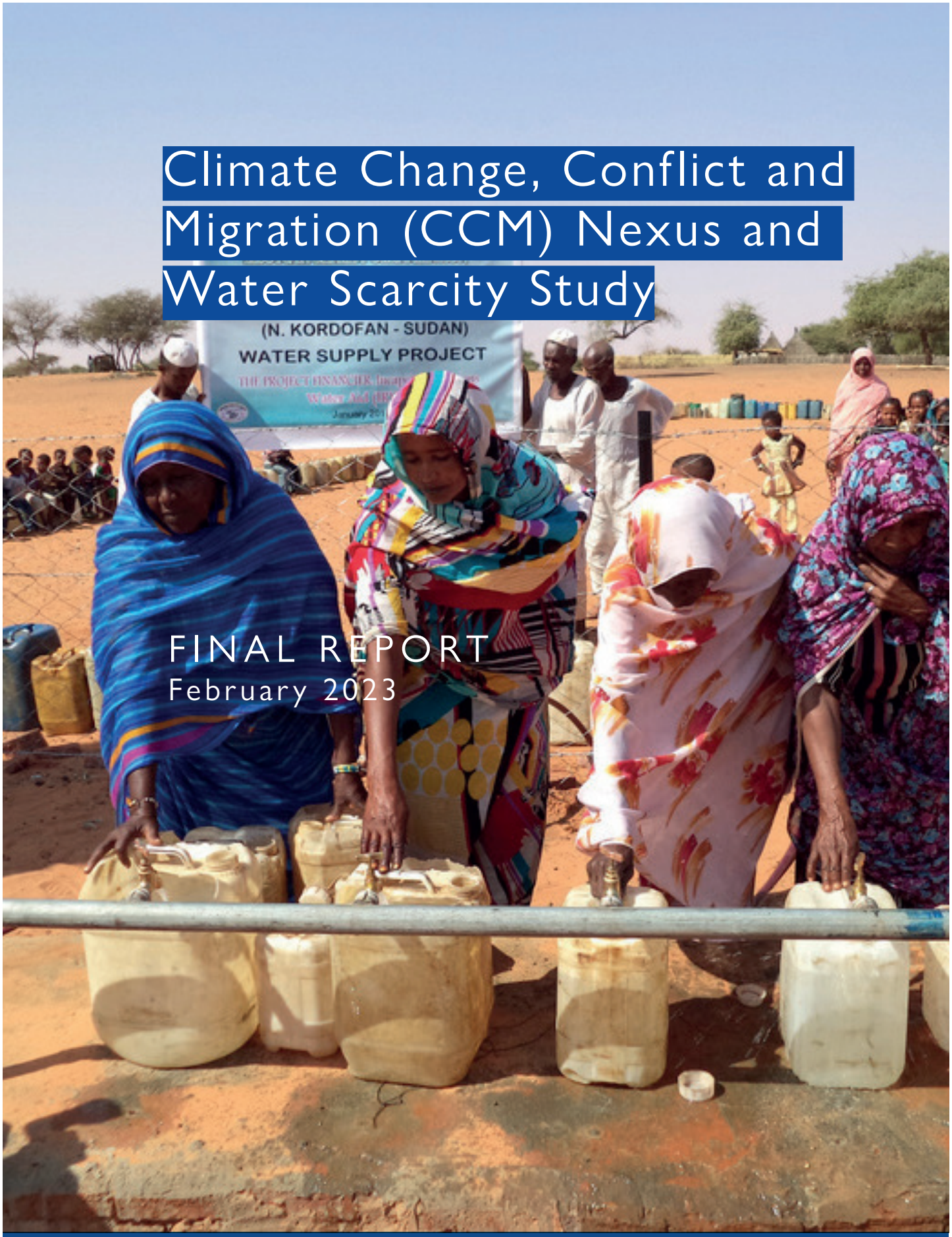
Climate Change, Conflict and Migration (CCM) Nexus and Water Scarcity Study



FINAL REPORT

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List of Acronyms

CCM	Climate Change, Conflict and Migration
DI	Direct interviews
ESCWA	United Nations Economic and Social Council for West Asia
EM	Environmental Migration
EU	European Union
EW	Ethnographic walks
FGD	Focus groups discussions
GOL	Government of Libya
GMMR	Great Man-Made River
GoS	Government of Sudan
IDP	Internally Displaced Person
INGO	International non-governmental organisation
IOM	International Organization for Migration
JMP	Joint Monitoring Programme
MECC	Migration, Environment and Climate Change
MENA	Middle East and North Africa
MM&E	Monitoring, measurement, and evaluation
NATO	North Atlantic Treaty Organization
NGO	Non-governmental organisation
RICARR	Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region
SI	Stakeholder interviews
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
ViEWS	Violence & Impacts Early-Warning System
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WRI	World Resources Institute

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Executive Summary

While the International Organization for Migration (IOM) has been working with communities in the Middle East and North Africa (MENA) Region on addressing the impact of environmental change through income generation over the last few years, it undertook a study in 2022 to increase the evidence base on the Climate Change, Conflict and Migration (CCM) Nexus. The study focused on the countries of Libya and Sudan, was funded by the IOM Development Fund (IDF) and occurred within the framework of the IOM Institutional Strategy on Migration, Environment, and Climate Change (MECC) for 2021-2030.

The findings draw from mixed-methods engagement with five sites in Libya (Jufra, Kufra, Sebha, Tajoura and Tripoli) and five sites in Sudan (Khartoum, North Darfur, South Darfur, Kassala and Gedaref).The report that follows first presents a brief review of academic and practitioner literature on CCM Dynamics. It then elaborates on critical points of intersection among the CCM Nexus dynamics in Libya and Sudan and how they catalyse or exacerbate vulnerabilities and challenges. At the aggregate level, it became clear that a critical step towards programme and policy design for these settings begins with the recognition that violence, migration decisions and environmental degradation not be reduced as pure causal mechanisms for one another. Complex, multifaceted relationships exist between them, as well as other cultural, structural and environmental factors.

In Libya, findings suggested that the CCM Nexus tends to touch on the following dynamics:

1. Legacies of conflict violence have resulted in displacement and the destruction of resource management infrastructures, shaping migration decisions for both international migrants to and internal migrants within Libya.
2. Widely shared concerns surround the potential for future conflict and environmental migration as a result of water scarcity.
3. A multi-faceted, non-linear relationship exists between competition over access to resources because of both environmental degradation and demographic shifts and the possibilities for conflict.

In Sudan, the CCM Nexus tended to implicate the following dynamics:

1. Climate change and environmental degradation represent the most consistently voiced concern among migrant and host communities and stakeholders across all.
2. Violent conflict and intercommunal clashes are key drivers of migration, and environmental degradation can amplify vulnerabilities related to these forms of insecurity.

Study recommendations identify the need for multi-stakeholder engagement that ensures participating actors are well-positioned for implementation, oversight and outcomes accountability. Strengthened administrative and governance capabilities at all levels can draw from and contribute to technical, relational, economic and physical capital. These processes can also involve non-state governance mechanisms, such as tribal councils, intercommunal compacts and other productive locally developed processes. Participatory, inclusive approaches to developing a coordinated response to CCM Nexus dynamics can create opportunities for traditionally underrepresented groups to engage meaningfully in policy and programme initiatives. And an approach to thinking about programme and policy development as opportunities for promoting social cohesion can help to reduce the risk of long-standing intergroup tensions that are exacerbated by resource access issues. Following, are the country-specific findings.

