CLIMATE CHANGE AND MIGRATION

MRU
Migration Research Unit
وحـــدة أبحـــاث الهجـــرة

IOM
UN MIGRATION

CAIRO UNIVERSITY
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This publication was issued without formal editing by IOM.

Required citation: Cairo University and International Organization for Migration (IOM) (2025). *Climate Change and Migration*. IOM, Egypt.

ISBN 978-92-9268-113-5 (PDF)

PUB2024/089/R

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Acknowledgements

This publication was developed by a team of researchers under the auspices of the Migration Research Unit (MRU), Faculty of Economics and Political Science (Feps), Cairo University, with the support of the International Organization for Migration (IOM). We would like to express our gratitude to the Faculty of Economics and Political Science for encouraging the team under the leadership of Prof. Adla Ragab, Professor of Economics, FEPS, in steering the discussions on projects related to migration and climate change.

We extend our appreciation to Mr Carlos Oliver Cruz, IOM Egypt Chief of Mission and Mr Mohamed Hashem, the National Programme Support Officer at IOM Egypt, for their valuable insights and support in approving and contributing to this research.

Special thanks to the research team for their contributions:

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Additionally, we would like to acknowledge the valuable academic contributions and insights provided by Prof. Peter Scholten, Professor Governance of Migration and Diversity at Erasmus University Rotterdam whose research on migration and climate change has greatly influenced this study.

Lastly, we appreciate the dedication of all individuals and institutions involved in highlighting the significance of climate change and its impact on migration patterns.

Contents

Abbreviations and acronyms

AWG-LCA:	Ad Hoc Working Group on Long-term Cooperative Action
CCDR:	World Bank Group's Country Climate and Development Report
COP:	Conference of the Parties
EMN:	European Migration Network
FAO:	Food and Agriculture Organization
IDMC:	Internal Displacement Monitoring Centre
IDP:	Internally Displaced Person
IFC:	International Finance Corporation
ILO:	International Labour Organization
IOM:	International Organization for Migration
IPCC:	Intergovernmental Panel on Climate Change
NELM:	New Economics of Labour Migration
OHCHR:	Office of the High Commissioner for Human Rights
RCCC:	Red Cross Red Crescent Climate Centre
SAIL:	Sustainable Agriculture Investments and Livelihoods project
SDG:	Sustainable Development Goal
UNECE:	United Nations Economic Commission for Europe
UNFCCC:	United Nations Framework Convention on Climate Change
WHO:	World Health Organization

1. Introduction

There are numerous and complex connections between migration, the environment and climate change, and these connections are frequently quite context specific. People's decisions to migrate, leave or remain in unfavorable circumstances are influenced by a variety of personal, social and structural elements, such as familial relationships, networks of friends and demographic and socioeconomic circumstances. In the past few decades, the international community has been paying more concern for climate change and its relation to human mobility. However, environmental deterioration and the effects of climate change are anticipated to put more pressure on people to leave their homes in many parts of the world as temperatures worldwide on average rise and other environmental concerns worsen. For instance, when catastrophic weather events increase in frequency and intensity, more people are likely to evacuate in search of immediate protection; others may depart temporarily, or permanently as more gradual environmental changes lead to insecurity in food, water, or livelihood. Furthermore, the ability of affected individuals and groups to migrate and improve their circumstances is being undermined by climate and environmental degradation.

Many people for whom movement is currently an option will likely be impacted by the erosion of already precarious livelihoods, such as dropping production of crops and the depletion of the capital required for migration, especially in less developed nations, which will raise the number of "trapped" populations. Furthermore, most people who migrate do so within their own nation, and the destinations they choose may also be facing other difficulties, including the effects of climate change. For instance, in many low and middle-income nations urbanization is accelerating due to population increase and rural–urban mobility. Cities already overworked public services and infrastructure may be strained as a result.

Environmental factors, social, economic, cultural, political and demographic processes all have an impact on human migration and are considered main drivers for it. Climate change can have a direct impact on migration by raising the frequency and intensity of environmental stressors such natural disasters, as well as an indirect impact through modifications in these main drivers.

Compared to internal climate migration, international climate migration is much less common; the majority of those impacted by climate change would like to remain in or close to their homeland. High mobility obstacles discourage international migration. These include the expense of transportation; insufficient knowledge of available mobility choices; difficulties in acquiring visas and concerns with language.

This study examines the role of climate change as a driver of migration, where climate can be seen as the envelope in which all activities take place. It aims to make significant progress in comprehending the relationship between migration and climate change. To achieve this aim, the study will begin with summarizing some concepts and theories related to the link between migration and climate change and then focuses on the climate drivers for migration. Then, climate migration from international perspectives will be tackled by analysing throughout three case studies: Mexico, Bangladesh and Morocco in which climate migration had persisted internally or externally, discussing climate migration within the COPs and linking SDGs with climate migration. Moreover, the study presents the status of climate migration in case of Egypt and which area and group of population are vulnerable to the effect of climate change. Finally, a road map for the future of climate migration and the role of different stakeholders both in the short and long term and on the international and national levels.

2. Conceptual framework

Migration is the foundation of human history and the evolution of human society. One of the most important factors in societal transformations has been the movement of individuals between administrative and political jurisdictions within a nation or across nations. The history of migration is as old as humanity. People have moved throughout history in pursuit of better lives, to escape violence or danger, or just to take advantage of new chances (IOM, 2024a).

Human environment has constantly been changing, due to a combination of natural or man-made forces. Mobility and/or Migration has thus always been a process through which human societies have adjusted to changes in their physical environment (Mayer, 2016). Some changes in the human environment directly threaten survival conditions, or affect living conditions and livelihood, particularly in the case of resource-dependent economic activities such as agriculture and fishing. Other environmental changes may render new destinations more appealing for people to migrate to (ibid.). Several concepts will be discussed in this section as follows:

2.1 Meaning of migration

"To move or settle/shift" is the Latin word "migrare," which is where the word "migration" comes from. There is no agreed-upon definition of migration. National Sample Survey Organization (NSSO) treated the individual as a migrant if the person place of enumeration was different from his/her last usual place of residence (NSSO, 1998). International Organization for Migration (IOM) defined migrant as "a person who moves away from his or her place of usual residence, whether within a country or across an international border, temporarily or permanently, and for a variety of reasons" (IOM, 2019).

2.2 Types of migration

There are various types of migration. These categories are typically classified as internal/external, long-term/short-term, seasonal or temporary/permanent, cyclical or circulatory, forced or impelled.

2.2.1 Internal/international migration

The classification of migration refers to the nature of location. Internal migration is the movement of people within the nation in which they were born, reside, or call home. In this context, "internal" refers to migration inside one's own nation. International migration is the movement of people from one nation to another, and travelling across national borders (Pencea and Curteanu, 2020)

2.2.2 Seasonal(temporary)/permanent or semi-permanent migration

This type of classification refers to the duration of migration. Moving from one place to another without intending to return to one's birthplace is referred to as permanent migration. A temporary migration is one that is carried out for a brief period of time (Bell and Ward, 2000; Chen et al., 2019).

2.2.3 Forced/Voluntary

Forced migration is when people migrate without any option under threat of danger, force or violence. On the contrary, voluntary migrants have the freedom to choose where to migrate or live (Bakewell, 2021).

2.2.4 Long term/Short term

A long-term migrant is "a person who moves to a country other than that of his or her usual residence for a period of at least a year (12 months), so that the country of destination effectively becomes his or her new country of usual residence". From the perspective of the country of departure the person will be an emigrant and from that of the country of arrival the person will be an immigrant" (United Nations Statistics Division, 1998). While people who relocate to a country other than their home country for a minimum of three months but less than a year are considered short-term migrants. Short-term migration does not include movements for leisure, vacation, visiting friends or family, business, medical care, or religious pilgrimage. For the duration of a short-term migrant's stay, the country of destination is the one in which they typically dwell (UNECE, 2011).

2.2.5 Circular

The European Migration Network (EMN) defines circular migration as "a repetition of legal migrations by the same person between two or more countries." Circular migration, according to EMN, is recurrent back-and-forth travel between the nations of origin and destination, whereas temporary migration is restricted to a single back-and-forth movement with a brief stay in the country of destination. One form of transitory migration that involves repeating a brief stay in a destination nation is known as "circular migration" (European Commission: Directorate-General for Migration and Home Affairs and European Migration Network, 2011).

2.2.6 Environmental migration

Environmental migration is defined by IOM as "the movement of persons or groups of persons [environmental migrants] who, predominantly for reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are forced to leave their places of habitual residence, or choose to do so, either temporarily or permanently, and who move within or outside their country of origin or habitual residence" (IOM, 2021).

2.2.7 Climate migration

Climate migration is a subcategory of environmental migration where the change in the environment is due to climate change. Climate migration is defined as *"the movement of a person or groups of persons who, predominantly for reasons of sudden or progressive change in the environment due to climate change, are obliged to leave their habitual place of residence, or choose to do so, either temporarily or permanently, within a State or across an international border"* (Migration Data Portal, 2024).

Climate migration involves the movement of people either forced by environmental crises or gradually due to prolonged changes in their environment. This movement can be internal within the borders of migrants' home countries or transnational. It could be temporary or permanent.

The term "climate migrant" refers to persons who are compelled by climate events (e.g. flood, drought, heat and sea-level rise) to leave their home and move either within their countries (internal migration) or abroad (transnational or cross-border migration) (IOM, 2007).

Some studies use the term environmental refugees, but this term is not so accurate because Geneva convention clearly defines "refugees" as people who are outside the country of their nationality owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion.

So, the displacement due to climate change does not have a legal basis in international refugee law. For the above reasons, the term "environmental migrant" is more precise because most of the people who moves due to climate change disasters prefers to stay in their own country of origin and thus is difficult to imagine that people whose livelihoods are undermining by climate change until manage to embark a journey to Europe and North America. (IOM, 2024a; Migration Data Portal, 2024).

3. Theoretical background

Although the environment as a driving force behind migration is not new to the literature, it is currently receiving more attention because of climate change and the frequency of extremely damaging disasters. "Environmental drivers such as climate and soil fertility feature prominently in the first attempts by geographers to systematize knowledge about migration," according to Piguet (2018), who cites important figures in the development of early migration theories like the theories mentioned by Ratzel (1882), Ravenstein (1889) and Huntington (1907).

Although these theories have been around since the late 19th and early 20th centuries, Piguet points out that "The environment disappeared" from the study of migration for most of the remaining 20th century. They only came back in the middle of the 1980s when environmental scientists were working on the threats posed by deteriorating environments and climate change and summarization of these theories are discussed in this section. Following (de Sherbinin et al., 2022), we do not make clear distinctions between concepts like theory and theoretical frameworks.

Some "Theories" have been proposed to be little more than stylized facts or empirical generalizations and frameworks are considered to be a graphical depiction of theory to show causal relationships.

3.1 Neoclassical migration theory

The recent spike in study on the relationship between migration and the environment, which is related to growing global concern about climate change, is not the first time environmental considerations have been mentioned in theories that attempt to explain migration. In fact, early migration theorists around the end of the 19th century recognized the environment. Economic factors, however, were typically at the forefront during the twentieth century.

