

# Radboud University Network on Migrant Inclusion Policy Brief Series Issue 1/2024

CLIMATE CHANGE AS A DRIVER OF MIGRATION? A SUB-NATIONAL EMPIRICAL STUDY ON THE EXTENT TO WHICH CLIMATE CHANGE IS A DRIVER OF MIGRATION IN AFRICA

By MSc. Dirk Arts and supervised by Dr. G. Solano

# **Executive** Summary

Climate change is expected to become a major migration driver. The first multi-country sub-national dataset on population distribution and climate offers new and distinctive evidence on the relationship between climate change and migration. This policy brief discusses the consequences of sub-national regional temperature and precipitation changes on migration in Africa regions. With the results and specific recommendation presented in this brief, national- and international level policymakers can, informed with evidence from climate models, better predict future migration patterns and work towards policies that anticipate and mitigate adverse consequences for affected populations.

#### **Key Points**

• The first multi-country sub-national dataset offers new and distinctive evidence on the relationship between regional temperature and precipitation change and migration from that region.

• Temperature increases are found to lead to increased migration, and, while smaller in effect, any change in precipitation – so both increases as well as decreases - is also found to lead to increased migration.

• Migration is greater from relatively unwealthy regions after temperature increases and precipitation changes.

• Agriculture seems to be the channel through which temperature and precipitation changes increase migration.

• Migration is greater from relatively dry regions than from relatively wet regions after precipitation decreases, while equal of size after precipitation increases.

• To prevent or mitigate adverse consequences for affected populations, national- or international policymakers should focus on policies for increased resilience in a changing climate, especially in unwealthy and agriculture-dependent regions.

• Mitigating climate change can also decrease migration, but would have a small effect in the short term.

• By allowing migrants to seek asylum in developed countries as climate refugees, migratory tensions within Africa could be lightened.

3

#### 1. Introduction

Migration and climate change are currently two of the greatest global challenges humanity faces.[1] In the short- and long-term, climate change could result in certain regions on Earth becoming less inhabited due to changing regional climates. In turn, this could lead to major migration. Already in 2011, about 500 million people thought that they would need to move within the next five years because of environmental problems.[2] This policy brief illustrates some of the findings from recent research on the topic. Based on a newly-created multi-country sub-national dataset, this policy brief discusses the effects of sub-national regional temperature and precipitation changes on migration from that region in Africa. With the results and specific recommendations presented in this brief, national- and international policymakers can, informed with evidence from climate models, better predict future migration patterns and develop policies oriented mitigating the adverse consequences towards for affected populations.

## 2. The effects of climate change on migration

By deploying the first multi-country sub-national dataset on population distribution and climate, this brief presents new and distinctive evidence on the relationship between climate change and migration. The sub-national nature of the dataset is a key contribution because internal displacement accounts for the majority of human mobility, and temperature and precipitation levels can differ significantly across regions in a country.

### 2.1 The general regional effects of climate change on migration

The empirical analysis on African regions (2000-2020) finds that temperature increases are significantly and positively related to increased migration. Researchers can roughly estimate the effect of a regional change in temperature ( $\Delta T$ , in %) on the migration from that region ( $\Delta M$ , in %) with the following formula:  $\Delta M = 0.314 * \Delta T$ . In other words, a 1% increase in regional temperature over five years is related to an increase of 0.31 percentage point in migration from that region. While this seems to represent a small effect, one should bear in mind that this is only with respect to a 1% increase in regional temperature over five years. In the 21st century, temperatures are projected to further increase throughout Africa, at an accelerating pace.[3] This is compounded by the fact that African's population is projected to have grown threefold by the end of the century.[4] For example, Ben-Gumz, a region in Ethiopia with at the time a population of 1.3 million, experienced a warming of 8.2% over a five year period between 2000 and 2005. While this is an extreme, even a consistent increase in temperature of 1% every five years would lead to total emigration from Ben-Gumz between 75.000 and 200.000 persons by the end of the century, depending on the population growth rate.

Next to that, every change in precipitation over 5 years is linked to additional migration. Namely, regional precipitation decreases as well as precipitation increases up to 55 percent lead to increased migration from that region. Due to the nature of the relationship between precipitation changes and migration, larger precipitation decreases sort increasingly stronger effects on migration than increases. Researchers can roughly estimate additional migration from a region caused by a regional change in precipitation ( $\Delta P$ , in %) with the following formula:  $\Delta M = 0.011 - 0.0002 * \Delta P$ .

[3] Trisos, C.H., et al., (2022). Africa. In: 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, Cambridge, UK and New York, NY, USA, pp. 1285–1455.
[4] United Nations Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022. Policymakers can benefit from evidence generated from this predictive model. If the found effect is related to actual observed precipitation changes, the effect is found to be smaller compared to the effect of temperature increases. Using Ben-Gumz as an example once more, the effects of temperature and precipitation can be compared. Between 2000 and 2005, this region experienced a dramatic precipitation decrease of 50%, compared to the preceding five years. Again, this has been an extreme period, but even a consistent 10% decrease of precipitation every five years would lead to at least 15.000 and up to 40.000 additional persons migrating from Ben-Gumz in the 21st century. As a result, Ben-Gumz, with a projected population of roughly four million by 2100, would by that time have lost up to 6% of its population, or 240.000 persons, because of its changing temperatures and precipitation. Considering that Ben-Gumz is just one of the 529 African regions included in this research, the total emigration caused by temperature and precipitation changes in the 21st Century could cumulatively surpass one hundred million.

## 2.2 Regional differences in the effect

A deeper dive into the data finds that the relationship of a changing climate with migration differs between, respectively, relative unwealthy and wealthy regions, relative agriculture-independent and agriculturedependent regions, and relatively dry and wet regions.