Key Findings and Implications

Libya

The top challenges for water management in Libya represent systemic issues. They include: 1) insufficient investment in desalination plants, technology and other alternative water sources; 2) underdeveloped transparency practices, regulatory frameworks and enforcement mechanisms related to water management; 3) insufficient monitoring and maintenance of existing water management infrastructures and their related elements and 4) low levels of overall awareness about these issues. Among study respondents, 61% reported obtaining their water from wells and the tap, and an overwhelming 94% of water for farming comes from irrigation systems. Hence, water access and management infrastructure shortcomings have severe implications for population health outcomes and agricultural production.

Successful responses to the above issues require multi-stakeholder engagement, intentionally engaging those actors who can be held directly accountable for program and policy implementation, oversight and outcomes. Critical areas for investment include alternative, diverse and renewable energy approaches to water management, responsible waste management, transparency and accountability, governance and oversight capabilities, equitable and inclusive solutions, public awareness and evidence-based programme and policy design.

Governance capabilities, citizen practices and environmental degradation – both because of climate change and man-made factors –create negatively reinforcing dynamics that contribute to poor population health outcomes, issues with access to water and unplanned migration. This is illustrated by the intersection of citizens' solid waste dumping practices, inadequate provision of waste management services, weak enforcement of sanitation regulations and resultant contamination of water sources. Furthermore, among stakeholders interviewed, government support and governance capabilities combine with man-made degradation to create insurmountable obstacles to effective programme and policy implementation.

Second- and third-order consequences of CCM Nexus dynamics include threats to livelihood, public health concerns, emergent threats tied to a solution that increase vulnerability in another domain and the amplifying effects of man-made environmental degradation. Such intermeshed social, economic and political life domains require holistic approaches to addressing them with particular attention to a balance of awareness raising, policy and programme design and governance and oversight.

Overcoming data challenges such as accessibility and quality along with achieving inclusive practices that engage decision-makers from all affected population groups will pose significant challenges given the current political and governance climate. **Programme and policy approaches that build on access to regularly collected, high-quality data and use participatory practices to strengthen local governance capabilities tend to achieve more sustainable success**. However, strengthened local administration represents a critical success factor. Training, financial backing and programme relevance form the bedrock of success. Administrative capacities can draw from and contribute to technical, relational, economic and physical capital. It can also implicate non-state governance mechanisms, such as tribal councils, intercommunal compacts and other conflict-resolution mechanisms.

There exists a persistent under-awareness of women's experiences with the CCM Nexus and water scarcity at the organisational and institutional levels. As a result, women are underrepresented in the national dialogue around these themes. Identified contributing factors, according to respondents, include prevailing cultural practices and norms in some areas of the country, and difficulty in locating women for data collection efforts when those efforts concentrated around zones in which agricultural laborers transited, and a lack of political will to include them in research and policy design (with one notable exception among respondents).

In addition to initial violent displacement and related vulnerabilities, violent conflict results in environmental degradation and complicates access to natural resources, exacerbating the effects of climate change. This can occur through the destruction of vital infrastructures, delay in intended resource management projects and, as a result, destruction of livelihood options.

There is a complex and multi-faced (rather than unidirectional) relationship between competition over access to resources and conflict. Though there were some reports of inter-communal tensions over natural resources (11 out of 185 total quantitative survey respondents), destruction of infrastructure and threats to water access were reported in qualitative accounts to occur more often *because of* conflict, rather than as the catalyst for the conflict itself. Nevertheless, the potential for future conflict related to water scarcity did feature prominently in study findings. This suggests an important point of intervention for security-building and stabilisation efforts in Libya moving forward. Caution must be taken to ensure that one policy or programme implementation does not trigger existing or emergent tensions when one population group perceives a disadvantage vis-à-vis the ostensible beneficiary group.

Conflict and economic conditions continue to be key drivers of migration in Libya. However, the relative importance of each depends on national origin and can concentrate differently depending on the destination community – as can vulnerabilities. For example, nearly all migrants in the urban community in Sebha arrived as a result of displacement due to violence and other forms of physical insecurity. Nearly all migrants who arrived in Tajoura, in contrast, had migrated in pursuit of improved economic conditions. Internal migration had overwhelmingly been catalysed by conflict, whereas most Chadian and Nigerian respondents had emigrated for financial reasons. Critical sources of vulnerability include lack of documentation, employment opportunities and essential needs (humanitarian assistance, food, water and housing). These tendencies should inform programme and policy initiatives in population- and site-specific ways.

While host communities may be disposed to helping those affected by environmental migration, resource strains (economic, security and water-related) could trigger tensions between migrant and host communities. Participants encouraged those considering environmental migration to exhaust all possible options before doing so. For rural-to-urban migration, areas of concern for the well-being of the migrant and his or her family included obtaining sustainable employment, insecurity in the cities, difficult living conditions, potential problems with community acceptance and disproportionate negative impacts on women and children in the family.

Sudan

Environmental degradation and its consequences represent the most significant concern among study participants across all instruments. These findings suggest that environmental degradation is an urgent issue that must be addressed. Sustainable water management strategies are urgently needed to improve access to clean water and protect the environment.

Loss of land and livelihood is the most significant threat posed by climate change and natural and man-made degradation. Climate change-related exposure to floods and drought were among the top five causes of livelihood shocks. However, man-made factors such as deforestation and poor infrastructure and engineering have exacerbated environmental degradation. These conditions can also pose adverse effects on well-being and social cohesion.

Environmental degradation is experienced differently according to gender and life cycle. Women are often responsible for adjusting to the changes brought on by climate change. Still, programmes targeting them may sometimes be met with resistance from men (examples of men's support for such programmes were also found). Youth are also particularly affected by the consequences of climate change, as flooding and other forms of environmental degradation can limit their access to education – especially for girls. This highlights the need for policies and initiatives that address the gendered impacts of environmental degradation on adults and youth.

Combining financial, technical and political capital and focusing on governance and adaptation capabilities are two approaches that tend to support success in policy and programme interventions designed to address environmental degradation challenges. In the Sudanese context, this requires awareness raising, the availability of alternative resources, such as fuel-efficient stoves and alternative building materials, prioritisation of water management, support infrastructure construction, update and improvement, development and dissemination of sustainability practices and development, application and enforcement of related legal frameworks.

Climate change and other forms of environmental degradation amplify pre-existing vulnerabilities related to the history and condition of violent conflict and intergroup tensions. Multiple data sources confirmed that existing and potential sources of conflict, violence and other forms of insecurity tend to emerge around competition over access to natural resources. Additionally, conflict over natural resources is not the only security concern for study participants, as drug and alcohol abuse and other public order concerns are also present.

Joint problem-solving committees are a productive form of conflict resolution. Those policies and programmes that focus on governance and adaptation capabilities are more successful when they are inclusive, address population management issues and build upon existing capabilities. Thus, stakeholders have found that promoting non-violent conflict resolution and justice mechanisms at the community level is crucial, ensuring diversity in leadership demographics and building upon an in-depth understanding of local histories of conflict dynamics.

Violent conflict and intercommunal clashes are the most significant catalysts for migration. Additionally, among those who had migrated, community rejection and inability to migrate despite a desire to do so were the most prominent dispositions held by respondents. Finally, youth migration patterns related to employment and livelihood have been changing distinctly from those of adults. They are more likely to migrate in search of employment and livelihood opportunities. These implications point to the need for more robust solutions to reduce the prevalence of violent conflict and intercommunal clashes and mitigate the effects of displacement on youth.

