Understanding the environment-migration nexus in the Mediterranean

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Chapter 5
Understanding the environment-migration nexus in the Mediterranean

Executive summary

The links between environmental factors and migration are complex and characterised by non-linearities and high context-dependency. Environmental migration is strongly influenced by local socio-economic and political conditions, and other co-stressors.

Most environmental migration is internal and over short distances, although migration over longer distances and across national borders is observed. Changes in temporary forms of mobility are common in response to environmental changes.

The complexity of the issues and the insufficiency of data make it difficult to empirically assess environmental impacts on migration, and to project future mobility under environmental change.[68]

Existing evidence points to nuanced links between environmental factors and migration in the Mediterranean region. Different areas and sub-populations are affected to different extents.

Vulnerability to environmental hazards plays a decisive role in shaping the impacts of environmental changes. A large proportion of populations affected by environmental change remain immobile. While some are not motivated to leave their home, others may lack resources to do so, resulting in potential entrapment.

Drought, aridity, and land degradation are important environmental hazards in the Mediterranean region, with major implications for human mobility. They can potentially lead to more permanent forms of movement.

Environmental factors are not only relevant for mobility within the Mediterranean, but they can also shape mobility to the region. The Mediterranean is an important transit and destination region with most migrants moving to urban areas.

[68] In this Analysis, the term 'environmental change', if not explicitly stated otherwise, is used to refer to changes in terrestrial and marine ecosystems as well as changes in climate conditions at local, regional or global scales.

5.1 Central concepts and frameworks on environmental migration

5.1.1 Conceptual framework

The link between the environment and migration is as old as humankind (see *Chapter 2*). People have always moved in search of better living conditions for themselves and for their families, or to escape environmental hardship or hazards in their homeland. While these two drivers constitute the fundamentals of the simple 'push and pull' theory (Massey et al. 1993), migration decisions in the context of environmental change are typically more complex. There is no single theoretical framework that provides a comprehensive understanding of the role of environmental conditions in human migration (de Sherbinin et al. 2022).

Given the complexity and interactions of the various drivers of migration with environmental change factors, a framework that encapsulates broader dimensions of the migration process is required. This chapter adopts the Foresight (2011) framework, which stipulates that the decision to move is influenced by five broad categories of drivers, namely environmental, social, economic, demographic, and political drivers, which constitute the macro-level factors *(Figure 5.1)*. By affecting the macro-level drivers, the impacts of environmental change are likely to vary with country-level characteristics, such as the level of economic development and the political capacity of the government to effectively address environmental problems (Adger et al. 2009).

Migration decisions are not only shaped by the complex interplay of macro drivers, but also by intervening factors at the meso-level (e.g. social networks, legal framework, technology) as well as personal and household characteristics (e.g. age, gender, education, wealth) (Black et al. 2011; Hunter et al. 2015). In line with the IPCC's risk framework (IPCC 2022), non-environmental characteristics affect people's vulnerability, which in combination with their exposure to different types of environmental hazards *(Section 5.1.2)*, determines the overall environmental risk, affecting their adaptation options and therefore also the decision to migrate *(Section 5.1.4)*. Overall, recognising that environmental migration is highly contextual *(Section 5.1.3)*, and that not all affected households or individuals will migrate is very important for understanding the nexus between environmental change and migration.

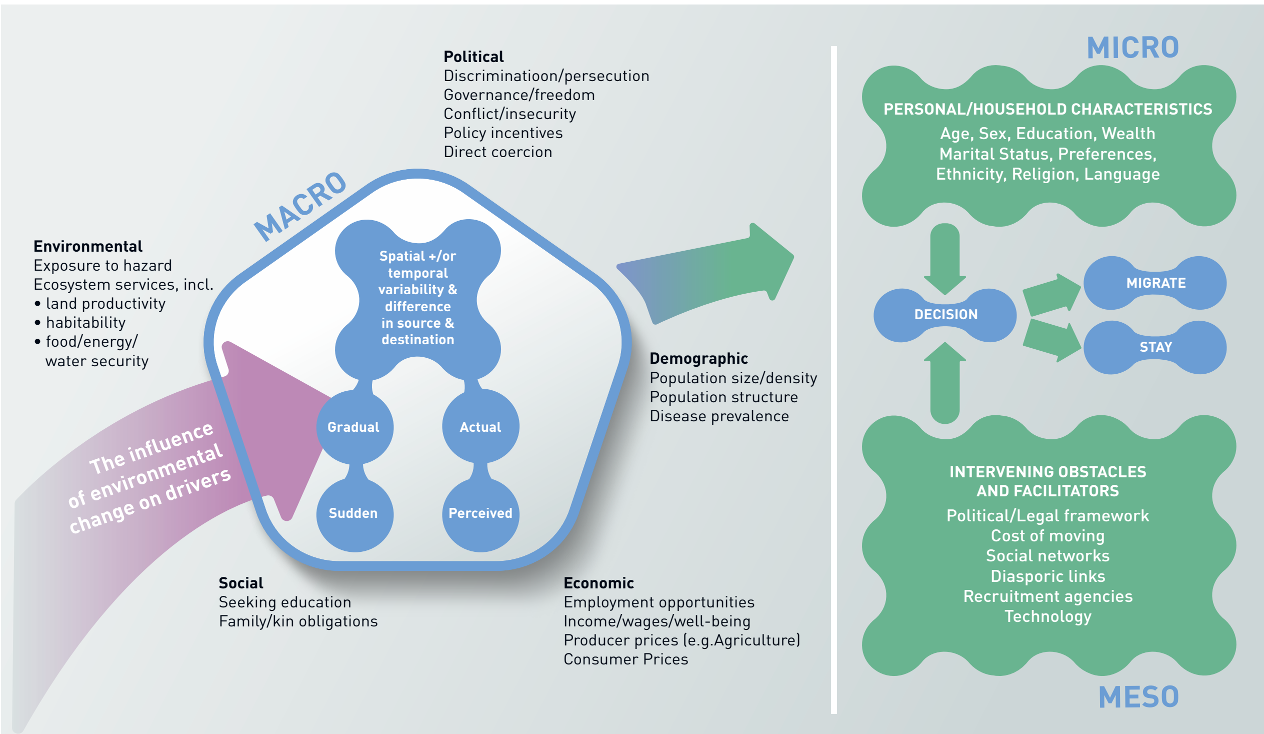

Figure 5.1 | A conceptual framework for understanding the migration-environment nexus. Source: Foresight, Migration and Global Environmental Change (2011).