Neoclassical theory (Lewis, 1954; Harris and Todaro, 1970; Borjas, 1989) placed emphasis on individual assessments of income differences between origin and destination areas, which led to migration. According to this theory, migration is an individual decision to maximize profits through the process of weighing costs and benefits. Environmental factors can be said to affect wages indirectly through impacts on rural livelihoods and urban wages rate. If we expand the neoclassical theory of migration, it can incorporate any form of utility maximization.

3.2 Push-pull theory

Push-pull theory is often grouped with neoclassical migration theory. The theory frames migration in terms of negative (push) factors in the place of origin that drive people to move away (such as low wages, poverty, lack of opportunities, weather), combined with a number of positive (pull) factors that attract migrants to a new destination (such as higher wages, social services, family members, etc.) (de Sherbinin et al., 2022).

3.3 Structural theory of sustained migration

Structural theories of sustained migration stress macroeconomic and demographic factors as fundamental explanatory factors underlying migration, particularly from lower income countries to higher income countries but also from rural to urban areas. These theories put the emphasis less on individual decision-making and more on structural economic factors (de Sherbinin et al., 2022).

Historical-structuralist theories highlighted migration as a component of a system that keeps exploited and marginalized countries dependent on the countries that control the levels of labour and capital ("dependency theory" (Frank, 1966) and "world systems theory" (Wallerstein, 1974).

3.4 The new economics of labour migration

The 1980s saw the rise of an alternative view known as the New Economics of Labour Migration (NELM), which continued to emphasize economic considerations. By shifting away from structuralists' emphasis on the global system of nations or neoclassical theory's emphasis on people, NELM altered the level of analysis. Rather, under NELM, migration is caused by income. According to NELM, households' measures for risk management and income maximization instead cause migration. After this study, families choose one or more qualified candidates within the household for migration. Through remittances and a diversification of income sources, this strategy enables the household to "spread" the risk associated with its susceptibility to economic shocks by migrating one or more household members. Migration is hence a kind of insurance.

The NELM approach can be effectively applied in the research of environmental migration thanks to the extension of this logic to environmental shocks (Flavell et al., 2020).

3.5 The sustainable livelihood perspective

The sustainable livelihood viewpoint developed concurrently with NELM and has become more prevalent in studies of the relationship between migration and the environment, despite not having a direct focus on migration. According to the sustainable livelihood perspective, which also emphasizes the household, migration is frequently a crucial way for rural households to diversify their sources of income and lower environmental risk. Other options include extensification (growing more land) or intensification of farming practices (using fertilizers) (Hussein and Nelson, 1998; Flavell et al., 2020).

Scholars of environmental migration that aim to highlight the more constructive aspects of migration in response to environmental stressors have heavily relied on NELM and the sustainable livelihood approach, which complement each other. Migration is used to reduce the risk that environmental shocks (such as floods, storms, droughts and so forth) will have an adverse effect on household income, according to the NELM perspective.

Remittances frequently "spike" to cover increased needs during these times (monetary resources for food and other necessities to survive the immediate effects, and then for recovery-related actions like reconstructing wrecked houses or substituting impaired agricultural facilities.

If environmental threats (such as climate change, land degradation and water scarcity) do not exist at the migrant's destination, migration is a potentially significant option for households to address the erosion of livelihoods brought on by these threats under the sustainable livelihood vision (Flavell et al., 2020).

3.6 Network theory

According to network theory, each new migrant adds to the dynamic that propels the growth of migrant communities and households with "social capital" – a network of relatives, friends and kinship contacts already established in prospective destination places – can migrate or send a migrant at a significantly lower cost and with a significantly lower risk of failing to establish a livelihood at the destination. According to the "transnational" and "translocal" branches of network theory, migrants are more likely to keep intimate relationships to their places of origin (relatives, society), and they frequently "circulate" between their places of origin and destination, sometimes for the whole of their lives (Etzold, 2017; Greiner and Sakdapolrak, 2013).

3.7 Aspirations and capabilities theory

A recent theory sees migration decision-making as the outcome of an individual's aspirations and capabilities (Carling, 2002; de Haas, 2010 and 2021). This perspective emphasizes personal agency, where the likelihood of migration depends on aspirations – defined as goals, desires and perceptions regarding the costs and benefits of migration – and on capabilities, such as education, skills, financial means, legal restrictions or disabilities, which determine whether individuals can act on their aspirations.

In formulating this approach, de Haas (2010) seeks to avoid the ecological fallacy, which mixes up macrolevel migration determinants – such as population growth, demographic transitions, development, environmental degradation and climate change – with individual motivations to migrate. While these factors may correlate with migration trends, they do not directly cause migration; rather, individuals migrate because they aspire to better opportunities and possess the means to act on these aspirations. Environmental factors, including risks and amenities, may influence aspirations and capabilities, but they are not considered direct drivers of migration in this framework.

Adams and Kay (2019) explore similar ideas in their study of climate-related mobility in the Ganges Delta, referring to the "psychological propensity to move" and "mobility potential". They suggest that some individuals are more inclined to migrate due to either aspirations or dissatisfaction with their current location, even though their study does not explicitly adopt the aspirations and capabilities framework (de Sherbinin et al., 2022).

3.8 Theories of forced migration and involuntary immobility

Although there is no specific theory of forced migration or displacement (Piguet, 2018), there are observed empirical patterns (Castles, 2003) and increasing theoretical exploration of both forced migration and immobility. Human mobility exists on a spectrum, ranging from voluntary migration to forced displacement (Hunter, 2005), with displacement being characterized by "push" factors being stronger than pull factors.

Erdal and Oeppen (2018) argue that migration appears less voluntary when individuals perceive no viable options for maintaining a reasonable quality of life without relocating. Importantly, the perception of suitable alternatives and what constitutes a "reasonable quality of life" is subjective.

In a risk framework, displacement is influenced by the likelihood, severity and nature of hazards, as well as people's exposure and pre-existing vulnerabilities (Internal Displacement Monitoring Centre, 2015). For those experiencing displacement, staying or leaving often involves significant risks to personal safety, with decisions made under conditions of high risk and uncertainty (World Bank, 2017). Displaced individuals typically face more severe challenges than other migrants, including loss of land, employment and shelter, as well as marginalization, food insecurity and increased rates of illness and mortality. Consequently, displacement often occurs over shorter timeframes due to the intensity of "push" factors (de Sherbinin et al., 2022).

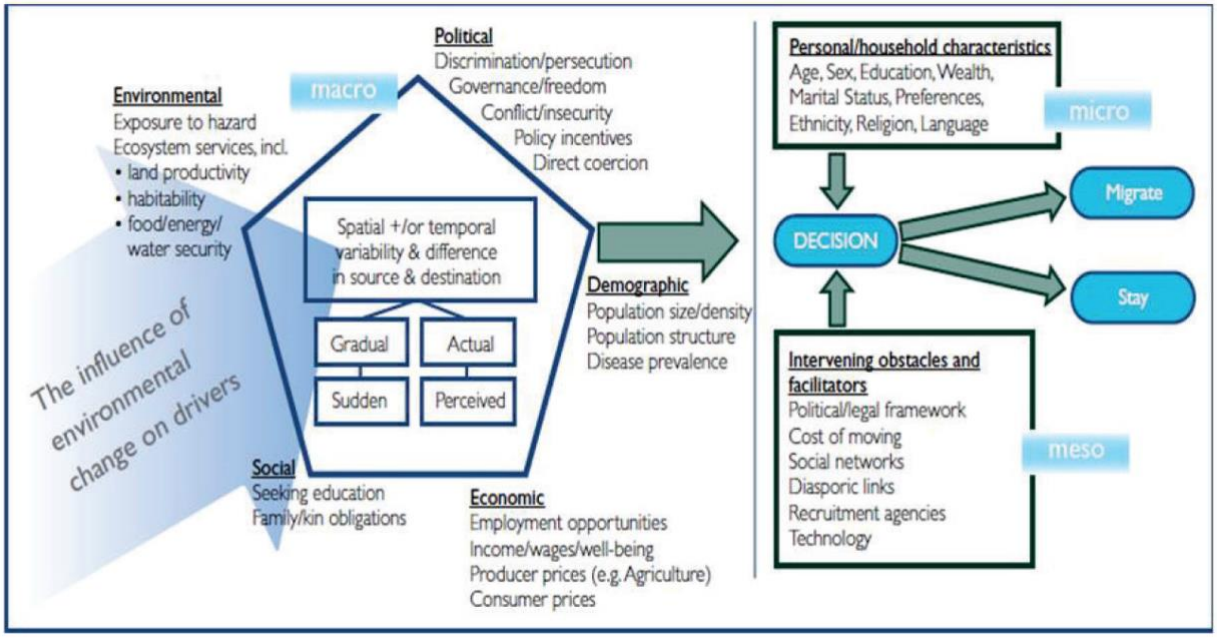
3.9 Environmental migration frameworks

These are conceptual diagrams that draw on the aforementioned theories to identify causal pathways through which environmental change may induce migration flows (de Sherbinin, et al., 2022). Since the publication of the seminal Foresight study (Foresight, 2011), scholars have agreed that environmental factors can play a significant role in influencing migration, and that a variety of "drivers" at different levels impact migration decisions. The Foresight project created a "conceptual framework" diagram, shown in Figure 1, which incorporates a number of the elements of other theories, including neoclassical theory, migrant selectivity, world systems and push-pull. It shows that climate change is, at most, an indirect driver of migration which operates on the direct drivers – namely the pre-existing economic, demographic, social, political and environmental conditions. Importantly, the Foresight report was one of the first to explicitly recognize "migration as adaptation" (Tacoli, 2009), framing it as an important policy response to the observed and projected impacts of climate and environmental drivers on migration.

Based on these various theoretical strands, the diagram has been extensively utilized and referred to in academic and policy circles ever since the study's findings were published. According to this framework, factors at the mesolevel and the microlevel work in tandem with macrolevel drivers to shape mobility outcomes (stay or migrate).

A more balanced perspective to migration in the context of environmental change is also emerging, as scholars start looking into how it might affect resilience and vulnerability in both positive and negative ways. As the complexity of studying the relationship between migration and the environment has become more widely recognized, more research disciplines – including political scientists, geographers, demographers, social anthropologists and migration scholars – are working on the subject. However, there are currently not many multidisciplinary research investigations.

Figure 1: Foresight conceptual framework



Source: Foresight (2011). Migration and Global Environmental Change: Future Challenges and Opportunities. Final Project Report. The Government Office for Science, London.

It is worthy to have a short brief at other theories that are not as prominent as the above-mentioned ones. For example, demographers have developed "Life course analysis" to focus on how migration is more prevalent at certain life stages. Life course can be applied to climate mobility studies by looking at the prosperity by age group, marital and family status.

Other theories include "Imaginaries" which focuses on people's perceptions, cultural norms and expectation (de Sherbinin et al., 2022).

4. Climate drivers for migration

Humanity is facing grave environmental challenges all over the globe and migration is one of the adaptive solutions to environmental challenges. Climate change is part of environmental push factors such as desertification, land degradation, drought, floods and rise in sea levels. Furthermore, climate migration becomes so complicated by the multifaceted association with other socioeconomic factors such as population growth, poverty, governance, human security and conflicts.

