made to enhance the preparedness and resilience of highly vulnerable areas to climate risks through strengthening early warning systems and implementing innovative risk management strategies targeted at specific regions and populations.
- Economic growth strategies in North Africa should pursue more effective transformational development policies by reorienting the economy to a greener growth trajectory that ensures sustainable economic growth, while conserving natural resources and protecting the environment.
- Building capacity of local institutions is essential to identify high exposure areas, support local communities with less adaptive capacity to mitigate the impacts of climate change risks, and effectively manage risks associated with climate-induced migration.
- Coordination and clearer definition of roles among government agencies and local authorities, and community-based policy formulation and implementation through greater collaboration with stakeholders and local actors are crucial to ensure that the voices and needs of the vulnerable groups are included in adaptation measures and policy interventions.
- Building the resilience of rural communities to the effects of climate change would require innovative climate-smart approaches to agriculture and natural resource management, together with targeted livelihood strengthening and diversification programmes to provide North African farmers with greater yield stability in uncertain climate conditions, diversify their income, and reduce their dependency on natural resources.
- Climate-resilient urban planning is essential to enhance preparedness of flood-prone coastal zones to burgeoning climate risks, and prepare the physical and institutional infrastructures of key destination areas to host potential climate migrants and integrate them socially and economically in the community.
- Sustainable finance for climate action through exploring bilateral and multilateral sources and mobilizing national public and private sources is necessary, since climate adaptation requires long-term investments that might not simply not available to some counties in North Africa.
- Improved regional coordination and integration among the governments of North Africa is an important step for sharing good practices in relation to effective adaptation and mitigation measures, given that the countries of the region face quite similar negative impacts of climate change.

- Ensuring that North African women have equitable access to resources and services, and involving them in decision making regarding change-related risks within their communities is crucial to enhance their resilience and adaptive capacity to the impacts of climate change and extreme weather events.
- More accurate data, systematic disaster risk assessments, continued monitoring and forecasting of climate hazards, and more rigorous empirical research on the causes and impacts of climate-induced migration in the context of environmental changes are critical to guide policymaking on the context specific ways to address them and formulate and geographically focused adaptation strategies.