The International Organization for Migration defines environmental migrants as 'persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual home, or choose to do so, either temporarily or permanently, and who move either within their country or abroad' (IOM 2007; see *Chapter 2, Section 2.1.2*). A complementary concept is that of 'climate mobilities', which emphasises the multiple forms of human movement, from permanent and seasonal movement to immobility in the context of climate change, as well as the transformative character of mobility and its impact on places of origin, transit, and destination (Boas et al. 2019; Wiegel et al. 2019).

Public debates around the issue of environmental migration often follow a simplistic and deterministic narrative, neglecting the diverse nature of human movements in the context of environmental change (Tschakert and Neef 2022). Often, the focus is placed on adaptive and involuntary migration, and the organised relocation of populations, as opposed to both voluntary and forced immobility, which have so far received less attention in research and policymaking (Cissé et al. 2022). While some groups may not have a motivation or incentive to migrate even when confronted with environmental hazards, others may not have the necessary resources to do so *(see Chapter 2, Section 2.1.2)* (Black and Collyer 2014; Adger et al. 2015). These 'trapped populations' are characterised by high levels of vulnerability and may find themselves in a vicious cycle of increasingly deteriorating environmental conditions, poverty, and immobility (Zickgraf 2018; Cundill et al. 2021; Benveniste et al. 2022). Immobile populations may need government support to remain in areas exposed to environmental hazards, or to relocate elsewhere. However, planned relocation has been linked to significant emotional, social, and economic costs (Cissé et al. 2022).

5.1.2 Different types of environmental hazards and their impacts on populations

5.1.2.1 Slow and sudden onset events

The existing literature on the links between climate change, the environment, and migration often distinguishes between slow and sudden onset events (Koubi et al. 2016b; Cattaneo et al. 2019; Hoffmann et al. 2021; IPCC 2022). Sudden onset events, such as hurricanes, floods, and wildfires tend to have severe, immediate consequences for the well-being, safety and health of individuals by inflicting injuries and casualties as well as causing economic disruption and food insecurity (Wallemacq and House 2018). In such cases, 'people must flee from a sudden onset environmental event to save their lives' (Warner et al. 2010). The resulting displacements tend to be temporary and over short distances (McLeman and Gemenne 2018), with the majority of those who are displaced returning as soon as possible to rebuild their homes and lives. Consequently, sudden onset events typically cause internal and not international migration.

Slow onset events such as drought, desertification, and water/soil salinity are usually not considered triggers of migration as their impacts unfold only gradually over time. The literature provides conflicting evidence of how these events affect human mobility. On the one hand, there are many cases of mass movements in response to drought, particularly in Africa (Sahel), South America (Argentina, Brazil), the Middle East (Iran, Syria), Central Asia, and Southern Asia (Piguet and Laczko 2013; Miyan 2015). On the other hand, studies have shown that people are unlikely to move in the presence of slow onset events (Koubi et al. 2016a; Cottier and Salehyan 2021). Slow onset events have also been shown to lead to reductions in both internal and international/external migration due to their impacts on migration capacities, including financial (liquidity constraints) and human (lack of education) capital (Cattaneo and Peri 2016; Koubi et al. 2022).

5.1.2.2 Cumulative stressors

The recent literature shows that it is not only the occurrence of a single event that has important impacts on people's livelihoods, including migration decisions, but also the occurrence of repeated events over a certain period of time (Devkota et al. 2017; Kim and Marcouiller 2018). The impact of a succession of such events can be very different from the impact of a single event, irrespective of their intensity (Berlemann and Steinhardt 2017). Due to a lack of appropriate data, only a few studies have been able to quantify the specific impact of repeated climate events on population movements (Bohra-Mishra et al. 2014; Safra de Campos et al. 2017).

5.1.2.3 Cascading and compound risks

Extreme environmental events can interact with other hazards and with human systems in important ways (Kruczkiewicz et al. 2021; Jehn et al. 2022; Thalheimer 2023). For example, rising global temperatures can affect agricultural productivity, and at the same time increase the frequency and severity of extreme events, that is floods and droughts, which may be occurring simultaneously. It is therefore analytically difficult to take into account how hazards can trigger other hazards and cause cascading impacts — and responses — in human systems (Zscheischler et al. 2018).

The IPCC (2018) acknowledges the difficulty of incorporating compounded and cascading impacts of multiple events in its analyses. In its special report on 1.5°C of warming, it observed that '[t]he literature on compound as well as interacting and cascading risks at warming of 1.5°C and 2.0°C is limited' (IPCC 2018, p. 245), and that 'risks across energy, food, and water sectors could overlap spatially and temporally, creating new and exacerbating current hazards, exposures, and vulnerabilities that will affect increasing numbers of people and regions.'(IPCC 2018, p. 10). Still, evidence shows that the simultaneous occurrence of extreme events on a large spatial and temporal scale can have cascading impacts on human systems, locally and globally.

An example of cascading and compounded events is the food security crisis of 2010–2011 and the Arab Spring (*see Chapter 4, Sections 4.1* and *4.2*). In early 2010, the Russian Federation experienced an unprecedented heat wave, which attribution analysis suggests was made five times more likely as a result of climatic warming (Rahmstorf and Coumou 2011). Such extremely hot and dry weather triggered widespread wildfires, which destroyed 20% of the Russian wheat crop. The same drought struck Ukraine and eastern China as well, causing major reductions in their wheat harvests (Sternberg 2012). Floods destroyed one million tonnes of grain reserves in Pakistan between August and October 2010. Unusual torrential rains shrunk wheat yields by nearly a quarter in Canada and reduced the quality of much of the crops to fodder in Australia and northwestern Europe (Holland 2012). Over the course of 2010, this combination of impacts contributed to a 40% increase in world food prices (Holland 2012), which, in turn, led China to make a large-scale wheat purchase to secure its domestic supply and Russia to levy an export ban for the same reason. This subsequently caused a spike in food prices in Egypt and elsewhere in the MENA region, where it became a major factor in the Arab Spring (Ciezadlo 2011; Bellemare 2015). Protesters in Tunisia brandished baguettes, while in Egypt they demanded 'bread, freedom and social justice'. By the end of 2011, popular revolts broke out in many Arab countries, including Egypt, Libya, Syria, Tunisia, and Yemen (Soffiantini 2020).