It is commonly documented in the literature that floods, droughts, sea-level rise, heat and coastal erosion are the main climate drivers for migration. Studies show that these effects are likely going to increase in intensity and frequency in the future (IPCC, 2014), which makes climate induced migration a critical issue to study, as it can have vast socioeconomic implications for countries development and people's livelihoods.

Migration due to climatic factors could be temporary or permanent, forced or voluntary, internal or transnational. Most climate induced migration is of the forced temporary internal type, in which people, faced with a natural disaster like rainstorm or flood, are forced to move to a nearby area internally and often return back after the region physically recovers. For example, 33 million natural disaster displacements were recorded in 2022 and by the end of the year most of the displaced people returned back to their homes (Huang, 2023). A worst-case scenario by the World Bank, predicts that by 2050 around 216 million people will move internally as water becomes scarcer and agricultural livelihoods are threatened. The World Bank also predicts that this number could be lowered to 44 million people if action is taken to slow the pace of climate change and adapt to its impacts (Clement et al., 2021). Studies suggest the largest future internal climate migration will occur in sub-Saharan Africa and the Asia-Pacific region (Huang, 2023).

In Many of the African countries rainstorms and floods are the most common rapid-onset climatic events that drive people away from their usual places of residence. Floods are caused by interaction between climatic factors like sea level rise and heavy rains; and human factors such as poor drainage systems and building structures in water ways.

Studies reported that more than 500,000 people across 11 West African countries, were affected by the 2007 floods. Subsequent rainfall-induced floods in 2009 impacted 600,000 people in Burkina Faso, Ghana, the Niger, Senegal and Sierra Leone. In 2012, severe flooding caused extensive property damage and forced displacement in Nigeria, the Niger, Senegal and Ghana, affecting about 260,000 people in Ghana, 35,000 in Burkina Faso and 20,389 in Togo. Heavy rains in 2015 also led to loss of lives, destruction of homes and displacement in Togo, Benin and Ghana (Teye and Nikoi, 2022).

On the other hand, droughts and rain fall variability are the main drivers of more gradual climate induced migration (ibid.). It is noteworthy that the slow onset climate change triggers more permanent, more voluntary and longer distance type of migration. Slow onset climate change amplifies pre-existing socioeconomic challenges faced by rural and coastal communities to the extent that renders areas increasingly unlivable and force people to migrate. These pre-existing challenges are mainly poverty, inequality, food insecurity, limited access to decent employment, poor infrastructure, lack of health and social protection.

The interaction between climate change and the socioeconomic and political challenges makes it difficult to identify and quantify the impact of climate change on migration patterns (Abou Dagher et al., 2023).

Whether migration is taken as an adaptation strategy will depend on characteristics of individuals and their ability to overcome intervening obstacles, such as cost of migration; as well as the institutional capacity to adapt to the adverse effects of climate change (Teye and Nikoi, 2022). Moreover, the slow onset climate change also amplifies the repercussions of sudden natural disasters.

Climate induced migration is a primary adaptation strategy to cope with sudden and gradual climate changes. Nevertheless, it may also generate adverse effects on migrants in resettlement areas as a result of the increased pressure on services and resources. Resettlement typically creates new vulnerabilities among resettled populations, especially among the poor, according to previous evaluations of the outcomes of "development-forced displacement and resettlement" as reported in Abou Dagher et al. (2023).

5. Implications of climate change

Climate change has led to profound implications on economic activities especially in agricultural and coastal areas. The largest effects are seen in the agriculture, livestock and fishing sectors as these sectors are heavily dependent on natural resources. Among the effects of climate change are changes in rainfall patterns, increased temperatures, sea level rise, increased frequency and intensity of droughts and floods, soil erosion, salinization, desertification. All these factors have already impacted and will continue to impact economic livelihoods, water scarcity, crop productivity and food security.

Studies show that heat waves and increased mean temperatures affect the output of labour-intensive industries by reducing labour productivity (Arouri et al., 2017 and Abou Dagher et al., 2023). Moreover, studies have found that hot temperatures are associated with cardiovascular, respiratory, cerebrovascular and blood cholesterol problems (Arouri et al., 2017).

In the agriculture sector, the types of crops grown and the timing of planting and harvesting are affected; some crops suffer from crop failure and reduced yields; pasture availability for livestock has also been reduced. Given the higher evaporation rates and decreased precipitation, water stress increases. This in turn puts further pressure on surface and groundwater resources and increases conflict over the use of water resources. Moreover, sea level rise also impacts low-lying coastal areas which could suffer flooding, damage

to infrastructure and saltwater intrusion in freshwater aquifers and could lead to internal migration as well (Clement et al., 2021).

In sub-Saharan Africa, where 80 per cent of cultivated land is rainfed, erratic rainfall and prolonged droughts have disrupted planting and harvesting seasons. This increased food insecurity and economic hardship, forcing people to migrate to other regions (FAO, 2022). In some cases, migration is seasonal during the dry season and in others, households permanently send some family members to urban areas or to rural areas with more favorable climate for work to secure food and financial assistance for the members left behind (Teye and Nikoi, 2022).

On the other hand, increased rainfall intensity is expected to accelerate soil erosion, also the rise in sea level in coastal areas sometimes trigger floods and erosion which poses additional risks to agricultural yields (Teye and Nikoi, 2022 and Abdi et al., 2024).

Taking Somalia as an example, it has suffered multiple chaotic forced displacements following extreme climate events. Given an increasingly fragile and degraded natural environment, more frequent and severe cycles of drought and floods, combined with insecurity, weak government institutions and a deterioration of flood control, irrigation and transport infrastructure in the south–central regions, Somalia witnessed a severe decrease in major crop yields and livestock production, exacerbating food insecurity in the country.

By early 2017, the cumulative impact of various failed successive rainy seasons had created a serious humanitarian crisis that threatened to become a famine in a few areas (World Bank and FAO, 2018). Besides climate change, Somalia's agricultural sector is also hindered by primitive farming techniques and a landscape dominated by smallholder systems (Abdi et al., 2024).

Among the most vulnerable regions for climate change is the MENA Region. Consequently, climate-induced internal displacement is becoming an increasingly critical issue in the MENA region. It is estimated that millions of people in the region are at risk of being displaced due to the effects of climate change, such as rising sea levels, water scarcity and extreme weather events. For example, Jordan which is characterized by limited arable land (less than 3 per cent of Jordan's total land area), arid climate and water scarcity, suffered from climate change in the form of higher mean temperature and reduced precipitation. This has led to large recent rural–urban migration especially to the capital city of Amman (Wenger and Abulfotuh, 2019). This has put further stress on the limited resources and services, increased energy demand and pushed agriculture to more arid and degraded areas in the east and south of Jordan (Clement al., 2021). Moreover, reduced rainfall and increased temperatures are expected to affect the production of staple crops such as wheat and barley while droughts, desertification and the degradation of rangelands could harm livestock production (ibid.).

In addition, climate change is a main threat to food security. It is documented that two thirds of the calories humans consume come from food grains like wheat, rice, maize and soybeans (Abdi et al., 2024). Thus, the reduction of crop yields and the frequent crop failures that are attributed to climate change, together with population growth intensify food security challenges. Over 30 per cent of the global population is experiencing a lower food supply, increasing vulnerability to food shortages and increasing poverty rates Moreover, most empirical studies indicate that higher temperatures reduce essential plant components like vitamin B, protein and micronutrients (ibid.).

Extreme climate events have exposed millions of people to acute food insecurity and decreasing water reservoirs, with the most severe impacts in highly vulnerable regions (IPCC, 2022). According to FAO (2023), climate change led to a reduction in average yields between 2000 and 2019, amounting to approximately 0.1 tons per hectare, representing over a 10 per cent decline from the average observed yield during that timeframe (Abdi et al., 2024). The persistence of severe and prolonged droughts has intensified food shortages in East African nations, especially in areas like Kenya, southern Somalia and southern Ethiopia, where rainfall has dropped to 50–75 per cent below typical levels.

Additionally, many regions experience food insecurity in various forms, including availability, stability, market access and competitive pricing (ibid.). The Mashreq countries (Egypt, Iraq, Jordan, the Syrian Arab Republic, Lebanon, the Occupied Palestinian Territory) – already some of the world's largest importers of food – are expected to become increasingly dependent on food imports. This increases their vulnerability to shocks from disruptions in trade and in supply chains, international price fluctuations and currency depreciations (Clement et al., 2021).

6. Climate migration from international perspectives

The Agenda for Humanity, the 2016 United Nations Summit for Refugees and Migrants, the Global Compact for Migration and the Global Compact on Refugees all acknowledge climate change as a major factor influencing migration. The subject has received substantial coverage in the popular press, with migration occasionally referred to as the "human face" of climate change (Kaczan and Orgill-Meyer, 2020). Thus, global attention has been devoted to climate change migration issues. Unfortunately, performance on the level of climate action has been very disappointing.

Rising temperatures and greenhouse gas emissions continue to climb. Communities worldwide are suffering from extreme weather and increasingly frequent and more intense disasters, destroying lives and livelihoods daily.

Thus, global attention has been devoted to climate change migration issues and based on this, climate migration from international perspective will be analysed by focusing on case studies for Bangladesh, Mexico and Morocco representing three different continents and highlighting the importance of climate migration within Conference of the Parties (COPs) and the link between SDGs and climate migration.

6.1 Country case studies

In the context of shifting environmental conditions and climate change, migration is a significant livelihood and adaptation option. It gives rural households the chance to build resilience, decrease vulnerability and diversify their sources of income. Compared to internal migration, international migration is much less common; the majority of those impacted by climate change would like to remain in or close to their homeland (Szaboova, 2023).

Studies on the various socioeconomic effects of climate migration in the destination region is extremely rare; examples include Pryce and Chen (2011), Rice et al. (2015), Maurel and Tuccio (2016), Rahaman et al. (2018), Schwan and Yu (2017); Comstock and Cook (2018) and they concluded that climate migration will pose various socioeconomic challenges (housing, health, social, economic). Moreover, other researchers concluded that most of the detrimental effects of migration caused by the climate on developing countries' cities can be represented as significant strains on infrastructure shortages (Khan and Kraemer, 2013), social and service deficiencies (Li et al., 2006), urban sustainability and governance (Rana, 2011; Mohit, 2012; Rana and Piracha, 2018 and 2020).

Case studies of climate migration shed light on the effects of climate change on human populations and the necessary actions to successfully address these issues, offering important insights into the complexities and difficulties of environmental migration.

Valuable lessons can be learned from analysing cases of climate-induced migration worldwide that guide international collaboration, humanitarian endeavours and policymaking in the management and mitigation of environmental disasters. Thus, this section will analyse the socioeconomic impact related to migration because of climate change by analysing case studies for Bangladesh, Mexico and Morocco, where they represented three different continents, and they faced detrimental threats from climate migration.

