Food and Agriculture Organization of the United Nations

Climate change, migration and rural adaptation in the Near East and North Africa region

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Contents

List of tables and figures

FIGURES:

TABLES:

BOXES:

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Abbreviations and acronyms

FAO	Food and Agriculture Organization of the United Nations
IDMC	Internal Displacement Monitoring Centre
IDP	Internally displaced persons
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
MENA	Middle East and North Africa
NENA	Near East and North Africa
RICCAR	Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region
SDGs	Sustainable Development Goals
UN	United Nations
UNESCWA	United Nations Economic and Social Commission for West Asia
UNHCR	United Nations High Commissioner for Refugees
WFP	World Food Programme

Executive summary

Migration has always been an integral part of people's lives and livelihoods in the Near East and North Africa (NENA) region. At least some of this migration is partly driven by a deterioration in environmental conditions and an increase in the frequency of weather extremes (e.g. drought, sea level rise, extreme heat and increasingly unpredictable rainfall patterns) that have important implications for rural farming livelihoods. However, the relationship between migration and climate change is complex, multicausal and non-linear. Climate change interacts with other factors and shapes the viability of rural livelihoods. These linkages are most pronounced between political, environmental and economic factors in the NENA region.

Growth-focused economic and agricultural policies across the region undermine the sustainable governance of resources and create loopholes that enable unsustainable and maladaptive practices. Inappropriate and ineffective policy amplifies existing social and ecological vulnerabilities, shapes the economic viability of agricultural livelihoods and often hinders adaptation to different manifestations of climate change. These impacts are observed through weakened social capital, changes in access to land and resources, constraints in access to financial and extension services, falling incomes and food insecurity.

The impact of climate change on different agricultural landscapes and livelihoods is not uniform, as different social-ecological and livelihood systems have varying thresholds for coping with or adapting to climate stressors. Drought emerges as the most important threat which negatively affects all livelihood practices in the region. Other factors include variable rainfall, extreme heat, desertification, soil erosion, salinization and sea level rise.

Migration as an adaptation to climate change provides rural households with the opportunity to diversify incomes, reduce vulnerability and increase resilience. Migration in the NENA regions can be broadly grouped into short-term, seasonal or circular migration to rural or urban destinations; longer-term and permanent migration to urban or international destinations; and whole household migration to other rural or urban areas. But migration is not the only adaptation strategy pursued by rural farmers in the NENA region, and it is not a strategy desired by or available to all. Rural households also deploy a number of on- and off-farm adaptation strategies, ranging from diversifying farming production through using local ecological knowledge to manage resources to seeking off-farm waged employment.

Migrant remittances have the potential to improve rural households' ability to adapt to climate change. Remittances are the social, material and in-kind transfers between migrants and their families, including skills, ideas, consumer goods, food and money. Remittances can facilitate access to land, resources and other forms of capital in settings of high climate vulnerability. They also provide an important safety net and income gap filler when farming livelihoods are compromised due to the impacts of climate change.

A number of social implications also arise due to out-migration through the economic impact of remittances. Social consequences of migration in rural areas include a restructuring of rural societies, which are manifest in the emancipation of previously landless marginalized groups. Migration also leads to changes in intra-household power dynamics and affects the well-being and resilience of those who remain in rural areas, especially women. These changes, in turn, have important ramifications for the management of natural resources, agricultural livelihoods and food security. They also influence decisions about risk management and shape the adaptation strategies of households and communities.

1. Introduction

Migration has always been an integral part of life and livelihoods for people in the Near East and North Africa (NENA) region. For example, pastoralist and transhumant groups undertake internal migration following rainfall patterns in search of pasturelands (Alary *et al.,* 2014). The region also has a history of post-colonial economic out-migration towards Europe (Zeitoun, 2015). While the phenomenon of migration is not new in NENA countries, recent decades have seen a change in the intensity and nature of migration flows due to a mixture of interacting political, social and economic factors. Migratory movements have been instigated by political change and conflict, including the creation of the State of Israel and a series of armed conflicts (Wenger and Abulfotuh, 2019). Some of this change in migration patterns is also linked to a deterioration in environmental conditions and an increase in the frequency of weather extremes, manifest through periods of drought, sea level rise, extreme heat and increasingly unpredictable rainfall patterns (Waha *et al.*, 2017; Wodon *et al.*, 2014).

Climate projections warn of future reductions in rainfall across the region and predict that North African countries, in particular, will become hotspots for drought during the course of the 21st century (Sivakumar, Lal and Selvaraju, 2013; Waha *et al.*, 2017). For example, using projections from climate modelling, the *Arab Climate Change Assessment Report* (RICCAR, 2017) predicts an increase in temperature and decrease in precipitation in NENA countries over the next 30 to 80 years. Building on the Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR) report, Lewis, Monem and Impiglia (2018) identify the most affected farming systems and potential hotspots in the region that will be greatly impacted by climate change. These predictions are alarming, given that a large proportion of the region's population, especially the poorest and most vulnerable, rely on agriculture for food and income. Climate change will likely exacerbate existing vulnerabilities and contribute to a continued decline in agricultural productivity and an increase in the rate of out-migration from rural areas (Waha *et al.*, 2017). Climate change impacts on farmers and the agricultural sector, in turn, will have implications for wider food security within the region, as small-scale farming constitutes the main source of food production. The *Intergovernmental Panel on Climate Change (IPCC) Special Report on Land and Climate* (IPCC, 2019) highlights the role of sustainable land management practices and diversified production systems as possible adaptation measures.

Off-farm livelihood diversification strategies, including migration, can support on-farm adaptation responses. For example, social and financial remittances from migrants (Sikder and Higgins, 2017; Szabo, Adger and Matthews, 2018) can enhance the adaptive capacity of small farmers who would otherwise lack the resources to invest in diversification measures. Migration is increasingly recognized as an important adaptation strategy to changing climate and environmental conditions (Black *et al.*, 2011). However, to date, there has not been a comprehensive study of the links between migration drivers and the implications of migration for climate change adaptation, food security and the resilience of rural livelihoods in NENA countries. Understanding these dynamics and relationships is necessary for informed and evidence-based policy-making that can support the achievement of the Food and Agriculture Organization of the United Nations (FAO) vision on migration and rural development (FAO, 2019), the *2030 Agenda for Sustainable Development* and the *Global Compact on Safe, Orderly and Regular Migration*.

This report attempts to fill this gap by reviewing and synthesizing empirical evidence on the climate–migration–adaptation nexus from NENA countries.

2. Report objectives

The report is designed to provide an evidence base for policymakers and practitioners working in and across NENA countries by reviewing and synthesizing empirical evidence from existing research and literature. Insights presented in the report are illustrated with case studies drawn from the reviewed literature.

The overarching aim of the report is to explore whether and how migration is deployed as an adaptation strategy to climate and environmental change in NENA countries and what implications this holds for the long-term resilience of rural livelihoods and food security.

The report addresses this objective through a review of empirical literature by asking the following questions:

1. What is the role of climate and environmental change as a potential driver of migration in the NENA region?
    a. Which manifestations of climate change contribute to migration in the region?
    b. How does climate change interact with other factors that operate at macro, meso and micro scales?
    c. What are implications for rural livelihoods?
2. How does migration contribute to climate change adaptation and enhance the long-term resilience of rural livelihoods in NENA countries?
    a. What is the role of migration as a climate change adaptation strategy? How does it complement or enable other adaptation strategies?
    b. What are the social impacts of migration?
    c. What are implications for rural agricultural livelihoods and food security?

The review aims to identify gaps in existing knowledge, highlight future research needs and outline key areas for policy action. Based on findings and insights from the literature review, the report identifies areas where carefully designed evidence-based policy action could harness the potential benefits of migration. These areas can support resilient and sustainable rural livelihoods and food security while ensuring that migration occurs through safe, regular and orderly channels.

3. Migration in the context of a changing climate

3.1 Migration as adaptation to climate change

Migration represents an important livelihood and adaptation strategy in the context of changing climate and environmental conditions. It provides an opportunity to diversify incomes, reduce vulnerability and increase resilience among rural households (Black *et al.*, 2011; Foresight, 2011; Gemenne and Blocher, 2017). Yet, migration continues to be viewed in public discourse and policy as an undesired outcome or, indeed, a failure to adapt by those who move (Gemenne and Blocher, 2017; Tacoli, 2009). While there are instances where individuals or households are forcibly displaced or leave because they feel a decent life is no longer possible, migration is more than just a response to an unfolding crisis. Under certain conditions, migration can be a proactive livelihood diversification strategy that contributes to rural households' capacity to adapt to changing conditions.

It is increasingly recognized that migration has the potential to support development and adaptation in sending, transit and destination areas (FAO, 2017). This is particularly true in the context of social and financial remittances through return migration and diaspora networks that provide skills, knowledge, investment and other resources for rural agricultural livelihoods (FAO, 2016, 2017; Tacoli, 2009). The 2015 *Sendai Framework for Disaster Risk Reduction* highlights that skills and knowledge imparted by migrants can also contribute to a more effective disaster risk reduction. Whereas the 2030 Agenda recognizes the role and contribution of migrants to sustainable development, and several of the 17 Sustainable Development Goals (SDGs) have relevance for facilitating migration as adaptation (e.g. SDG 11 on sustainable cities and communities, SDG 8 on decent work) (United Nations, 2015). Whether or not migration enhances adaptive capacity depends on a number of contextual factors, such as social dimensions of vulnerability and a household's situation prior to movement (Warner and Afifi, 2014). The COVID-19 pandemic, which emerged and spread rapidly at the start of 2020, compounded existing vulnerabilities and acted as an additional intervening factor that has shaped the potential of migration as climate change adaptation. Countries, including those in the NENA region, introduced a series of measures to contain this new and yet unknown disease. These measures limited mobility and disproportionately affected the livelihoods of the most vulnerable worldwide – among them migrants, internally displaced persons (IDPs) and refugees – with potentially dire consequences for adaptive capacity and food security (Box 1).

If not well managed, migration can exacerbate vulnerability to climate risks, increase pressure on land and resources, and even result in conflict between migrants and host communities (FAO, 2017). In an effort to reduce the adverse impacts of migration, the *Global Compact on Safe, Orderly and Regular Migration* underpins an international collaborative effort to ensure that migration occurs through regular and safe pathways and that migrants are not discriminated against (United Nations, 2018). The review findings highlight the need to incorporate migration into rural development and agricultural policies and call for improved coherence and coordination between climate, migration, agricultural and rural development policies.

BOX 1. Migration as adaptation in times of a global pandemic

In the wake of the COVID-19 pandemic, countries imposed public health measures, such as lockdowns and quarantines, and many opted to completely or partially close their borders. These actions represented a sudden and unanticipated development that curtailed people's movement. Migration plans had to be put on hold, some got stranded in places of transit, and others became trapped at their destination without incomes or access to social protection mechanisms. For example, in NENA transit hubs such as Tripoli, the capital of Libya, Europe-bound migrants became stranded due to the toughening of European Union enforcement, while the Algerian Government expelled thousands of sub-Saharan transit migrants, claiming pandemic concerns.

Impact on migrants and their rural families: Most migrants work in the informal sector (75 percent of women and 70 percent of men), live in precarious conditions in illegally constructed informal settlements, and lack access to social safety nets. They were among the most affected by job losses during the pandemic. Some returned to their rural places of origin, while others became trapped in destinations without jobs, income and support. They were at a high risk of food insecurity, and many employed negative coping strategies, such as skipping meals or going entire days without food. Through the loss or interruption of remittance flows, migrants' job losses and return had wider implications for their rural families' livelihoods and food security. For example, research by the International Food Policy Research Institute (IFPRI) warned that the fall in remittances to Egypt could result in a 14 percent income drop for poor rural households. While globally, remittances proved countercyclical and picked up again after an initial dip, it is difficult to tell how many of these reached the poorest and most vulnerable rural households due to the aggregate nature of remittance statistics. Mobility restrictions also had indirect impacts on food supply and food security, as migrants could not access seasonal agricultural work and agricultural value chains were beginning to feel the consequences of an insufficient labour supply. There is also a risk that the pandemic eroded savings and other resources that may preclude the future migration of the rural poor, thus negatively affecting their adaptive capacity.

Impact on refugees and IDPs: Several countries in the Near East (e.g. Lebanon, Jordan, the Syrian Arab Republic and Yemen) are home to vast numbers of refugees and IDPs due to protracted conflict in the Syrian Arab Republic and Yemen, as well as in Iraq and Afghanistan. Non-oil producing countries such as Lebanon and Jordan host large numbers of Syrian refugees and rely on remittances from migrants. Meanwhile, the Syrian Arab Republic and Yemen have vast refugee and IDP populations, with the Syrian Arab Republic receiving refugees from Iraq and Afghanistan and Yemen serving as a transit route from the Horn of Africa. These war-torn countries are themselves grappling with ongoing civil conflict that displaced millions, degraded their economy and service infrastructure and made them particularly vulnerable to the impacts of the pandemic. Food insecurity has seen a sharp rise during the pandemic, and more refugees and IDPs, as well as rural farm households, have reported resorting to negative coping strategies. For example, an FAO study with rural farmers in Yemen found an increase in borrowing and unpaid debt, buying food on credit, a reduction of non-essential expenditure and a decrease in spending on agricultural, livestock and fisheries inputs. As a consequence of COVID-19 restrictions, many refugees and IDPs lost their jobs and income, became even more dependent on humanitarian assistance, and some even resorted to returning to unsafe places of origin. For example, it has been reported that thousands have returned to the Syrian Arab Republic from Turkey in early 2021, and similar mobility patterns were also observed from Yemen to the Horn of Africa.

It is evident that already marginalized and vulnerable groups, such as migrants, refugees and IDPs, were disproportionately impacted by COVID-19 related government interventions. Through its direct and indirect impacts, the pandemic emerged as an additional factor that shaped people's ability to migrate and the potential of migration as a climate change adaptation. Its short-, medium- and long-term implications for adaptive capacity will need to be carefully considered as the world embarks on building a post-pandemic future.

Sources:
1. **FAO.** 2021. *Yemen | Agricultural livelihoods and food security in the context of COVID-19: Monitoring Report – January 2021*. Rome.
2. **International Organization for Migration & World Food Programme (IOM–WFP)**. 2020. *Populations at Risk: Implications of COVID-19 for Hunger, Migration and Displacement*. Geneva, Switzerland and Rome.
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3.2. Climate and migration: the deterministic view

The idea that climate and environmental change shape population movement is not new. However, recent years have seen a change in the scale of migration, and much of this has been attributed to changes in climatic events and environmental degradation. The *IPCC Fourth Assessment Report* highlighted that climate change is likely to result in population movement due to the growing frequency of extreme weather, environmental degradation and sea level rise (IPCC, 2007). The *IPCC Sixth Assessment Report* (2022) demonstrated that climate and weather extremes are increasingly causing displacement in all world regions. The report explains that human-induced climate change is contributing to the increasing frequency and intensity of extreme events such as storms, wildfires and heatwaves, as well as to cumulative change processes such as sea level rise and droughts. Through these, human-induced climate change is altering the world's ecosystems, affecting livelihoods and potentially contributing to people's needs and decisions to move.

Environmental determinism, or the idea that people move as a direct consequence of environmental or climate change, has become a common approach to framing discourses around human mobility and predicting future migration flows. These predictions, however, often overestimate the numbers that will move due to climate change and contribute to unhelpful narratives about migration as a crisis and security threat (see Boas *et al.*, 2019). Despite empirical evidence increasingly showing that migration is rarely driven by climate or environmental change alone, alarmist predictions continue to emerge. For example, Myers (2002) predicted that by 2050 the world could see over 200 million "environmental refugees" as a result of sea level rise, desertification and other climatic events. More recently, the Institute of Economics and Peace's Ecological Threat Register (2020) suggested that nearly 1.2 billion people will become displaced due to ecological threats by 2050. A common feature of these projections is that they usually foresee a lot of this movement taking place at the international level, especially in the direction of Europe and the United States of America. Yet, empirical evidence, including the World Bank's *Groundswell Report*, demonstrates that most climate-related migration occurs at the country or regional level, with those affected moving within their country or neighbouring countries (Rigaud *et al.*, 2018). The updated *Groundswell Part II* finds that in the absence of concerted climate and development action, between 75 million and 216 million people could be compelled to move within national borders in sub-Saharan Africa, East Asia and the Pacific, South Asia, North Africa, Latin America, and Eastern Europe and Central Asia (Clement *et al.*, 2021).

Language increasingly utilized to describe those who move from places affected by climate or environmental change – including terms such as "climate migrants" and "climate or environmental refugees" – has also received criticism. For example, the International Organization for Migration (IOM) and the United Nations High Commissioner for Refugees (UNHCR) caution against using the term refugee in this context because environmental migrants are not recognized as refugees under the *1951 Refugee Convention*. Misuse of the term could undermine the legal protection of refugees fleeing the threat of violence or persecution. At the same time, there is an evident gap in the legal protection of those who move in the context of climate change.

Aside from terminology, climate change and migration scholars highlight a number of further problems with environmental determinism in migration scholarship and policy (e.g. Foresight, 2011; Piguet, Pécoud and Guchteneire, 2011):

- An environmentally deterministic view of migration assumes that a simplistic typology of migrants can be developed from the main cause of their move. However, it is very difficult to separate economic, environmental and other factors that shape migration decisions, and it is therefore impossible to make claims about the proportion of people who move as a direct result of environmental change.

- Simply linking migration to climate or environmental change can lead us to overlook important local adaptation actions and strategies in response to these changes, as well as create the impression that migration is always a last resort solution or failure to adapt locally rather than an integral part of some households' livelihood and risk-spreading strategies.