Unplanned migration due to CCM Nexus dynamics has far-reaching implications, including expanded environmental degradation, water scarcity, increased risk of conflict, public health risks, **increased exposure to threats of gender-based violence, armed violence, human trafficking and family separation**. These issues are further amplified by environmental factors such as heavy rainfall, leading to environmental displacement, reduced access to farmlands and destruction of housing. These findings suggest an urgent need for policies and strategies that consider the complexity of the CCM Nexus and its effects on migratory flows.

Individuals impacted by CCM Nexus dynamics make migration decisions based on violence-related factors, economic viability and socio-familial ties. The urban contexts associated with migration present both opportunities and risks. Programme and policy designers should thus be aware of the complex factors influencing decisions to migrate due to CCM Nexus dynamics. Policies should reduce the risk of violence and other tensions, improve economic viability in migrants' places of origin and mitigate potential risks associated with socio-familial ties. Additionally, policymakers should be mindful of the economic impacts and other risks associated with large-scale rural-to-urban migration.

Familial and social networks, existing practices for coping with flooding, non-violent conflict management capabilities, adequate documentation, initiatives to address discrimination and risk mitigation are essential for facilitating regular, orderly, and dignified migration tied to CCM dynamics. Achieving these conditions requires understanding migrants as individuals embedded in social networks and implicated in social dynamics, building holistic solutions to support them in this way.

1.0 Background

1.1 Migration, Environment, and Climate Change (MECC)

In 2021, IOM launched its 10-year Institutional Strategy on Migration, Environment and Climate Change 2021-2030 (IOM, 2021). Regarding environmental migration, IOM pursues three broad objectives in managing environmental migration, intervening at each stage of the migration cycle:

1. **"We develop solutions for people to move"** – Managing migration in the context of climate change, environmental degradation and disasters due to natural hazards.
2. **"We develop solutions for people on the move"** – Assisting and protecting migrants and displaced persons in the context of climate change, environmental degradation and disasters due to natural hazards.
3. **"We develop solutions for people to stay"** – Making migration a choice by building resilience and addressing the adverse climatic and environmental drivers that compel people to move.

To support this, the Organization has set forth four priority areas of engagement (policy, knowledge provider, operational, and convening roles). This study supports IOM's **knowledge provider role:** As a leading knowledge provider, IOM will strengthen evidence-based policy and operational approaches to address migration in the context of climate change, environmental degradation and disasters due to natural hazards, through the production, analysis and dissemination of relevant data and knowledge.[1]

1.2 Climate Change, Conflict, and Migration (CCM) Nexus Regional Study

Within the mandate of the Regional Programme on Mobility, Climate Change and Water Scarcity, the present study sets out to support the IOM's MECC Institutional Strategy to create a comprehensive, evidence- and rights-based approach to migration in the context of environmental degradation, climate change and disasters for the benefit of migrants and societies.

Climate change and water scarcity are increasing existing threats to vulnerable communities in the Middle East and North Africa (MENA) region. Already the most water-scarce region in the world, MENA is projected to be severely impacted by global climate change. Extreme weather events, like floods, droughts and wildfires are likely to increase in scale and frequency because of climate change, with severe impacts on people's basic needs and livelihoods, security, well-being and resilience. Additionally, displacement can amplify disaster risk alongside resource and water scarcity in areas where large-scale movements strain already limited water sources. This can result in tensions over access to critical resources, such as water, between different community groups, thereby amplifying fragility.

The International Organization for Migration (IOM) has a proven history of developing and implementing interventions that support communities and governments to prepare for, reduce the risks of, and respond

1) This information along with relevant organization documents is available on the IOM MECC portal (IOM, 2023a).

to, the effects of climate change, environmental degradation and disasters, such as water scarcity, as part of its Migration, Environment, Climate Change and Risk Reduction (MECR) portfolio. The present study aimed to assess how migration, climate change, environmental degradation, water scarcity and conflict interact and influence community resilience against climate and conflict shocks. To achieve this, the MENA Regional Office led this study on the Climate Change, Conflict and Migration (CCM) Nexus with the Libya and Sudan Country Missions between February and November of 2022. These efforts were supported by the IOM Development Fund (IOM, 2022a).

The main objective of this study is to contribute to developing public policies that address issues related to conflict, migration, environment and climate change in Libya, Sudan and the Region. It aims to equip key actors and institutions with the evidence and analysis necessary to implement public policies and design programmes considering the CCM Nexus. The basis of this approach is completing this dual qualitative and quantitative design to generate empirical data and shed light on the linkages between the study themes. The data used to illustrate these linkages derive from five methodological instruments:

1. Quantitative Survey (*n*=185 Libya, *n*=264 Sudan)
2. Stakeholder Interviews (*n*=14 Libya, *n*=25 Sudan)
3. Direct Interviews (*n*=113 Libya, *n*=82 Sudan)
4. Focus Group Discussions (*n*=12 Libya, *n*=7 Sudan)
5. Ethnographic Walks (*n*=0 Libya, *n*=21 Sudan)

This work should generate data and knowledge supporting public policies, content elements for capacity-building of state and other actors through training activities, implications and recommendations for integrating the CCM nexus into policy and programme design, two related concept notes and a policy note on coordinated approaches to addressing the key issues that emerge.

2.0 Theoretical and Contextual References

A comprehensive desk review on the Climate Change, Conflict and Migration (CCM) Nexus formed the basis for study design. It represented a collaborative effort, developed and refined together with the MENA Regional Office and the Libya and Sudan Missions. **Appendix A** provides a summary table of leading academic work in this domain at the global level; the following sections elaborate on key points, especially as they relate to the MENA region and selected countries.

2.1 The Climate Change, Conflict and Migration (CCM) Nexus

Historically, research has argued that climate change and its effects (including increased frequency of extreme weather events) lead to dramatic shifts in human mobility, resulting in conflict with receiving communities due to resource scarcity (Buhaug, 2017). However, to date, little conclusive evidence has emerged that would substantiate such a linear pathway (Burrows & Kinney, 2016). Furthermore, the underlying premise of much academic work in this field is that climate change causes resource scarcity and this scarcity can lead to conflict due to its effects on key aspects of society such as income, food, and capabilities to cope (Koubi, 2019). Although a correlation between drought and conflict has been observed (Dai et al., 2004), for example, a deeper understanding of the mechanisms driving this relationship is necessary to assess the impact of climate change on future conflicts and the relationship of resource scarcity to these dynamics. Research on the Sudan, for example, has found that converging dynamics of resource abundance, militarized state power and global political economic forces may have a much greater explanatory power for the presence of potential conflict and impacts of environmental degradation than mere resource scarcity alone (Selby & Hoffmann, 2012). The purpose of the present study is to contribute to deeper understandings of how CCM Nexus dynamics materialise in everyday life

Though each element within the Nexus stands apart in the organisation of this report, the structure is for analytic ease, as the three elements are inextricably intertwined. Furthermore, it is widely acknowledged that social, economic and political factors in context are inextricably tied to critical adaptation processes and human security outcomes. This is the underlying justification for the present in-depth inquiry into the nature of these relationships and forces.

2.1.1 Environmental migration (EM)

Environmental migration (EM) refers to the movement of a person or groups of persons who, predominantly for reasons of sudden or progressive change in the environment due to climate change, are obliged to leave their habitual place of residence or choose to do so, either temporarily or permanently, within a State or across an international border (IOM, 2019). Furthermore, such migrations can be evolving and dynamic: beginning, for example, as voluntary and becoming forced under changing sets of circumstances. EM tends to fall into five categories: out-migration, in-migration, networks (that facilitate movement either out or in), public policies and personal motives (Black et al., 2011).