First, the effects of temperature increases on migration are slightly stronger in relatively unwealthy regions compared to relatively wealthy regions, whereas precipitation changes are related to increased migration only in relatively unwealthy regions. The resulting formula by which the effect of changing temperatures and precipitation on migration is estimated for relatively unwealthy regions is as follows:  $\Delta M = 0.040 - 0.0006 * \Delta P + 0.369 * \Delta T$ . When comparing the effects for relatively unwealthy regions to the general effects, a change in precipitation has an effect roughly four times greater while the effect of a change in temperature is nearly twenty percent greater.

In contrast with existing knowledge that emigration is more intense in relatively wealthy countries due to the capability to migrate, these findings may suggest that the ability to migrate could be a less decisive factor at the sub-national level compared to the country level, due to the lower costs of migration within borders. As a result, an increase in temperature or a change in precipitation is suggested to increase the aspiration to migrate - especially from relatively unwealthy regions - due to the relative lack of resilience of the population. Being relatively unwealthy is concretely linked to a lack of resilience because such populations do not have the financial capabilities to adequately adapt to changing circumstances or bridge periods of economic downturn caused by a changing climate. For instance, individuals in affected regions are often unable to invest in adaptive measures or compensate for missed income due to a failed harvest.

Second, temperature increases and precipitation changes only lead to increased migration in relatively agriculture-dependent regions, and are similar of size to those for relatively unwealthy regions. Agriculture, therefore, seems to be a channel through which temperature and precipitation changes affect migration. This is a significant finding especially for the African context, because as of 2021, employment in agriculture as a share of total employment is hovering around 50%.[5] Moreover, without innovation, climate change will decrease crop productivity 5 to 17 percent throughout Africa.[6] As this often concerns subsistence farming, these populations seem to be particularly vulnerable to a changing climate due to its detrimental effect on agriculture, and consequently, these populations' source of sustenance.

Furthermore, for relatively wet regions, only precipitation increases are related to increased migration. In contrast, for relatively

dry regions, both precipitation decreases as well as increases are related to increased migration. This finding suggests that populations in relatively dry regions are more vulnerable to precipitation decreases, while equally vulnerable to precipitation increases as populations in relatively wet regions.

#### 3. Recommendations to policymakers

Climate change and migration are currently two of the most urgent challenges of humankind. From these findings, policymakers can conclude that a changing climate indeed has been a migratory driver in the African regions over the past two decades, in particular for relatively unwealthy and agriculture-dependent regions. Due to the projected size of the African population and the size of found effects, additional migration due to changing temperatures and precipitation could cumulatively surpass one hundred million by the end of the century. Additionally, fleeing from one region because of a worsening climate to another nearby region is not likely to solve the issue because of similar conditions in surrounding regions. This will greatly enlarge tensions within and between countries on the continent due to ever moving and dynamic migration patterns. Next to that, it will greatly increase immigratory pressure for nearby countries and regions that have a relatively attractive climate. To lighten these tensions, these migrants could formally be seen as climate refugees so that they have also the possibility to seek asylum in developed countries.

To prevent or mitigate migration, the findings suggest that national policymakers--or international policymakers that have similar objectives--should focus on increasing resilience to a changing climate, particularly in unwealthy and agriculture-dependent regions. This is especially the case for regions that are projected to experience a rapidly changing climate, or are already relatively dry and will only experience further precipitation decreases.

Concretely, population resilience can be sought either via methods to adapt to a changing climate, or creating less dependence on the climate. Adaptation can be achieved by introducing modernized agricultural methods and crops that are more efficient and productive, as well as resilient to a changing and volatile climate. In addition, increased income enables adaptation in the form of livelihoods conditions. Improved housing, an air-conditioner, a fridge and additional savings could well compensate for hotter conditions and less predictable agricultural outputs. Making populations less dependent on the climate can be accomplished by decreasing the share of the population working in agriculture. This requires more efficient farming, but also job creation in other sectors.

Policymakers can also look at the climate side of the relationship. Climate change could be mitigated by cutting greenhouse gas emissions worldwide, and in turn, this would lead to decreased climateinduced migration. However, as mentioned, this will only have an effect in the long term, as the climate will still change everywhere for the foreseeable future even if greenhouse gas emissions are cut to zero by tomorrow. Therefore, action to prevent or mitigate migration should be taken now to increase resilience of vulnerable populations by adaptative measures, and decreasing dependence on subsistence farming.

# Policy Insights

for national and EU level policymakers in policy fields of migration, development, labor and economics

#### Key Messages

- Temperature increases and precipitation changes are related to increased migration in African regions.
- Total emigration caused by temperature and precipitation changes in the 21st Century could cumulatively surpass the hundred million.
- Migration after temperature increases and precipitation changes is greater from relatively unwealthy regions.
- Temperature increases and precipitation changes only lead to increased migration in relatively agriculture-dependent regions.
- Populations in relatively dry regions are more vulnerable to precipitation decreases, while equally vulnerable to precipitation increases as populations in relatively wet regions.

#### Recommendations

- By allowing migrants to seek asylum in developed countries as climate refugees, migratory tensions within Africa are lightened.
- To prevent or mitigate migration, national- or international policymakers should focus on increasing resilience to a changing climate.
- Resilience of vulnerable populations is increased by adaptative measures and making them less dependent on subsistence farming.
- Increase household income so that livelihood conditions can be adapted to hotter conditions and less predictable agricultural outputs.
- Reduce the share of employment in agriculture by improving efficiency of farming and creating jobs in other sectors.
- Mitigating climate change can also decrease migration, but this would only have a small effect in the short term