6.1.1 Bangladesh

a. Overview

With a total territory of 15,7566 square kilometres and a population of over 160 million, Bangladesh has an average density of roughly 1,015 people per square kilometre (but big cities like Dhaka have densities closer to 34,000 people per square kilometre (Alam et al., 2018). Bangladesh is less able to adapt to climate change due to several important issues, including its low elevation, large population size, inadequate infrastructure, poor institutions and reliance on natural resources. In 2022, Bangladesh released its National Adaptation Plan (2023–2050), acknowledging that the country will be among the most severely impacted by climate change. The plan is named climate relocation as one of the negative effects associated with climate change (ILO, 2023).

b. Climate change and human migration

Every year, hundreds of thousands of people are forced to migrate due to natural disasters resulted from climate change in Bangladesh (Priovashini and Mallick, 2021; McDonnell, 2019). Most of these migrations are caused by cyclones, floods, river erosion and landslides, which are sudden-onset disasters, and these are considered push factors based on push-pull theory. However, slow-onset disasters like salinization and sea-level rise also cause migration. According to some estimates, by 2050, over 35 million people and 97 per cent of Bangladesh's coastal areas are predicted to be at risk from a variety of climate-related phenomena, including as cyclones, floods, droughts, riverbank erosion and rising salinity (IDMC, 2024a). The worst threat to Bangladesh is sea level rise, and in the upcoming years, there will likely be an increase in the number of people attempting to leave Bangladesh's coastal areas as sea levels rise (ILO, 2023; Hossen et al., 2022).

c. The socioeconomic impact of climate change on migration

- Internal migration

Most disaster refugees are impoverished individuals who seek refuge in flood and storm shelters. Many people returned to their former villages and means of subsistence after the disaster. In quest of employment, some displaced persons relocate to large cities' shantytowns. Numerous towns and cities are not designed to support more people, which exacerbates the environmental issues already present in these regions and leads to hurried, high-carbon urbanization and sub-par living conditions (ILO, 2023).

The displaced persons predominantly move to urban destinations, particularly the large cities such as the capital Dhaka, Chattagram, Khulna and Rajshahi, in search of better living conditions and income-earning opportunities. As a result, the nation’s cities are highly susceptible to migration brought on by the environment. They face severe environmental, socioeconomic and political challenges arising from climate change and disaster-induced rural to urban migration (Rana and Ilina, 2021).

For instance, approximately 32,000 square kilometres were submerged by the most recent, devastating floods that occurred in 2007, impacting approximately 3 million houses and nearly 16 million people. There were over 85,000 badly damaged buildings, 1.12 million hectares of destroyed agriculture and an estimated BDT 5.8 million worth of cattle lost. While damage to embankments and other vital infrastructure is a serious issue that frequently delays the affected families' return, most households do eventually return to their land when the waters recede (Walsham, 2010).

Also, as noted by IDMC (2024a), the effects of human movement brought on by disasters disrupt children's education, increase malnutrition, damage people's regular means of living and raise the danger of infectious and water-borne illnesses. This study aims to review the recent trends of climate change and urbanization phenomena to explore the nexus between climate-induced human mobility the subsequent impact on cities of Bangladesh. The socioeconomic impact of climate change on migration in Bangladesh is numerous.

The needs for urban services and facilities are impacted by the swift migration wave. The reason for this is that unplanned slums appear in high-rise buildings' backyards, next to railway tracks, above floodplains flooded by water, in environmentally unstable places and on the edges of construction zones (Rana and Ilina, 2021) and several researchers confirmed that there is there are little educational and medical resources available to Dhaka's slum dwellers (Kabir et al., 2000; Pryer, 2003; World Bank 2007).

Moreover, Bangladesh's issues, akin to those of many developing nations, include the extreme urbanization of poverty (in large towns and cities), the dearth of ecological and social services and the growth of the informal sector and its effects on the attainment of effective governance and the effects of this climate-induced migration seem to be entirely unanticipated, and the authorities are unprepared for them (Rana and Ilina, 2021). The effects of climate change and the resulting migration raise serious concerns about Bangladesh's human security. While there are many major concerns for those who move to urban areas, such as being exposed to health risks (both at home and at work) and crime, temporary workers migrated between rural areas may be susceptible to the abuse by owners of land along with additional risks to their employment opportunities and mental and physical health. For instance, research indicates that inadequate workplaces and lengthy hours make garment labour unsustainable as an ongoing source of income for low-income women (Walsham, 2010; ILO, 2023).

- International migration

For a considerable amount of time, international migration has been crucial to income diversification through remittances, alleviating poverty and climate adaptation, where remittances as percentage of GDP is 5.06 per cent in 2023, up from 4.67 per cent in 2022 in Bangladesh.

According to data from 1976 to 2023, Bangladesh's historical average is 4.61 per cent (World Bank Group, 2025). In the Gulf Cooperation Council nations, most Bangladeshi migrants hold low-skilled employment. 11.5 million Bangladeshis were employed overseas in 2020 (ILO, 2023).

d. Bangladesh's national adaptation to climate migration

In Bangladesh, adaptation governance has emerged as a critical policy issue to address the detrimental consequences of climatic change. With the assistance of foreign donors, the Government of Bangladesh has currently made considerable efforts to lessen the effects of climate change and support programmes and policies that are specifically aimed at adaptation, such as the 2009 Bangladesh Climate Change and Action Plan (Bangladesh Ministry of Environment and Forests, 2009) and the 2022 National Adaptation Plan of Action (NAPA) (Hossen et al., 2022; Manuamorn et al., 2020). Additionally, a primary component of the country's 8th National Five-Year Plan, 2021–2025, is the role that migration from outside the country plays in lowering poverty.

As part of the 8th Five Year plan, the Government of Bangladesh is still dedicated to creating cities that are more welcoming to internal migrants by putting in place effective structures that aid in their reintegration. The importance of international migration in lowering poverty is highlighted in Bangladesh's National Eighth Five Year Plan, 2021–2025. The Government of Bangladesh is still dedicated to implementing effective mechanisms for reintegrating migrants into society and designing cities that are more welcoming to internal migrants under the terms of the 8FYP (ILO, 2023).

6.1.2 Mexico

a. Overview

Owing to its placement in a region vulnerable to notable fluctuations in variations in precipitation, it is approximated that every year at least 25 per cent of the nation suffers from some form of drought. Due to Mexico's high rate of drought recurrence, this occurrence has become a permanent hazard to the country's citizens and an essential aspect of its climate. In fact, throughout Mexico's history, the drought has caused major upheavals, such as the fall of pre-hispanic civilizations. Mexico is not just extremely subjected to, but

it is also extremely vulnerable to consequences of drought. This vulnerability is caused, in part, by the inverse relationship between the location of consumption of water and the amount of rainfall pattern. Nearly half of the nation's yearly rainfall falls on less than ten percent of the country's territory in the south, while just five to ten percent of the country's rainfall falls on the north and centre, which together contain roughly 60 per cent of the nation's inhabitants and have a significantly higher level of economic activity. Drought would be more likely to affect northern Mexico and also hurricane damage would mostly affect coastal areas (Stahle et al., 2016; Dobler-Morales and Bocco, 2021).

b. Climate change and human migration

Migration rates, both internally and internationally, will probably be impacted by climate change. An analysis of the subregion's migration patterns shows that it already varies as a consequence of climatic fluctuation. Rainfed agriculture-dependent households are especially vulnerable to the effects of cyclones and droughts, which forces families to look for alternate sources of income in other towns or internationally (World Bank, 2018b).

Hotspots for climate outmigration can be found in places where crop production and water availability are declining, as well as, in certain situations, low lying coastal areas and towns that are susceptible to sea level rise. Rather than leading to a decline in population, climate outmigration frequently slows down rises in population overall in these areas. Lowland regions near the Gulf of Mexico and Guatemala's Pacific coast are examples of these hotspots. People will migrate from hotter, lower lying places to highland, more climatically favored areas as these areas are considered push factors based on push-pull theory.

Consequently, major cities in these highland regions – such as Mexico City and Guatemala City – will be hotspots for climate in-migration (ibid.). Between 90,000 and 8 million climate migrants are expected to arrive in Mexico by 2050, relocating to cities ranging in size from Mexico City to medium-sized towns like Monterrey and Guadalajara. The estimated number of climate migrants at the high end of the pessimistic scenario will be 5 million in Mexico City, 850,000 in Monterrey and 750,000 in Guadalajara (Saliba and Zanuso, 2022).

Additionally, one of the biggest socioeconomic occurrences in the world today is the migration of people from Mexico to the United States of America. Peak migrant movements between the two countries have been linked to climate, namely drought (Feng et al., 2010; Nawrotzki et al., 2016; Murray-Tortarolo and Salgado, 2021). It is widely acknowledged that unfavorable aspects of the environment, for instance climate change, play a major role in both present day and future international migration. In the last half century, up to 10 per cent of Mexicans have immigrated to the United States, both legally and illegally. As of right now, between 11 and 13 million individuals have left the nation in search of better living conditions.

The majority opted for staying in the United States, where those with a full Mexican ancestry now make up more than 36 million individuals, or 11.2 per cent of the country's total population (Murray-Tortarolo and Salgado, 2021).

c. The socioeconomic impact of climate change on migration

- Internal migration

There is a tendency to frame the climate change migration movements in a "Securitization approach" without capturing the complex, mobile and interconnected nature and key challenges of climate change and internal migration (Boas et al., 2019).

Although most studies examined the impact of climate change on international migration in Mexico, but such patterns of climate change-induced urbanization can lead to insufficient living conditions for internal migrants and impair their entitlement to an appropriate standard of living. Furthermore, research showed a favorable association between migration, eroding soil and land deterioration, particularly in Mexico's poorer areas (Albo and Ordaz Diaz, 2011; Deheza and Mora, 2013).

- International migration

For Mexico, drought is a disruptive threat. Due to its large-scale and long lasting character, it is typically one of the most destructive natural disasters on an individual level (Boyd and Ibarrarán, 2009). In Mexico, migration has traditionally been a key tactic for promoting economic advancement, stabilizing consumption and diversifying income. The desire to migrate and the efficiency of remittances as a technique for managing weather fluctuations may be impacted by the growing challenges of climate change.

Mexican households rely heavily on remittances as a source of income as their continuous reliance on the agriculture industry, especially in rural areas, makes them vulnerable to natural disasters as crop cultivation is one of the main sectors in Mexico that is impacted by the drought (Nawrotzki et al., 2015; Braun, 2022). Braun (2022) confirmed that remittances serve as a kind of informal insurance in Mexico since they lessen the impact of climate change. The most recent 2023 remittances as per cent of GDP are 3.7 per cent, which are lower than the 2022 figure of 4.2 per cent. According to data, Mexico's historical average is 1.77 per cent between 1979 and 2023 (World Bank Group, 2025).

d. Mexico's national adaptation to climate migration

Certain poverty reduction initiatives are implemented by Federal Government of Mexico to combat both the effects of climate change and poverty. At the household level, initiatives are mostly dependent on financial remittances to mitigate detrimental socioeconomic circumstances, such as pressures associated with climate change. Moreover, transnational organizations have a big impact, as evidenced by the abundance of migrant clubs and federations that connect immigrants and non-immigrants between the United States and Mexico (Aksakal and Schmidt, 2015).

6.1.3 Morocco

a. Overview

Given that Morocco became one of the world's top emigration destinations in the latter part of the 20th century, it presents an important case for studying environmental migration. The country faces significant climatic challenges – such as water insecurity, extreme heat and recurrent droughts – that render it a "climate hotspot" (Cherif et al., 2023; Nevitt, 2024). Situated at the crossroads of the temperate Atlantic and Mediterranean regions and the arid western Sahara, Morocco is particularly vulnerable to the impacts of global climate change.