Migration represents a key node in the constellation of CCM and related factors since it is the most frequently cited connection between conflict and climate change (Brzoska & Fröhlich, 2016). For example, climate change and extreme weather events can contribute to displacement of populations forced to migrate due to damage to their property, lands and livelihoods, though not necessarily through direct causal pathways (Dun & Gemenne, 2008). Such environmental factors can shape mobility decisions when 1) increasingly extreme and intensifying events force people from their homes; 2) longer-term changes result in a gradual degradation in standards of living, which can drive various forms of livelihood-motivated migration and 3) the arrival of migrants in contexts of already strained resources can feed into existing or emergent tensions (Seyuba et al., 2021).

In recent years, perspectives on EM have shifted from pathologizing the movements as individual human mobility problems to understanding them instead as adaptation strategies in the face of threats to fundamental human security. Specifically, CM might include moving in search of new livelihoods or developing solutions to remain. While this conceptual step is important for thinking about the relationship between human security, adaptation and resilience, more still needs to be done to account for the structures and systems within which migration decisions are made as a result of the effects of climate change (Bettini, 2014). The present study represents an effort to add to the empirical base of our knowledge about these structures, systems and decision-making criteria.

As an example of these complexities, mobility patterns may shape conflict patterns in each setting, but conflict-induced migration can also result in environmental damage and degradation (e.g., destruction of resource management infrastructures). Alternately, communities may adopt environmentally harmful practices because of conflict-related displacement that have long-term negative repercussions on resource availability (e.g., deforestation). Agricultural production, pastoralism, non-state armed group recruitment and activity and rural-urban migration have all been identified as dynamics that interact with conflict and migration dynamics under conditions of environmental scarcity (Selby & Hoffmann, 2012). Scenarios also exist in which environmental change and migration occur somewhat independently of one another and yet result in conflict when their effects are experienced together (Freeman, 2017). The qualitative and quantitative instruments in this study surfaced instances of these dynamics and their convergences.

Unsurprisingly, the CCM Nexus bears significant implications for overall human security, understood as the right of people to live in freedom and dignity, free from poverty and despair and with the protection of their physical safety, economic and social well-being, and human rights. It includes the right of all individuals, vulnerable people in particular, to live free from fear and free from want, with an equal opportunity to enjoy all their rights and fully develop their human potential (United Nations, 1994). Along these lines, the present study aligns with thinking that migration alone does not pose a security risk (Humphrey, 2013; Morrissey, 2009). Indeed, migration itself can be a strategy for climate adaptation involving the following four processes, among others: 1) relocation to less vulnerable areas (e.g., those exposed to the deleterious effects of sea level rises, extreme weather events, or drought); 2) diversification of livelihoods (e.g., access to alternative sources of income and livelihoods that are less vulnerable to climate change impacts); 3) transfer of knowledge and skills (e.g., migrants who bring knowledge of alternative farming practices or effective water management techniques); and 4) building of social networks (e.g., maintaining family and community networks that can further facilitate support and knowledge transfer) (Bettini, 2014; Van Praag, 2021) It represents a necessary and regular part of global population dynamics and occurs quite regularly without threat. Instead, it is the convergence of multiple factors and threats that together result in substantive threats to overall human security for migrant populations and their receiving communities.

For the above reasons, it is important to not overstate the relationship between climate change, migration and conflict without a strong empirical base for analysis. It is thus necessary to adopt a nuanced approach to understanding the relationship of each of these elements to the other that does not presume direct causality or linearity. The analysis and findings presented in this report attempt to enable this degree of nuance, building on narrative accounts for these dynamics as they occur in the context of individuals' everyday lives and with quantitative survey data complementing these accounts.

2.1.2 Violence, Conflict and Other Forms of Insecurity

Recent approaches to the study of human security adopt a holistic analytic approach that cautions against the false pretence that, if people were simply resilient enough, they would be able to contend with the forces that generate insecurity (Van Praag, 2021). Expanding the analysis to include political, institutional and other actors in context ensures a more systematic understanding of processes that are systematic in nature. The five methodological instruments developed for this study represent an effort to capture this more holistic understanding of conflict as it plays into the CCM Nexus. They build on an understanding of violent conflict as a consequence of mutual hostilities resulting from the incompatibilities dividing rival actors that escalates into violence, even if it does not result in killing (e.g., gender-based violence), and recognize that recent violent conflicts tend to increase vulnerabilities to future ones (Conteh-Morgan, 2019).

Challenges with adaptive capacities – e.g., disaster response, institutional governance capabilities, economic resilience, cooperative capacity, technological innovation – can result in heightened vulnerability to the violent potentials of combining food and water scarcity, climate change and events, civil unrest and political exclusion (Scheffran, 2020). Governance capabilities for managing conflicts also feature in much research on the CCM Nexus at the community, state and national levels. These considerations are especially important, given that many CCM Nexus interventions and policies undergo implementation in fragile and precarious conditions (Scheffran, 2020; Seyuba et al., 2021) and they feature prominently in study data and findings.

2.1.3 Climate Change

Framing climate change as a variable that amplifies existing conditions of insecurity, as opposed to a direct causal mechanism, represents one of the more productive approaches to research on the CCM Nexus – i.e., the relationships between one domain (e.g., conflict) and another (e.g., climate change) are not direct, but rather mutually influential and mediated by other things. For example, some have argued that migration mediates the causal relationship between environmental change or climate change and political violence, and that these effects are determined by social, economic and political factors (Freeman, 2017). According to such lines of thinking, climate change creates stresses in the abovementioned dimensions of human security (e.g., it can result in reduced agricultural productivity, water scarcity and competition for resources). This, in turn, tests the responsive and adaptive capacities of implicated individuals, communities and institutions (Council of the European Union, European Commission, 2008).

Researchers have found that the physical effects of climate change can increase the risk of conflict as a result of livelihood deterioration, exploitation and mismanagement by elites, changing migration and mobility and armed group tactics in several contexts across the world (Ovidie Grand & Tarif, 2021). Climate change effects interact with trade policies and pathways, national finances and debt, regional cooperation and management of shared natural resources (Sisdoia, 2022). However, governments can fall short in mainstreaming climate risk management in their short-, mid- and long-term development planning. This undermines other critical policy areas, including investment and aid flows, trade and social and geopolitical concerns (including migration).

The present study set out to better understand experiences and effects of water scarcity as an element of broader climate change effects. Water scarcity is generally defined as the physical or economic lack of water resources to meet the demands of a specific population. Physical water scarcity occurs where natural water resources are over-exploited and economic water scarcity occurs where there is insufficient investment in and maintenance of water distribution systems and infrastructures. Rising temperatures, longer periods of drought, reduced rainfall and the rise in frequencies and intensities of flooding are all impacts of climate chance that have direct bearing on both physical and economic water scarcity (Crumpler, 2022; IPCC, 2021)sector-specific synthesis of the agriculture, water and land use sectors in the nationally determined contributions from Near East and North Africa. It summarizes the substantial contributions already put forward by countries, opportunities for further action and the gaps, barriers and needs that will need to be addressed if the region is to raise mitigation and adaptation ambitions. The findings of this report will help member countries to reflect on their progress in advancing toward nationally determined contributions priorities for agriculture, water and land use, and associated national climate goals including related targets under the Sustainable Development Goals. The analysis also helps to make clear the links between the nationally determined contributions from the region and the ongoing work of the United Nations Framework Convention on Climate Change in support of the Koronivia Joint Work on Agriculture (KJWA.