5.1.3 The role of contextual effects and co-stressors

The growing scientific evidence documenting environmental migration has produced a mixed collection of findings. While it is acknowledged that environmental factors can influence patterns of human mobility, questions often remain as to when, how, and why different forms of climate mobility emerge (Cattaneo et al. 2019; Hoffmann et al. 2021).

5.1.3.1 Differences in mobility responses to environmental hazards

Environmental factors can affect communities and human mobility both directly and indirectly. Extreme weather events such as storms and floods may force people to flee to survive (see above regarding sudden onset events). A direct impact may also occur in the context of slow onset events, where, for instance, sea level rise forces inhabitants of coastal areas to relocate. On the other hand, environmental factors can impact mobility indirectly by influencing another driver, such as income from agriculture or fishing. This can lead to heterogeneity in the migration response across different population groups, as some may be more affected by environmental hazards than others. Taken together, while the direct effects help us to understand whether climatic events affect mobility, the heterogeneous (i.e. contextual) effects help us to understand when climate mobility emerges (Berlemann and Steinhardt 2017; Cattaneo et al. 2019; Hoffmann et al. 2021).

There is ample evidence that mobility outcomes of environmental events differ depending on various factors at the micro-, meso-, and macro-levels (see *Figure 5.1*), reflecting the diverging vulnerabilities to environmental pressures of different population groups (Black et al. 2011; Cattaneo et al. 2019). A concrete example of such heterogeneous impacts is the well-established inverted U-shape association between wealth and environmental migration. As environmental shocks can increase both the pressure to move and liquidity constraints, poor people might become immobile in the aftermath of adverse events, while middle-income populations might move at increased rates (Cattaneo and Peri 2016; Benveniste et al. 2022). The literature further provides evidence on heterogeneous effects in interaction with, for example, gender (see Dillon et al. 2011; Thiede et al. 2016; Becerra-Valbuena and Millock 2021), education (see Drabo and Mbaye 2015; Šedová et al. 2020), and agricultural dependence (see Dillon et al. 2011; Šedová et al. 2020). However, many gaps remain in our systematic understanding of when environmental migration emerges (Cattaneo et al. 2019).

5.1.3.2 Channels of influence

By affecting migration drivers (e.g. economic, social, or political factors), environmental hazards change the manifestation of human mobility, whereby the drivers act as mechanisms linking these two phenomena. Thus far, the evidence shows that economic (e.g. income differential between origin and destination, income variability) and political (e.g. onset and incidence of violent conflicts) factors are potential mechanisms explaining environmental migration (Berlemann and Steinhardt 2017; Cattaneo et al. 2019). As for the political factors, there is evidence that adverse climate impacts may increase the likelihood of violent conflict (Hsiang et al. 2013), which could then lead to forced displacement both within countries, but also internationally (Missirian and Schlenker 2017; Abel et al. 2019). Overall, more evidence on the role of different mechanisms in the link between climate and mobility is needed (Cattaneo et al. 2019).

5.1.3.3 Social tipping points and thresholds

Tipping points and thresholds are important for understanding environmental impacts on human mobility. Migration often takes place after a threshold has been crossed, beyond which risks or effects are too substantial to sustain (Meze-Hausken 2008; McLeman 2018; McLeman et al. 2021). The literature has identified the following six steps that play a role in the context of environmental impacts on mobility: (1) adaptation becomes necessary; (2) adaptation becomes ineffective; (3) substantive changes in land use/livelihoods become necessary; (4) in situ adaptation fails, migration ensues; (5) migration rates become non-linear; and (6) migration rates cease to be non-linear (McLeman 2018). These thresholds are a product of multiple factors, including climatic conditions or events in question, individual and household decisions, as well as larger group mobility dynamics. These processes are affected by people's perceptions, actions of influential individuals or groups, and changes in key infrastructure, services, or other community assets (Bardsley and Hugo 2010; McLeman 2018; Adams and Kay 2019; Horton et al. 2021).

5.1.4 The IPCC risk framework

In the context of the IPCC's Sixth Assessment Report, McLeman et al. (2021) developed a conceptual framework, which considers environmental migration from a climate change risk perspective *(Figure 5.2).* It shows how environmental migration may emerge from the interactions of both environmental and non-environmental factors, and what the potential outcomes could be. Accordingly, risks in the context of environmental change are a function of a particular climatic hazard, as well as the exposure and vulnerability of non-environmental factors (e.g. people, resources, and systems) to such a hazard.

Adaptation to an environmental hazard typically starts with in situ measures. If these are successful, they can lower the risk, and migratory patterns remain unchanged. However, if the local, context-specific thresholds are crossed and in situ adaptation becomes insufficient to address the risk, changes in the mobility strategy can be used to adapt by those with the capacities to do so. The mobility outcomes are uncertain and may both increase or decrease risk, depending on the different conditions including the political, socio-economic, and demographic situation. Typically, mobility with higher agency leads to better outcomes, as migrants have more control over their destination choices, and make decisions based on economic and security prospects (Adger et al. 2015; Jacobson et al. 2019). People who cannot afford to move and whose *in situ* adaptation fails typically experience increased risk and vulnerability (McLeman et al. 2021; IPCC 2022).