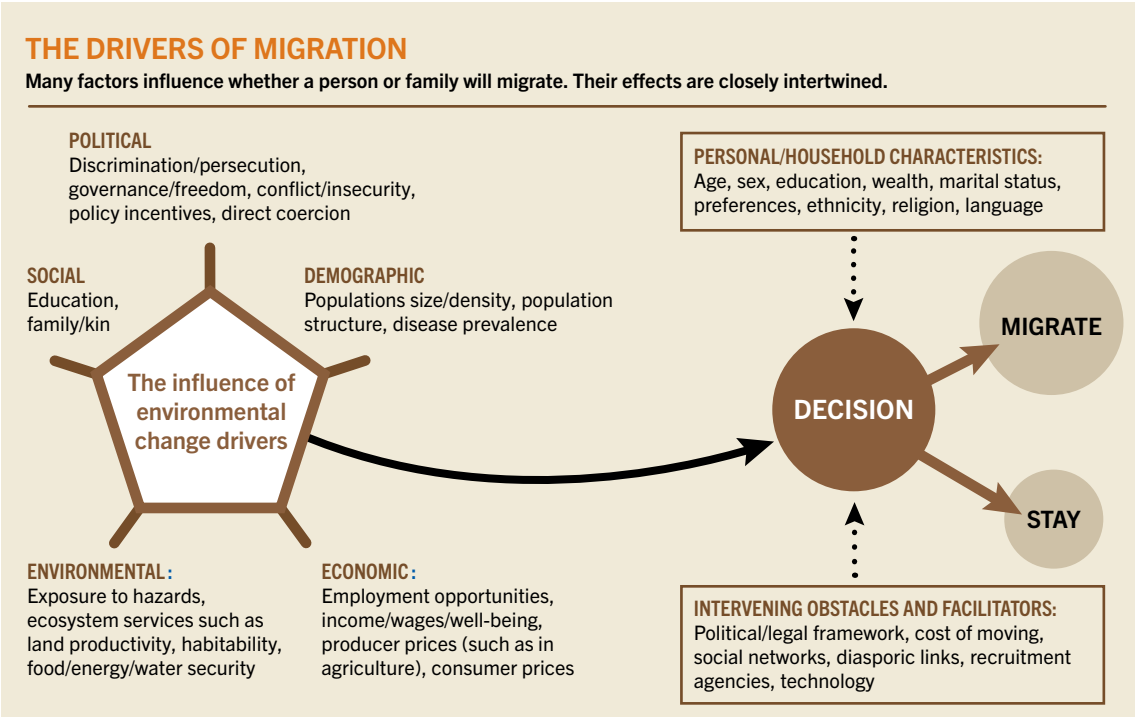
- Most predictions of migration flows made on this basis do not tell us anything about the nature and destination of migration, whether it is seasonal, temporary or permanent and whether it occurs internally within countries or internationally. Yet, these are all important considerations for designing effective policy to govern safe and orderly migration, address the challenges and harness the opportunities that migration presents, both at source and destination.

3.3. Climate and migration: a multicausal relationship

As an alternative approach to the environmentally deterministic view, the Foresight (2011) report characterizes the relationship between migration and climate change as complex, multicausal and non-linear. While environmental change that occurs due to climatic and non-climatic causes (i.e. human practices such as those associated with land use) acts as a direct and indirect driver of migration, it is not the only driver. Instead, environmental change interacts with and reinforces a number of other drivers that contribute to the need or decision to migrate.

The prevailing economic, political, social, demographic and environmental conditions in a given geographic context determine whether populations choose to migrate (Black *et al.*, 2011). These five migration drivers do not exist in isolation but are closely intertwined and influence the scale and nature of movement, whether internal or international, temporary or permanent (Black *et al.*, 2011). Climate-induced environmental change shapes migration through interactions with the five migration drivers (Figure 1).

FIGURE 1. Multiple drivers of migration: the "pentagon" framework



Source: **Black, R., Bennett, S.R.G., Thomas, S.M. & Beddington, J.R.** 2011. Migration as adaptation. *Nature*, 478: 447-449.

For example, changing environmental conditions can result in changes to the availability of and access to natural resources (an environmental driver), affecting the livelihoods and well-being of some of the poorest resource-dependent communities (an economic driver). Over time, competition for increasingly scarce resources can even lead to conflict (a political driver) and trigger population displacement.

Changes to the environment are linked to climate-related weather events or occur as a result of human practices and activities (Black *et al.*, 2011). Changes linked to the climate include sea level rise, change in the frequency and intensity of tropical storms and cyclones, variable rainfall patterns, temperature increase and change in atmospheric chemistry, while changes of a non-climatic nature are land degradation and the degradation of coastal and marine ecosystems. These two sources of change often intersect and cumulatively lead to alterations in the physical and biogeochemical environment, affecting the provision of ecosystem services, elevating exposure to hazards, and amplifying other migration drivers (Black *et al.*, 2011; Foresight, 2011).

The most direct path between climate change and migration is through sudden-onset weather and climate-related risks and disasters that unfold over a short time period, such as cyclones, storms or flash floods. Their impact is felt immediately, the resulting damage is apparent and visible, and they can displace vast numbers within a very short time frame. For example, cyclone Mora, which struck Bangladesh in 2017, led to the displacement of around 500 000 people who were evacuated from coastal villages to cyclone shelters. In 2020, over 2 million people were evacuated in Bangladesh as cyclone Amphan approached the country with great force. It is often assumed that this type of displacement tends to be short distance and temporary and that those affected eventually return and rebuild their residences and livelihoods. However, emerging evidence suggests that not all displaced may return following climate disasters and that what starts as a temporary move can become protracted or permanent (e.g. many residents of New Orleans in the United States of America did not return following Hurricane Katrina) (Gemenne, 2011). In contrast, slow-onset climate events such as droughts or sea level rise occur over extended timescales, bringing about a gradual change in the environment (e.g. desertification, biodiversity loss, saline intrusion). Slow-onset climate change manifestations, in turn, gradually interact with existing vulnerability and structural factors and shape household or individual decisions to migrate (FAO, 2017). Different forms of migration (e.g. circular, seasonal or temporary) are increasingly pursued as a form of adaptation by rural folk whose farming livelihoods suffer due to these changes (Black *et al.*, 2011; Gemenne and Blocher, 2017).

Migration decisions are, therefore, complex and non-linear and reflect the multiple interlinked factors, motivations and capabilities that shape people's willingness and ability to move away from hazard-prone areas. While climate change acts as a risk multiplier that can lead to an increased propensity to migrate, it can also erode vital capital and resources necessary for migration and lead to some of the most vulnerable and poorest groups becoming "trapped" or unable to move in response to climate and environmental risk (Black and Collyer, 2014; Foresight 2011). Therefore, while migration represents an important coping and adaptation strategy for many, it may not be an option for everyone (Black *et al.*, 2011). Others may choose to stay or demonstrate a lack of willingness to move due to a strong sense of place attachment or identity, leading vulnerable populations to persist even in high-risk geographic settings (Adams, 2016; Farbotko, 2018).

This report remains sensitive to these nuances of climate-related mobility while it considers the multiple ways in which population movement serves as an adaptation strategy in the context of rural livelihoods and contributes to enhanced resilience. The "pentagon" of migration drivers (see Figure 1) provides a holistic tool for understanding and unpacking the complex, non-linear and multicausal relationship between climate change and the decision to migrate among rural populations in the NENA region. It facilitates a comprehensive analysis that treats climate change as one of several interlinked drivers of migration, rather than viewing it as the only driver. As such, it allows for an exploration of the direct and indirect

relationships between migration and climate change. The framework also draws attention to the wider structural factors and institutional context that affect migration decisions, or indeed the ability to migrate.

3.4. Key concepts, their use and interpretation in the report

Rural livelihoods: These are the "the capabilities, assets and activities that rural people require for a means of living". Sustainable and resilient rural livelihoods "can cope with and recover from stresses and shocks, and maintain or enhance [their] capabilities and assets – both now and in the future – while not undermining the natural resource base" (FAO, 2003). Table 1 presents a typology of livelihoods referred to in this report. Rural livelihoods provide a lens through which the report interprets the interaction between climate and environmental change and migration as well as examines the impact of migration as an adaptation strategy on rural livelihoods and food security. For example, distinct livelihood groups are likely to experience climatic perturbations or environmental degradation differently and have varying capacities to adapt in response to these.

TABLE 1. Typology of rural livelihoods referred to in the report

Livelihood type	Characterization
Sedentary crop cultivation	Usually small-scale growers of one or multiple different crops; dependent on different types of water sources (irrigated, rainfed); sedentary lifestyle around permanent settlements.
Agropastoral	A mixture of growing crops and rearing livestock; predominantly sedentary with some element of seasonal migration.
Nomadic pastoralism	Nomadic livestock rearing; seasonal migration not necessarily between the same locations; temporary dwellings and tents as residences.
Transhumance	Livestock rearing with seasonal migration; usually between the same locations; encampment in both locations; characteristic of montane environments.
Agroforestry	Growing trees in a farm setting; usually for commercial purposes; sedentary lifestyle around a permanent settlement.
Waged labour or sharecropping	Working on other people's farmland, either in exchange for payment or a share of the profits from the yield; either in one's origin or migrating to other nearby rural provinces; may or may not have own land or farm.

Source: Author's elaboration.

Adaptation: Adaptation is, in effect, a change in response to external shocks or stressors. The goal of adaptation is to reduce vulnerability and increase adaptive capacity to future shocks (Nelson, Adger and Brown, 2007). Climate and environmental change act as external stimuli that trigger adaptation. The IPCC defines *climate change adaptation* as an adjustment to actual or expected climate and its effects, with the aim to minimize harm and harness potential benefits (IPCC, 2014). Successful adaptation can lead to improved resilience. While adaptation is often thought of as something positive, in some cases, adaptive measures can also have undesired consequences – this is referred to as *maladaptation*. For instance, an adaptation action may be beneficial in the short term and afford a way of coping but may pose potential for harm in the long run, or it may benefit one group or system but harm another (Barnett and O'Neill, 2010).

Vulnerability: Susceptibility to harm or stress as a result of social and environmental change and hazard. Vulnerability can be understood as having three components: exposure, sensitivity and adaptive capacity.

Exposure is the likelihood of occurrence of a hazard, shock or crisis (such as an extreme climate event) and its impact on a particular geographic area or location. *Sensitivity* is the ability of the social and ecological system to absorb these impacts without undergoing permanent change to their state or structure. Finally, *adaptive capacity* is the ability to accommodate change and adapt to it (Adger and Winkels, 2014). Vulnerability, therefore, has social and ecological aspects, and it is socially differentiated. This means that its impacts are not equal across different social groups (e.g. based on gender, age and ethnicity). Some of the most marginalized groups are also thought to be the most vulnerable to climate and environmental risks and hazards, as well as the least able to adapt and respond to them.

Adaptive capacity: Simply put, it is the ability to undertake adaptation. It constitutes the conditions and capabilities that allow people to anticipate and respond to change. This involves taking advantage of new opportunities that foster adaptation and help minimize the consequences of shocks and crises (Grothmann and Patt, 2005). While adaptive capacity is usually context-specific, local adaptive capacity is also shaped by broader factors (e.g. political systems, socioeconomic circumstances). Aspects of adaptive capacity include but are not limited to strong social capital, access to financial resources, technology, and different forms of knowledge and information (Smit and Wandel, 2006).

Resilience: Resilient systems are learning systems. This involves learning from a past disturbance to anticipate and prepare for future shocks and stressors. It is essentially the ability to adapt and change (Walker, 2020). While the literal meaning of resilience is the ability of a system to "bounce back", recover and maintain its functions, transformation to a new state is increasingly recognized as an outcome that supports long-term sustainability in the face of multiple and co-occurring changes (e.g. economic, environmental, demographic) (Brown, 2014). Transformation is associated with innovation and diversification.

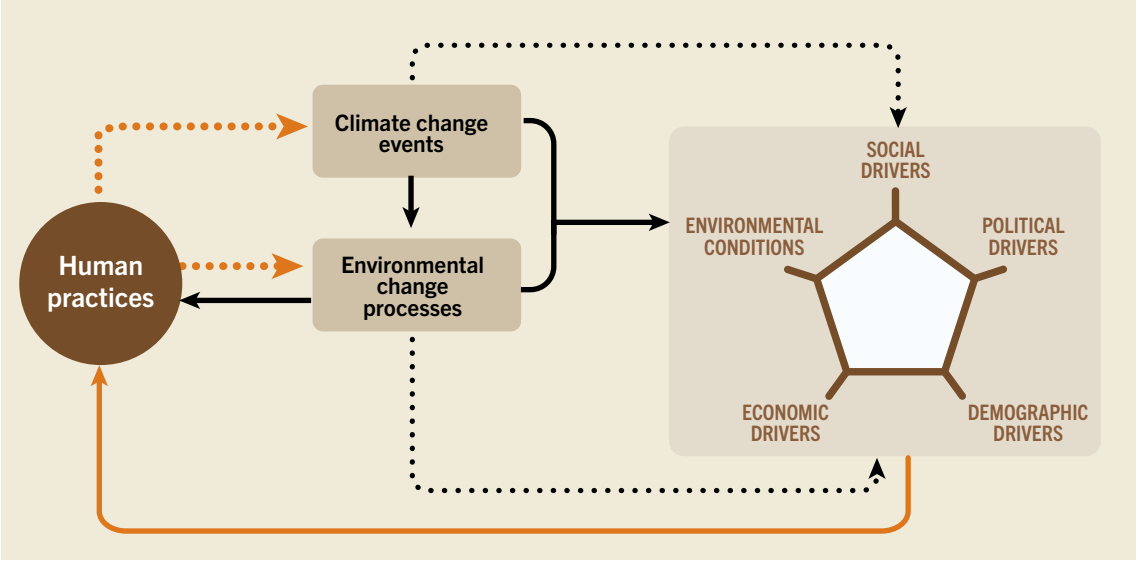
Livelihood resilience: Following Tanner *et al.* (2015), we define livelihood resilience as people's ability to sustain and improve their livelihoods and well-being despite environmental, economic, social and political disturbances, either through individual or collective action. Central to livelihood resilience is human agency, or people's differentiated capacity to perceive risk and take anticipatory action. The concept highlights the need to place less focus on recovery from shocks (reactive actions) and promotes the role of adaptation strategies (proactive actions) for the long-term resilience of livelihoods.

Climate and environmental change as drivers of mobility: Climate and environmental change can significantly disrupt rural livelihood systems on which some of the poorest and most vulnerable groups depend. Climate change events and environmental change processes interact with the five migration drivers (see Figure 2) and may lead to different forms of mobility, ranging from a voluntary decision to migrate, through forced displacement, to voluntary or involuntary immobility.

Building on the Foresight report, by *climate change* we mean four things: (i) rapid-onset climate events or disasters such as floods, hurricanes or cyclones, (ii) slow-onset or gradual changes such as droughts, (iii) notable increases in the frequency and/or intensity of weather extremes, such as heavy rainfalls or temperature extremes, and a (iv) reduction in the reliability or predictability of weather patterns, for example rainfall patterns (Foresight, 2011).

Environmental change refers to processes that occur as a result of climate change and human practices and can include biodiversity loss, soil salinization or land degradation. These, usually in combination, shape the environmental conditions on which rural livelihoods depend. For example, they affect the availability of vital ecosystem services. *Ecosystem services* are the various goods and services that humans derive from ecological systems (MEA, 2005). Many regulating (e.g. climate regulation, pollination), supporting (e.g. soil formation, nutrient cycling) and provisioning (e.g. genetic resources, water) services are central to agricultural livelihood systems. Hence, the negative impact of climate and environmental change on ecosystem services has important ramifications for the sustainability of rural livelihoods.

FIGURE 2. Climate and environmental change as drivers of migration decisions



Source: Adapted from **Black, R., Adger, W.N., Arnell, N.W., Dercon, S., Geddes, A. & Thomas, D.S.G.** 2011. The effect of environmental change on human migration. *Global Environmental Change*, 21: S3–S11.

Migration: Usually a voluntary decision to move and involves a departure from a person's regular place of residence. It consists of a spatial and temporal dimension. Temporally, it can range from short-term or temporary movement (e.g. circular or seasonal migration) to longer-term and permanent migration. Spatially, we can broadly distinguish between internal, cross-border (between neighbouring countries) and international migrants. When migration occurs within country borders, movement is usually to other rural areas or growing urban centres. The spatial and temporal dimensions of migration interact with each other. For example, internal or cross-border migration are more likely to be short-term, while international migration often involves longer time frames.

Displacement: The involuntary and often sudden movement of people from their places of residence. People may become displaced due to forced removal or relocation or when fleeing an unfolding hazard or crisis such as a storm or cyclone. It is generally believed that such movement is mostly temporary, however, not all who are displaced may return, depending on the circumstances of their move. Displacement often takes place over a short distance from the source location, and many of those involved remain within national borders (i.e. internally displaced persons). However, under some conditions, especially where displacement is driven by conflict (e.g. over natural resources), displacement can take place at the international level, and return may not be possible.

Remittances: The contribution and importance of remittances for rural adaptation and resilience are well-established in the literature (e.g. Sikder and Higgins, 2017; Szabo, Adger and Matthews, 2018). Remittances are the flow of social, financial and in-kind transfers between migrants and their families. Social remittances are skills and ideas that can facilitate innovation, such as the use of new production techniques or irrigation methods. In-kind remittances usually involve food, clothes or other consumer goods.

4. Method

4.1. Literature review

The report presents findings from a literature review. The geographic focus of the review constitutes 19 countries in the NENA region: Algeria, Bahrain, Egypt, (Islamic Republic of) Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, the Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, and Yemen. The report's objective guided the review process to provide an understanding of whether and how migration is used as an adaptation strategy in response to climate change and environmental degradation, including identifying the implications this has for the long-term resilience of rural livelihoods and food security in NENA countries.

Search terms were deployed in three databases (Web of Science, EBSCO Host and Google Scholar) during November 2019, and subsequently updated in November 2020 and March 2022, to capture relevant articles, books, book chapters, discussion papers, proceedings papers and review papers. In addition to published literature, searches in Google Scholar also identified grey literature sources (e.g. working papers) and reports by organizations such as IOM, World Bank and others. Literature sources were further complemented with relevant FAO reports and publications on the topic of migration, agriculture and rural livelihoods (e.g. the *State of Food and Agriculture 2018*).

To complement database searches, literature sources for the review were also identified through the use of snowball searches that resulted in the inclusion of relevant sources cited in reviewed articles. This was a valuable exercise, in particular for identifying relevant French-language sources, given that the main search was conducted using English terms (Table 2). This is a limitation of the study, as it does not fully capture French resources and does not extend to literature that may have been published in the Arabic language. Acknowledging these limitations, the report presents key themes and patterns relating to the role of migration as an adaptation strategy in the context of rural livelihoods and food security.

The literature search yielded sources covering 10 of the 19 NENA countries, six located in North Africa (Tunisia, Morocco, Egypt, the Sudan, Libya and Algeria) and four in the Near East (Lebanon, the Syrian Arabic Republic, the Islamic Republic of Iran and Yemen). The search did not identify sources for Gulf states such as Saudi Arabia, the United Arab Emirates, Oman or Qatar. While these states did emerge in the review as migration destinations due to labour demand in thriving oil and construction industries, we did not find studies that discussed migration as adaptation in the context of rural livelihoods within these countries.