A recent report on UNICEF's Water, Sanitation and Hygiene (WASH) programme, which aims to ensure water, sanitation and hygiene for all towards Sustainable Development Goal 6, names lack of water access as a major obstacle for programme implementation (UNICEF, 2021). The global COVID-19 pandemic further highlights how water scarcity strains delivery in healthcare systems worldwide, making crucial sanitation practices such as handwashing difficult. These conditions, in turn, contribute to malnutrition and digestive disease, hunger-driven displacement and armed conflicts over territory and resources.

Because water is a core element of household labour (e.g., cooking, washing and caring for the ill, children and the elderly), many of the difficulties associated with water scarcity also tend to disproportionately burden women (Lama et al., 2021)while at the same time gendered dimensions of vulnerabilities remain limited to binary approaches. There is limited cross-fertilization between disciplines that go beyond comparison between males and females but interrogate gender in association with climate change and migration. Here, we seek to develop an analytical lens to the nexus between gender, migration and climate change in producing, reproducing and sustaining at risk conditions and vulnerabilities. When gender and mobility are conceptualized as a process, and climate change as a risk modifier, the nexus between them can be better interrogated. Starting by using gender as an organizing principle that structures and stratifies relations entails viewing gender not as a category that distinguishes males and females but as a discursive process of social construction that (re. Climate impacted migration and displacement only amplify these gender-specific difficulties. For example, reports from humanitarian aid agencies in MENA countries describe women and girls' increased exposure to sexual assault and violence in conflict zones and migrant-refugee settlements where access to water requires walking long distances (Aamer, 2021).

Research has also shown how the out-migration of men can leave women behind to face the intensification of water scarcity while also caring for children and living through various forms of physical insecurity. In contrast, however, water scarcity can also lead to women gaining more household and community decision-making power (Chindarkar, 2012; Lama et al., 2021)needs and priorities of climate migrants will vary by gender and these differences need to be accounted for if policies are to be inclusive. Among the vulnerable groups, women are likely to be disproportionately affected due to climate change because on average women tend to be poorer, less educated, have a lower health status and have limited direct access to or ownership of natural

resources. Both the process (actual movement. Some existing programs have reported that addressing the intersection of water scarcity, migration and community resilience that engage with collectives of women have achieved success in managing communal water resources (IOM, 2023b; UNDP, 2018). For these and other reasons, the study instruments and methodology design account for the differential experiences of water scarcity and CCM Nexus dynamics by gender.

In the sections that follow, the Libya and Sudan Country Studies, supporting theoretical framing, data and analysis comprise distinct sections. The report includes study implications and recommendations. Data collection instruments and methodologies, through referenced throughout, can be found elaborated more thoroughly in **Appendix B.**

3.0 Libya: Country Study

3.1 A brief presentation of the country

Libya is a North African country with much of its land mass occupying the Sahara Desert. Most of its population (87%) concentrates around coastal cities Tripoli and Benghazi and surrounding areas (UNICEF, 2019). It is bordered by the Mediterranean Sea to the north, Egypt and Sudan to the east and southeast, respectively, Chad and Niger to the South, and Algeria and Tunisia to the west.

3.1.1 The Climate Change, Conflict and Migration (CCM) Nexus in Libya

In terms of migration, Libya is classified as both a destination country for people seeking better quality of life and economic survival from across the continent of Africa and as a transit point (including human trafficking and migrant smuggling) due to its location on the Mediterranean Sea. The Missing Migrants Project regularly updates the number of counted migrant fatalities, noting that the Mediterranean, and the coast of Libya especially, are sites where the most reported disappearances have occurred (Missing Migrants Project, 2022). Some of these people are fleeing violence and instability in their countries of origin: however, the trajectories and dispositions of these individuals are diverse. Some are migrant workers, for example, which includes those who can no longer make a living because of climate change (e.g., drought-induced crop failure, rising ocean temperatures affecting fisheries). Regardless, migrant populations are particularly vulnerable to human and sex trafficking networks, gender-based violence as well as conditions of modern slavery (Onuoha & Okafor, 2021). Furthermore, non-state actors continue to vie for power and benefit from human trafficking and migrant smuggling (Al-Dayel et al., 2021).

Libya offers desirable employment opportunities and highest salaries in the region, drawing in migrants from neighbouring countries despite a plummeting standard of living from the aftermath of the armed conflict (IOM, 2014; OECD, 2019). Two years after the signing of the UN-brokered Ceasefire Agreement, tensions and divisions between governmental institutions persist and the socioeconomic situation has been further impacted by the Ukraine crisis as well as the COVID-19 pandemic (UNICEF, 2022). Since the start of the uprising against Muammar Gaddafi in 2011, close to 400,000 Libyans have been displaced; as of June 2022, around 143,000 internally displaced persons (IDPs) remain displaced in Libya (IOM, 2022d). Even still, a recent IOM Report documents that most migrants traveling into Libya (90%) state that their primary reason for migration was related to economic factors and the search for a better livelihood. More than half of respondents to an IOM survey (53%) stated that insufficient income in their countries of origin was the core reason that drove them to migrate and 9% of respondents stated that they had been internally displaced in their countries of origin before arriving in Libya (IOM, 2022d). Despite armed conflict, tightening border restrictions and exclusionary European immigration and refugee policies, geographic proximity and diasporic ties between Libya and the neighbouring countries of Chad, Egypt, Niger and Sudan continue to shape in-flow migration patterns in Libya, with migrants from Niger constituting the majority of the migrant population (IOM, 2022d).

Following the death of Muammar Ghaddafi in 2011, state agencies have had to contend with economic collapse, resource scarcity, fragmentation of political and military groups, significant numbers of IDPs and the resulting tensions with host communities (El Ghamari & Gabriela Bartoszewicz, 2020). Multiple armed factions continue

to jostle for power (including over resources such as water and oil) and Libya remains intensely destabilized (Megerisi, 2021; USAID, 2017).

Libya's geography is characterized by vast and semi-deserts covering 85-90% of the country, with the Mediterranean coastal region giving way to the hyper-arid Sahara (Braun et al., 2020). It is one of the driest countries in the world, with less than 2% of its land mass receiving enough rainfall to sustain agriculture and only 5% of the country receiving a minimum of 100ml of rainfall annually (USAID, 2017). Despite the programmes in the past to plant millions of trees, there has still been notable desertification. Many have also argued that the Arab Spring uprising was intimately tied to the effects of climate change (i.e., rising food prices caused by decreased rainfall or natural hazards) (Kuobi, 2019; Smith, 2014), in no small part due to reduced agricultural output of supplier nations like Russia and China. These conditions combine with issues related to water scarcity and the factors in the above paragraphs to create significant challenges to stability in the region (Scheffran, 2020).

More research in countries of origin for migrants in Libya is required to understand the relationships between the increase in political unrest and the trajectories and intensity of migrant flows. To date, researchers have highlighted the diversity of needs, interests and challenges within different implicated populations (i.e., there is no singular "migrant experience"). For example, a recent ethnographic study of children with migrant or refugee backgrounds in Libya found that threats to their security comprised those related to health, safety, education and recruitment to militias and terrorist organizations. Underlying conflict-induced factors exacerbated the situation (El Ghamari & Gabriela Bartoszewicz, 2020). The observable stunted growth of children that prompted the study supports the assertion that research into these contexts must also factor in the different challenges faced by individuals over the various stages of the life course, among other axes of differentiation (e.g., ethnicity, gender). The design of the qualitative study instruments for the present study factors in these aspects, ensuring the coverage of both gender and life cycle concerns as well as nuancing the diverse array of migrant origins and experiences in the country.

Importantly, sources of resiliency and coping mechanisms used in insecure settings in Libya have also been used in non-violent contexts, suggesting that, while violent conflict may give rise to certain conditions of insecurity, the mechanisms that individuals, families, communities, and societies have at their disposal to adapt to these challenges may not necessarily be limited to conflict settings (Swesi et al., 2020). The qualitative instruments used in this study include questions designed to identify existing coping mechanisms in the face of all three of the CCM Nexus dynamics.