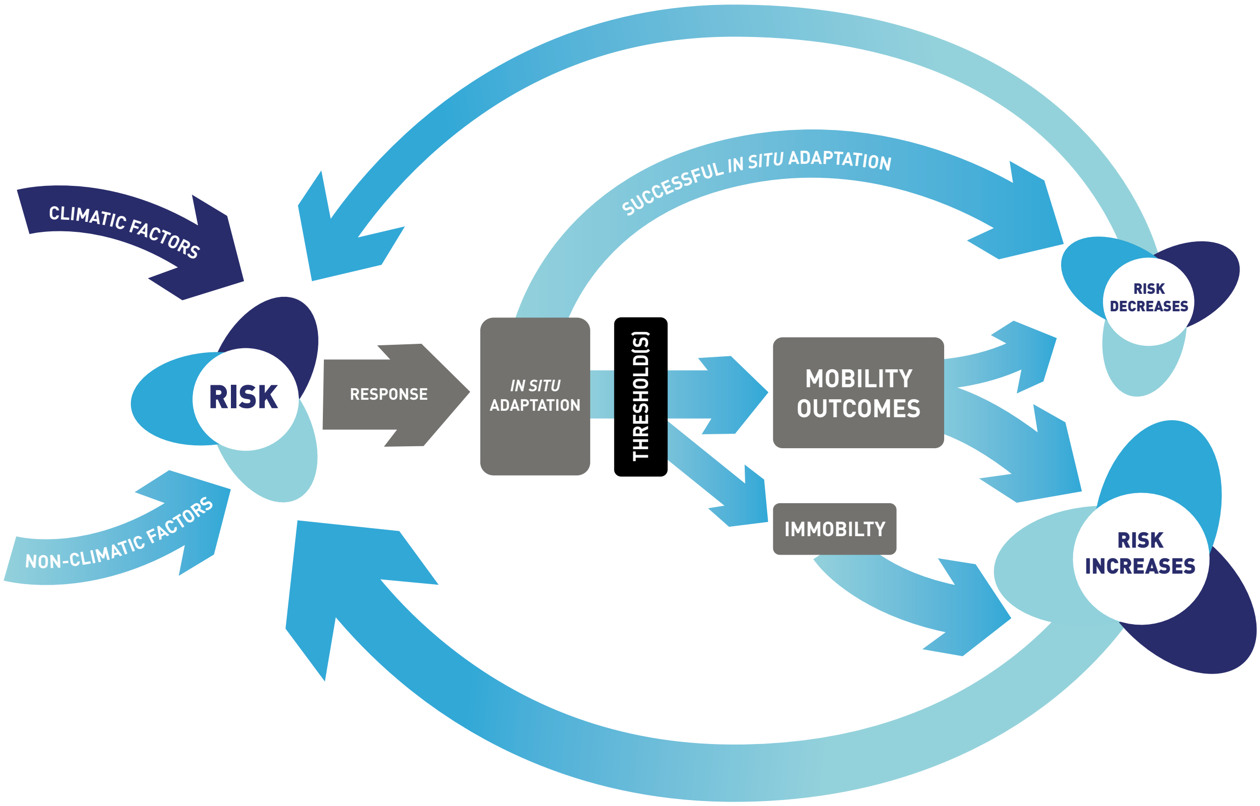

Figure 5.2 | Environmental migration risk framework. Source: McLeman et al. (2021).

5.2 Empirical evidence on environmental migration in the Mediterranean

5.2.1 North Africa and Sahel

In the Mediterranean, all North African countries — Algeria, Egypt, Libya, Morocco, and Tunisia — have historically been, and remain, significant countries for migrant destination, transit, and departure (de Haas 2011). Mixed migration patterns are observable in the region with economic conditions, environmental changes, and political instabilities contributing to migration dynamics. According to the seventh Afrobarometer carried out between 2017 and 2018, high migration intentions are observed in Tunisia (23%) and Morocco (13%), the two North African countries covered by the survey. Among all interviewed respondents, 47% indicated Europe as their preferred destination (Appiah-Nyamekye Sanny et al. 2019).

While environmental factors influence migration in the region, particularly for short-term and internal moves, political and economic conditions and social networks are more significant drivers (Hunter et al. 2015; Sow et al. 2016). In particular, economic shifts, urbanisation, demographic changes, rising education levels, and cultural transformations have all contributed to increased mobility, including rural-to-urban migration and emigration to Europe (de Haas 2011; Borderon et al. 2019).

Households in North African countries often do not directly attribute environmental hazards as the main cause of migration. However, they mention indirect factors such as insufficient agricultural revenue, a lack of agricultural employment, and better employment opportunities in destination areas. These indirect channels can be significantly influenced by adverse weather shocks and environmental change processes (Nguyen and Wodon 2014; Wodon et al. 2014). According to International Labour Organization (ILO) estimates for 2021, the agricultural sector employs a substantial proportion of the population in Sudan (41%), Morocco (35%), Egypt (20%), Libya (16%), Tunisia (14%), and Algeria (10%).

Rural communities that rely heavily on the environment for their livelihoods, such as pastoralists and agro-pastoralist communities are particularly susceptible to the impacts of environmental change (Hoffmann et al. 2022; Wolde et al. 2023). The shrinkage of grazing areas over past decades has severely affected these communities, prompting some mobile populations in the region to travel longer distances. Additionally, sedentary farmers experience challenges due to delays in rainy season onset, mid-season heat waves, and heavy rains, resulting in crop loss and diminished yields (Connolly-Boutin and Smit 2016).

Drought and desertification processes as well as resulting land degradation represent considerable risk factors for North African dryland regions (Waha et al. 2017; Wiederkehr et al. 2018; Hoffmann et al. 2022). Rural dryland communities face various environmental hazards, frequently leading to extensive losses in agricultural yields and livestock (Huho et al. 2011; Middleton and Sternberg 2013). While dryland residents have adapted to their surroundings, the frequency and intensity of environmental hazards are on the rise due to climate change (Diffenbaugh et al. 2017), exacerbating the strain on local livelihoods (Thornton et al. 2011). In most dryland regions around the Mediterranean, the majority of climate models predict an increase in aridity, which will have a negative impact on agricultural and pastoral systems' productivity and reliability (Geddes 2015). In some cases, limits to adaptation may be reached, beyond which local adaptation may no longer be possible (Dow et al. 2013; Xu et al. 2020).

A case study in El Faouar in Tunisia demonstrates how affected communities must cope with unanticipated crop destruction that restricts their ability to pay their daily expenses by either selling livestock or migrating to seek out alternative income sources. The findings also demonstrate that local households attempt to increase their resistance to environmental constraints and climate change by expanding their agricultural capacity, provided they have additional funds from employment outside El Faouar, or remittances. Additionally, migration has evolved into a larger socio-economic transformation process where individuals move away to deal with or adapt to environmental changes (Sobczak-Szelc and Fekih 2020).

In addition to gradual changes in environmental conditions, sudden onset extreme weather events have caused displacement in the North African region. Overall, the region is less affected compared to other world regions with a share of only 0.35% of all displacements recorded in the period 2010–2019 (IDMC 2020). In Libya, for example, which does not have dedicated policies on internal displacement, approximately 7600 people were displaced between 2010 and 2019 due to disasters (IDMC 2020). In September 2023, Storm Daniel led to 42,000 displacements in the country (UNOCHA 2023). Infrastructure and agricultural lands that were crucial to the local economy were severely damaged by the floods.