TABLE 2. List of search terms used in database searches, organized by topic, with Boolean operators where applicable

Topic	Search terms (with Boolean operators where applicable)
Mobility	migra*, displace*, refugee*, IDP*, returnee*, return migration, return migrant
Climate/environment	climate, environment*, change*, risk*, stress*, disaster*
Natural resources	natural resource*, resource use, resource manage*, landscape, territorial
Resilience	adapt*, adapt* capacity, resilience, transform*, innovate*, knowledge, skill*
Livelihood	rural, rural livelihood*, livelihood*, agricultur*, pastoral*, fish*, forest*, agro-forest*, farm*, transhumance
Development	develop*, poverty, poverty alleviation, poverty reduction, remit*, invest*, social remittance*, wellbeing, well-being, entrepreneur*
Geographic location	Algeria, Bahrain, Egypt, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syrian Arabic Republic, Tunisia, the United Arab Emirates, Yemen
Other	NENA, North Africa, Near East, Gulf, MENA

A set of eligibility (inclusion and exclusion) criteria were applied to screen titles and abstracts. For a source to be included in the literature review, it had to meet these criteria (Table 3). For example, a study that focuses on urbanization and urban growth as a result of rural out-migration would not be included, while a study discussing the consequences of rural youth out-migration for the future of farming would be subjected to a full review and analysis. Publications included in the review were then subjected to thematic coding and analysis using NVivo 12 (Bazeley and Jackson, 2013).

TABLE 3. Criteria for inclusion/exclusion from the literature review

Include if…	Exclude if…
It presents findings or evidence from empirical research (quantitative or qualitative) in one or more of the 19 NENA countries and:	focuses on migration without any reference to climate/ environmental change as a driver;
the evidence pertains to the role of migration as adaptation to climate/environmental change, and	focuses on the impact of migration only on urban receiving areas – e.g. urban growth, urbanization;
explores the implications of migration for rural livelihoods and food security.	discusses the impact of climate/environmental change on resource availability, agriculture or food security but makes no reference to migration; and
	contains only quantitative modelling of future climate or migration trajectories without reference to past events and their implications.

5. The climate–livelihood–migration nexus in the Near East and North Africa

Farming is an important livelihood and significant contributor to food security in rural parts of many NENA countries. As well as being a source of subsistence, farming also provides income and employment for rural households. For example, the agricultural sector is an important employer in Morocco, Yemen, Egypt and the Islamic Republic of Iran, where between 20 and 40 percent of people work in agricultural production (Jobbins and Henley, 2015). Nearly 85 percent of agricultural land in NENA countries is farmed by small-scale farmers whose livelihoods are directly dependent on natural resources and will be greatly affected by the impacts of climate change. Small farmers have limited adaptive capacity due to a high prevalence of poverty and constrained access to social safety nets and extension services (Lewis *et al.*, 2018). Undernutrition is a major challenge across the region, with 33 million people affected (Jobbins and Henley, 2015). Climate change is already shaping the viability of rural livelihoods across the NENA region, and this trend is predicted to continue. The region is becoming hotter and drier, and it is highly likely that the frequency and intensity of extreme events will increase over the course of the twenty-first century (RICCAR, 2017). Climate change thus already presents a serious risk to rural farmers, who are some of the poorest, most vulnerable and least able to adapt. It is likely to affect all four aspects of food security – availability, access, stability and utilization – by increasing competition for natural resources necessary for food production and driving unsustainable land-use types that eventually lead to land and resource degradation (Jobbins and Henley, 2015). However, climate change is only one of many risk factors that shape the livelihoods of rural households. Others are social, political, economic, environmental and demographic changes and processes that interact with slow- and rapid-onset climate change manifestations and may lead to the need or decision to move. This section of the report highlights the most relevant factors that have shaped rural livelihoods in NENA countries and contributed to the need or decision to engage in migration or mobility in response to unfolding changes. The first part of this section explores the most relevant factors that have shaped rural livelihoods in NENA countries. The second part unpacks the ways in which these factors have shaped rural adaptive capacity and, as such, contributed to the need or decision to migrate.

5.1. Multiple intersecting factors drive migration

5.1.1 Climate change amplifies existing vulnerability

Climate impacts on rural livelihoods in NENA countries are observed through two pathways. First, climate change directly shapes environmental conditions by affecting the integrity of ecosystems and their natural capitals, especially land and water resources, upon which rural livelihoods depend. Second, climate change interacts with and potentially exacerbates the impacts of other migration drivers – such as existing policies, social and economic challenges, and demographic changes – which shape human practices that can have negative consequences for environmental conditions, for example, through unsustainable land use.

The most direct links between climate and migration are established through observations of significant changes to ecosystems, their services and the availability of natural resources. A number of NENA studies highlight the links between slow- and rapid-onset climate events and the resulting deterioration of livelihoods that were viable and successful prior to their exposure to climate change impacts. These studies emphasize changes to the ecosystem and a growing scarcity of vital resources, such as freshwater, upon which rural agricultural production relies. In particular, recurring and persistent droughts, as well as unpredictable and reduced precipitation, are increasingly challenging agricultural livelihoods and production systems on these arid and semi-arid lands (Mohammadi and Khanian, 2021; Rignall and

Kusunose, 2018; Schmidt, Gonda and Transiskus, 2021). For example, the drought of the 1990s had a devastating effect on agroforestry, in particular almond and walnut tree cultivation, in Imzilne, Morocco; severe water scarcity compounded with existing socioeconomic conditions meant that farmers were not able to adapt, leading them to either abandon their fields or to leave them fallow (Rignall and Kusunose, 2018). Drought also damaged wheat and barley production in the northeast of the Syrian Arab Republic during the 2007–2008 agricultural season, resulting in crop failure for many farmers and decimating the livestock of pastoral herders. Rural households responded by large-scale out-migration towards cities in the west of the country (Feitelson and Tubi, 2017). Climate-induced changes to the environment require adaptation measures in the context of rural livelihoods, which may include moving to new locations. The 2006 drought in the Syrian Arab Republic and Iraq, which caused crop failure and reduced livestock numbers, resulted in a sharp increase in food prices and imports. Many farmers could not recover their losses and resorted to abandoning their fields in order to migrate to cities (Feitelson and Tubi, 2017).

While climate change undoubtedly shapes decisions to migrate, it does not act in isolation from other factors. Climate change often exacerbates other migration drivers and amplifies existing conditions of vulnerability. As previously stated, rural farmers are heavily reliant on climate-sensitive livelihoods and natural resources. Their vulnerability is further reinforced by high levels of rural poverty and their disconnect from social protection schemes. For example, while subsidies to alleviate food insecurity are in place in several NENA countries, the poorest and most needy often fail to benefit (Jobbins and Henley, 2015). Based on experiences in Tunisia, Zuccotti *et al.* (2018) demonstrate that agricultural production is not only conditioned by climate factors but also by structural constraints that shape farmers' access to technology, land and financial or other inputs. Whereas, in the context of the Syrian Arab Republic, de Chatêl (2014) argues that it would be an oversimplification to blame climate change, namely drought, alone for failed agricultural livelihoods or indeed for the outbreak of conflict. She points to the intersection of climate change *and* other causes that predate the onset of drought in 2006 – such as ineffective governance and the mismanagement and unsustainable use of natural resources – as crucial in shaping the events that catalysed conflict.

Therefore, given the complex relationship between people, the environment and livelihoods, it is important to evaluate and interpret the role of climate change in driving migration with regard to existing structural vulnerabilities and other driving factors, taking into account the geopolitical and socioeconomic setting, as well as the agricultural livelihood and ecological landscape.

5.1.2. Demographic change drives demand for land and resources

Changes in population size and composition present both challenges and opportunities for rural livelihoods in NENA countries. The literature highlights demographic change due to climate-driven environmental change and ineffective policy as a driver of migration decisions in the NENA region. A number of NENA countries have seen rapid population growth during the course of the twentieth century. For example, Egypt's population has quadrupled since the 1960s, reaching 100 million in 2019, making it the most populous country in the region (World Bank, n.d.). Similarly, the Islamic Republic of Iran's population has more than doubled since the Islamic Revolution, reaching 82 million in 2019 (World Bank, n.d.). Population mobility that has been affecting most NENA countries also contributed to population change, both in terms of growth and composition. Some of this movement occurred due to conflict, whereby displaced populations sought shelter in urban refugee camps within the same country (e.g. the Sudan) or in neighbouring countries (e.g. Syrian refugees in Lebanon and Jordan) (UNESCWA, 2020). Changing climate and environmental conditions have altered established coping strategies and resulted in migration in search of employment opportunities within countries, either to other rural areas or growing urban centres, as well as beyond national borders. These mobilities had important implications for access to resources and rural livelihoods in source, transit and destination areas.

Population change is generally perceived as a negative factor in the NENA literature, especially when coupled with climate variability, environmental degradation and resource scarcity (e.g. de Haas, 2001; Waha *et al.*, 2017; de Waroux and Chiche, 2013). Population change hindered the resilience of rural livelihoods in several NENA countries by way of increasing competition over natural resources, contributing to land fragmentation and environmental degradation and disrupting the social capital of rural inhabitants. These negative impacts were amplified where demographic change intersected with climate and environmental change processes. For example, in the Sahelian Zone of the Sudan, farmers managed intense periods of drought by way of strong group solidarity and reciprocity in the past. The actions of individuals used to be governed by a sense of responsibility and obligation towards members of their social group (e.g. extended family, ethnic group, village). Crucially, social capital also facilitated seasonal migration to wetter areas during droughts. However, growing competition over dwindling resources due to in-migration from surrounding areas and intensifying droughts and desertification put a strain on traditional relations and coping mechanisms (Ibrahim and Ruppert, 1991).

In combination with climate and environmental change, population change can lead to a decline in the availability of land and water resources, thus jeopardizing rural farming livelihoods. Drought emerged as an amplifier of population pressure in the context of rural livelihoods in Maghreb countries (Morocco, Tunisia and Algeria), the Sudan and the Syrian Arab Republic (de Haas, 2001; Ibrahim and Ruppert, 1991; La Rovere *et al*., 2009; de Waroux and Chiche, 2013). Drought and variable rainfall compromised water availability and had negative repercussions for agricultural livelihoods, to some extent also affecting previously highly resilient oasis farming (de Haas, 2001; Ibrahim and Ruppert, 1991; de Waroux and Chiche, 2013), resulting in fields and marginal orchards being abandoned (Brown, Hammill and McLeman, 2007; Kmoch *et al.*, 2018). The importance of agriculture declined in favour of alternative occupations such as off-farm entrepreneurial ventures and indeed (mostly youth) migration to cities, but also to Europe and Arab countries (Ibrahim and Ruppert, 1991; Kmoch *et al.*, 2018; La Rovere *et al.*, 2009; de Waroux and Chiche, 2013).

In addition to climate and environmental conditions, demographic change as a factor influencing migration also intersects with political and economic factors, such as policy interventions or the profitability of production. Where population pressure coincides with ineffective or inappropriate policy, it further exacerbates the impact of changing environmental conditions on the economic viability of rural livelihoods, especially sedentary crop farming. The combined effect of land fragmentation due to subdivision through inheritance and population growth in the context of Morocco and the Syrian Arab Republic, as well as other NENA countries, meant that landholdings shrunk in size and no longer enabled profit generation and, in some cases, did not provide enough to meet farmers' basic needs (Abdelali-Martini *et al*., 2003; de Haas, 2001; Kmoch *et al*., 2018; La Rovere *et al*., 2006). The Government of Egypt has been using agricultural policy measures since the 1950s in order to relieve population pressure on the green belt of the Nile Valley, the most fertile as well as the most densely populated area of the country. The Five Feddan Scheme of the 1950s was designed to reclaim and redistribute desert land among landless peasants. Reclamation remained on the political agenda throughout the century, and the Mubarak Project, initiated in 1987, used the promise of land ownership to attract graduates to desert areas of the Eastern and Western Delta (Warner *et al*., 2010). Later the project was extended to also include landlords evicted through earlier land reforms. Most of the land reclaimed for the Mubarak Project was located in the Western Delta and involved diverting water from existing agricultural land through purpose-built irrigation canals (Adriansen, 2009). These policies and reforms took place in the context of changing climate and environmental conditions, which already constrained access to productive land due to land degradation. In Egypt, the land reclamation initiative elevated competition for increasingly scarce land and water resources in marginal desert lands and created conflict between settlers under the scheme, local inhabitants and Bedouin pastoralists who lost access to grazing land (Alary *et al.*, 2014; Warner *et al.*, 2010). Therefore, while these reforms sought to alleviate population pressure on the Nile Valley and expand agricultural production, critics regard them as an example of top-down maladaptation that

has instead aggravated the impacts of climate change (Malm and Esmailian, 2013). These experiences demonstrate that linear and short-sighted agricultural policy can amplify the impact of climate and demographic change on farming livelihoods, making it necessary to seek off-farm alternatives, including migration to urban areas and abroad, either seasonally or permanently (Abdelali-Martini *et al.*, 2003).

5.1.3. Policy incentives and interventions shape rural livelihoods and resource use

Agricultural policies of the NENA region often favour economic development through continuous agricultural intensification and expansion and lose sight of long-term sustainability by promoting quick-return strategies. Agriculture is the biggest consumer of water in the region. For example, 94 percent of renewable freshwater resources are consumed by agriculture in Egypt, while this figure reaches a staggering 906 percent in Libya and 936 percent in Saudi Arabia (Michel *et al.*, 2012). Government subsidies have been used to incentivize more intensive farming practices with a view to increasing agricultural output and productivity (Madani, 2014; Schilling *et al.*, 2012; Selby and Hoffmann, 2014), although more recently, a number of NENA countries have reduced the level of subsidies. Incoherent sectoral policies, in turn, hindered the sustainable governance of resources and created loopholes that enabled some illegal practices (e.g. the installation of groundwater pumps despite water scarcity) and had important implications for access to land and water resources. In turn, high economic dependence on agriculture and the mismanagement of land and water across these arid and semi-arid landscapes accelerated environmental degradation (e.g. salinization, desertification) and had negative repercussions on the farming sector (Madani, 2014; Schilling *et al.*, 2012). Falling and unpredictable yields and prolonged periods of drought made migration a necessary livelihood diversification strategy among rural households (de Chatêl, 2014; Selby and Hoffmann, 2014). For example, a move to water-intensive crops such as sugar beet and apple in the Islamic Republic of Iran's Lake Urmia basin pushed local production systems to their limit. The combined effects of climate change (decrease in precipitation, increase in air temperature and persistent droughts) and intensive water use have resulted in the desiccation of the lake. This caused secondary environmental impacts (wind erosion, salty dust storms), which were detrimental to the region's farmland, orchards and pastures. Due to failing crops and the absence of alternative employment opportunities, migration has been adopted as an adaptation strategy, especially by young people who have been moving to cities for work (Schmidt *et al.*, 2021).

A number of governments in the region, such as Morocco, the Syrian Arab Republic and the Islamic Republic of Iran, have actively encouraged the expansion of irrigated agriculture, which usually relies on the withdrawal of limited groundwater reserves or the capture and diversion of surface waters by dams (de Chatêl, 2014; Madani, 2014; Selby and Hoffmann, 2014). The underlying motivation was the desire to maintain independence from imports and to strengthen the country's presence on the global market. For example, the production of water-intensive crops in Morocco and the Syrian Arab Republic has been justified using the narrative of food self-sufficiency (de Chatêl, 2014; Schilling *et al.*, 2012). In turn, Morocco's production of drought-prone wheat was enabled by government support for intensive irrigation, using both surface and groundwater. Groundwater extraction was easily accessible to farmers, in some areas, free of charge, due to weak regulation (Schilling *et al.*, 2012). To a similar effect, the Islamic Republic of Iran's introduction of high water and energy subsidies in favour of agricultural growth was coupled with an unregulated digging of wells for groundwater pumping (Madani, 2014). For example, around 50 percent of the 90 000 deep wells in the Lake Urmia basin were put in place illegally, making it impossible for the government to track or regulate how much water is being withdrawn. Furthermore, the subsidies and the system in place for water allocation removed any incentive to manage water sustainably. Farmers in the Islamic Republic of Iran usually pay a set fee to obtain their water rights at the start of the season, and since they are not charged by the volume of water used, there is little motivation to save or conserve water (Schmidt, Gonda and Transiskus, 2021).

Sectoral policies formulated without due regard for interlinkages between different land-use types and livelihood practices inevitably create winners and losers. Some government responses to drought, including bans that forbade certain farming practices, have led to conflict and competition between different livelihood groups across the region (Rignall and Kusunose, 2018; La Rovere *et al.*, 2009; Schilling *et al.*, 2012). In many instances, these policies exacerbated pressure on ecosystems and led to further environmental decline. For example, the Government of Morocco introduced fodder subsidies as drought relief during the 1960s, which encouraged a settled lifestyle among previously nomadic herders. The combination of sedentarization, an increase in herd sizes and variable precipitation eventually resulted in rangeland degradation, threatening the viability of livestock farming (Schilling *et al.*, 2012). To address rangeland degradation during the 1990s, the Syrian Government forbade irrigation in the arable zone, banned cultivation from the steppe and established conservation areas to support the recovery of damaged lands. However, by doing so, it interrupted the symbiotic relationship between crop farming and livestock herding. These bans pushed sedentary and semi-sedentary systems towards areas previously occupied by herders, elevating competition for land and resources, and the diminished availability of forage threatened the future of livestock herding (La Rovere *et al.*, 2009). Some of these policies carried the legacy of a colonial and post-colonial development ethos that lacks appreciation for traditional governance structures, i.e. the social, economic and political space within which rural livelihoods operate (Rignall and Kusunose, 2018; Selby and Hoffmann, 2014). Another shortcoming of these policies rested in their focus on minimizing the impact of drought on the ecosystem without recognizing that ecological resilience is intimately linked to the resilience of social systems, that is, the groups of people that depend on the ecosystem for their livelihoods. In the above examples, migration emerged as an increasingly necessary livelihood strategy, as ineffective policy interventions rendered some agricultural livelihoods unviable.