As noted previously, there exist few studies that convincingly link the three elements of climate change, conflict, and migration – especially in terms of constituting a causal chain of relationships. However, one recent piece did find that there was a statistically significant relationship between these three factors during specific time periods and contexts. In the countries involved in the Arab Spring – Libya, Egypt, Syria and Sudan – climatic conditions affected drought severity and likelihood of armed conflict, which in turn became an explanatory factor for asylum seeking between 2010-2012 (Abel et al., 2019). For additional findings in Libya and other comparable findings, see **Appendix 1: Review of contemporary academic literature on the Climate Change, Conflict and Migration (CCM) Nexus.** These above highlight several elements important for the present study: 1) it is apparent that some relationship exists between CCM Nexus and water scarcity dynamics; 2) the interplay among climate change, conflict and migration is subject to specific sociohistorical, political and economic factors; and 3) more empirical data, and especially qualitative insight that is based on the perspectives of those people most affected, is needed to be able to describe the relationship between CCM factors and their impact on living conditions.

3.1.2 Water scarcity in Libya

Libya is ranked number 15 in a list of 33 countries across the world facing extreme water scarcity by 2040 (Hofste et al., 2019). The World Resources Institute (WRI) combined 13 water risk indicators into a composite Water Risk Score that reflect the country's water quantity, quality and regulatory reputation—or water governance capacity. The majority of Libya is considered "extremely high risk," except for the coastline on the Mediterranean Sea. 95% of the country is desert and only 1% is cultivated agricultural land (FAO, 2016). There are ephemeral rivers or wadis, but no permanent rivers or lakes, and so drinking water is sourced entirely from groundwater aquifers. In addition to water scarcity as a contributing factor for migration, these conditions also create significant vulnerabilities during the migration journey, with desert deaths in Libya attributable to heat, difficult terrain, and a lack of water along the way (McMahon & Sigona, 2021).

The country holds Africa's largest oil reserves, with petroleum exports comprising over 90% of all exports (OPEC, 2022). During oil exploration in the 1950s and 60s, deep fossil aquifers were discovered in the south. They were first used to develop agricultural projects in the desert close to the wells, but when the population concentrated on the coast required potable water, they were further developed to transfer supply to the North. In terms of regulatory frameworks, The Water Law of Libya (1965), renewed and expanded in 1985, states that water is a public good that should be protected by all. The National Strategy for Integrated Water Resources Management (2000-2025), approved in 2005, also sets guidelines for sustainable development and shared responsibilities of water resource protection (FAO, 2016). While these laws set up a regulatory framework, implementation remains inconsistent amidst armed conflict.

The Great Man-Made River (GMMR) Project, one of the largest civil engineering projects in the world, channels fresh groundwater from the Southern desert to the coastal cities through a series of pipelines connected to the Nubian Sandstone Aquifer (FAO, 2016). The GMMR was funded by the Gaddafi government beginning in the 1980s and constructed in several phases over the course of decades. It is still incomplete and was partially destroyed by NATO bombings in 2011 and the civil unrest that preceded and followed. In Libya, the GMMR mostly supplanted desalination plants—the other major technology for generating potable water in arid climates. Improving the desalination plants that were constructed by foreign investors in the 1960s is considered an option for future development in the face of increasing water scarcity. Although the GMMR continues to deliver water to millions of people, under current conditions of disrepair, it is not a sustainable infrastructure. Over- exploitation of groundwater, particularly in coastal cities, has led to seawater invasion of the freshwater aquifers and is rapidly depleting the water supply (Alfarrah & Walraevens, 2018; FAO, 2016).

Desalination is an obvious way to obtain potable and irrigation water for those countries that have a coastline. While desalination plants have been in use since the 1960s, many plants are currently closed down or in disrepair. Libyan researchers have urged greater attention to local conditions and expertise in future desalination projects, and trace histories of plant failures to this oversight (Abufayed & El-Ghuel, 2001). As demonstrated in the 2017 Tobruk protests, disinvestment in desalination is coupled with intense investment in the oil industry. Protestors called on the National Oil Corporation to solve the water crisis and threatened to disrupt oil exports (Alharathy, 2017). The petroleum industry uses massive quantities of water in producing and processing petroleum; the extraction of one barrel-of-oil-equivalent, for example, requires 250 gallons of fresh water (Chenoweth & Al-Masri, 2022). This means that there are millions of gallons of water per day going into producing petroleum. Indeed, gasoline production is the largest water consumer at 0.60–0.71 gallons of water per gallon of gasoline, and jet fuel refining requires the least, at 0.09 gallons (Sun et al., 2018).

More research is needed on the different stakeholders invested in petroleum production at the expense of improving desalination technologies and the possibility of shifting these priorities. While the desalination process is energy intensive, Libya - and MENA countries in general - have plenty of sunlight. They could harness thermal processes or use of solar electrical power. Furthermore, there is an issue with the brine remaining after desalination: returning this waste to the seas/oceans will increase the salinity of those bodies of water (Belhassan, 2022). It is also possible to mine various minerals from the brine, including salt. Additionally, prior to implementing desalination, investment in wastewater management and improved irrigation and agricultural methods is necessary (Zarroug et al., 2021). This last concern is also addressed at length in this study's analysis and findings.

As migrant workers and displaced people converge in Libyan coastal cities, the sustainability of potable water infrastructure is an urgent concern. Water access has become a central topic of political contestation across a variety of axes (e.g., service and economic disruptions, public health and other related forms of insecurity. For example, there is an ongoing investigation into the rise of hepatitis A, a disease that can be passed in drinking water (Ismail et al., 2022)or through consuming contaminated food and water. This study aims to estimate the frequency of HAV infection from medical records of Tobruk Medical Center, eastern Libya and its distribution during 6 years. The medical records department of Tobruk Medical Center follows guidelines of the international classification of diseases-10 for coding the diseases. The research estimates the frequency and distribution of HAV infection based on age and sex during the period from January 2015 to December 2020. HAV screening assay was performed using commercially available enzyme-linked immunosorbent assays HAV IgM microwell. 245 cases were recorded, 53.5% of cases were males. HAV infection was the most prevalent (92.6%. Separately, in 2019, armed groups turned off water pipes as leverage in a struggle with the state over a captured leader, creating a temporary, but critical water crisis in Tripoli (Wintour, 2019).

Indeed, water, sanitation and hygiene needs have increased in Libya due to continued deterioration in service delivery during armed conflict, and these needs have only been exacerbated by the COVID-19 pandemic. Nearly one in five migrants (19%) report having insufficient access to clean drinking water, which also compromises societal health and hygiene levels (IOM, 2022). Laws in the countries of origin, such as Niger's 2015 anti-smuggling law, have had uncertain results for migrant wellbeing by shifting transit routes through less supported and more arid regions (IOM, 2020b, 2020a). Competing and unreliable criteria of entry and recognition of refugee status between European, African and international agencies present an additional challenge, and several agencies have worked to voluntarily return migrants to origin countries with mixed results (Forced Migration Review, 2021; IOM, 2022d). It is important to note that Libya, while being a major destination country for migration in Africa and the Middle East, is not party to the 1951 Convention Relating to the Status of Refugees.