5.2.2 The Middle East as part of the MENA region

The literature on environmental migration in the Middle East has largely focused on the links between environmental hazards, conflict, and migration. Conflict and violence continue to be the principal causes of displacement in the sub-region, despite progress in some countries toward peacebuilding and conflict resolution. Empirical studies have suggested a correlation between environmental change and hazards and the exacerbation of political instability in the MENA region, with climate change potentially contributing to intensifying pre-existing tensions (Sofuoğlu and Ay 2020).

Although historically accustomed to dealing with dryness, the Middle East has struggled with prolonged drought in the last decades, which is one of the costliest socio-economic disasters it has faced. However, obtaining clear statistics on the number of displaced individuals due to drought in the region remains challenging. As frequently discussed in the literature, a prolonged drought that destroyed sources of livelihood in the Syrian Arab Republic, prior to the conflict's outbreak in 2011, is considered one of the complex factors that contributed to the country's civil war *(Chapter 4, Section 4.2).* The severe drought that struck Syria between 2007 and 2010 was made two to three times more *likely* as a result of climate change (Kelley et al. 2015). This drought contributed to massive crop failures that undermined livelihoods and forced 1.5 million people to move from rural areas into cities, exacerbating existing social tensions (Gleick 2014).

However, the contribution of the drought to the conflict and resulting migratory movements is also questioned in the literature (see *Chapter 4* for discussion). An interdisciplinary study conducted in Türkiye reveals that Syrian farmers employed adaptive measures against the drought before the war (Dinc and Eklund 2023). The authors also show that land abandonment during the drought was less extensive than often portrayed in the literature. Other evidence indicates that protests were more likely to occur in Syria's drought-prone regions, and that extreme weather events may have indirectly influenced civil unrest (Ash and Obradovich 2020).

Drought events and water scarcity represent a considerable challenge for the region. Cases of displacement in Iraq have shown that many families displaced due to water stress remained in their original governorates, with most of them moving towards urban areas (IDMC 2020; IOM 2022). Also, in Iran, environmental factors, including drought and resulting water stress, are among the main causes of rural migration, with many farmers heading to urban areas in pursuit of safety or a decent life (Khavarian-Garmsir et al. 2019; Ebadi et al. 2020). Since several countries in the area have recently experienced major droughts, there is enduring concern that the number of displaced people could rise as a result of environmental change.

Sudden onset disaster events also had adverse effects, in particular for those communities that are already affected by conflicts. Floods and wildfires caused hundreds of thousands of displacements in Lebanon and Syria recently. Between 2019 and 2022, there were multiple displacements due to repeated severe floods and storms, and the majority of people affected were internally displaced persons (IDPs) residing in camps (IDMC 2020). In some cases, the events have led to secondary displacements showing how the confluence of conflict and disaster creates a spiral of vulnerability and displacement (IDMC 2022).

In addition to severe floods, 25,000 people were forced to flee their homes due to wildfires in Syria in 2020, which caused damage to homes, water, electricity networks, and cropland, and increased food insecurity (IDMC 2021). Unfortunately, data on disaster displacement are collected incompletely, and small-scale disasters frequently go unreported because there is no systematic, national monitoring of displacement resulting from disasters in several countries in the Middle East (IDMC 2021). In Israel, 91,693 people were displaced by disasters between 2008 and 2021, and all the large-scale displacements in the country were due to wildfires (IDMC 2021).

In the future, environmental changes and hazards could lead to increased poverty and social instability, further destabilising the region and potentially contributing to increased migration (Geddes 2015). In the suddenly developing metropolitan areas of the Middle East, heat waves and flooding could result in significant losses and damages (Salimi and Al-Ghamdi 2020). Dervash and Wani (2022) draw attention to the fact that recently, migration from urban-to-urban areas has surpassed migration from rural to urban areas. The authors emphasise that the next stage may take place in the form of migration to Türkiye and Europe, due to the water shortage experienced in big cities, especially in summer.

Existing research on climate change and migration in the MENA region[69] has revealed important insights, but several gaps and unanswered questions remain. The availability and accuracy of data on environmental migration need to be improved in order to obtain precise statistics on the number of people displaced by environmental factors. It is crucial to understand the dynamics shaping the intricate relationship between environmental change and socio-economic and political factors, and particularly their long-term impact on migration decisions. Furthermore, studies focusing on the vulnerabilities and adaptive capacities of specific population groups, such as women, children, and marginalised communities, are necessary to address their unique challenges in the region.

5.2.3 Southeastern Europe

Climate change is expected to have a major impact on countries in southeastern Europe and the Balkans, including a significant increase in the number of extreme heat events in summer, and precipitation

[69] Although this Analysis focuses primarily on the Mediterranean region, it also draws on data from the Mediterranean Basin, the Eastern Mediterranean and Middle East (EMME), and the broader Middle East and North Africa (MENA) region (also referred to as Southern and Eastern Mediterranean Countries). In this Analysis, the MENA region refers specifically to countries bordering or closely connected to the Mediterranean Sea.

events in the winter months (Alfthan et al. 2015). The entire region will become drier as a result of rising temperatures and declining precipitation, with droughts predicted to increase in frequency, for example in Albania (Angelini et al. 2012). This trend has implications for agricultural production and food security in the region, especially in countries with an already strained food supply. For example, in 2022, more than 30% of the population in Albania and more than 20% in North Macedonia are moderately or severely food insecure (World Bank Data Catalog, World Bank Group[70]).

Increased insecurity can enhance migration intentions in the region. Although Southeastern European countries face a low to moderate risk regarding the effects of climate change in comparison to the rest of the world, they are already facing a number of sudden and slow onset disasters (Barron and van Manen 2022). Floods, drought, and extreme temperatures, for instance, caused 79% of crop and livestock production losses in the Western Balkans between 2005 and 2014 (FAO 2017). Countries like Montenegro have not seen a single year in the last two decades without an extreme event such as heat waves, floods, prolonged droughts, or forest fires (Burić et al. 2022).