Over the past three decades, Morocco's climate cycle has undergone marked changes, including declining precipitation rates, more frequent and prolonged droughts and an increase in extreme weather events. These shifts have disrupted groundwater flows, intensified salinization, accelerated desertification and contributed to the expansion of arid areas across the country. Between 1961 and 1990, Morocco experienced relatively stable precipitation levels. However, from 1971 to 2000, annual rainfall declined by approximately 15 per cent below the long-term average. Severe droughts were recorded during the hydrological years of 1982–1983, 1983–1984 and 1994–1995. Drought has, in fact, been a recurring issue in Morocco since the early 20th century, with an average recurrence cycle of about 11 years.

In recent decades, droughts have become not only more frequent but also longer and more intense, increasing their temporal endurance, particularly in the spring. Groundwater in coastal regions is especially susceptible to salinization, as rising sea levels – driven by climate change – allow saltwater intrusion, a process worsened by the reduced flow of freshwater from rivers to the sea during droughts, which in turn, if severe enough, can contribute to salinization (Praag et al., 2021).

b. Climate change and human migration

Although it is not the primary cause of migration in Morocco, research by Wodon et al. (2014) indicates that it appears to play a role, and future migration patterns are expected to be exacerbated by deteriorating climatic circumstances. Most of the environmental migration in Morocco will most likely only include internal

moves, with urban areas most likely to be the primary destinations as after severe weather, international environmental migration is low as compared with internal migration because of impacted households' inability to pay for long-distance travel. Wodon et al., 2014 found that there is proof that households depart from drought-affected areas. For instance, two-thirds of the undocumented migrants detained in Spain in 2007 during a severe drought came from the Khouribga farming and mining region. In both of its national communications to the United Nations Framework Convention on Climate Change (UNFCCC), the Government of Morocco brought this to the attention of the UNFCCC. It attributed the internal movement in Morocco's environment, climate and migration in part to the more severe and frequent drought phases. Natural disaster-related migration is a problem in Morocco.

Thousands have been displaced by disasters in the nation in the last few years, despite the fact that the numbers are not as large as in other states. The Internal Displacement Monitoring Centre (IDMC) reports that between 2008 and 2014, 22,271 persons were displaced as a result of natural catastrophes and these natural catastrophes are considered push factors based on push-pull theory. In November 2014, the Moroccan Red Crescent had to evacuate 1,690 people from the provinces of Agadir-Ida-Ou Tanane and Guelmim due to flooding in the southern part of the nation, which killed 32 lives (Tangermann and Bemmani, 2016).

It is worth noting that migration from the Todgha valley to large Moroccan towns and, more specifically, European nations like France, the Netherlands and Spain, had persisted unchecked despite notable improvements in income and overall living circumstances over the preceding decades. Thus, push-pull models and neo-classical migration theories, which would have predicted a decline in migration because of higher local living standards, did not account for this at all in the Moroccan case study. International migration had become so strongly associated with material and social success that many young people had become practically obsessed with leaving. They contended that, even though local living conditions had improved significantly in the preceding decades, Moroccans' general life aspirations had increased faster, leading to growing migration aspirations.

Enhanced education, increased media exposure and the regular return of the migrant "role models" and exposure to their relative wealth had all contributed to the rapidly increasing material and changing social aspirations of people living in the valley and this is in line with Aspirations and Capabilities Theory (de Haas, 2021).

c. The socioeconomic impact of climate change on migration

- Internal migration

Internal migration from rural to urban areas as a result of climate change led to the rapid urbanization in the past few decades that has resulted in slums in larger cities, primarily Rabat and Casablanca, that are especially susceptible to the consequences of climate change. It would be logical to assume that some of the people who moved to the cities in recent decades for environmental concerns are now facing new climate change vulnerabilities (Tangermann and Bemmani, 2016). Droughts are one of the main causes of macroeconomic volatility. They also affect the balance of payments since Morocco depends more on imported food during dry years, especially grains, and public budgets because the Government helps farmers in need (Cherif et al., 2023). By 2080, it is anticipated that Morocco's average agricultural productivity will have decreased by about 30 per cent due to shifting precipitation patterns. Climate projections for 2030–2060 indicate that worsening cultivation circumstances will significantly affect the production of vegetables and grains, with anticipated declines ranging from 15 per cent to 40 per cent (Praag et al., 2021).

- International migration

Most climate-induced migration in Morocco is internal, and the number of Moroccans who have left the country due to environmental change remains unstudied. In recent years, however, Morocco has increasingly served as a transit hub for migrants from sub-Saharan Africa en route to Europe. As a result, many of these migrants have remained in the country, particularly due to stricter European border controls and Morocco's

strategic location. In parallel, foreign remittances have become a significant contributor to Morocco's economy (Tangermann and Bemmani, 2016; Praag et al., 2021; Meisenhelter, 2014). More than 3 million Moroccan migrants – primarily residing in the European Union – sent USD 11.5 billion in remittances in 2023. Therefore, Morocco is the third-largest recipient of remittances in Africa and the second largest in the MENA region, with remittances accounting for 8.5 per cent of GDP in 2023, up from 8.13 per cent in 2022 and well above the historical average of 6.07 per cent recorded between 1975 and 2023 (World Bank Group, 2025).

d. Morocco's national adaptation to climate migration

One of the Government of Morocco's top policy priorities is urbanization management. Initiative for Human Development subproject (INDH) partially targeted improving the slums' conditions. By improving infrastructure, sanitation and electricity, as well as by relocating, the Initiative for Human Development seeks to improve the lives of those residing in slums in the greater Casablanca area.

Morocco unveiled their national plan to combat global warming at COP15 in 2009: increasing rural populations' ability to adapt; developing a national agricultural production forecast system; implementing new farming methods, resistant crops and creative planting strategies; improving irrigation; educating farmers about sustainable farming; and implementing consumption-based water pricing.

There are no broad allusions to environmental migration in the strategy. The Ministry of Housing, Urbanism and Spatial Planning, however, is tasked with overseeing the "implementation of programmes to relocate people whose homes are located in major hazard sites and threatened by floods and the drilling of deeper wells," as stated in the section on "housing and urbanism" (Tangermann and Bemmani, 2016).

6.2 COPs tackling climate migration

The international community has been paying more concern for climate change displacement in the past few decades, even if different international forums have adopted different perspectives and come to different judgements regarding the best course of action.

Human mobility was mentioned in the assembly text of the AWG-LCA, which was drafted to facilitate future discussions, in December 2008 during COP14 in Poznan, Poland, based on proposals made by Party and observer organizations to the AWG-LCA during the previous year (IOM, 2018). Throughout COP14, there was also an initial scheduled side event focused on the relationship between human mobility and climate change. Since then, several COP decisions have acknowledged migration, displacement and planned relocation brought on by climate change as summarized in Table (1).

Table 1: COP and climate migration

Year	COP	Place	Actions
2015	COP 21	Paris, France	The Paris Agreement's preamble acknowledges that climate change is a global issue. Among other things, it mentions migrants and requests that parties respect, encourage and take into account their particular responsibilities to them when addressing climate change. Additionally, it requests that a task force on displacement be prepared by the Warsaw International Mechanism's (WIM) Executive Committee. The risks of displacement and the reality that climate change contributes to displacement are acknowledged by the Conference of the Parties in its decisions (paragraph 50).
2017	COP 23	Bonn, Germany	To lessen the devastating humanitarian consequences of climate catastrophes by assisting vulnerable populations in their recovery, COP23 established the InsuResilience Global Partnership for Climate and Disaster Risk Finance and Insurance Solutions platform.

Year	COP	Place	Actions
2018	COP 24	Katowic, Poland	COP 24 urged the parties, in its decision text paragraph 5(b), to "continue working on human mobility under strategic workstream through an enhanced cooperation and facilitation in relation to human mobility, including migration, displacement and planned relocation". Additionally, it suggested in its Annex1(c) strengthening "coordination, coherence and collaboration across relevant bodies under the Convention and the Paris Agreement, and institutional arrangements, programmes and platforms, with a view to enhancing understanding of human mobility (including migration, displacement and planned relocation), both internal and cross-border, in the context of climate change, as they undertake their work, and in collaboration with the Executive Committee".
2021	COP 26	Glasgow, Scotland	The goal of the COP26 was to create a framework for prevention that would include early detection systems, defences, resilient infrastructure and agriculture in order to respond to the loss of lives, homes and livelihoods brought on by climatic disasters and, in turn, stop migration brought on by climate change.
2022	COP 27	Sharm El-Sheikh, Egypt	Forcible displacement was successfully acknowledged as a type of "loss" in the historic agreement made by the COP27 to create a new loss and damage fund for nations most at risk from climate-related disasters. The Climate Mobility Pavilion, a platform established by the Global Centre for Climate Mobility as a venue for talks on policy solutions for climate mobility and displacement, was also launched during the event.
2023	COP 28	Dubai, UAE	The historic decision reached on the first day of COP 28 to operationalize the Loss and Damage Fund and include displacement and displaced persons within its purview is welcomed by the Internal Displacement Monitoring Centre (IDMC). This would enable the Fund to finance the implementation of displacement-related policies and actions in vulnerable developing nations, including filling in data gaps and strengthening evidence.

Source: Apap, J. and S.J., Harju (2023). The concept of "climate refugee" towards a possible definition, European Parliamentary Research Service; Baillat, A. (2023). COP28: What did it say about displacement and climate change, Internal Displacement Monitoring Centre (IDMC); United Nations Framework Convention on Climate Change (UNFCCC) (2018). Executive Committee of the Warsaw International Mechanism for Loss and Damage.

6.3 Sustainable development goals (SDGs) and climate migration

The 2030 Agenda for Sustainable Development was approved by the United Nations General Assembly in September 2015. By 2030, the world community should aim to achieve the 17 goals and 169 associated targets outlined in this landmark statement. This is the first agenda of its kind that specifically recognizes how important it is to include migration in development plans. Considering that migration was not included in the Millennium Development Goals in 2000, this is a significant advancement. In recent years, migration and development have become more closely associated, particularly in papers like the Global Compact for Safe, Orderly and Regular Migration (adopted in 2018) and the New York Declaration (approved in 2016).

Since the negative effects of climate change and other stressors, like environmental degradation, pose a severe danger to development, the 2030 Agenda mentions climate change in all its aims. Additionally, it supports significant global frameworks that have been established recently, like the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) and the Sendai Framework for Disaster Risk Reduction (Vidal, 2018).

Migration and its relevance to climate change are not specifically addressed by SDGs. Nonetheless, the Declaration that goes along with Agenda 2030 lists migrants, refugees and internally displaced people as actors whose needs are represented in the agenda (United Nations, 2015). Resettlement and displacement in relation to environmental change are not specifically included in any of the Sustainable Development Goals (Banerjee and Mishra, 2017). It is anticipated that the present trends in environmental unexpected events and stresses would make attaining the SDGs difficult. Migration is one of the ways that people react to environmental shocks and stressors, so it's important to evaluate the potential and challenges that migration can present for the SDGs.

Since both migration patterns and climate change have the potential to have a substantial influence on water resources, SDG 6 on Clean Water and Sanitation is pertinent to environmental migration. For governments to fulfil its objective of guaranteeing safe and orderly migration for everyone, it is imperative that everyone has access to clean and sustainable water. Migration is also closely related to SDG 7, which is about affordable and clean energy. To address the economic and environmental factors that influence migration, managing local energy development planning in conjunction with migration policy helps to create social and economic prospects for migrants that are environmentally sustainable.