Even policies that were formulated with good intentions, at times, resulted in unintended negative consequences or were jeopardized by corruption. Morocco's 1995 *Water Law No.10–95* set out to make irrigation more efficient and rationalize water use. However, the introduction of new surface water management initiatives and projects – for example, through dam construction – transferred power over resources from local to national stakeholders and disrupted traditional water management systems. By doing so, it encouraged a switch from surface water to groundwater use, with negative implications for groundwater reserves (Van Praag *et al.*, 2021). The case of the Syrian Arab Republic provides another example of unsuccessful water governance due to lack of transparency, bureaucratic complexity and corruption, as manifestations of the absence of coherence and coordination between water and agricultural policies. Ambitious water policies (e.g. 2005 *Water Law*) were overshadowed by corruption that created loopholes and hindered the effective implementation of water laws. In fact, the number of wells continued to increase in the Syrian Arab Republic (de Chatêl, 2014).

Alongside unsuccessful policy attempts, the NENA literature also highlights some positive examples of policy measures and government initiatives that support successful coping and reduce the likelihood of large-scale out-migration. Such interventions focus on mitigating the impact of climate stress by creating mechanisms that support the recovery of resources and rural farmers (Feitelson and Tubi, 2017) (see Box 2 and Box 3).

BOX 2. Dealing with severe drought in the lower Jordan catchment: the role of policy interventions

The severe drought of 2006 had different implications for the countries of the lower Jordan catchment: the Syrian Arab Republic, Palestine, Jordan and Israel. Different strategies employed by the four governments demonstrate the role of policy in mediating farmers' differentiated adaptive capacity during crises.

In the Syrian Arab Republic, the 2006 drought culminated in a humanitarian crisis that can be seen as a failure to adapt. This occurred as a result of an ineffective government response once the event took place, on the back of inappropriate water and agricultural policies from earlier years. Farmers of the north-east were hardest hit by the drought. As the country's breadbasket, the region was subject to ambitious agricultural development targets that depleted limited groundwater reserves and elevated vulnerability to drought. Progressive deregulation of the agricultural sector resulted in many state subsidies being cancelled or cut overnight. Some of these coincided with the aftermath of the drought, such as the removal of fuel and fertilizer subsidies, which had a detrimental impact on the livelihoods of already struggling farmers. While cancelling and cutting certain subsidies may have made sense from a macroeconomic perspective, it crippled rural farmers who could no longer sustain their production. In the absence of safety nets, farmers were not able to absorb the resulting losses, and many were left with no other option but to abandon their lands and migrate to cities, southern governorates and international destinations in Europe or the United States of America in search of new livelihoods.

Palestine, Israel and Jordan did not experience large-scale out-migration following the drought, neither did the drought evolve into a prolonged humanitarian crisis in these countries. Government responses in Jordan and Israel focused on mitigating the negative impact of drought and supporting the coping and recovery of the farming sector. Jordan introduced measures that enabled the recovery of water resources. To limit agricultural water use, the government reduced farmers' water quotas by 45–55 percent in the Jordan Valley and placed a ban on summer irrigation. In Israel, farmers received financial compensation for losses suffered during the 2008–2009 season, in line with the country's '*Drought Law*'. Thanks to these policy responses, no significant rural out-migration took place following the 2006 drought in Israel, Jordan and Palestine.

Sources:
1. **de Chatêl, F.** 2014. The Role of Drought and Climate Change in the Syrian Uprising: Untangling the Triggers of the Revolution. *Middle Eastern Studies*, 50(4): 521–535.
2. **Feitelson, E. & Tubi, A.** 2017. A Main Driver or an Intermediate Variable? Climate Change, Water and Security in the Middle East. *Global Environmental Change* 44: 39–48.
3. **Selby, J. & Hoffmann, C.** 2014. Beyond scarcity: Rethinking water, climate change and conflict in the Sudans. *Global Environmental Change,* 29: 360–370.

BOX 3. Revitalizing oases in Morocco and Tunisia

Oasis farming is central to agriculture in arid regions of Morocco and Tunisia. Oases are centres of economic activity and produce goods for consumption as well as export. However, oases have been negatively impacted by climate change and some policy measures that have disrupted traditional production and water harvesting practices. For example, the Plan Maroc Vert employed subsidies to encourage the use of modern scientific approaches and methods – such as mechanization, drip irrigation, chemical fertilizers and pesticides – to increase farm productivity. These have pushed traditional knowledge and practices aside but proved less sustainable in the long term, particularly in the face of changing climatic conditions that have affected water availability and contributed to desertification. Over time, oasis livelihoods have become less viable, and migration emerged as an increasingly favoured alternative, especially by rural youth. It was in this context that initiatives aimed at the revitalization of oases and through the restoration of traditional practices and rural job creation took place in Morocco and Tunisia. The "Oasis Sud" project in Morocco, implemented by the government, focused on sustainable water management using traditional practices of water allocation and the creation of alternative livelihoods in southern oases. Similarly, the Government of Tunisia adopted a sustainable development approach to oases, which consisted of reinstating traditional oasis practices to better manage natural resources and creating new job opportunities through its soil rehabilitation initiatives. Both of these projects focused on enhancing the capacity of youth, who were most likely to migrate, and women, who were likely to remain in rural areas, to support their engagement in sustainable oasis farming that can respond to the challenges of climate change.

Sources:
1. **Abdelmajid, S., Mukhtar, A., Baig, M. B & Reed, M.R.** 2021. Climate Change, Agricultural Policy and Food Security in Morocco. In: M. Behnassi, M. Barjees Baig, M. El Haiba & M.R. Reed, eds. *Emerging Challenges to Food Production and Security in Asia, Middle East, and Africa*, pp. 171–196. Springer, Cham.
2. **International Organization for Migration & United Nations Convention to Combat Desertification (IOM-UNCCD).** 2019. *Addressing the Land Degradation – Migration Nexus: The Role of the United Nations Convention to Combat Desertification*. IOM, Geneva, Switzerland.

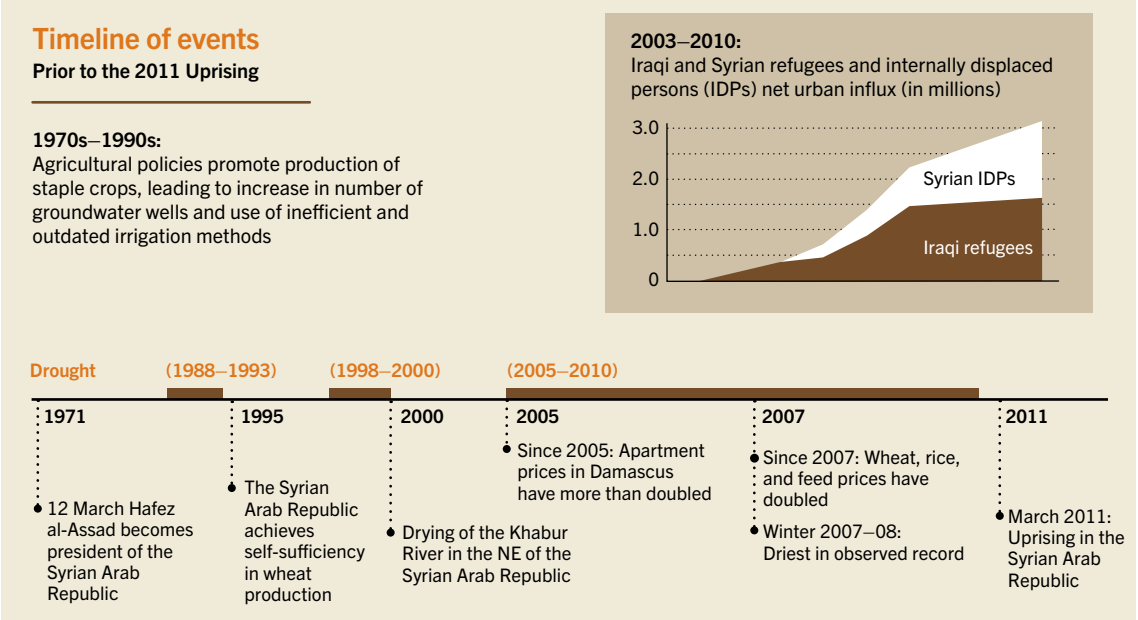
5.1.4. When climate and conflict intersect: displacement and refugee migration

The lines between involuntary forms of migration (e.g. internal displacement and refugee migration) and voluntary migration are often blurred. Migration decisions depend on many factors and take place along a continuum where aspects of choice and coercion coexist and interact (FAO, 2019). As the example of the Syrian Arab Republic and the Sudan demonstrates, when climate change impacts are met with policy that stifles adaptation and increases competition for resources, they may potentially culminate in civil unrest or violent conflict (Kelley *et al.*, 2015; Daoudy, 2022). One thing that emerges strongly from the literature on climate change and conflict in NENA countries – and beyond – is that it is crucial to understand the broader political economy and historical legacy within which climate change and conflict meet and unfold.

In the Syrian Arab Republic, the viability of rural agricultural livelihoods has suffered a gradual decline since the millennium, culminating in widespread food insecurity and malnutrition by 2010 (de Chatêl, 2014; Feitelson and Tubi, 2017; La Rovere *et al.*, 2006). While the protracted drought between 2006 and 2010 is often assumed to be at the root of conflict in the Syrian Arab Republic, it was neither the first nor most severe drought the country has seen in recent decades. However, it coincided with harmful political and economic reform implemented by the Assad regime and growing tension between Assad and opposition groups (Daoudy, 2022; Linke and Ruether, 2021). The cumulative impacts of ineffective policy, mounting political tensions and drought led to a decline in agricultural productivity between 2000 and 2008, where per capita GDP growth (2.5 percent) during the same period was lower than in low- and middle-income economies (3.1 percent and 5.5 percent respectively). The combined effect of prolonged intense drought during 2006–2010 and rising food prices delivered the final blow to the livelihoods and food security of many Syrian rural farmers: 1.3 million people were affected by drought, and 800 000 of those lost their livelihoods (de Chatêl, 2014; Feitelson and Tubi, 2017; Verme *et al.*, 2016). Around 1.5 million people became displaced or migrated to cities and other governorates. This was coupled with the arrival of refugees from Iraq (600 000) and Palestine (500 000), which increased pressure on limited

urban and rural infrastructure and elevated competition for dwindling resources such as land or water (Feitelson and Tubi, 2017; Verme *et al.*, 2016). The outbreak of the Syrian civil war in 2011 resulted in further population movements, which involved both internal displacement (6.6 million) and refugee migration to neighbouring countries, in particular, Lebanon and Jordan (Dehnavi and Süβ, 2019; Verme *et al.*, 2016) (Figure 3). There are over 900 000 refugees registered in Lebanon and just over 650 000 in Jordan, according to UNHCR statistics (UNHCR, 2018).

FIGURE 3. Climate–conflict–mobility nexus: the example of the Syrian Arab Republic



Source: **Kelley, C.P., Mohtadi, S., Cane, M.A., Seager, R. & Kushnir, Y.** 2015. Climate change in the fertile crescent and implications of the recent Syrian drought. *Proceedings of the National Academy of Sciences of the United States of America*, 112(11): 3241–3246.

High exposure to droughts is coupled with high dependence on rainfed agriculture in the Sudan. Rising temperatures in recent years have contributed to the progressive southward expansion of the Sahel, creeping into previously cultivated regions (Dutta Gupta *et al.*, 2021). While agricultural production was put to the test by these changing conditions, there has been little support from the Sudanese Government. Instead of coming to the aid of affected small farmers, investment has been skewed towards large commercial or mechanized farm operations. This was coupled with institutional discrimination towards non-Riverain populations in the Darfur through development policy that perpetuated existing vulnerability and marginality, as well as contributed to ethnic tensions. Fearful that this could trigger unrest in the Darfur region, the government relied on the local militia to maintain order and traditional land tenure. Livelihoods were disrupted and lost when lands were taken over by the Janjaweed militia (Daoudy, 2022; Dutta Gupta *et al.*, 2021). Other policy factors included colonial and post-colonial policies, such as the construction of dams and canals, which have led to the displacement and dispossession of landowners, sparking protests and demonstrations (Dutta Gupta *et al.*, 2021). The combination of progressive change in environmental conditions due to climate change and inappropriate policy have contributed to the outbreak of conflict in the Darfur region in 2003, which led to around 200 000 fatalities (Cohen, 2007) and the displacement of millions. According to Internal Displacement Monitoring Centre's (IDMC) statistics, there were nearly 2.3 million internally displaced persons in the Sudan at the end of December 2020, including those unable to return to their homes for nearly two decades following the 2003 war (IDMC, n.d.). Others fled the country across the border, mostly to Chad, where they live in refugee camps or have become dispersed into towns and villages across the country.

While the relationship between climate and conflict is often portrayed as simple causation, the Syrian and Sudanese cases show that it was not drought or resource scarcity alone that resulted in conflict. Instead, it was the interaction between climate change, environmental degradation, mounting political and ethnic tensions, and the political economy of resource use and governance (de Chatêl, 2014; Selby and Hoffmann, 2014; Daoudy, 2022; Linke and Ruether, 2021). Although drought and climate change did not directly trigger conflict in the Syrian Arab Republic or the Sudan, they amplified ineffective and inappropriate policy decisions, already building political tensions and underlying vulnerabilities.

Displaced populations, refugees and host communities experience various social and economic challenges, ranging from discrimination, unemployment, falling incomes, competition for resources and food shortages. Displaced populations living in camps or informal settlements are also disproportionately exposed to climate change impacts. Those who have already fled an earlier crisis, which may have been related to climate change, conflict or indeed both, may become uprooted again. For example, during January 2021, heavy floods prompted the displacement of 53 000 IDPs in the north-west of the Syrian Arab Republic (IDMC, 2022). Therefore, it is important to understand how internal displacement and refugee migration shape the adaptive capacity of both the host community and refugees themselves in order to identify opportunities for building resilience and supporting food security for these vulnerable groups (Box 4).

BOX 4. Syrian refugees in Jordan and Lebanon: unemployment and food insecurity

Jordan and Lebanon are popular destinations among Syrian refugees due to an agreement between the governments that allow free cross-border movement. Refugees are usually dispersed into host communities, as there are no official camps in Lebanon and only three camps exist in Jordan. Upon registration with UNHCR, refugees can also access public services such as health care and education. In theory, refugees can also work in Lebanon, subject to a work permit, but these are difficult to obtain. Jordan is more upfront about restrictions on employment, as the government requires proof of skill shortage in the domestic labour market before issuing permits. Consequently, refugees in both countries are forced into precarious working conditions in the informal sector. In Lebanon, the agricultural sector is considered "legally informal" because it is not covered by any labour or other laws. It is a major employer for Syrian refugees, who use informal channels to access work opportunities. A recent study found that many Syrian refugees employed in the Lebanese agricultural sector are children and young people who miss out on their education.

Despite opportunities in the agricultural sector, refugees experience relatively high unemployment rates, which is sometimes down to a mismatch between their experiences and skills and labour demand and opportunities in the host countries. Unable to earn a living, refugees rely on aid in the form of cash transfers and food to meet their basic needs, making them highly vulnerable and prone to food insecurity and malnutrition. Building on earlier attempts by others, a micro-gardening project in Bourj Hammoud, in Lebanon, demonstrates the role of investment and capacity building as an alternative solution to aid. A joint venture of three organizations (the American University of Beirut, Near East Foundation and the Young Women's Christian Association), the project supported refugees and vulnerable host communities with food production on rooftops and balconies. Participants received a starter kit containing soil, seeds, fertilizer and a planting kit, which were designed according to the space available, either as horizontal or vertical planting kits. Growers received training and were encouraged to recycle and utilize plastic waste to extend their growing space or build composting units. Most participants were able to access fresh food and vegetables thanks to the scheme, and some also reported improved nutritional diversity.

Sources: 1. **Dehnavi, S. & Süβ, V.** 2019. Urban agriculture towards food security of Syrian refugees and vulnerable Lebanese Host Communities. *Development in Practice,* 29(5): 635–644.
2. **Habib, R.** 2016. *Survey of Child Labour in Agriculture in the Bekaa Valley of Lebanon: The Case of Syrian Refugees*. Beirut, American University of Beirut Press.
3. **Turkmani, N. & Hamade, K.,** 2020. *Dynamics of Syrian refugees in Lebanon's agriculture sector*. Beirut, Issam Fares Institute for Public Policy and International Affairs.
4. **Verme, P., Gigliarano, C., Wieser, C., Hedlund, K., Petzoldt, M. & Santacroce, M.** 2016. *The Welfare of Syrian Refugees: Evidence from Jordan and Lebanon*. Washington, DC, World Bank.

Research with internally displaced groups, who sought refuge in towns and cities following the conflict in Darfur, highlights the challenges associated with maintaining rural farms and attempting to return. Fearful of attacks by rebels and afraid of airstrikes, the Zayadia could no longer cultivate their land or tend to their livestock. Though they have made attempts to retain their rural assets, the men suffered attacks and endured beatings when they attempted to return to their farms. To make ends meet in the camps, women risked being attacked and assaulted in order to collect grass, firewood and wild fruits in the nearby forests. Despite these efforts, inhabitants in the camps remained dependent on food aid for meeting subsistence needs. In the meantime, increased demand for fuelwood extraction presented added pressure on the surrounding ecosystem (Osman-Elasha *et al.*, 2006; Young and Jacobsen, 2013).