Sudden onset disasters such as increasing and intensifying floods and wildfires are a key hazard in the Western Balkans, causing major livelihood losses and displacement (Alfthan et al. 2015). For example, severe late spring frosts have caused significant damage to fruit plants in Bosnia Herzegovina over the last five years (Trbic et al. 2021). Floods are the most prevalent disaster, with six flood events causing significant destruction in Montenegro in the last decade (Bisaro and Meyer 2022). The floods that occurred in May 2014 as a result of two months of rainfall in three days caused significant damage to settlements, and led to the relocation of approximately one million individuals in Serbia, Bosnia and Herzegovina, and Croatia (Hadžić 2022). The floods killed 51 people, displaced 31,000 individuals, and pushed an estimated 125,000 people into poverty (Alfthan et al. 2015). Those without a Schengen visa, who could not escape to neighbouring EU countries, were often trapped or internally displaced while seeking shelter (UNESCO 2023). In 2021, the Balkan region encountered catastrophic forest fires, like many other parts of the world. However, there is no conclusive evidence as to the impacts of these events on displacement and migration (Bisaro and Meyer 2022; IOM 2023).

Slow onset hazards, notably droughts, have had a considerable negative impact on the Balkans' welfare and economy in recent years. A Drought Management Centre for Southeastern Europe (DMCSEE)[71] was formed in 2009 to analyse regional vulnerability and risks, reduce the effects of drought, and establish an early warning system (Alfthan et al. 2015; Županić et al. 2021). This was especially important, since the Republic of North Macedonia is one of the driest countries in Europe (Županić et al. 2021). Albania is becoming more vulnerable to climate change due to its reliance on agriculture (Zhllima et al. 2022), and agricultural lands in Bosnia and Herzegovina are completely dependent on precipitation for water supply and groundwater replenishment (Trbic et al. 2021). The 2012 drought in the Western Balkans, particularly in Bosnia and Herzegovina, saw grain and vegetable production drop by up to 70% (Županić et al. 2021). Environmental change disproportionately affects those who are already vulnerable due to poverty, unemployment, and social exclusion, reducing their capacity to adapt and increasing the risks of displacement (IOM 2023). Recent studies from the region have raised doubts about the potential of migration as an adaptation strategy for households (Šimunić et al. 2020; Marić et al. 2023).

Türkiye experiences many sudden and slow onset climate events, such as floods, storms, forest fires and drought, and these mostly cause temporary displacement. During the last decade, hundreds of people have been displaced in Türkiye due to floods and wildfires, especially in the northern and southern parts of the country (IDMC 2020, 2021). The year 2021 was one of the country's worst in terms of sudden onset events. Four hundred and twelve widespread wildfires broke out in the southern and southwest provinces, displacing 81,000 people. At least 2500 homes were burned in the fires, putting almost 9000 people at risk of long-term displacement. In addition, a strong storm hit Türkiye in August of 2021, resulting

[70] Indicator 'Prevalence of moderate or severe food insecurity in the population (%)': https://data.worldbank.org/indicator/SN.ITK.MSFI.ZS

[71] https://www.dmcsee.org/

in heavy rains, flooding, and the deaths of 82 people. This disaster also led roughly 2500 people to flee their homes in several cities (IDMC 2021).

The overall effect of drought on migration in Türkiye is notable but not definitive; certain environmental factors, which might seem pivotal in driving migration, are overshadowed by non-climatic variables. Studies have reported declines in migration from rural areas during rainy seasons in regions where security is not an issue (Delju et al. 2019). Research indicates that it is often wealthier families that tend to permanently relocate to urban centres, whereas economically disadvantaged individuals often seek seasonal employment in agriculture (Afifi and Jäger 2010).

5.2.4 Southern Europe

In the empirical literature, Europe is mainly considered as a destination for migrants (Missirian and Schlenker 2017). Very limited evidence exists related to the impacts of environmental changes on migration within Europe. Given the expected impacts of climate change on relevant migration drivers, including agricultural productivity, it may be expected that parts of Southern Europe may also see increased migration in the future, if climatic impacts become more severe (EEA 2019; Hoffmann et al. 2023).

Climate change is expected to have a wide range of implications for mobility in Europe, including more frequent and powerful heat waves, retreating glaciers, and altered terrestrial ecosystems. In the Mediterranean and Southern Europe, rising temperatures and prolonged droughts are predicted to reduce water availability and crop productivity, and increase the possibility of wildfires. Despite receiving little attention in the literature, Southern Europe has witnessed thousands of people displaced in the previous decade because of a number of sudden onset disasters due to climate change.

The main causes of environmental displacements in the region are intensifying wildfires, floods, and storms. Between 2018 and 2021, an ongoing series of storms and floods displaced about 40,000 people in France, Greece, Italy, and Spain (IDMC 2020, 2021). Even though wildfires are a natural part of the Mediterranean ecosystem, changes in land use, overgrazing, deforestation, abandonment of agricultural lands, a decrease in rural population, and record high temperatures and long-term droughts all contribute to an increase in their size and severity.

The region's intensifying wildfires also damage vegetation such as trees and grass, lowering the soil's ability to absorb water, increasing the risk of flooding (IDMC 2021), and bringing the compound risk of disasters and consequent displacements. In 2022, Spain experienced record high temperatures, rivers dried up in Italy, thousands of hectares of forest burned in Southern Europe, and about 100 million people across Europe were affected by water shortages (Kaeding et al. 2023).

Recent case studies in Southern Italy's Apennines highlight the need for targeted measures to prevent elevated risks of future disasters and capitalise on risk reduction and resilience capabilities associated with migration (L. Guadagno and E. Guadagno 2021; E. Guadagno 2022). These suggest that interventions should occur both at migrants' places of origin (e.g. planning, capacity building, risk awareness) and at their destinations (e.g. diaspora engagement), and should involve migrants, their households, and community members to ensure a fair distribution of risk-reduction benefits. More research and data, and a stronger focus on European countries, are needed to understand the implications of environmental change processes on migration within and across European countries.

5.3 Trajectories and destinations of mobile populations

5.3.1 Environmental changes and urbanisation processes

Urbanisation has changed the world in the 21st, with cities now housing more than half of the world's population. The urban population has grown dramatically, especially in the Global South's low- and middle-income countries (Gemenne et al. 2016). Small- and medium-sized cities in Africa, Asia, and Latin America are becoming more urbanised. By the middle of the century, approximatively two thirds (68%) of the world's population is expected to live in urban areas, with an estimated 2.5 billion additional individuals projected to live in cities worldwide by 2050 (UN DESA 2019).