SDG 8 intends to promote full and productive employment, decent work for everyone and sustained, inclusive and sustainable economic growth. Reducing inequality both inside and between nations is the goal of SDG 10. At their destination, many migrant labourers from rural areas susceptible to severe weather conditions are employed in the informal sector. Temporary employees, many of whom are migrants, are typically the first in labour-intensive industries to be dismissed during a crisis. These workers in the unorganized sector are not protected by the law or eligible for social security benefits. Furthermore, rules or administrative processes limit migrant workers' access to social assistance at their destination (Banerjee, 2017; Banerjee and Mishra, 2017). For governments to fulfil its objective of guaranteeing safe and orderly migration for everyone, it is imperative that everyone has an equal employment opportunity.

SDG13 on Climate Action takes urgent action to combat climate change and its impact, although no reference to migration or displacement is clearly noted. The requirement for well-planned, facilitated and controlled migration policies is mentioned in other SDGs, particularly SDGs 8, 10 and 17, although they do not link this to climate change. So, the SDGs do not specifically address how climate change may affect migration and the problems this presents for planning and policy. Neither are the more general obstacles that human mobility poses to achieving targets for climate change adaptation and mitigation.

Thus, governments have to propose strategies to assist migrants adapt and reduce risk wherever they reside in order to increase climate resilience for everyone. Also, because of enduring climate change, governments will have to negotiate long-term resettlement and local integration solutions to meet the requirements of those migrants (Wilkinson et al., 2016).

When considering the effects of climate-migration on local land systems, both positive and negative, SDG 15 on Life on Land is particularly crucial. Given the difficulties brought on by climate migration, the Government must combat desertification in order to accomplish this goal.

Finally, a major obstacle to achieving the SDGs will be environmental change, especially in the least developed nations (LDCs). Degradation of the environment will be exacerbated by large infrastructure expansions. The majority of LDCs are currently experiencing this. As a result, populations that are already at risk including migrants are exposed to additional risk factors. Countries should make sure that vulnerable groups are not exposed to new risks as they work towards their development aspirations. To fully realize the potential of migration to lower environmental change risks and hence support SDGs, enabling conditions must be developed in both the origin and destination societies.

7. Climate migration in Egypt

Egypt is a typical example of an emerging lower-middle income economy that is highly vulnerable to climate change and faces numerous threats to its economic, social and environmental sustainability. According to the Notre Dame-Global Adaptation Index (ND-Gain Index), which assesses a country's vulnerability to climate change and readiness to improve resilience, Egypt ranked 102nd over 187 countries in 2022. Egypt also ranked the 110th most vulnerable country and the 127th most ready country in the same year (ND gain website). This signifies that Egypt is among the most vulnerable countries to the effects of climate change. Yet, Relative to other countries, its current vulnerabilities are manageable, but improvements in readiness will help it better adapt to future challenges.

Egypt's reliance on the Nile River for 97 per cent of its water needs makes it especially vulnerable to the increasing unpredictability of the Nile River's water supply (State Information Service, 2023). In this part we discuss the main climate change effects in Egypt followed by a discussion of the impact on migration, the impact on health outcomes and finally the impact on vulnerable groups especially women.

7.1 Climate change effects

The main climate change effects facing Egypt are increased mean temperatures, rise in sea level water and desertification. It is argued that climate change will intensify key development challenges already facing Egypt, which are mainly rising poverty, persistent unemployment and limited productivity growth as per World Bank Systematic Country Diagnostic (SCD). (World Bank Group, 2022). It is also argued that the climate change effects, combined, will worsen water scarcity, food security, increase the vulnerabilities of exposed groups and displace large populations (Al-Mailam et al., 2023). The 2022 World Bank Group's Country Climate and Development Report (CCDR) expects that that the population living on less than USD 4 a day (approximately the expected national poverty line) will increase by 0.8 per cent by 2030 due to a subset of climate change impacts (effects on agriculture, health, temperature and increase of natural disasters) (World Bank Group, 2022).

7.1.1 Increased mean temperature

Temperatures have increased in Egypt over the past three decades. By 2050, temperatures are expected to increase between $1.5°C$ to $3°C$,with greater increases in the country's interior and during growing season. Heat waves will increase in their severity, frequency and duration, with an average of 40 additional days of extremely hot days per year projected by mid-century (World Bank Group, 2022). Areas such as South Sinai and Aswan will be especially vulnerable to extreme temperatures (Al-Mailam et al., 2023).

As shown earlier, it is well documented in the literature that the rise in mean temperature has negative impacts on labour productivity, agricultural productivity, livestock productivity and biodiversity and this, in turn will have a multiplier effect on income and employment in many sectors. For example, there is evidence that temperature increases from $26°C$ to $31°C$ can lead to 30 per cent drop in labour productivity (World Bank Group, 2022). The higher temperatures imply higher evaporation rates and reduced soil moisture, which increases the demand for the already scarce irrigation water and reduces the production of major crops.

Warmer temperatures also lead to decreased milk and meat production, shorter growing cycles, which are often associated with lower crop yields and a change in cultivation zones suitable for specific crops (Abou Dagher et al., 2023, Al-Mailam et al., 2023).

7.1.2 Sea level rise

Local sea-level rise in Egypt has been occurring consistently over the past decades. Sea levels rose from 1.8 mm per year until 1992 to 3.2 mm per year after 2012 and are expected to rise 1.6 mm per year along coastal zone (World Bank Group, 2022).

The rise in sea level water will have a negative impact on both urban areas and fertile agriculture land in the Nile Delta. On the one hand, it increases the possibility of coastal erosion, damages buildings and amplifies water availability challenges. Egypt ranks fifth in the world in terms of sea level rise's potential economic impacts on urban areas, with damage costs under a medium sea level rise scenario of 1 per cent of GDP annually by 2030. Coastal cities such as Alexandria, Port-Said, Ismailia and Suez face the highest level of climate and economic risks (World Bank Group, 2022). On the other hand, sea level rise leads to agricultural land loss particularly areas adjacent to the Mediterranean Sea, within the northern parts of the Nile Delta. (Noureldeen and Zohry, 2022; World Bank Group, 2022).

Moreover, the rise in sea level and the increased evaporation rates because of higher temperatures increase the salinization of the soil due to the intrusion of sea water into the groundwater sources of the Delta lands. This reduces the quality of the soil and agricultural yields and affects the quality and availability of drinking water and water available for agriculture (World Bank Group, 2022). Studies predict that by 2050 the productivity of two major crops in Egypt – wheat and maize – will be reduced by 15 per cent and 19 per cent, respectively, which will further reduce food security (Abou Dagher et al., 2023).

As for the fishing industry, it is also worth noting that climate change, among other factors, has contributed to a decline in the productivity of marine capture fisheries over the years despite the expansion of the fishing fleet. This is likely going to increase food insecurity as fisheries and aquaculture contribute 25 per cent of household's protein intake in Egypt (World Bank Group, 2022).

The effects of climate change on Egypt encompass not only internal climate change that affects Egypt directly, but also climate change in other countries that can have repercussions on Egypt's own welfare. For example, external climate change would affect the main sources of the Nile water in the Ethiopian Plateau of East Africa and in Equatorial Central Africa, as these regions will be affected by the rainfall variability and thus the supply of the Nile water will be affected as well (Noureldeen and Zohry, 2022). This implies Egypt will be subject to more frequent drought years and more frequent high flow years, as well as higher frequency and intensity of flash flooding in Egypt's coastal areas (World Bank Group, 2022). Moreover, the increased temperatures will increase evaporation rates of the Nile River water along its journey from the south to the north of Egypt, causing significant water losses in an already water stressed country.

7.1.3 Water scarcity

Egypt's annual per capita water share has been declining over the years. In 2022, the Government announced that Egypt had officially entered a period of "water poverty," with the country lacking enough water for its citizens (Sayigh et al., 2023). As of 2023, Egypt's water share stands at approximately 560 cubic metres per person per year, which is significantly below the international water poverty line of 1,000 cubic metres (IFC, 2023). The decline in water availability in Egypt has been accelerated by various factors, including the construction of the Grand Ethiopian Renaissance Dam, which has reduced water flow to Egypt, as well as population growth, fast-paced urbanization and temperature increases. Moreover, unsustainable water usage for extensive agricultural projects and the construction of hydro-energy plants upstream on the Nile have further strained water resources.

Egypt is quite close to hit the absolute water scarcity threshold of 500 cubic metres per person per year. Some studies project that Egypt could fall below the absolute water scarcity threshold by 2025. If that happens, Egypt is expected to suffer from more water evaporation, declined precipitation patterns and increased water-related climate disruptions, such as floods and prolonged droughts (Sayigh et al., 2023).

It is evident that climate change effects will further exacerbate the existing water scarcity in Egypt (World Bank Group, 2022). It is estimated that a reduction in Nile River inflow to the High dam, from 55 billion cubic metre to 45 billion cubic metre which may be expected during the increasingly frequent droughts in Basin can reduce irrigated land by 22 per cent, productivity per hectare by 11 per cent and agricultural employment by 9 per cent. Overall food production in Egypt is projected to decline by 5.7 per cent by 2050 (World Bank Group, 2022).

Egypt already suffers a net water deficit amounting to 22 billion cubic metres after the reuse of another 20 billion cubic metre of wastewater. This water deficit caused a deep food gap worth 65 per cent of Egypt's total needs of strategic commodities such as wheat and maize for fodder, cooking oils, beans, lentils, red meat, butter and dried milk (Noureldeen and Zohry, 2022). Moreover, following a number of consecutive shocks including the 2019 pandemic and the Russian Ukrainian war, more than a quarter of the population has continued to face mild to acute food insecurity (Al-Mailam et al., 2023). The various Climate change effects discussed above will aggravate food security challenges and food gaps. Food imports will also increase

to close the food gap. This will place extra pressure on Egypt's current account and increase Egypt's vulnerability to external commodity price shocks.

7.1.4 Most vulnerable areas

It is noteworthy that the low-lying Nile delta, home to 50 per cent of the Egyptian population, is already subsiding at a rate of 3–5 mm per year (Ullah, 2012). This is in part due to upstream dams that prevent the replenishment of silt and to natural gas extraction. These factors are predicted to exacerbate the effects of sea level rise with "potentially catastrophic consequences." (Othering and Belonging Institute, Climate displacement case studies: Egypt). Coastal cities such as Alexandria, Port-Said, Ismailia and Suez face the highest level of climate and economic risks. The United Nations' Intergovernmental Panel on Climate Change predicts that global sea levels could rise by as much as 68 cm by 2050 (Mixed Migration Centre, 2023).

Estimates of citizens who will be forced to relocate inland from the Delta and coastline due to climate change vary in proportion to the forecast sea level rise; the higher sea levels are expected to rise, the more people are estimated to relocate (Noureldeen and Zohry, 2022). According to Agrawala et al., (2004), only a 0.25 metre rise in sea level would devastate most cities that keep Egypt's economy vibrant. For example, with 45 per cent of Alexandria's population already living in areas below sea level, Alexandria is at acute risk of flooding (Al-Mailam et al., 2023). As little as 0.5 metres of sea-level rise "would place 67 per cent of the [city's] population, 65.9 per cent of the industrial sector and 75.9 per cent of the service sector below sea level; 1.5 million people would have to be evacuated and over 195,000 jobs would be lost." (Agrawala et al., 2004).