Most of the existing literature does not consider the complexity of the migration situation in Libya in relation to increasing water scarcity. If it is considered, it is a brief mention that connects the issue to population growth (Boretti & Rosa, 2019). Population growth has long been the default framework of causality for describing the strains of environmental and resource degradation, but it fails to capture relevant dynamics. Population growth does not explain water scarcity in Libya, where the annual growth rate for the period 2005-2015 was estimated to be 0.8 percent—in decline since the 1980s and 1990s, when it was 4.2 and 2.8 percent respectively (FAO, 2016). .

As mentioned earlier, water scarcity links urban and rural vulnerabilities and must therefore be considered from two angles: 1) as an element that drives new out-migration flows, often from rural agricultural zones towards urban centres, and 2) as a problem that emerges with the overexploitation of resources in destination

sites, especially in urban developments and sites where migrants and refugees reside. Along these lines, IOM has investigated environmental degradation and water scarcity as causes of migration with surveys of migrants moving through Niger and Libya (IOM, 2020b, 2020a, 2022d). Most survey respondents note the main reason for migration as economic need, so more research is needed to understand the correlation between decreases in rainfall, and more broadly, processes of desertification and intensifying water scarcity as interrelated with more obvious economic drivers of migration into Libya.

Land titling and tenure issues also factor into water scarcity and management concerns. Private and public property entitlements and responsibilities were a core issue during the Gaddafi era and are central to the unresolved conflicts in post-2011 Libya. During the Gaddafi period, foreign-owned property was nationalized, and Libyan-owned property was redistributed. During the 2011 uprising, villages and homes were destroyed as a challenge to the standing property regime. One central question that has not been adequately addressed in either the academic or policy–making literature is how different scales and histories of property disputes intersect with issues of water scarcity. For instance, decrepit city water infrastructure, combined with targeted sabotage on water systems by armed groups have led households to drill through city pavement to create private water wells (Gatenby, 2017). These issues are multi- scalar, with short- and long-term effects tied to private well drilling, water conservation and sustainability, all embedded in a larger context of unresolved debates about public property. Towards this end, this study will combine both lay insights about household coping strategies and Libyan expert-technical knowledge on best practices for water resource sustainability.

Existing interventions illustrate the complexity of policy and program design in these contexts. Additionally, they serve as cautionary tales with regards to limitations of migration governance frameworks that do not account for the deeper structural conditions of livelihood loss, water scarcity and armed conflict. Successful programs in this domain have also taken care to include local input. For example, IOM's Community Stabilisation program "Together We Build", with funding from the European Union (EU), was able to rehabilitate neighbourhood water wells in the southern city of Sabha after arranging meetings with community representatives (IOM, 2017). This example shows how successful interventions have focused on sustaining household water access as a neighbourhood issue, which also reaffirms the idea of water as a shared public good.

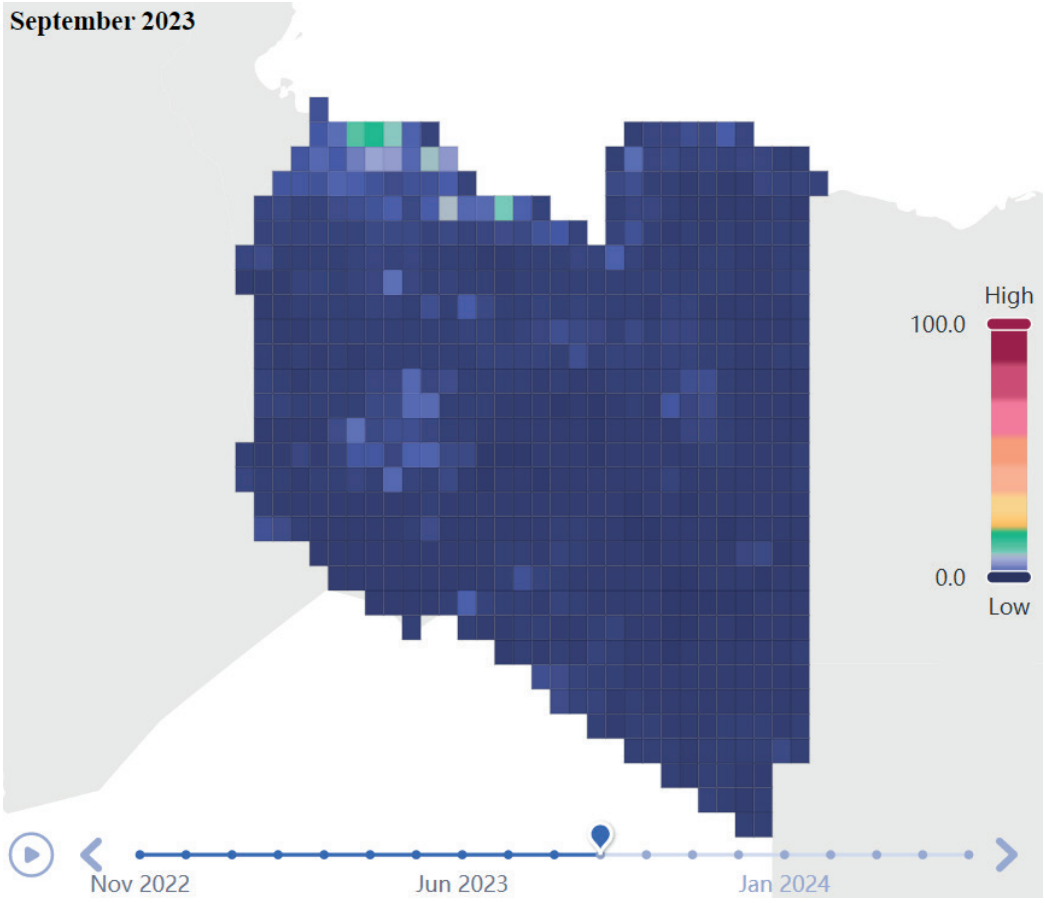
3.1.3 The ViEWS-ESCWA & RICCAR Models Risk Assessment Report1

A 2020-2022 collaboration between the United Nations Economic and Social Council for West Asia (ESCWA) and the Violence & Impacts Early-Warning System (ViEWS) resulted in a forecasting model that incorporates data of particular importance to the Arab states. In collaboration with this study, a Risk Assessment Report was prepared using the ViEWS-ESCWA model, which provides the probability of violence in Libya and Sudan (ESCWA, 2022). It also includes climate change projects using RICARR models, as well as key developments and humanitarian trends.

1) The analysis included in this section was prepared for this project by the United Nations Economic and Social Commission for Western Asia (ESCWA) (ESCWA, 2022).

The model predicts that, in September 2023 the risk of 25 or more fatalities from state-based violence in Libya is partially likely, meaning there is a medium level of risk (Figure 1). The main areas in which this risk manifests are Tripoli, Zawiya, Jafara, Misrata and Sirte.