While these trends are mainly driven by natural urban growth, rural-urban and urban-urban migration also contribute to these developments around the world (Gemenne et al. 2016). Rural-urban migration, particularly to major metropolitan areas, is an important engine of societal transformation (Geddes 2015). Historically, culturally, and linguistically interconnected countries in the Mediterranean Basin have experienced intense urbanisation since the 1950s (Tabak 2008; Marraccini et al. 2015). For example, between 1960 and 2015, the total population of the Middle East and North Africa quadrupled (Guida 2022), and 66% of the population was residing in urban areas by 2022 (World Bank 2023). While Egypt, Morocco, and Algeria are anticipated to continue to have an exceptionally high urbanisation rate at around 60% by 2030, Lebanon, Jordan, and Libya are expected to have an urbanisation rate of roughly 88%, 84% and 79%, respectively (UN DESA 2019).

Environmental change plays an important role in urbanisation processes, both as a driver and as a risk factor (de Haas 2011). As a driver, environmental factors can amplify rural-urban migration in pursuit of better opportunities, such as access to education, health care, and employment prospects (Lu 2010; Naude 2010; Scheffran et al. 2012; Henderson et al. 2014, 2017; Nguyen and Wodon 2014; Chen and Mueller 2019; Lyu et al. 2019; IPCC 2022; Helbling and Meierrieks 2023). In this context, secondary and tertiary cities, that is, smaller urban agglomerations, play an increasingly important role as migration destinations experiencing growing immigration in many countries (Andreasen et al. 2017; Marais and Cloete 2017).

Migration to urban destinations can contribute to economic growth and facilitate individuals' access to public goods. However, if not managed well, cities can struggle to cope with the influx of people, potentially leading to multidimensional social problems, including poverty and inequality. Displaced persons and migrants frequently settle in informal neighbourhoods, where they face health, economic, and security issues (Alexander and Tomalty 2002; Keivani 2009). Especially in North African countries, the percentage of the urban population living in informal settlements has increased in recent decades (UN-HABITAT 2022). This can lead to a downward spiral of 'slumification', with climate change contributing to increased risks alongside other socio-economic factors (Cities Alliance 2021; Abu Hatab et al. 2022). Poorly managed urbanisation and underdeveloped infrastructure can increase disaster risks due to a high population concentration, and exposure to threats. These risks can also influence relatives of urban dwellers outside the city (IOM 2020).

Rural-urban mobility, on the other hand, is also critical to risk reduction measures for households, offering access to markets, services, economic opportunities, and disaster and environmental protection systems. Cities provide prospects for development and prosperity, particularly in low- and middle-income countries (IDMC 2018). Although rural-urban migration is often blamed for rising urban poverty, in most countries rural migrants and displaced people do not make up the majority of the urban poor (Montgomery 2008), and are not the only residents of low-income informal settlements (Tacoli 2009). Evidence suggests that IDPs can boost local economies, and cities offer various advantages over camps hosting displaced people (Gemenne et al. 2016; IDMC 2020).

One of the key gaps in the data collected on disaster-related displacement is the lack of information on whether displaced people have achieved durable solutions by resettling elsewhere in the country. Addressing these gaps and gaining a more comprehensive understanding of not only where individuals are displaced from, but also where they seek shelter, would provide a clearer picture of the trajectories and destinations of environmental displacement in the Mediterranean and its neighbouring countries. In this context, understanding the displacement risks that cities face is critical. Measures by local and provincial governments are essential for reducing risks by investing in coordinated climate change adaptation and urban development. To fully understand how cities respond to these challenges, power dynamics among different levels of governance and political stakeholders must be considered (Turhan and Armiero 2019).

5.3.2 Regional migration towards the Mediterranean

Countries in the Mediterranean are important migration destinations for both regular (i.e. legal, authorised, and documented) and irregular (i.e. illegal, unauthorised, and undocumented) migration. In total, approximately 25% of all immigrants worldwide live in the extended Mediterranean region (Testaverde and Pavilon 2022). In Europe, immigrants tend to be more concentrated in cities with larger labour markets and better infrastructure. For instance, in 2014, nearly three-fifths (61.3%) of immigrants of non-EU origin lived in cities, while almost a quarter (24.7%) lived in towns, and a seventh (13.9%) in rural areas (European Commission: Eurostat 2017).

Irregular migrants to Europe take three main routes: the Western Mediterranean route (from Morocco and Algeria to Spain), the Central Mediterranean route (from Libya and Tunisia to Italy), and the Eastern Mediterranean route (from Türkiye to Greece) (Fargues 2017). While the Eastern route is primarily used by Afghan, Iraqi, and Syrian refugees, the others are used by a more diverse migrant population (Werz and Hoffman 2017). Transit migration through Türkiye and the Western Balkans increased significantly in 2015 and early 2016 (McAuliffe and Triandafyllidou 2022).

The Mediterranean Sea represents an important transit route for migrants to Europe (see *Chapter 1, Section 1.1* and *Chapter 2, Section 2.2.1*). Over the last four decades, more than 2.5 million migrants have crossed the Mediterranean to Europe, driven by demographic disparities, economic inequalities, and political instability in their countries of origin (Marquina 2010). In 2016 and 2017, boat crossings from Libya to Italy and Türkiye to Greece via the Aegean Sea were the most popular routes into Europe. The Western Mediterranean route became more active than the Central Mediterranean route from 2018 to mid-2019, with more arrivals in Spain than Italy.

Historical linkages and post-colonial relationships have influenced migration pathways from North African countries to destinations such as France, Spain, and Italy (McAuliffe and Ruhs 2017). In 2020, Egypt, Morocco, South Sudan, Sudan, Somalia, and Algeria had the highest number of emigrants in Africa (McAuliffe and Triandafyllidou 2022). Sub-Saharan African migrants have also joined migration flows from North Africa, typically crossing the Mediterranean by boat (Marquina 2010). Due to conflicts and disasters, mixed migratory flows (see *Chapter 2, Section 2.5.2*) from Asia and Africa have become more prevalent in the Western Balkans over the last ten years.