Some scenarios project a rise of 0.5 metres in sea level could displace 2–4 million Egyptians by 2050 and encourage migration from the coastal zone to other areas (Abou Dagher et al., 2023).

7.2 Impact on climate migration

To date, the various effects of climate change have not had significant effects on migration both internal and external, with only few climate-related displacement incidents. For example, in 2010, heavy flooding in the southern governorate Aswan displaced thousands of people and over 4,000 houses were damaged or completely destroyed. In 2015, unprecedented heavy rains left several people dead, hundreds of families displaced and millions of dollars in damage to private property across coastal areas of Alexandria including Al Max area in Alexandria, which is an unplanned area with industrial and residential development (Othering and Belonging Institute, Climate displacement case studies: Egypt). However, a recent study conducted by The Mixed Migration Centre interviewed a number of households residing in Al Max area and did not find a strong connection between climate or environmental stressors and mobility into or out of Al Max (Mixed Migration Centre, 2023). This confirms that climate induced migration does not constitute a pressing problem at the moment. Indeed, Egypt has a relatively low number of internally displaced persons. According to the Internal Displacement Monitoring Centre, Egypt had a total of 31,000 internal displacements were recorded from 2008 to 2023 due to disasters, including drought, flooding and wildfire (IDMC, 2024b).

Nevertheless, following reductions in income related to climate change impacts, some people, in their search for better opportunities, have already begun to migrate from the Nile Delta However, they mostly take the form of "Circular migration," or the temporary and repetitive migration between home and host areas. Although circular migration is not included in the census, empirical observations and academic studies show that circular migration is a widespread model, particularly since Cairo is a megacity that draws most of the migration in the country (Othering and Belonging Institute, Climate Displacement Case studies: Egypt).This type of migration is in line with the aspirations and capabilities theory, which regards migration as primarily caused by migrants aspirations for better opportunities.

Undoubtedly, if climate change effects continue to intensify, internal and external climate induced migrations are expected to increase, including regular and irregular international migration to countries of southern and western Europe and other countries (Noureldeen and Zohry, 2022). Furthermore, global and regional

climate change will alter the seasonal timing and intensity of rainfall in Egypt's coastal areas, which further exposes coastal areas to more frequent and intense flash floods and puts an additional 1.1 million people annually at risk (World Bank Group, 2022).

Moreover, substantial job mobility is expected to occur as jobs related to agriculture and aquaculture may decline. Farmers are expected to incur higher production costs to produce the same crops; some farmers might be forced to transfer other soil to the salinized areas periodically if they want to continue growing seasonal crops with shallow roots. Some may be forced to look for alternative job opportunities, resulting in significant job mobility and rural urban migration.

Climate change displaced populations, combined with the natural population growth rate and rapid urbanization will thus place additional stress on services, infrastructure, clean water, housing in urban areas. Densely populated cities are likely going to face significant degradation in livability and productivity and will suffer disproportionately more from "urban heat island effect", which is a phenomenon referring to the fact that urban areas become significantly warmer than their rural surroundings due to human activities. For example, increased use of air conditioning to survive the hot waves, itself expels hot air, making cities even warmer. These effects will be disproportionately borne by the lower income populations which cannot afford energy costs.

There may be an increased flow of climate induced emigrants into Egypt, particularly from East and sub-Saharan Africa. This will further amplify pressures on Egypt's resources. As such, Egypt will have to be prepared for its own rural migrants moving to urban areas besides those emigrants from neighbouring countries (Ullah, 2012).

7.3 Impact on health outcomes

Climate change definitely impacts human health in Egypt adversely. These impacts include increases in the prevalence and severity of asthma, infectious diseases, vector-borne diseases, skin cancer, eye cataracts and heat strokes. More deaths from cardiovascular and respiratory illnesses and diarrheal and dysenteric infections are expected. Moreover, children's mortality rate and malnutrition cases are expected to be more frequent. In the baseline year of 2008, there were an estimated 2,700 diarrheal deaths in children under 15 years old. Under a high emissions scenario, diarrheal deaths attributable to climate change in children under 15 years old are projected to be about 10.9 per cent of about 1,000 diarrheal deaths in 2030. Although diarrheal deaths are projected to decrease to about 300 deaths by 2050, the percentage of deaths attributable to climate change might rise to approximately 15.2 per cent (WHO, 2015).

More specifically, under a high emissions scenario, heat-related deaths in the elderly (65+ years) are projected to increase to nearly 47 deaths per 100,000 by 2080 compared to the estimated baseline of about one death per 100,000 annually between 1961 and 1990. In August 2015, several elderly people died due to heatstroke and many others were hospitalized due to heat stress.

In addition, under a high emissions scenario and without large investments in adaptation, an annual average of about 2.4 million people are projected to be affected by flooding due to sea level rise between 2070 and 2100. If emissions decrease rapidly and there is a major scale up in protection the annual affected population could be limited to about 700 people. Egypt also faces inland river flood risk due to climate change. Also, under a high emissions scenario, it is projected that by 2030, 1.1 million additional people may be at risk of river floods annually due to climate change and 839,700 due to socioeconomic change above the estimated 986,100 annual affected population in 2010. In addition to deaths from drowning, flooding causes extensive indirect health effects, including impacts on food production, water provision, ecosystem disruption, infectious disease outbreak and vector distribution. Longer term effects of flooding may include posttraumatic stress and population displacement. A projected increase in flash floods could raise the incidence of waterborne diseases, such as diarrhea. Warmer temperatures and shortages in water, leading to limited hygiene and sanitation services, could similarly increase the risk of diarrheal diseases. Statistics show that 3,500–4,000 children under five years old die of diarrhea in Egypt every year.

Similarly, dust and sandstorms are becoming more frequent due to rising temperatures, increasing the risk of air pollution. As a result, respiratory diseases such as asthma, influenza, pneumonia and pulmonary fibrosis are projected to increase, with older people and children at the highest risk. Moreover, outdoor air pollution can have direct and sometimes severe consequences for health. Specifically, fine particulate matter ($PM_{2.5}$) that penetrates deep into the respiratory tract increases mortality from respiratory infections, lung cancer and cardiovascular disease. In 2011, Cairo and Delta cities, for which air quality data were available, recorded annual mean $PM_{2.5}$ levels exceeding the WHO guideline value of 10 $\mu g/m^3$. An estimated one-third of Cairo's $PM_{2.5}$ air pollution concentrations are attributable to road transport, while the second source is agricultural slash-and-burn, followed by industrial power and electricity generation. Other sources of air pollution include the mismanagement of waste, biomass burning and domestic and commercial combustion (RCCC, 2024; WHO, 2015).

Climate change, through higher temperatures, land and water scarcity, flooding, drought and displacement, negatively impacts agricultural production and disrupts food systems. These changes disproportionately affect the most vulnerable populations, exacerbating hunger and leading to food insecurity. Without considerable efforts made to improve climate resilience, it has been estimated that the risk of hunger and malnutrition globally could increase by up to 20 per cent by 2050. In Egypt, the prevalence of child malnutrition in children under age 5 was 7 per cent in 2014.

All the above-mentioned negative health impacts are related to climate-induced migration (RCCC, 2024). With climate change effects and related health threats in Egypt, many communities will seek better living conditions in a different place, either as an adaptation strategy or out of necessity. Some people living in drought areas have migrated temporarily or permanently to improve food security. Yet, many studies indicate that livelihood diversification and structural determinants are key drivers of migration from sites of food shortage. Although many people globally live and remain in places with considerable health risks, the extent to which climate related health risks will drive outmigration is uncertain (McMichael, 2020).

On the other hand, immobile populations live in places with climate risks and associated health consequences. These include so-called trapped people, who do not have the resources, assets or networks to migrate, and voluntarily immobile populations, who choose to remain for reasons of place attachment, sociocultural continuity and values. There is limited empirical research on the health effects of immobile populations. However, some researchers argue that immobile people living in climatically vulnerable areas could experience adverse health impacts resulting from changes in water and food security, disease ecology, flooding and saltwater intrusion and the psychosocial effects of disrupted livelihoods (ibid.). Therefore, a framework that connects climate change, migration and health to shape research agendas and policy responses is needed.

7.4 Impact on women

The phenomenon of internally displaced persons (IDPs) has not been a serious problem in Egypt so far, recording a meager 3,181 persons in 2021. Between 2008 and 2021, the total number of IDPs was approximately 30,660, and it was caused primarily by droughts, flooding and wildfire. By comparison, Egypt hosts significantly more refugees from abroad, with the official recorded figure reaching 271,102 persons by December 2021, half of them Syrians.

The explanation of this low level of internal migration is the absence of extreme variations in temperatures or the prevalence of severe precipitation that force Egyptians to decide to migrate. Rather, their decision to migrate temporarily is driven primarily by better climate in their destinations.

The threat of climate change and the high vulnerability of Egypt are likely to change the situation significantly in the future, especially for farmers and workers in the agriculture, and precisely women. Climate change is expected to have many adverse effects, but these effects will be felt more acutely by those living in the agricultural sector through change-induced droughts, heat stress and increasing evapotranspiration due to higher temperatures, decreasing water availability and rising salinity. Making this impact more severely felt is

that the agriculture sector in Egypt employs 30 per cent of the population and contributes 12 per cent of GDP. Agricultural Labour is informal, comprising mainly women. Eighty per cent of cultivated land ("old land") is in the Nile Valley and the Nile Delta, while 20 per cent ("new land") is in the land which has recently, or is being, reclaimed.

Over 85 per cent of all freshwaters is used by irrigated agriculture and is heavily polluted by industrial effluents and untreated sewage. A reduction in water availability and quality, especially of the Nile River, due to climate change will negatively affect irrigation and, as a result, agricultural production. This means that most farm workers, including women, and farmers will lose their daily incomes, and may in some cases be forced to migrate internally.

What makes the anticipated adverse effects of climate change induced water scarcity particularly severe in Egypt is that over 40 per cent of the female population depends on agriculture as their main source of income (RCCC, 2024). Women in rural areas are likely to bear a higher share of the cost, because their role in the household is often focused on caring for the children, doing housework, raising poultry and animals. Hafez (2020) studied the impacts of climate change on agriculture, livelihoods and women in the Nile Delta, Egypt. She found that climate change may widen the gender gap in rural areas because it is highly related to access to resources like information, skills and technologies that determine individuals' ability to cope with new challenges. In her study, Hafez found that 70 per cent of the women knew little about climate change and could not think of strategies to respond to it, while about 30 per cent said they did not care about climate change at all. Therefore, educating women increases their awareness of the issue and improves their ability to find solutions to adapt, even if they do not know that they are adapting to a global challenge and that they are only adapting to what they can sustain in their small family economy (FAO, 2015).