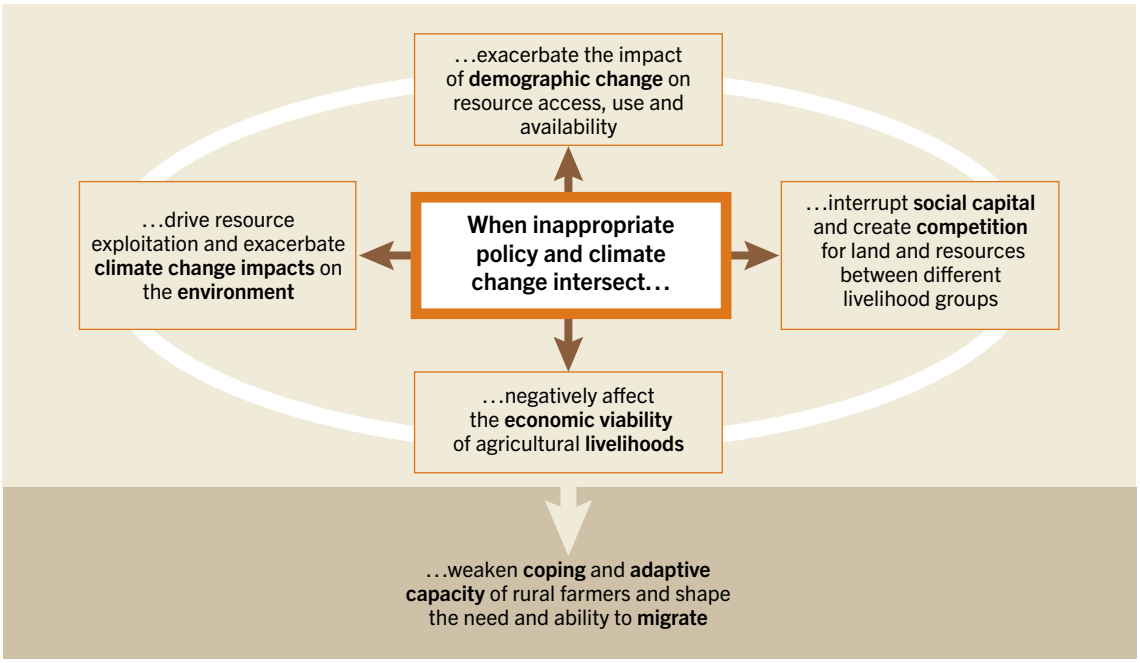
Haug (2002) reports on a successful attempt at restoring the rural livelihoods of pastoralists displaced by protracted drought during the 1980s. While this took place prior to the civil conflict, the project's success offers some valuable lessons nonetheless. The Um Jawasir Project was established in 1994, thanks to funding and leadership from the Adventist Development and Relief Agency (ADRA) and the Norwegian Agency for Development Cooperation (NORAD). The project provided Hawaweer pastoralists with ownership of small plots of irrigated land. The decision to develop irrigated farming stemmed from the fact that pastoralists had already started investing in it themselves. When it came to choosing land for the project, care was taken not to disrupt traditional ownership and cultivation rights, which could lead to conflict and jeopardize the project's success. Instead, previously common grazing land was used, which may not have coincided with the most fertile soil, but respected traditional cultivation rights. This experience highlights that investment in technical solutions that respect the social and cultural context within which they are implemented can support the reconstruction of livelihoods and the return of displaced groups to rural areas.

Examples of successful initiatives from the Sudan and Lebanon highlight the role of investment in and provision of capacity building programmes that build on the existing skill set of displaced persons and refugees, either to harness opportunities for return through a reconstruction of livelihoods or to provide an alternative to food aid. Dependence on aid makes populations highly vulnerable, as evidence shows that aid can not reach everyone in need (Dehnavi and Süβ, 2019; World Food Programme, 2018). Supporting people to produce their own food using innovative techniques in marginal conditions can help build resilience by improving food security and nutritional diversity, and if successful, it can also provide much-needed income.

5.2. Implications for rural adaptive capacity

Evidence from the NENA region showcases the multiple interlinked drivers that shape rural adaptive capacity and inform migration decisions. The literature also indicates that these links are most pronounced between policy, environmental and economic drivers within the region. Policy emerged as an overarching factor, which amplifies existing social and ecological vulnerabilities, shapes the economic viability of agricultural livelihoods and often hinders adaptive capacity when it intersects with climate change manifestations in the NENA region (Figure 4). These impacts are observed through weakened social capital, changes in access to land and resources, constraints in access to financial and extension services, falling incomes and food insecurity.

FIGURE 4. Example of how policy shapes rural adaptation and the decision to migrate when it intersects with climate change and affects interlinked social, economic, demographic and environmental conditions



5.2.1. Weakened social capital

Policy measures that erode rural social structures and social capital affect access to land (de Haas, 2006; Young *et al.*, 2009), as well as the coping and adaptive capacity of rural folk who rely on social networks and reciprocity during times of crisis (Aziz and Sadok, 2015; Ibrahim and Mensah, 2017).

Social capital plays an important direct and indirect role in rural adaptation strategies in NENA countries. In its indirect supporting capacity, social capital facilitates traditional resource management (Wilson *et al.*, 2017) and enables different types of migration (Ibrahim and Ruppert, 1991; La Rovere *et al.*, 2006). Social capital is also a direct source of coping or adaptation in NENA countries. Cohesive communities offer each other support during times of crisis through solidarity, good neighbourly relations and reciprocity (Aziz and Sadok, 2015; Ibrahim and Ruppert, 1991). For example, cooperating with neighbours is a key strategy among Tunisian oasis farmers who share expenses to access irrigation water to cope with shortfalls in precipitation (Sobczak-Szelc and Fekih, 2020). Reciprocal helping arrangements between different communities also provide a form of insurance that gives rural farmers access to land in neighbouring villages and improves their adaptive capacity to extreme events. Those displaced by drought are able to access land to continue their livelihoods (Tiitmamer, Mayai and Mai, 2017).

The social impacts of climate change, combined with government ambitions towards integration into the global economy and changing resource use patterns, have placed a strain on social relationships and had negative repercussions for future adaptation to climate and environmental change. For example, farming communities affected by drought in the Islamic Republic of Iran experienced social discord, and a disruption to traditional power structures and social hierarchies, which led to diminished trust and cooperation (Keshavarz, Karami and Vanclay, 2013; Khanian *et al.*, 2018). The resulting water scarcity, failing production and declining income and food security created tensions between community members

and even led to social isolation (Keshavarz *et al.*, 2013), thus exacerbating vulnerability to emerging climate shocks and stresses. Economic integration into the global market saw rural communities of NENA countries move from a moral economy of reciprocity towards increasingly individualistic systems. In Tunisia, rural development policies sought to promote socioeconomic development and served ambitions to integrate the national economy into the global market. The 1964 Land Privatization Policy was part of a wider agrarian reform and changed land tenure from collective rangelands to individual landholdings (Sghaier *et al*., 2012). Similar processes and experiences were observed in Morocco, Egypt and the Syrian Arab Republic (Alary *et al.*, 2014; Rignall and Kusunose, 2018; La Rovere *et al.*, 2006). Under these conditions, livelihoods and resource use practices that have relied on informal tenure, trust and cooperation became increasingly constrained, demonstrated by the example of pastoralists' loss of access to communal grazing land (Alary *et al.*, 2014; Rignall and Kusunose, 2018).

5.2.2. Constrained access to land and productive resources

Access to land and productive resources such as water is contingent on social capital, embedded social norms and customary arrangements that mediate access, use and ownership rights over land for different livelihood groups. In the past, customary tenure and collective ownership have facilitated the coexistence of pastoralist herders and sedentary tree- and crop-based farming systems, especially widespread in North African countries such as Morocco and Egypt (Alary *et al.*, 2014; Kmoch *et al.,* 2018; Rignall and Kusunose, 2018). However, government ambitions to align NENA economies with the global market system have resulted in macroeconomic policy incentives and interventions (e.g. land reclamation, subsidies that incentivized sedentarization) that eroded long-standing informal tenure arrangements and made some livelihood practices unviable (de Chatêl, 2014; de Haas, 2006; Rignall, 2016; Rignall and Kusunose, 2018; Selby and Hoffmann, 2014). This has led to conflict and competition between previously complementary farming practices (Kmoch *et al.,* 2018; Rignall, 2016). In some cases, it also resulted in unsustainable land use (Rignall and Kusunose, 2018). For example, tensions between tree farmers and pastoralists in the Méknes-Saiss region of Morocco developed over the uncontrolled grazing of tree orchards, which was attributed to shepherds' lack of access to grazing lands, the absence of support from extension services and unaffordable feeds due to rising prices. The resulting damage to orchards left farmers with no incentive to invest in tree cultivation (Kmoch *et al.*, 2018).

Pastoralist groups who rely on communal lands and informal tenure for access to vital grazing land are disproportionately affected by poorly informed policy decisions (Alary *et al.*, 2014; Rignall, 2016; Rignall and Kusunose, 2018). As one of the poorest and most vulnerable groups, pastoralists often lack political representation and a voice in decision-making processes and become increasingly marginalized as a result of changes in tenure systems (La Rovere *et al.*, 2009; Young *et al.*, 2009). As the transformation of land access and tenure takes place in the context of changing environmental conditions (e.g. rangeland degradation) and climate extremes (e.g. drought), the future survival of pastoralist livelihoods is put to the test, and migration becomes inevitable. While migration has always been an integral part of nomadic pastoralism, the nature and destination of migratory movements are changing. For example, policy decisions following Morocco's independence from French rule that constrained the mobility of pastoralists and interrupted customary land access rights coincided with worsening cycles of drought (Box 5). Under these conditions, extensive pastoralists could no longer survive on livestock herding only and made a move south, from the mountains onto the steppe, in search of employment. As they lacked native land rights in their destination, they could only acquire small plots of land, insufficient for agricultural production. Pastoralists experienced social marginalization in the Mgoun Valley and faced social barriers to land acquisition. Their disadvantaged position prevailed even following long-term residence in the Valley over two generations (Rignall and Kusunose, 2018). As such, a new class of waged labourers and sharecroppers emerged, placing former pastoralists on the lowest rung of social and economic hierarchy in the Valley (Rignall, 2016).

BOX 5. Public policy measures and the demise of nomadic pastoralism in Egypt and Morocco

The viability of nomadic herding livelihoods in Egypt and Morocco has been challenged by public policy that paved the ground for agricultural intensification and the development of other industry sectors such as tourism in the region. These included Egypt's Mubarak National Project and various subsidies and land reclamation strategies that encouraged the settlement of previously mobile groups. The Mubarak Project reclaimed desert land for the purposes of farming and incentivized the resettlement of the landless and urban poor from Cairo and elsewhere by promises of land ownership. These actions aimed to extend cultivated land, create new jobs and alleviate food insecurity and pressure on the Nile Valley. However, this came at the cost of excluding pastoralist tribes from their territory, over which they held ancestral claims.

In a similar vein, Moroccan structural adjustment and land reform policies have gradually eroded seasonal transhumance in the Atlas region. Traditionally, the migration of transhumant groups between lowland and highland pastures was enabled by tribal ownership rights that granted access to grazing lands. However, following independence from the French in 1956, tribal areas were converted into administrative districts (communes rurales). The creation of "state land" (terres dominales) severed access to woodlands, overriding traditional ownership rights and precluding access to lowland grazing. In part, Morocco's land reform was also motivated by the desire for agricultural expansion and intensification. To this end, farmers were encouraged to claim ownership over previously communal lands for the purposes of crop cultivation. Agricultural intensification, coupled with the sedentarization of previously mobile groups, places additional pressure on limited resources and creates tensions between different livelihood groups.

Such policies and initiatives overlook the complementary nature of sedentary and migratory farming practices, disrupt traditional social institutions and hamper the livelihoods of nomadic herders. These policies fuel tensions between national economic interests and rural economies, and the resulting social and institutional changes affect the adaptive capacity of rural populations. Herders have to diversify their livelihoods when access to grazing land is lost. Animals often remain a large part of their new strategies, which also include different forms of migration, from seasonal rural migration to longer-term international migration.

Sources:
1. **Alary, V., Hassan, F., Daoud, I., Naga, A. A., Osman, M. A., Bastianelli, D., Lescoat, P., Moselhy, N. & J. F. Tourrand.** 2014. Bedouin Adaptation to the Last 15-Years of Drought (1995 – 2010) in the North Coastal Zone of Egypt: Continuity or Rupture? *World Development,* 62: 125–137.
2. **Barrow, C. J. & Hicham, H.** 2000. Two complimentary and integrated land uses of the western High Atlas Mountains, Morocco: the potential for sustainable rural livelihoods. *Applied Geography,* 20: 369–94.
3. **de Haas, H.** 2006. Migration, remittances and regional development in Southern Morocco. *Geoforum,* 37(4): 565–580.
4. **Warner, K., Hamza, M., Oliver-Smith, A. & Julca, A.** 2010. Climate change, environmental degradation and migration. *Natural Hazards,* 55: 689–715.

5.2.3. Limited access to financial services and extension advice

The ability of rural farmers to respond to climate and environmental change impacts is also hampered by limited access to financial services and other public support such as extension services, subsidies and credit facilities (Abdelali-Martini, Ibrahim and Dhehibi, 2016; Keshavarz *et al.*, 2013; Osman-Elasha *et al.*, 2006). Credit can support investment into infrastructure, irrigation and other technology where existing financial resources are insufficient. During times of hardship, farmers also use credit to cover their basic living costs (Kmoch *et al.,* 2018; La Rovere *et al.,* 2006). However, credit is usually unattainable for poor farmers who do not own land or assets to secure their borrowing and cannot provide an appropriate guarantor (Keshavarz *et al.*, 2013; Kmoch *et al.*, 2018; Zuccotti *et al.*, 2018). However, rural farmers frequently lack the necessary social networks and connections to secure a guarantor and are pushed into further hardship as a result of borrowing from private moneylenders or usurers (Keshavarz *et al.*, 2013).

Tree farmers in Morocco's Méknes-Tafilalet region expressed a need for improved provision of extension services, in particular, to help with identifying appropriate tree and crop species to match soil quality and water availability on their farms and to develop a best practice for phytosanitation (Kmoch *et al.*, 2018).

However, weak social capital and social organization have constrained access to extension services and other government support, such as those available under the Plan Maroc Vert (Giuliani *et al.*, 2017; Kmoch *et al.*, 2018). Farmers often lack the capability to organize into associations and economic interest groups, which are a prerequisite for accessing some types of support. Carefully planned investment in social development (e.g. education, literacy) and relevant training can foster rural capacity to organize, as demonstrated by the example of an assisted adaptation project in Arba'at, the Sudan (Osman-Elasha *et al.*, 2006).

Rural women and youth groups face additional barriers when accessing credit facilities and extension advice, negatively affecting their capacity to absorb the impacts of climate change on farming production. As age and gender norms often influence access to land (Giuliani *et al.*, 2017; Najjar, Baruah and Garhi, 2019; Zuccotti *et al.*, 2018), rural youth and women are especially disadvantaged when it comes to taking advantage of financial services or insurance. Women also face discrimination by landlords when attempting to rent land for farming. While renting land has become an important practice in response to rural land fragmentation, landlords tend to prefer renting their lands to men (Najjar *et al.*, 2019). This, in turn, has negative repercussions for women's livelihoods and food security, especially those whose spouses have migrated. Women farmers, especially in female-headed households, are also disadvantaged when it comes to benefiting from extension services and training. However, these constraints can be overcome by designing gender-sensitive programmes that also consider the needs of women, for example, by training female extension staff to carry out farmer visits and deliver training (Baig *et al.*, 2019).

5.2.4. Falling incomes and food insecurity

The intersection between policy measures (e.g. agricultural, macroeconomic and resource management) and climate change plays an important role in shaping the viability of farming livelihoods across the NENA region. The viability of rural livelihoods, in turn, has important implications for the capacity of farming households to successfully absorb the impacts of climate and environmental change (Abdelali-Martini and Hamza, 2014; Abdelali-Martini *et al.*, 2016). During periods of protracted drought and other climate extremes, farmers' quality of life is compromised. It is not uncommon that they experience food insecurity as a result of failing agricultural livelihoods. For example, in the Syrian Arab Republic and Morocco, migration from rural areas was motivated by a combination of food insecurity and malnutrition, as well as the lack of education, sanitation and health facilities and the absence of extension services and transport infrastructure (Feitelson and Tubi, 2017; Giuliani *et al.*, 2017; Rignall, 2016; La Rovere *et al.*, 2006).

The absence of extension services shaped the resilience and viability of rural livelihoods. Farmers failed to achieve the full potential of their livelihoods due to lacking the necessary skills, knowledge or information that would enable them to enhance the efficiency and profitability of their production. Despite a diverse production system of olive and fruit trees, Moroccan farmers were unable to make a profit, and 25 percent of the population in the Méknes-Saiss region continued to live below the poverty line (Kmoch *et al.*, 2018). Despite growing lucrative or diverse crops, the absence of value-added activities meant that farmers struggled to benefit from their economic potential (Giuliani *et al.*, 2017; Kmoch *et al.*, 2018). Similar experiences from Yemen highlight that, although more and more land was being used for growing cash crops such as coffee, poor rural farmers could not always benefit from their earning potential due to the absence of extension advice on how to market their produce (Baig *et al.*, 2019). Meanwhile, cash crops took over the land from food crops and placed additional pressure on dwindling water resources, affecting food security and compromising the long-term resilience of rural social-ecological systems.

6. Situating migration in rural adaptation strategies of the Near East and North Africa region

6.1. Migration as adaptation in the Near East and North Africa region

Migration is a well-recognized and important adaptation strategy, which can be proactive (risk-spreading by livelihood diversification) or reactive (in response to the onset of extreme weather events or food crises). Depending on whether migration takes place in anticipation of (i.e. livelihood diversification) or in response to (i.e. coping strategy) intersecting drivers, it can have different implications for the long-term sustainability and resilience of rural livelihoods and the well-being of migrants and their families. While migration is often regarded as a last resort in policy circles, if planned, safe and orderly, migration can represent an effective adaptation strategy to climate and environmental change. Indeed, migration emerged from the literature review as an increasingly important adaptation strategy in NENA countries. There is a clear relationship between migration and intersecting political, economic, demographic, social and environmental drivers. Migration as a livelihood diversification strategy has a long history in the region, demonstrated by the size of the current migrant stock (estimated at 4.6 million), as well as by established migration flows that unfold at different spatial scales, within, between and outside of NENA countries (Wenger and Abulfotuh, 2019).

While migration plays a key role as an adaptation strategy in rural areas of NENA countries, not everyone has the ability or desire to move. We first explore some of the factors that shape whether someone pursues migration before outlining the different types of migratory movements characteristic of the region with regard to their role in building resilient rural livelihoods.

6.2. Who pursues migration as adaptation in Near East and North Africa?

Although migration is becoming increasingly necessary due to climate change and other change processes, not everyone has the required means or desire to move (Figure 5). The poorest are often the most exposed and vulnerable to climate impacts, as well as the least equipped, in terms of capital or resources, to cope with or adapt to changing conditions (Abdelali-Martini *et al.*, 2016; Daoud, 2016; Waha *et al.*, 2017; de Waroux and Chiche, 2013; Wodon *et al.*, 2014). The NENA literature indicates that the poor and landless are least likely to migrate, the moderately well-off usually move shorter distances, often to other rural areas and nearby towns, while those with larger landholdings and other assets are also able to pursue international migration (Abdelali-Martini *et al.*, 2016; Daoud, 2016; Young, 2006).