Countries in the Middle East and North Africa represent important migration destinations and transit points, especially for regional migration flows from Western and Eastern African countries. Rural areas in Sub-Saharan Africa are particularly affected by environmental hazards and climate change due to their dependency on rain-fed agriculture and limited adaptive capacity (McAuliffe and Triandafyllidou 2022). A case study from Niger demonstrates that migrants from rural areas migrate to the Mediterranean region to cope with environmental hazards (Snorek 2016).

Morocco and Senegal launched the Initiative for Sustainability, Stability and Security in Africa (3S Initiative)[72] to address environmental drivers of migration in Africa. Its primary goal is to mitigate climate impacts by supporting affected areas and expanding arable land and forest protection. Furthermore, the project aims to create rural jobs through agriculture, agro-industry, and forestry investments, easing migration pressures. Fourteen African countries have planned activities to meet these targets, including Benin, Burkina Faso, Ghana, Morocco, Senegal, and others.

[72] https://www.unccd.int/resources/knowledge-sharing-system/initiative-sustainability-stability-and-security-3s-africa

Cross-border migration is frequently the result of a failure to protect and assist internally displaced persons (IDPs) in their home country, as many refugees have suffered internal displacement numerous times before leaving their home country (IDMC 2020). An emphasis on understanding the root causes of mobility and applying measures to improve adaptive capacity and resilience in the countries of origin is required. Development cooperation and emergency relief can be critical, as are the strengthening of communities' resilience to disasters and the provision of aid for safe passage and resettlement (Werz and Hoffman 2017).

5.4 Projecting environmental impacts on migration flows in the future

A growing portion of the existing scientific literature on the environment-migration nexus focuses on projecting future migration patterns within the context of environmental change. The main objective of such studies is to assess future human mobility considering anticipated changes in environmental conditions resulting from enhanced climate change.

5.4.1 Projection types and methods

In order to conduct projection exercises of the environment-mobility relationship, scholars must first evaluate how population movements and population compositions might evolve overall, regardless of environmental changes. The main tool used for this purpose is population scenarios. Two sets of scenarios are most prominently used, one developed following an approach adopted by the United Nations, and the other known as Shared Socioeconomic Pathways (SSP) (see *Chapter 3, Section 3.4.2*; O'Neill et al. 2014, 2017; K.C. and Lutz 2017). Neither restrict their focus to the Mediterranean region, yet both provide elements specific to it – with at least a country-level resolution and sometimes disaggregated further.

The UN approach includes probabilistic projections of population (Raftery et al. 2012), and emigration, return migration, and transit migration (Azose and Raftery 2019). The SSP framework, revolving around five narratives of future global socio-economic development (O'Neill et al. 2014, 2017), includes projections of population by age, sex, and level of education at the country level (K.C. and Lutz 2017), urbanisation (Jiang and O'Neill 2017), population change at highly local levels (Jones and O'Neill 2016), migration, population, and education for the EU countries (Lutz et al. 2019), and bilateral migration and remittance flows between pairs of countries, and the effects thereof on income and inequality (Benveniste et al. 2021).

Regarding migration specifically, projections often require estimating bilateral migration flows, that is, knowing both the origin and the destination – whereas most of the existing data is available for migrant stocks, that is, how many individuals from a given location are present at another location at a given time. Several methods have been developed to that end, recently providing refined results by sex (Abel 2018; Abel and Cohen 2019, 2022). Note that most existing migration projections assume levels of net migration tending towards zero in the long run (end of the century). However, this hypothesis is unlikely to hold in reality, and revising it could significantly impact population and migration projections (Abel 2018).

For projections of climate variability and the impacts of change on mobility patterns, existing projections are rarely confined to a specific geographic region. Nevertheless, most offer helpful information relevant for the Mediterranean Basin. To generate such projections of migration, scholars use a variety of models, ranging from including just some of the drivers of mobility, to general equilibrium approaches (Millock 2015). Some studies propose projections restricted solely to exposure to climate change impacts, not including the mobility response (Xu et al. 2020). Other analyses employ reduced-form approaches with causal inference to project migration, if unexamined drivers remain constant. By estimating migration responses to specific factors without accounting for all underlying mechanisms, these methods may overlook the complex interactions between various migration drivers (Missirian and Schlenker 2017).

More recent efforts complement empirical methods with machine learning (Molina et al. 2023), while others focus on individual decision-making using agent-based models (Bell et al. 2021; Choquette-Levy et al. 2021), although without a focus on the Mediterranean Basin yet. Finally, a prominent approach in the literature has used gravity-based models of internal migration (Rigaud et al. 2018; Clement et al. 2021), focusing on a series of world regions including Sub-Saharan Africa (2018), West Africa (2021), Middle East and North Africa (2021), and the Mediterranean region in the context of sea level rise (Reimann et al. 2023). Such gravity approaches have also been coupled with larger models capturing feedback between economic activity and the climate system (Benveniste et al. 2021, 2022). These models are foundational to models of dynamic economic assessment offering high spatial resolution (Desmet and Rossi-Hansberg 2015; Burzyński et al. 2021, 2022; Cruz et al. 2023).

5.4.2 Projecting future migration due to environmental stress in the Mediterranean

Overall, existing projections of future migration patterns related to climate change in the Mediterranean Basin offer a contrasting picture. Some studies suggest a substantial increase — up to a doubling — in migration flows under conditions of climate change, measured, for example, by internal migration towards urban centres in North Africa (Clement et al. 2021) or by asylum applications to the European Union (Missirian and Schlenker 2017).

Others counter that massive international flows of migrants are improbable, except in the unlikely event of both high levels of climate change and significant opening of borders (Burzyński et al. 2022). In particular, North Africa appears at high risk of a 'trapped population' effect, whereby increased climate change strongly limits the ability of lower income populations to migrate internationally due to decreased available resources (Benveniste et al. 2022).

Importantly, several studies highlight the key role of policies in determining both mobility outcomes and the conditions in which migration — or lack thereof — takes place. For instance, restrictive border policies are expected to significantly increase exposure and vulnerability to environmental change in North Africa, by trapping people in areas where they find themselves more vulnerable, than at locations that they would otherwise migrate to (Benveniste et al. 2021). As another example, projected significant internal migration from Mediterranean coastal areas to urban centres, for instance in the Nile Delta region, is significantly reduced when coastal adaptation policies such as hard protection, managed retreat, and accommodation strategies are implemented (Reimann et al. 2023).

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