Accentuating the adverse impact of climate change on women in rural areas is that, although over 40 per cent of them work in agriculture, they only own 5.2 per cent of agricultural land, they hardly engage in the political and community decision-making, they tend to have higher rates of illiteracy and school dropouts, they tend to face higher risks of early marriage and harmful practices (Female Genital Mutilation, domestic violence and marital rape) and they have limited access to health care and family planning services as compared to their urban counterparts (UN Women, Under the United Nations Sustainable Development Cooperation Framework 2023–2027). There is further evidence that shows that women farmers in Egypt are often excluded from agricultural extension services, training programmes and producer organizations as these are tailored to suit the needs of men (IOM, 2024b). There are several reasons for this: sociocultural norms that consider it inappropriate for women to attend management meetings; subtle deterrents such as an overwhelming overrepresentation of men in agricultural groups or institutions; and holding meetings at night-time or in areas that are not socially acceptable for women to attend.

In addition, women in Egypt are often denied access to inheritance, most particularly if it is land or other property. This practice is debilitating because financial asset ownership is essential for women to exercise agency and make decisions about their lives, pursue educational opportunities, finance entrepreneurial work, or simply have some financial security. Furthermore, tiny landholdings, seasonal production processes and work and unstable earnings characterize most of Egypt's agriculture and thus leave millions of women who rely on this sector for their livelihoods impoverished.

It is estimated, based on the national proportion of females to males and the percentage of the rural population in the country that about 27 million females live in rural areas. From the rural poverty rate – 32 per cent – we can estimate that about 8 million rural women (many of whom working at an age younger than 15) are poor – including those who work in agriculture. The average daily wage for a seasonal farm worker in Egypt is in the range of USD 5–8; it is usually lower for women compared to men. Accordingly, it can be argued that climate change presents considerable risks to an already fragile socioeconomic situation of so many rural Egyptian women (Kandeel, 2017).

One can say that up till now climate change induced migration has not been a serious problem for women in Egypt thus far. However, as climate change worsens, its impact through water scarcity is likely to be severe, especially for those living in rural areas. Among those who will face the threat of losing income and possibly be forced to migrate, women will carry a heavier burden because of the nature of the activities they are engaged in and because they tend to have high illiteracy rates, little to no asset ownership and a weak capacity for economic mobility and adaption.

Thus, it is important that the Government not only plan and take the necessary steps to minimize the adverse effects of the anticipated climate change, but also come up with a tailored plan to ease burden on women, especially in rural areas.

Hence, as discussed in this chapter, a country such as Egypt – with desert and delta, low rainfall, hot summers, huge cities, a long coastline and a single main river – is highly vulnerable to climate change. The uncertainty of water availability dramatically increases with climate change. Egypt must be prepared for this new normal now. The IPCC (2014) in the nineties stated that the most significant single impact of climate change might be on human migration. There is a consensus among scholars that research, awareness-building, legislation change, empowering humanitarian aid and policy provisions are the main steps to managing the effects of climate change. These could balance local infrastructure development to defend against environmental change, develop opportunities, support resources in its inevitability and provide for those who will inescapably be forced to leave their homes for another destination. In this regard, maintaining an international overseeing body, which coordinates the appropriation and use of funding from UNDP, IOM and national governments, is a clear necessity.

8. Conclusion and policy recommendations

The study investigates the role of climate change as a migration driver, viewing climate as the envelope within which all activities occur. It discusses three case studies – Mexico, Bangladesh and Morocco – in which climate migration had persisted internally or externally. It also discusses the case of Egypt by addressing the main climate change effects and the status of climate migration in Egypt. It seeks to make substantial advances in understanding the relationship between migration and climate change. From analysing this relationship, it can be noticed that climate change has implications for human migration and mobility, and its impact is anticipated to continue to rise. No region is immune to the negative impacts of climate change whether directly or indirectly as it will continue to be a major driver of migration and displacement. The most vulnerable groups such as the poor, disabled, elderly, women and children, are the most affected by climate change as they have little or no means, skills, knowledge and information to respond. Also, one must not forget that since the formation of the UNFCCC, advanced countries have avoided taking direct responsibility for harms from their carbon pollution. Not only budgetary requirements but also institutional challenges in implementing coherent programmes are formidable. While large-scale climate migration once appeared as a distant possibility, today, it is upon us. Without diminishing the urgency of mitigating climate change, the human and political costs of continuing to neglect climate migrants have simply become too great. Hence, from an institutional perspective, there are good reasons to distinguish support for climate migrants from established UNFCCC categories of "adaptation" and "loss and damage". Up to now, adaptation has largely been understood as adapting existing social and environmental sectors to effects of climate change. "To build the unified perspective essential for coherent policy, it makes sense to establish new institutions that have the well-being of climate migrants as their mandate" (Clements, 2024).

While many international laws and policy frameworks mention persons crossing borders in the context of climate change, implementation is lacking to provide comprehensive protection. All persons are rights-holders and nearly all countries have ratified at least one international human rights treaty. These obligations require a human rights-based approach to climate action and migration. Countries should address the needs of people affected by climate change and protect their rights before, during and after migration. Such action includes measures to mitigate climate change and prevent its negative impacts on human rights, to ensure all persons have the capacity and means to adapt; and to ensure accountability and effective

remedies for harms caused by climate change. And in this context, the first step is to leverage public power and commitments to secure more ambitious action against climate change, in accordance with the Paris Agreement, to reduce its role as a driver of human mobility (ibid.).

Thus, acknowledging that climate migration is an urgent and persisting matter, it requires immediate attention and prioritization by international organizations and governments both at the international and national levels.

Recommendations on the international level

- Build a unified perspective essential for coherent policy as it makes sense to establish new institutions that have the well-being of climate migrants as their mandate.
- Leverage public power and commitments to secure more ambitious action against climate change, in accordance with the Paris Agreement, to reduce its role as a driver of human mobility.
- Strengthen the role of regional bodies in addressing climate change-related human mobility by engaging with human rights mechanisms, including with their enhanced monitoring, review and technical support on the issue of climate change-related cross-border movement.
- Integrate human rights and human mobility, as well as climate change impacts, in relevant national reporting to the UNFCCC and to United Nations human rights mechanisms, particularly the Universal Periodic Review. Include a climate change specific focus in national action plans on implementing the Global Compact for Migration.
- Operationalize the OHCHR/Global Migration Group's Principles and Guidelines, supported by practical guidance, on the human rights protection of migrants in vulnerable situations.
- Facilitate the inclusion of migrants in host communities, the regularization of their status and their access to labour markets and mobilize means of implementation for effective climate change mitigation and adaptation measures to address human rights protection gaps.
- Mobilize global multi-stakeholder coalitions to accelerate feminist action for climate justice.
- Address data gaps through the collection of disaggregated data related to the drivers of human movement and measure the adverse effects of climate change and generate knowledge.
- The International Organization for Migration (IOM) could play a pivotal role, by building the capacity of relevant stakeholders to improve adaptability to climate change by establishing more IOM's national and regional offices in many countries.
- Collective efforts at the global level are essential to address climate change and its implications for migration.

Recommendations on the national level

- Countries should address the needs of people affected by climate change and protect their rights before, during and after migration. Such action includes measures to mitigate climate change and prevent its negative impacts on human rights, to ensure all persons have the capacity and means to adapt; and to ensure accountability and effective remedies for harms caused by climate change.
- A skill building and education for people at risk of migration due to climate change should be taken in consideration.
- A need for sustainable solution for climate migration whether adaptation in place or integration at destination.
- Mapping the profile of sending areas climate migrants and the profile of destination areas.
- Refrain from returning migrants to territories affected by climate change and uphold the fundamental principle of non-refoulement to protect those unable to return to their homes.

- Continue to build infrastructure to protect coastlines and shield existing human settlements.
- Raising awareness about the importance of environmental conservation and sustainable resource management through education campaigns and community outreach programmes. These programmes can include training on sustainable agriculture practices, early warning systems for natural disasters and access to alternative livelihood options.
- Streamline coordination between various stakeholders, especially at the local level. Coordination is particularly necessary when it comes to water-related issues, which fall within the domains of various governmental and non-governmental institutions. Avoid overlap between the different levels of government and connect the various development agencies with government and United Nations players.
- School curricula are also an essential tool for informing people about the effects of climate change. Educating children about the changing environment can have a spillover effect on their parents' behaviours.
- Promote sustainability programmes such as the Sustainable Agriculture Investments and Livelihoods (SAIL) project, led by the International Fund for Agricultural Development (IFAD) and the Ministries of Agriculture in countries. SAIL helps small farmers adapt to a changing environment and promotes micro-investment in smart agriculture.
- Institutional framework and capacity-building aspects should be addressed to ensure sustainable adaptation, including proper local and national governance. Multilevel policy and institutional frameworks are related to different elements, which need to be reformed in some cases. Moreover, a cumulative relationship between the various components is a pre-requisite for developing adaptive capacity.
- Empower women and girls to realize their environmental rights, especially climate vulnerable women such as indigenous women and women affected by climate migration. The adaptive capacity of women, in particular, should be prioritized from social, financial, political and cultural perspectives.
- Strengthen women's rights to land and natural resources, including through better tenure security, elimination of discriminatory laws and greater gender responsiveness of customary and informal justice institutions.
- Foster an approach to climate finance that promotes more equitable funding for women-led climate change adaptation and mitigation initiatives.
- Foster good governance for climate induced migration both in urban and rural areas as it is suggested that without giving rural resilience more thought, it will be hard to create resilient cities, and this is considered a valuable lesson learned from the country case studies (Bangladesh and Morocco).
- Initiatives to alleviate negative socioeconomic conditions, such the pressures of climate change, can primarily rely on financial remittances at the household level as one important lesson learned from Mexico case study.
- Understanding modes and routes of migration, enabling and disabling factors: This could mean real-time data gathering and temporal and spatial analysis of migration patterns with the aid of Geographical Information Systems (GIS).

We have discussed in this report, the case of Egypt as a typical example of an emerging lower-middle income economy that is highly vulnerable to climate change effects and faces numerous threats to its economic, social and environmental sustainability. We argued that climate change effects, combined, will worsen water scarcity, food security, increase the vulnerabilities of exposed groups and displace large populations. By implementing the aforementioned recommendations on the national level, Egypt can work towards adaptation and mitigation of the negative impacts of climate change. With international stakeholders, Egypt can leverage resources, expertise and support (for example "the fund of damage and losses" to enhance resilience to climate change). By engaging in meaningful partnerships, Egypt can develop new technologies, approaches and solutions to address climate change and migration dynamics, provide humanitarian needs for

internal migrants such as relief, shelters and health and education services. Of particular relevance for Egypt are measures to address the water scarcity challenge. On the top of these measures are:

- Implementing water desalination projects (for hydrogen production and general water needs).
- Implementing advanced water recycling systems.
- Promoting smart irrigation in agriculture.
- Adaptation options such as improving rain-harvesting techniques, increasing extraction of groundwater and enhancing water transportation.
- Adopting stress-resistant crops.
- Running public awareness campaigns to foster water-saving habits.
- Reforming laws, policies and justice institutions to make women more responsive to the climate needs of women and girls, in line with international human rights standards and national development plans.
- Preparing for the health implications of climate change-induced migrations' needs mapping the epidemiological profile of the places that could become "sending" areas and those that could become "receiving" ones and a climate change resilient health care system needs to be developed along with improved accessibility for vulnerable people.

By implementing these environmental policies and initiatives, Egypt can work towards adaptation and mitigation of the negative impacts of climate change.

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