In addition to material endowment, age, gender and marital status also play an important role in shaping whether and where a person is likely to move. Overall, younger unmarried males are more likely to migrate than older or married men. Younger men with lower educational attainment and financial resources are more likely to move within their country, to other rural areas or cities, often for seasonal or temporary work. Some younger people perceive the absence of skills and low level of education as a barrier to their migration, which has ramifications for their capacity to adapt (Giuliani *et al.*, 2017). Whereas younger, educated and well-endowed males are also able to pursue international migration (Abdelali-Martini and Hamza, 2014; Abdelali-Martini *et al.*, 2016; Alary *et al.*, 2014). However, this distinction is not always clear-cut because a number of other factors interact with a migrant's choice of destination. For example, the demand for cheap labour in fast-growing oil states in the Gulf provides an opportunity for young

FIGURE 5. Factors shaping the ability or wish to migrate in NENA countries

Source: Author's own elaboration.

males with lower educational attainment to also engage in international migration, often with the help of intermediaries. Older rural males are less likely to migrate, and when they do, they often send lower remittances relative to younger males. This is explained by their level of health and fitness, which reduces their productivity in physically demanding work in which migrants are often engaged (e.g. construction). However, better-endowed and more skilled older males are more likely to pursue international migration compared to younger men, allowing them to send home higher value remittances (Aziz and Sadok, 2015; de Haas, 2001; Keshavarz *et al.,* 2013; Khanian *et al.*, 2018; Kmoch *et al.,* 2018; La Rovere *et al.,* 2006). These experiences indicate that initial endowments, in terms of finances, skills or education, intersect with demographic characteristics such as age and gender and shape the decision to migrate, as well as the migration destination.

The decline of rural livelihoods and ensuing poverty and insecurity made it more necessary for women in NENA countries to also engage in paid work. However, women's mobility continues to be constrained by social restrictions that stem from cultural norms regarding what is appropriate behaviour for women. According to these traditional norms, women's place is in the household, tending to domestic work and childcare. Women's work outside the house is still mostly viewed as shameful in many rural settings. This sense of shame is not only experienced by women but also by men who perceive women's need to work as a failure to provide for their family. Working is associated with the congregation of men, which brings dishonour to young unmarried women (Abdelali-Martini and Hamza, 2014; Daoud, 2016; Zuccotti *et al.*, 2018). However, recent years have seen a gradual increase in female migration, which is most often internal and seasonal for the purposes of waged agricultural labour (Keshavarz *et al.*, 2013; La Rovere *et al.*, 2006; Young and Jacobsen, 2013). Women move in groups through well-established and secure networks, making their migration for work more acceptable in the eyes of society, as well as ensuring their safety (Abdelali-Martini and Hamza, 2014). Women also deploy other strategies to address prevailing prejudices. In rural Egypt, women have opted for the full veil when leaving the village for work, which they regarded as a form of "social work permit" (Daoud, 2016). Importantly, women's earnings enhance the adaptative capacity of their rural households during times of crisis.

As well as demographic characteristics, social capital in source and destination shapes whether people pursue migration. Family members or other kin in the destination facilitate access to job opportunities and provide various forms of assistance to new arrivals (Abdelali-Martini *et al.,* 2016; La Rovere *et al.,* 2006; Young, Osman and Dale, 2007). For example, Abdelali-Martini *et al.* (2016) and La Rovere *et al.*

(2006) observed that Syrian migrants who had a family member in the destination area could also obtain work in non-agricultural sectors. In Morocco, better off and better connected sedentary farmers are more likely to migrate than nomadic or semi-nomadic groups who live in more isolated remote areas (Van Praag *et al.*, 2021). Social capital in origin is also important, especially when migrants leave a family behind. The extended family provides support in taking care of the migrant's wife and children (Daoud, 2016). However, strong social ties in the area of origin can also discourage migration, especially when coupled with a sense of obligation or caring responsibility towards elderly family members. For example, Moroccan youth felt that they could not leave their parents behind. Their sense of responsibility and obligation towards their families constrained their ability to migrate for employment elsewhere (Giuliani *et al.*, 2017). Overall, young women most often perceived caring duties; however, they are not uncommon for younger married males too, who seek local adaptation strategies that allow them to remain close to their families (Alary *et al.*, 2014; Giuliani *et al.*, 2017).

Remaining in rural origins is not always due to a lack of choice. Some people prefer to stay due to their attachment to their rural homes and a strong sense of identity linked to their traditional livelihood practices. For example, a strong sense of place attachment discouraged migration from Famenin County in the Islamic Republic of Iran despite changing environmental conditions that negatively affected farming productivity (Khanian, Serpoush and Gheitarani, 2019; Mohammadi and Khanian, 2021). Therefore, it is important to recognize that so-called "left behind" populations are not a homogenous group. Depending on whether remaining is an act of choice or the absence of it, people will require different types of support. Where migration is desired but not otherwise possible, interventions could support safe and orderly migration. However, if people wish to remain in their rural area of origin, they will benefit from the support that enables *in situ* adaptation. A further area of interest is whether those who choose not to or cannot migrate benefit from the migration of others.

6.3. Migration patterns characteristic of the region

Based on the reviewed evidence, migration as adaptation in the NENA regions can be broadly grouped into short-term, seasonal or circular migration to both rural or urban destinations and longer-term and permanent migration, mostly to urban or international destinations.

In addition, evidence from the NENA region also includes examples of entire household migration and a shift in agricultural livelihood practices. This shift either involves a horizontal shift to other types of farming or a vertical shift to new livelihood types. It is important to understand why this becomes inevitable and why migration as adaptation does not prevent the decision to move away from rural areas and agricultural livelihoods.

6.3.1. Seasonal and circular migration

Seasonal or circular migration to other rural parts of the country or nearby towns and cities has different purposes in the reviewed NENA countries: to work as hired agricultural labourers or sharecroppers and to seek other waged employment (Abdelali-Martini *et al.,* 2016; de Chatêl, 2014; Giuliani *et al.,* 2017; Ibrahim and Ruppert, 1991; Osman-Elasha *et al.,* 2006; La Rovere *et al.,* 2006). Young (2006) describes the long tradition of seasonal migration among Masalit sedentary farmers in the Sudan who exploited wage-earning opportunities in rainfed mechanized agriculture in the East Sudan and brought their savings back at the end of each season. Demand for seasonal labour is also characteristic of irrigated olive and cotton-growing areas of the northeastern Syrian Arab Republic, and it is usually met by young rural men. In fact, most internal migrants in the Syrian Arabic Republic are employed in the agricultural sector, and only a small proportion of seasonal migrants end up in the construction industry (La Rovere *et al.,* 2006).

During earlier years, this type of migration usually occurred in response to seasonal weather patterns. It complemented season-specific farming activities in places of rural origin, as such forming part of the

livelihood portfolio. In the past, as much as 93 percent of the population of Burush, located in the northern Sahelian Zone of the Sudan, participated in seasonal rural migration to work in wetter southern regions of East Darfur. Strong social capital in the destination facilitated farmers' annual journey in search of work clearing fields, sowing, weeding, or harvesting. They were a welcome force initially. However, following the prolonged drought of the 1980s, migrants were perceived as a threat by the receiving communities and could no longer find work as wetter regions were also affected by drought (Ibrahim and Ruppert, 1991). In a similar vein, Hawaweer nomadic groups in the Sudan have used seasonal migration as a key livelihood mechanism for decades, working in the Nile area as well as further afield as hired labourers. More recently, however, they have struggled to secure work due to prolonged and more intense periods of drought. The Hawaweer have gone from being an essential source of labour to being unwelcome in the Nile region, sometimes facing humiliations by host communities (Haug, 2002). In both cases, agricultural productivity declined in rural migration destinations due to drought and resulted in the saturation of the labour market, which was no longer able to accommodate the influx of seasonal migrant workers (Haug, 2002; Ibrahim and Ruppert, 1991). Importantly, these examples demonstrate that while climate change is one of the drivers behind migration, it can also act as an intervening factor when migration destinations also fall victim to its impacts.

It is not uncommon that seasonal, circular and temporary labour migration transcends national borders, as has been observed in the Syrian Arab Republic (to Lebanon and Jordan), Egypt (to Libya and Jordan) and the Sudan (to Egypt and Libya) (Abdelali-Martini *et al.,* 2003; Alary *et al.,* 2014; Young and Jacobsen, 2013; Zohry, 2009). Cross-border mobility is usually facilitated by openness to low-skilled migrant workers who constitute an important labour supply for agricultural production and the construction industry in destination countries. This openness is reflected in bilateral agreements between host and origin countries, as well as legislative frameworks and policies that grant migrants the right to enter without visas or major border checks. Examples are open-door arrangements that allowed Syrian migrants the right to enter and work in Jordan and Lebanon (Abdelali-Martini *et al.,* 2003) or established migration routes between Sudan to Libya (Young and Jacobsen, 2013).

6.3.2. Migration to cities and abroad

The region has seen a contraction in the size of its rural population over the past 50 years, going from 60 percent in 1970 to 38 percent in 2017. At the same time, the region's urban population continued to grow, and this growth is expected to continue until 2050 (UNESCWA, 2020). Rural to urban migration is partly responsible for the rapid increase of urban population numbers. It is largely driven by a mixture of rural-urban disparities – especially in the region's low-income economies – the declining productivity of agriculture and the perceived lack of opportunities in rural areas (La Rovere *et al.,* 2006; de Waroux and Chiche, 2013; Wenger and Abulfotuh, 2019). Rural to urban migration is a popular adaptation strategy and has contributed to rapid urbanization, especially in low-income settings (Tacoli, McGranahan and Satterthwaite, 2015). Migration to cities in the NENA region has become particularly popular among rural youth, who often do not see a future in agriculture (Aziz and Sadok, 2015; Keshavarz *et al.,* 2013; Zuccotti *et al.,* 2018). Although, this feeling is not unanimous, and many young men do continue to farm. Their reluctance to abandon their rural origins and livelihoods is often rooted in strong place attachment and social capital (Alary *et al.,* 2014; Giuliani *et al.,* 2017; Khanian *et al.,* 2019). Youth unemployment rates are indeed high in a number of North African countries: 41.4 percent in Libya, 34.7 percent in Tunisia and 33 percent in Egypt, based on data from 2017 (UNESCWA, 2020). Young farmers from the Taliouine region of Morocco responded to dwindling crop yields due to reduced precipitation by moving to nearby cities such as Agadir, Ouarzazate and others (Aziz and Sadok, 2015). Those who move to urban centres usually perform low-skilled work in factories, workshops or on construction sites (de Chatêl, 2014; Giuliani *et al.,* 2017; Khanian *et al.,* 2018). While urban migration has been shown to enhance adaptation and resilience in rural areas thanks to remittances from migrants (Adger *et al.,* 2002), research increasingly shows that this comes at a cost to migrants' well-being and resilience as they navigate highly precarious living and working conditions in the city (Adger *et al.,* 2020; Porst and Sakdapolrak, 2018; Siddiqui *et al.,* 2020).

Urban migration is often a precursor of international migration. Due to the rising need for alternative income sources, many choose international destinations with higher financial returns. Higher financial remittances, in addition to new skills and knowledge, can, in turn, facilitate investment into rural adaptation efforts. However, international migration is not possible for everyone. Ibrahim and Ruppert (1991) describe it as class-specific migration, which is only an option for the more educated and well-off in the rural social hierarchy. Existing diaspora networks in destination and labour agreements can facilitate international migration, including those for whom it would not ordinarily be an option. Thanks to well-established migration links, shared religious and cultural norms and existing social capital, the Arab oil states of the Near East are highly popular among international migrants from Morocco, Egypt, the Sudan, the Syrian Arab Republic, Yemen and Lebanon (Amery and Anderson, 1995; Burger *et al.,* 2014; Daoud, 2016; de Haas, 2001; Haug, 2002; Zohry, 2009). In a number of wealthy Arab countries that receive international migrants from across the region, a system of sponsorship, or so-called *"*kafala*"*, is used to facilitate the admission of new arrivals to meet the demand for labour. If migrants can secure a sponsor, they are considered residents in the country by law, but they remain tied to their sponsor for the duration of their stay. This can, however, leave migrants vulnerable to exploitation, an issue that has been acknowledged and addressed by some governments (UNESCWA, 2020). Migration to Europe also has a long history, particularly to countries with a colonial legacy in North Africa (de Haas, 2007). In Morocco, this dates back to post-colonial recruitment efforts and migration to France, which have paved the path for present-day migration facilitated by a large diaspora (Hamdouch and Wahba, 2015; Kmoch *et al.,* 2018). Although European countries have tightened their immigration policies on the back of rising discourses about the securitization of borders and mobility (Karamanidou, 2015), this does not necessarily deter migrants. On the contrary, Hamdouch and Wahba (2015) observe that many Moroccans decided to settle permanently in France when stricter immigration rules were introduced.

6.3.3. Whole household migration and shifting livelihoods

While migration as adaptation is usually conceptualized as a household risk-spreading strategy realized through remittance flows and linkages between source and destination, evidence from the NENA region also includes examples of entire household migration due to climate and environmental change processes. This often means a shift in livelihood practices, which ranges from switching to other agricultural livelihoods to abandoning farming altogether.

Poorer pastoralists in Morocco's Mgoun Valley responded to rangeland degradation and loss of access to grazing land by moving down to the steppe. Although their migration took place within a rural setting, it nevertheless resulted in a shift in livelihoods from nomadic herding to sharecropping and waged agricultural labour in their new location (Rignall, 2016; Rignall and Kusunose, 2018). Whereas better off pastoralist households, who also chose rural destinations in low lying slopes of the Atlas Mountains, were able to acquire land for farming and retained their social status thanks to their financial endowments (Rignall, 2016). Agriculture remained an important part of livelihoods following their move, even among poorer landless groups, though the activities may have differed from their traditional livelihoods. In their new location, former pastoralists chose to cultivate fruit and nut trees, as sales from these made an important contribution to livelihoods, and cultivation asserted ownership claims over land and signified community membership (Rignall and Kusunose, 2018). Importantly, moving down to the steppe, closer to wage-earning opportunities, allowed pastoralist households to continue with agricultural livelihoods (Rignall, 2016). Pastoralists who now pursued a more settled lifestyle experienced a change in the scope and range of their mobility. For instance, Hawaweer nomadic pastoralists in the Sudan used to move in large groups, covering extensive areas of the desert. However, since converting to settled farming, they only move in small family units and never venture too far from their farms (Haug, 2002).

In other examples, migration no longer acted as a rural adaptation strategy but constituted a conscious departure from farming to alternative forms of work, often in urban areas. Farmers in Morocco opted to abandon their orchards and lands and made their way to urban centres. They did so in order to escape

poverty and food shortage when agricultural livelihoods were no longer able to cater for basic household needs due to prolonged drought and water shortage (Kmoch *et al.,* 2018; Rignall, 2016). For them, migration represented a clear break with farming and a complete exit from agriculture, evidenced by abandoned lands and absent landlords (Kmoch *et al.,* 2018; Rignall, 2016; Wilson *et al.,* 2017). The wider political economy within which these agricultural livelihoods are situated emerged as a key factor in shaping whether or not households continued to pursue farming livelihoods following their move.

6.4 Rural adaptation strategies in the Near East and North Africa region

Migration is not the only adaptation strategy pursued by rural farmers across the region, and it is not a strategy desired by or available to all. Farmers adapt to changing climate, environmental and other conditions through a whole host of actions and strategies that do not involve migration; these range from on- and off-farm strategies. Rural adaptation can go hand-in-hand with migration when some family members undertake migration while others remain on the farm. Migration as a form of livelihood diversification can support rural adaptation through social and financial remittance flows that contribute to building viable and resilient rural livelihoods (see Section 7 of the report). Our review of existing evidence highlighted the following as the most common rural adaptation strategies in the NENA region: diversifying the farming portfolio, using local ecological knowledge to manage resources and seeking off-farm waged employment.

6.4.1. Diversifying the farming portfolio

Farmers diversify their portfolio through three types of action: diversifying crops, diversifying herds and adopting a mixed farming system. A mixed farming system involves simultaneous engagement in crop cultivation and livestock rearing to enhance resilience and improve adaptive capacity (Freier *et al.,* 2012; Ibrahim and Ruppert, 1991; Rignall, 2016; Young and Jacobsen, 2013). A move from previously nomadic livestock rearing towards more settled lifestyles and the adoption of crop cultivation is particularly observed among pastoralist groups across Morocco (Freier *et al.,* 2012; Rignall and Kusunose, 2018), with these farmers usually also maintaining their livestock. There has been an observed decline in the role of livestock as a primary source of income in a number of North African countries due to a mixture of political (policy and conflict) and environmental drivers (Ibrahim and Ruppert, 1991; Young, 2006).

Confronted with the impact of changing climatic and environmental conditions, farmers often opt to extend and diversify their farms' range of crops and livestock. Cultivating different types of crops helps avoid complete crop failure and can protect against food insecurity during long periods of drought (Barrow and Hicham, 2000; Rignall, 2016). Based on soil conditions, farmers are increasingly opting for a mixture of subsistence and commercial crops such as tomatoes, potatoes, watermelons and tobacco, as well as various fruit and nut trees (Barrow and Hicham, 2000; de Haas, 2001; Osman-Elasha *et al.,* 2006; Rignall, 2016). In addition, seeds are stored and preserved, and shifting cultivation might be practised to allow soils to recover and maximize productivity (Tiitmamer *et al.,* 2017). Saffron farmers in the mountain regions of Morocco who were affected by the impact of variable precipitation, desertification and rising temperatures used additional strategies to prevent crop failure. They changed the planting and irrigation dates and spread out their harvest over a longer period of time. They also extracted the saffron bulbs earlier and planted them elsewhere (Aziz and Sadok, 2015). However, some of these crop-based adaptation techniques can fail under conditions of prolonged environmental stress, as demonstrated by experiences from the Sudan, Morocco and the Islamic Republic of Iran (Barrow and Hicham, 2000; Ibrahim and Ruppert, 1991; Khanian *et al.,* 2018). A transition to dry farming took place in response to drought, variable precipitation and water scarcity in Famenin County in the Islamic Republic of Iran. While opting for less water-intensive crops is not an uncommon adaptation strategy in NENA countries (e.g. Daoud, 2016), in this case, dry farming was only able to meet 20 percent of households' basic needs, resulting in the subsequent decline of agriculture and out-migration (Khanian *et al.,* 2018).

More intensive forms of animal rearing are adopted in order to reduce reliance on local natural resources. For example, intensive lamb fattening that does not depend on local feed sources is capital intensive, but it was accessible even to the landless in the Syrian Arab Republic, as long as they had the finances to start their business (La Rovere *et al.,* 2006). As an adaptation to drought and resulting rangeland degradation, poultry farming presented an alternative to migration for younger married Bedouin males in Egypt who did not want to leave their families behind. These men did not have sufficient finances to invest in lamb fattening, hence poultry farming was their next best option. Poultry farmers usually secured their start-up capital by selling off their flocks and borrowing money (Alary *et al.,* 2014).

Selling off livestock is a common coping mechanism among pastoralist and agropastoral groups during periods of extended drought (Alary *et al.,* 2014; Haug, 2002; Young, 2006). Animals are sold to raise money for feed to maintain the reproductive flock and purchase food and other household necessities (Alary *et al.,* 2014; Haug, 2002). Changing and diversifying the composition of livestock herds is known to enhance adaptive capacity during times of hardship, as different animals can be sold to different markets or used for household consumption (Alary *et al.,* 2014; Haug, 2002; Ibrahim and Ruppert, 1991; Young, 2006). The success of this strategy is, however, contingent on the number of animals owned and on microeconomic factors, such as the role of supply and demand in regulating market prices. The experience of the Burush in the North Sahelian Zone of the Sudan during the protracted drought of the 1980s demonstrates that despite selling sheep, goats and poultry, farmers could not purchase enough millet due to the price of grain rising at a faster rate than that of livestock (Ibrahim and Ruppert, 1991). Also, in the context of the Sudan, a similar observation is reported by Haug (2002) about the experience of Hawaweer nomadic pastoralists who exhausted their flocks during the first year of drought, and entire households resorted to migrating north to the Nile region in order to work as servants. Selling livestock is only a sustainable coping strategy if herders can rebuild their livestock following droughts. However, this can take anywhere between three to five years and becomes impossible during periods of protracted drought, leading to some farmers losing their entire flock (Alary *et al.,* 2014).

6.4.2. Using local ecological knowledge to manage resources

Resource management practices that use traditional local knowledge of ecosystems have a long history in the region and can support improved resilience. Examples include traditional resource use and water management practices (Table 4).

Table 4. Examples of traditional resource use and management from the NENA region

Tradition or practice	Resource management purpose
Trus cultivation	A traditional water conservation method using earth bunds (also referred to as trus) in El Fashir, the Sudan (Osman-Elasha *et al.,* 2006).
Salif	A social code of conduct that underpins sustainable resource use among Beja pastoralists in Arbaat, the Sudan (Osman-Elasha *et al*., 2006).
Agdal	A form of collective ownership and management of natural resources among transhumant pastoralists in the Drâa Catchment in Morocco's High Atlas (Dominguez *et al.*, 2012; Freier *et al.,* 2012).
Khetaras	A traditional irrigation system used in Morocco (de Haas 2001).
Jessour	A traditional water harvesting technique (small dam) used in the highlands of Tunisia (Sghaier *et al.,* 2012).

Further cultivation techniques characteristic of the region, and designed by communities to meet the challenges of variable rainfall and drought, use terrace farming along slope contour lines to prevent water and soil loss (Aziz and Sadok, 2015) or capture water in small pits at the base of trees for irrigation (Kmoch *et al.,* 2018). However, the success of indigenous forms of resource management relies on strong social

capital, manifest in social cohesion and cooperation of community members. Evidence from Morocco points to instances where traditional management is placed under strain and gradually disappears due to a mixture of policy, demographic and environmental pressures that drive out-migration and the eventual decline of agriculture (de Haas, 2001; de Waroux and Chiche, 2013; Wilson *et al.,* 2017). For example, Wilson *et al.* (2017) note that out-migration and land abandonment in the Ait Arfa du Guigou area of the Middle Atlas undermined local social networks and disrupted many local practices that previously sustained a healthy ecosystem (e.g. crop rotation, irrigation techniques, terracing). Abandoned and unmaintained terraces collapsed and contributed to environmental degradation such as visible erosion, soil loss and landslides. Nevertheless, positive examples that involve the restoration of traditional irrigation channels, or khetaras, also exist (Aziz and Sadok, 2015).

A common theme that emerges across different contexts is the role of social capital, knowledge pathways and social memory in securing the survival of indigenous resource management techniques that can play an important role in achieving long-term social-ecological resilience in increasingly fragile environmental settings. Out-migration is mentioned as a prominent threat to these initiatives for two reasons. First, maintaining some of the traditional cultivation and irrigation systems (e.g. terraces, khetaras) is labour intensive, thus, the loss of workforce leads to their eventual demise (de Haas, 2001). Second, traditional knowledge is lost, and knowledge pathways are interrupted when community members leave their rural origins (Osman-Elasha *et al.,* 2006; de Waroux and Chiche, 2013; Wilson *et al.,* 2017). While labour shortage can be addressed by hiring external waged labourers, they no longer hold the knowledge or family values and traditions that underpin the successful functioning of traditional resource management.

Combining "new" technical and local ecological knowledge can enhance and sustain traditional management practices by providing vital innovation that improves efficiency and responsiveness to rapidly changing social, economic and ecological conditions. With help from organizations such as FAO, the Institut National de la Recherche Agronomique and the Migration and Development Association, saffron farmers of the Taliouine region of Morocco integrated new technological knowledge into local traditions of cultivation. They made some crucial changes that enhanced crop resilience and reduced the likelihood of crop failure due to heat and water scarcity (Aziz and Sadok, 2015). Similarly, farmers in El Fashir, the Sudan, were supported by a non-profit organization, the Intermediate Technology Development Group, in enhancing local water harvesting techniques (e.g. trus) to maximize the capture of floodwater during rainy seasons (Osman-Elasha *et al.,* 2006). Saffron farmers further benefited from government subsidies that incentivized water saving and led to the restoration of traditional irrigation channels, or khetaras (Aziz and Sadok, 2015). These positive experiences highlight the role that external research, programming agencies and governments can play in sustaining traditional resource management practices and, as such, supporting rural adaptive capacity and long-term resilience.

6.4.3. Off-farm employment and entrepreneurship

There has been an observed decline in the role of agriculture as the main or indeed sole source of income in rural areas of several NENA countries due to intersecting climate, environmental, policy and economic drivers. At the same time, off-farm activities have become more important as a way of risk-spreading and income diversification. Three main sources of off-farm income are identified from the NENA literature: (i) waged agricultural work and sharecropping, (ii) entrepreneurship and commercial activities, and (iii) skilled and unskilled trade work. While some off-farm activities take place locally, others involve circular or seasonal migration to nearby rural areas or urban centres.

Waged agricultural labour, mostly performed by men, either locally or at other nearby rural locations, has become an increasingly important adaptation during periods of drought. Examples of this are present in the literature from Egypt, the Syrian Arab Republic, Morocco, Yemen and the Islamic Republic of Iran (Alary *et al.,* 2014; Baig *et al.,* 2019; Keshavarz *et al.,* 2013; Kmoch *et al.,* 2018; Najjar *et al.,* 2019; Rignall and Kusunose, 2018; La Rovere *et al.,* 2006). The rising prominence of waged work is also symptomatic of

the transformation of land tenure arrangements in several NENA countries over the past half century. The landless and nomadic pastoralists who can no longer graze their herds on formerly communal land, and the rural poor who cannot acquire their own landholding, can only continue participating in the agricultural sector as waged labourers or sharecroppers. In some contexts, however, working on other people's farms is seen as a disgrace and bears a stigma that often prompts farmers to hide their misfortune as a matter of pride (Alary *et al.,* 2014; Keshavarz *et al.,* 2013). For example, in the Islamic Republic of Iran's Fars Province, male farmers became socially isolated when they reduced social interactions in order to conceal their hardship following drought. This, in turn, made them more vulnerable and less able to recover following drought (Keshavarz *et al.,* 2013).

Enterprising and commercial activities provide an additional source of income which becomes important when drought impacts agricultural production. They involve running small businesses (e.g. kiosks or transportation), as well as petty sales and trading. In some North African countries (e.g. Egypt, Morocco and the Sudan), these activities can be gendered. For example, animal trading (e.g. goats, sheep) is usually a job performed by men (Alary *et al.,* 2014), while the sales of other products (e.g. fodder, vegetables, crafts, fuelwood) can also be carried out by women, affording women an income outside of the family farm (Daoud, 2016; Ibrahim and Ruppert, 1991; Rignall and Kusunose, 2018).

The third type of off-farm income generation stems from engagement in skilled trades or unskilled non-agricultural waged employment. Skilled work ranges from public sector employment to craftsmanship (e.g. leatherwork, blacksmiths, pottery) (Ibrahim and Ruppert, 1991; La Rovere *et al.,* 2006). Whereas less-educated males, who are often also poorer, tend to find employment in the construction industry (Keshavarz *et al.,* 2013; La Rovere *et al.,* 2006). This type of off-farm work usually requires migration to nearby towns and cities.

7. Rural livelihoods and food security: the impact of migration as adaptation

The final part of the report considers whether and how migration enhances long-term resilience and adaptive capacity to climate and environmental change in NENA countries. The discussion considers how migration enhances adaptive capacity and whose adaptive capacity, as well as explores the mechanisms and processes that enable this. The section first explores the impact of social and financial remittances on rural adaptation before turning to the social impacts of migration and their implications for adaptation at the community, household and individual levels.

7.1. Remittances patterns in the Near East and North Africa region

The remittance economy, which constitutes a flow of social, material and in-kind transfers between migrants and their families, links migrant sending and receiving areas. Remittances contribute to rural adaptation and resilience through a variety of social and economic impacts. Remittances can facilitate access to economic and human capital that boosts the adaptive capacity of rural households in settings of high climate vulnerability (e.g. Sikder and Higgins, 2017; Szabo, Adger and Matthews, 2018). For example, remittances provide an important safety net for Syrian farmers practising rainfed cultivation who are highly vulnerable to variable rainfall patterns (Abdelali-Martini and Hamza, 2014). They can fill income gaps when the adverse impacts of climate change compromise rural agricultural production. As such, they replace insurance and other financial services, which are often not accessible for poor or landless farmers. Thanks to their multiplier effect, remittances can also benefit those for whom migration is not an option (de Haas, 2006). This occurs, for example, when remittances are used to finance business ventures that create local employment opportunities or to build schools and health centres that afford better access to education and health care. As such, remittances also have the potential to support the adaptive capacity of those who choose to stay or cannot move.

Several NENA countries are among the largest remittance receivers in the developing world. For example, remittances constitute a vast proportion of national revenues in Egypt and Morocco (de Haas, 2006; Zohry, 2009). In 2017, Egypt received USD 22.5 billion in remittances, while in Morocco, these amounted to USD 6.8 billion (UNESCWA, 2020). The governments of Morocco and Egypt strive to facilitate the smooth flow of remittances and actively encourage diaspora investment. To this end, Egypt established the Investor Service Centre and set up the "Your vacation at your home country" initiative for its diaspora (UNESCWA, 2020). In Morocco, similar examples include the Banque Centrale Populaire, which has been channelling financial transfers and investment between source and destination since 1968, and the Ministry of Moroccans Residing Abroad, which was set up in 1990 to strengthen links between diaspora communities and to facilitate remittances (Sow, Marmer and Scheffran, 2016).

There is a lack of systematic information about the size of remittances sent by internal migrants in the region, yet most climate-driven migration takes place within country borders. This is likely due to the fact that these remittances are not sent via official channels, and data collection is therefore constrained. Nonetheless, remittances sent by internal migrants constitute an important safety net for rural populations for a number of reasons. They tend to be more regular and often come in the form of in-kind transfers, which include different food items, clothing, spare parts for equipment and consumer goods (Nyberg Sørensen, 2004; Young, 2006; Zohry, 2009; Zuccotti *et al.,* 2018). Internal remittance flows can act as a buffer against the impacts of climate shocks. For example, they fill the income gap when agricultural

livelihoods are compromised by climate impacts such as drought, and in-kind transfers of food help maintain food security, thus boosting the well-being of rural farming households. While it is often assumed that, although smaller in value, remittances from internal migrants are more regular and reliable, the NENA literature also reveals some exceptions to this rule. For example, rural households in Tunisia with international migrants were more likely to receive remittances compared to households that only had an internal migrant (Zuccotti *et al.,* 2018). This was also true in the Syrian Arab Republic, where lower education levels were correlated with higher remittances. Less-educated labour migrants could only find work in low-skilled sectors of neighbouring Lebanon and Jordan, where incomes were higher relative to Syrian cities and most educated migrants ended up (Abdelali-Martini *et al.,* 2016).

Alongside financial and in-kind transfers, social remittances – that is, ideas, skills and knowledge – also play an important role in facilitating agricultural innovation and economic diversification in rural areas.

7.1.1. The impact of remittances on rural adaptive capacity

Evidence from the region indicates that poor rural households often prioritize spending on immediate daily needs before investing in education or productive agricultural assets (Rignall, 2016; Young, 2006; Zohry, 2009; Zuccotti *et al.,* 2018). Remittances are also increasingly used to purchase luxury goods and gifts, especially during holidays (Lazaar, 1987; de Waroux and Chiche, 2013). Construction projects are yet another type of investment favoured by many remittance-receiving households who spend on building or renovating houses before investing or saving (Lazaar, 1987; de Waroux and Chiche, 2013; Zohry, 2009). In rural Morocco, building projects also took over valuable agricultural land, which was preferred compared to the steep slopes where earlier houses were built (de Waroux and Chiche, 2013).

Remittance-receiving households become increasingly involved in the emerging 'new economy' comprised of small and medium enterprises and the service sector (e.g. cafes, restaurants, transportation services) (Hamdouch and Wahba, 2015; Kusunose and Rignall, 2018; Nyberg Sørensen, 2004; Rignall and Kusunose, 2018). In particular, younger and more educated returnees who have acquired some savings, as well as new skills and knowledge, are more likely to initiate enterprises (Hamdouch and Wahba, 2015). Small businesses and commercial activities create alternative off-farm income sources and also provide employment opportunities for non-migrants, thanks to their income multiplier effect (de Haas, 2006; Haggblade, Hazell and Reardon, 2010; Kusunose and Rignall, 2018). As early as the 1970s, Moroccan households in receipt of remittances from international migrants in France, the Netherlands and Belgium were setting up small businesses. Whereas households in the Syrian Arab Republic used their remittances to facilitate self-employment. They were motivated by improved and more reliable incomes in the medium- to long-term (Abdelali-Martini and Hamza, 2014). These investments can help build adaptive capacity for farming households because they provide off-farm income generation opportunities and thus reduce dependence on resource-based livelihoods prone to climate impacts. Moreover, they also have the potential to improve the resilience of more vulnerable groups who cannot move or those who choose not to leave their rural homes and families. However, investment into business and service sector enterprises can also divert funds from the agricultural sector, and an over-reliance on waged work can create a new type of vulnerability for rural folk (de Waroux and Chiche, 2013). Hence, the impact of these initiatives on rural adaptive capacity is mixed.

With the help of remittances, rural households in the NENA region have also been purchasing land and other productive assets. On average, migrant-sending households in the Syrian Arab Republic use 10 percent more fertilizer, manure and seeds compared to households without migrants (Abdelali-Martini and Hamza, 2014). While in Morocco and Egypt, they enjoy enhanced access to technology such as tractors, pumps and other equipment (Daoud, 2016; de Haas, 2001, 2006; de Waroux and Chiche, 2013). In the Syrian Arab Republic, migrant-sending households were also able to benefit from land reclamation and expanded their farm operations. Because remittances replaced credit, poorer landless groups could also buy land using remittances in cash transactions, whereas before, this was simply unattainable

because without land titles, they could not gain access to credit (Abdelali-Martini and Hamza, 2014). Once farmers own land, they are able to access further financial and insurance services that facilitate their ability to absorb the impacts of climate change. In Morocco, better-endowed pastoralists expanded their lands to water and land-rich parts of the steppe (Rignall, 2016). By doing so, they were able to adapt to the impacts of drought and continued farming. Others invested their remittances into livestock and diversified their farming portfolio, making their livelihoods more resilient to shocks (Box 6). For example, migrants from rainfed areas of the Syrian Arab Republic, where crop production is unpredictable due to variable rainfall patterns, preferred to invest in livestock (Abdelali-Martini and Hamza, 2014; Abdelali-Martini *et al.,* 2016). Small ruminants such as goats and sheep were popular due to market demand (Abdelali-Martini and Hamza, 2014). An increased interest in animal farming was also symptomatic of male out-migration, as livestock breeding is a socially acceptable activity for women. Importantly, selling off livestock during intense periods of drought is a well-established coping mechanism which allows farming households to meet their basic needs and maintain food security (Alary *et al.,* 2014).

BOX 6. Remittances supporting sustainable and resilient farming in Morocco

The example of the el Harte region of Morocco exemplifies how migration remittances can enhance rural agricultural livelihoods and improve resilience to changing climate and environmental conditions. Migration from the area to international destinations resulted in remittances that enabled families to expand their farming operations. They purchased new land and pursued a diverse farming portfolio which involved a mixture of trees, livestock and vegetables. Planting decisions were made based on the location and agroecological conditions of a given plot of land. For example, farmers planted trees that did not require a lot of water on the steppe. People made investments with a longer time horizon in mind, therefore, the sustainability of their production was a key consideration. Farmers avoided specializing in any one spatial area or any one crop. Instead, they spread out their production over disparate smaller plots of land, which were purchased gradually over the years, as and when migration remittances allowed. They extracted smaller profits from many different types of produce and exploited three seasons of agricultural production. This practice enhanced their resilience to fluctuations due to climate impacts. They exercised a high degree of flexibility and were prepared to adapt their strategy within the course of a season. By the time many migrants retired and returned home, their families were no longer dependent on remittances, as these had been invested into land and other productive assets, creating a self-sufficient and climate-resilient livelihood system.

Source: **Rignall, K.** 2016. The labor of agrodiversity in a Moroccan oasis. *Journal of Peasant Studies,* 43(3): 711–30.

Social remittances, which involve the transfer of skills and knowledge, make an important contribution to agricultural innovation in the NENA region. In the agricultural plains of Ait Ali, Moroccan youth migrate to obtain non-diploma training tailored around practical skills. When they return to their villages to work in farming, they bring with them a host of skills and knowledge (Ftouhi *et al.,* 2015). In the Biskra region of Algeria, young migrants from northern parts of Algeria and Morocco brought diverse skills that fostered innovation and enhanced the efficiency of Biskra's agricultural livelihoods thanks to the development of a new drip irrigation system for greenhouse production (Naouri, Hartan and Kuper, 2015).

Experiences in the context of rural-rural and refugee migration demonstrate that social remittances can also benefit migrant destinations. Migrants bring a unique set of skills that have been found to enhance the productivity and sustainability of farming practices, restore lost livelihoods and foster innovation (Al-Husban and Adams, 2016; Naouri *et al.,* 2015; Volpato and Howard, 2014). Following the Moroccan occupation of traditional Sahrawi territory, Sahrawi nomadic pastoralists were forced into Algerian refugee camps. To begin with, they relied on food aid, but eventually, they could purchase small ruminants and later camels. The refugees were drawing on their extensive knowledge of camel husbandry and adapted the practice to the environmental conditions of the camp. Camels and ruminants provided food products and a tradable asset for the camp dwellers. Nomads from the region benefited from the thriving economy

in the camps, which they used to trade livestock and buy other produce (Volpato and Howard, 2014). These initiatives are particularly important in the context of refugee and IDP migration. They show that if recognized and supported, social remittances can contribute to the creation of enterprises and livelihood opportunities for vulnerable groups and, at the same time, enrich the host community.

7.2. The social impacts of migration: implications for adaptation

A number of social implications arise due to demographic change resulting from out-migration, as well as the economic impact of remittances on rural areas of NENA countries. Social impacts of migration in rural areas include changing power relations and a restructuring of rural societies, which are manifest in the emancipation of previously landless marginalized groups, changing intra-household dynamics, and greater participation of women in agriculture and other aspects of social life. These changes, in turn, have important implications for the management of natural resources, agricultural livelihoods and food security. Additionally, they influence decisions about risk management and shape the adaptive capacity of households and those who remain in rural areas.

7.2.1. Changing adaptive capacity of communities

Migration created new opportunities for previously marginalized and subordinate groups, such as the landless and sharecroppers who previously could not acquire land or start entrepreneurial ventures for lack of capital and access to credit. Migration represented not only an economic opportunity but also a political one, which enabled previously landless groups to challenge sharecropping arrangements (Rignall and Kusunose, 2018). Increased land ownership and businesses among migrants and migrant returnees have resulted in an altered rural class structure (Nyberg Sørensen, 2004). The emancipation of previously landless or subjugated ethnic groups raised challenges for rural farming, which relies on traditional social hierarchies for the maintenance of resource management practices or infrastructures. For example, in Morocco's Todgha Valley, the emancipation of formerly enslaved people, serfs and sharecroppers led to the breakdown of traditional institutions that governed land and water management. The newly emancipated groups no longer wanted to take part in communal labour that underpinned the functioning of traditional irrigation systems (khetaras). Neither did they want to comply with communal laws, and there was an emergence of freeriding behaviour and resource exploitation, which indicated a shift from collective towards individualistic values and behaviours (de Haas, 2006). The permanent migration of former pastoralist groups from the Atlas Mountains onto the steppe resulted in less favourable social outcomes, especially for those who lacked financial capital. As immigrants in the host society, the poorer pastoralists were not able to access land and resorted to wage labour or sharecropping as a new form of livelihood (Rignall and Kusunose, 2018).

In both examples, migration disrupted traditional social ties and social contracts that have been central to resource-dependent livelihoods. As we have seen earlier in this report, traditional mechanisms of resource access, use and governance can enhance the sustainability and resilience of rural livelihoods. Cooperation between community members and principles of reciprocity offer a form of risk-spreading and boosts adaptive capacity, as demonstrated by the example of farmers accessing agricultural land in neighbouring communities during periods of drought (Tiitmamer *et al.,* 2017). However, the observed changes to rural social structures, in part driven by migration remittances, meant that decisions about resource use and management took place increasingly at the individual or household level. On the backdrop of reduced cooperation within communities and the adverse impacts of climate change, competition for limited resources intensified. Collective approaches to dealing with climate-induced resource constraints, such as water shortage, were replaced by individual efforts. For example, rural farmers invested in wells to extract groundwater for irrigation. However, while these efforts afforded a way of coping with dwindling water availability during periods of drought in dryland areas, in the long term, they constituted a form of maladaptation and undermined the resilience of farming livelihoods.

Weakening social cohesion in rural parts of the NENA region can also have implications for the adaptive capacity of those who remain in rural areas, often women and children. For these groups, reciprocal helping arrangements can provide an important social safety net in the absence of their male spouses.

7.2.2. The impact of migration on those who stay behind

Migration also leads to changes in intra-household power dynamics in rural parts of NENA countries. These changes have important ramifications for the adaptive capacity of households, as well as for the well-being and resilience of those who remain in rural areas. The evidence indicates that women are among the most impacted by the social consequences of migration.

7.3. Women's contribution to household adaptive capacity

Following their husband's migration, rural women take on additional roles and responsibilities, including on-farm and off-farm agricultural labour. To compensate for men's labour, women are playing an increasingly important role in the management of farms, and there has been a surge in the number of female-headed households and farms under female management (Daoud, 2016; Ibrahim and Ruppert, 1991; Zuccotti *et al.,* 2018). Meanwhile, they continue to perform their more traditional roles, taking care of the household, producing and preparing food and looking after the children.

Women's greater involvement in farming and control of farms represents a shift in farming activities, which become aligned with social norms about acceptable behaviours for female household members. As such, livestock gains greater significance because women can take care of animals on their farms. This is important because, in many conservative Arab-Muslim societies, it is not socially appropriate for women to work away from their homes. Hence, many women do not get involved in working on farmlands and instead limit their activities to taking care of small animals (e.g. pigeons, chickens) and larger livestock, such as cows (Daoud, 2016; de Haas, 2001; Ibnouf, 2009). Beyond being a source of food and cash, livestock also enhances social status and acts as a source of savings, thus providing a buffer and enhancing adaptive capacity (Ibnouf, 2011).

In addition to household duties and on-farm work, women are increasingly taking on off-farm employment to bring in much-needed income. Women's off-farm work ranges from seasonal agricultural labour through housekeeping to hard physical work (e.g. weeding, thinning cotton) (de Haas and Van Rooij, 2010; Keshavarz *et al.,* 2013). Women's off-farm work can have both positive and negative implications for food security and adaptive capacity. On the one hand, off-farm employment leaves women with less time for growing vegetables and looking after livestock (Zuccotti *et al.,* 2018). On the other hand, their income is crucial for food security because women use most of their earnings to provide food for their family (Ibnouf, 2009; Keshavarz *et al.,* 2013). Women's off-farm work diversifies the household's livelihood portfolio, reduces dependence on remittances and mitigates vulnerability to agricultural fluctuations, as it provides an additional source of income.

Women are also responsible for subsistence cultivation, which takes place on backyard plots or other small pieces of land attached to the farm (so-called "juburaka" in rural areas of the Sudan) (Ibnouf, 2009; Zuccotti *et al.,* 2018). Although the plots are small, they can make a greater contribution to nutritional diversity than extensive farming. This is because home gardens specialize in multiple food products (e.g. okra, beans and other vegetables), whereas farmland is often dedicated to cereals or fodder. As such, women enhance the resilience of their households by promoting self-sufficiency while also improving the nutritional diversity of their diets.

7.4. Implications for women's adaptive capacity

Women's increased workload and the burden of taking sole responsibility for the household's welfare can have negative repercussions for their well-being, manifest in sentiments of stress, depression and hopelessness (de Haas and Van Rooij, 2010; Keshavarz *et al.,* 2013). This could undermine the individual resilience of women and their ability to support their families' resilience and adaptive capacity. School dropout rates often increase following the migration of male household members due to women's increased responsibilities on the farm and the inability to monitor children's school attendance and performance (Abdelali-Martini and Hamza 2014). Girls are disproportionately affected because they are expected to contribute to both on- and off-farm work (Ibnouf, 2009; Zuccotti *et al.,* 2018). For example, women and girls become the primary sources of farm labour when males migrate in Tunisia (Zuccotti *et al.,* 2018). This can have detrimental impacts on the future prospects of rural youth whose low educational attainment perpetuates existing vulnerabilities.

While women's ability to make independent decisions is important in the context of male out-migration with implications for their coping and adaptive capacity, it is often constrained by prevailing social norms and familial arrangements. Taking urgent decisions about selling livestock, crops or other assets during crises is crucial for effective coping and preventing food insecurity (Ibnouf, 2009). However, in Yemen, women are generally not recognized as farmers, and despite contributing significantly to work on the farm, they are not allowed to make decisions (Baig *et al.,* 2019). Women in patrilocal households lack access to remittances and cannot make decisions regarding their use, as these are received by the male household head. However, there has been a shift in intra-household dynamics in some NENA settings. For example, in rural Tunisia, migration reshaped the roles and responsibilities of family members and resulted in greater decision-making power for women and younger household members (Zuccotti *et al.,* 2018). Women's vast contribution to meeting household needs through farm labour and off-farm work also resulted in a shift in social gender norms in the Western Sudan. Women were able to make decisions without the consent of their husbands (Ibnouf, 2011).

Although some women consider the migration of their husbands and their new-found decision-making power liberating, others view it as a burden and would prefer not to assume this role (de Haas and Van Rooij, 2010; Zuccotti *et al.,* 2018). Experiences of the wives of internal and international migrants in Morocco revealed that women feared judgement and criticism if they broke prevailing cultural norms about women's behaviour. Fear of gossip as a powerful social mechanism was associated with a loss of respectability in the eyes of rural society. This could have dire consequences for women's adaptive capacity and coping ability during times of crisis or hardships, as women relied on social safety nets afforded by their community, especially when their husbands were absent (de Haas and Van Rooij, 2010).

The adaptive capacity of women who remain in rural areas is also impeded by structural and systematic forms of exclusion and discrimination, which leave women unable to perform certain tasks on the farm or access financial services and resources. Women are often overlooked during the delivery of extension services and development programmes (Baig *et al.,* 2019; Ibnouf, 2011; Najjar *et al.,* 2019). For example, women in Kafr Sheikh, Egypt, are not offered training to enhance skills and knowledge in the use of different irrigation techniques because they are viewed as less educated by some irrigation officials, as well as physically not strong enough to carry out irrigation (e.g. using the "hawal" method) (Najjar *et al.,* 2019). Additionally, women struggle to obtain basic farm inputs and credit, which often results in reduced agricultural productivity and the decline of some crops (Baig *et al.,* 2019; Ibnouf, 2011; La Rovere *et al.,* 2006). For instance, in most of the Sudan, a married woman cannot obtain credit without her husband's signature. Therefore, in the absence of their husbands, women cannot take out loans that could provide important investment into farm production (Ibnouf, 2011). Yet, the role of credit has been highlighted for farmers' ability to respond to and absorb the impacts of climate change on rural livelihoods.

8. Conclusions and a way forward

The findings of this study showcase the ways in which climate change interacts with other factors and affects the viability of rural livelihoods in the NENA region. The intersections between climate change and political, environmental and economic factors emerge as most relevant, contributing to migration decisions among rural populations.

Drought is the most significant climate-related threat, which negatively affects all livelihood practices in the region. Countries in both North Africa and the Near East have experienced prolonged periods of drought with devastating consequences for livelihoods and food security. Other climate change manifestations observed in the reviewed literature include variable rainfall, extreme heat, desertification, soil erosion, salinization and sea level rise. The study demonstrates that challenges stemming from climate change have been often exacerbated by ineffective or inappropriate policy choices that have weakened social capital, brought about changes in access to land and resources, constrained access to financial and extension services, and contributed to falling incomes and food insecurity.

Migration as an adaptation strategy to climate change forms part of a wider portfolio of household strategies. Migration allows rural households in the NENA region to diversify incomes, reduce vulnerability and increase resilience. Migrant remittances – that is, the social, material and in-kind transfers between migrants and their families – have the potential to improve rural households' ability to adapt to climate change. For example, remittances facilitate access to land, resources and other forms of capital in settings of high climate vulnerability, such as parts of the NENA region. The study highlights that remittances also provide an important safety net and income gap filler when farm production fails due to the impacts of climate change. But migration is not a strategy desired by or available to everyone in NENA countries. Those who cannot migrate or choose to stay in their rural homes pursue a range of on- and off-farm adaptation options such as diversifying farming production by using local ecological knowledge to manage resources to seeking off-farm waged employment.

A number of social implications also arise as a result of rural out-migration across the NENA region. These include the restructuring of rural societies, which is manifest in the emancipation of previously landless marginalized groups. Migration also leads to changes in intra-household power dynamics and affects the well-being and resilience of those who remain in rural areas, especially women. These changes, in turn, have important ramifications for the management of natural resources, agricultural livelihoods and food security. They also influence decisions about risk management and shape the adaptation strategies of households and communities.

The analysis of existing literature reveals a number of knowledge gaps where more research will be required, as well as based on insights from existing evidence, the report highlights implications for future programming and policy.

8.1. Research gaps and areas for future research

- Better understanding of the impact of gradual environmental change on changing migration patterns. To understand how slow-onset events interplay with other factors to cause changes in migration patterns.

- Need for better understanding of the role of internal migration and associated social and financial remittances in building adaptive capacity. There is a lack of systematic data about the extent of internal remittances. Yet more people migrate internally than internationally, and those who pursue

this type of migration are more likely to be from poorer households or belong to marginalized groups (e.g. women, minority ethnic groups, landless).

- Better data and understanding of seasonal and circular migration and how its effectiveness as a livelihood strategy has changed over time or in response to climatic and environmental changes.

- Need for an improved understanding of the necessary conditions that enable migration to be a successful adaptation strategy. What typologies of households? What types of migration? Which conditions need to exist? How can these be supported and enhanced?

- Climate and environmental change impacts are not experienced uniformly by different livelihood groups operating in distinct agroecological systems. Often those who disproportionately bear the consequences of environmental change are least able to adapt and respond. Moreover, when people migrate, their experiences of migration are not homogenous. Therefore, more disaggregated analyses are required to identify the needs of different groups and inform the design of future programmes and interventions. Disaggregated analyses will require a qualitative approach that can capture the nuances of the context and identify points of leverage for intervention (e.g. different types and manifestations of vulnerability, which may vary between groups). However, once elicited through qualitative inquiry, these can potentially be scaled up and integrated into the design of survey tools that can collect data from a representative sample within a given context.

- Better understanding of who benefits from migration within the household. Most existing analyses use the household as their unit for evaluating whether or not migration successfully improves adaptive capacity and resilience in rural areas. Yet, households are not homogenous and, therefore, it remains unclear who benefits from migration and whose adaptive capacity is enhanced.

- An improved understanding of feedback within complex social-ecological systems and how these are affected by different types of (im)mobility. In particular, better understanding of interdependencies between different livelihoods. How does (im)mobility affect these? Identifying thresholds where livelihood systems might collapse and/or transition to unsustainable resource use or lead to conflict (e.g. of land, as demonstrated by rangeland degradation due to overgrazing as a result of constrained mobility and loss of access to grazing lands by pastoralists).

- Better understanding of the impact of (social and financial) remittances on community-level resilience in rural origins. Some evidence points to the impact multiplier effect of remittances, but it is unclear what is the extent and who exactly benefits. What facilitates the dispersion of benefits to the wider community, and how can non-migrants benefit?

- Better understanding of the environmental impact of migration: through livelihoods in destination, as well as through change to livelihood practices in origin (e.g. investment into intensification). What are the implications for ecosystems in these settings? Focus also on the implications of involuntary mobility, such as IDPs and refugee migration. Explore the environmental implications of their increased reliance on concentrated resources (e.g. fuelwood) and the impact of this on the ecosystems and their services.

- Better understanding of the complex relationship between climate change and conflict, including community-level conflicts over scarce resources and how this relationship may change over time, especially as the effects of climate change, economic and population growth become more pronounced.

8.2. Policy and practical implications

- Improving the coherence and coordination of climate, migration, agriculture and rural development policies: integrating migration considerations into climate and rural development policy and action.

- Identifying and considering links and feedback between social and ecological systems at different scales: facilitating the sustainable use and management of natural resources, including water and land. A shortcoming of existing policies lies in their focus on minimizing the impact of climate change on ecosystems without recognizing that ecological resilience is intimately linked to the resilience of social systems, that is, the groups of people that depend on the ecosystem for their livelihoods.

- Harnessing the role of migration as adaptation and enhancing the enabling environment for migration to significantly contribute to resilience: facilitating the transfer of financial and social remittances and supporting their investment into sustainable and climate-resilient rural livelihoods.

- Support with entrepreneurial ventures in rural areas, as well as by IDPs and refugees in camps and host communities. What works might be context-specific, as evidence about what are the most effective types of support appears to be inconclusive (as per Grimm *et al.,* 2015 and Piza *et al.,* 2016 systematic reviews). Based on evidence from the NENA region, support in rural areas could be directed at the investment of remittances, extension training, and skills and knowledge development. Whereas those in IDP and refugee camps could benefit from skills training for sustainable and environmentally friendly production methods and support with initial inputs and materials.

- Supporting the adaptive capacity of those who cannot or choose not to move: building capacity for climate-resilient rural livelihood practices as alternatives to migration. Supporting and enabling the multiplier effect of remittances.

- Supporting the adaptive capacity of vulnerable groups that remain in rural areas, such as women, children and the elderly: ensuring women's access to extension services and credit, mainstreaming gender considerations into rural development and agricultural policy and programming, and supporting the well-being of women as agents of adaptation.

- Harnessing local ecological knowledge and building on traditional forms of resource management while providing training and information on new technical and scientific knowledge in order to improve the adaptive capacity and resilience of rural agricultural production systems.

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Farming is an important livelihood and significant contributor to employment and food security in rural parts of the Near East and North Africa (NENA) region. But climate change is increasingly shaping the viability of rural livelihoods in NENA countries. The region is becoming hotter and drier, and countries in both the Near East and North Africa have experienced prolonged periods of drought with devastating consequences for livelihoods and food security.

Migration is already recognized as an important adaptation strategy to changing climate and environmental conditions. Yet, to date, there has not been a comprehensive review of the nexus between climate change, rural livelihoods and migration and the implications of migration for adaptation in NENA countries. Understanding these dynamics and relationships is important for implementing the Food and Agriculture Organization of the United Nations (FAO) vision on migration and rural development, the *2030 Agenda for Sustainable Development* and the *Global Compact on Safe, Orderly and Regular Migration*.

This report reviews evidence on the climate–livelihoods–migration nexus in the NENA region, identifies knowledge gaps and makes suggestions for future policy and programming to leverage the potential of migration for climate change adaptation.

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