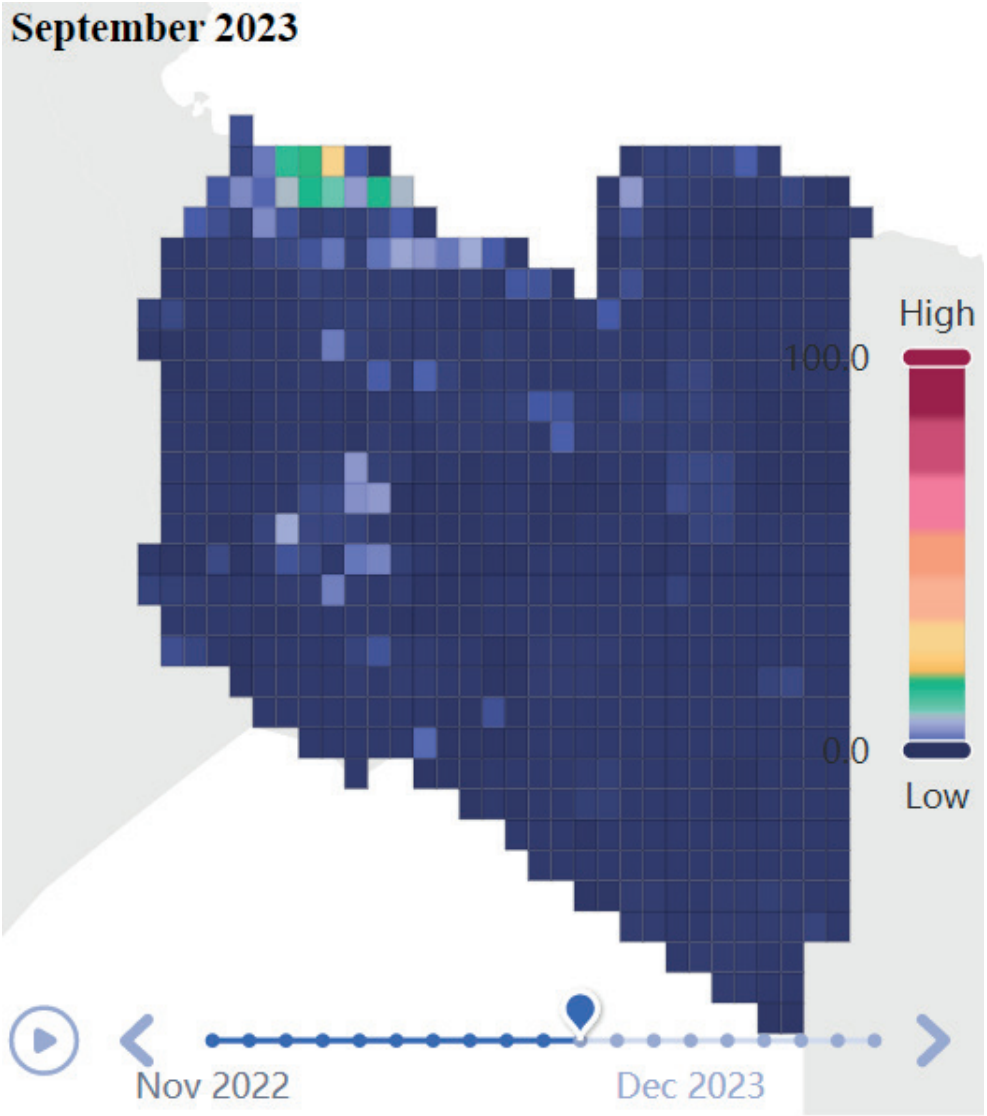
Figure 1: Predicted probability of state-based deadly violence in September 2023 (Libya)



Source: The Violence Early Warning System (ViEWS-ESCWA) Dashboard. Accessed in August 2022. Note: the grid-cells correspond to an area of approximately 55x55 kilometers at the Equator, or 0.5x0.5 decimal degrees.

The areas where the drought and vulnerability sub-model has predicted an elevated risk of violence in Libya, include Tripoli, Zawiya, Jafara and Murqub (Figure 2).

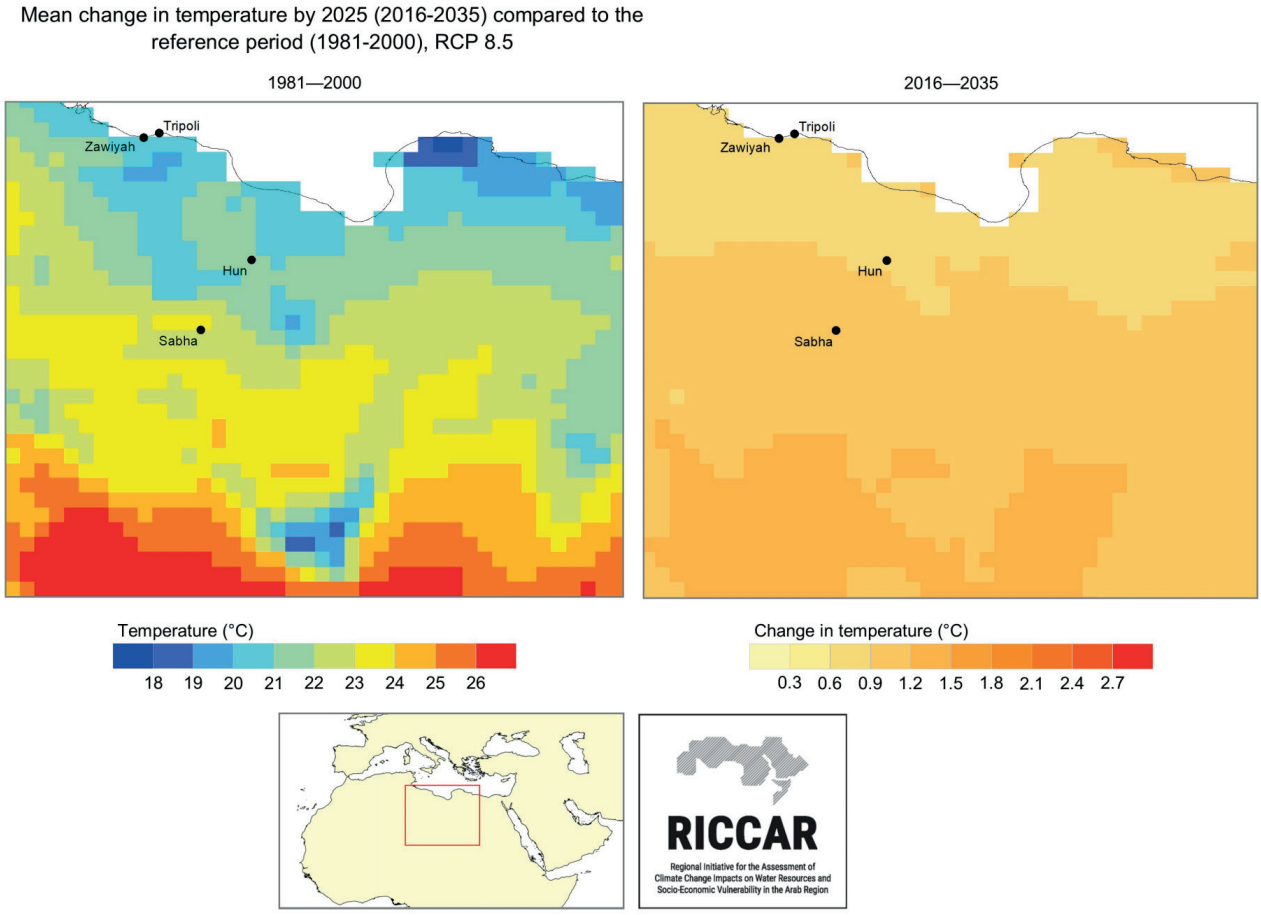
Figure 2: Predicted probability of state-based violence in September 2023 (Libya) – Drought and Vulnerability



Source: The Violence Early Warning System (ViEWS-ESCWA) Dashboard. Accessed in August 2022. Note: the grid-cells correspond to an area of approximately 55x55 kilometres at the Equator

In terms of climate change forecasts and according to the Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR) models, mean temperatures in Libya are projected to increase by about 1 degree Celsius by 2025 in comparison to the reference period (1981-2000). Currently, the temperature is increasing by an average 0.07 degrees Celsius per decade (Figure 3). Precipitation levels are expected to remain largely consistent through 2025, though variability is expected to increase.

Figure 3: Mean change in temperature in Libya by 2025

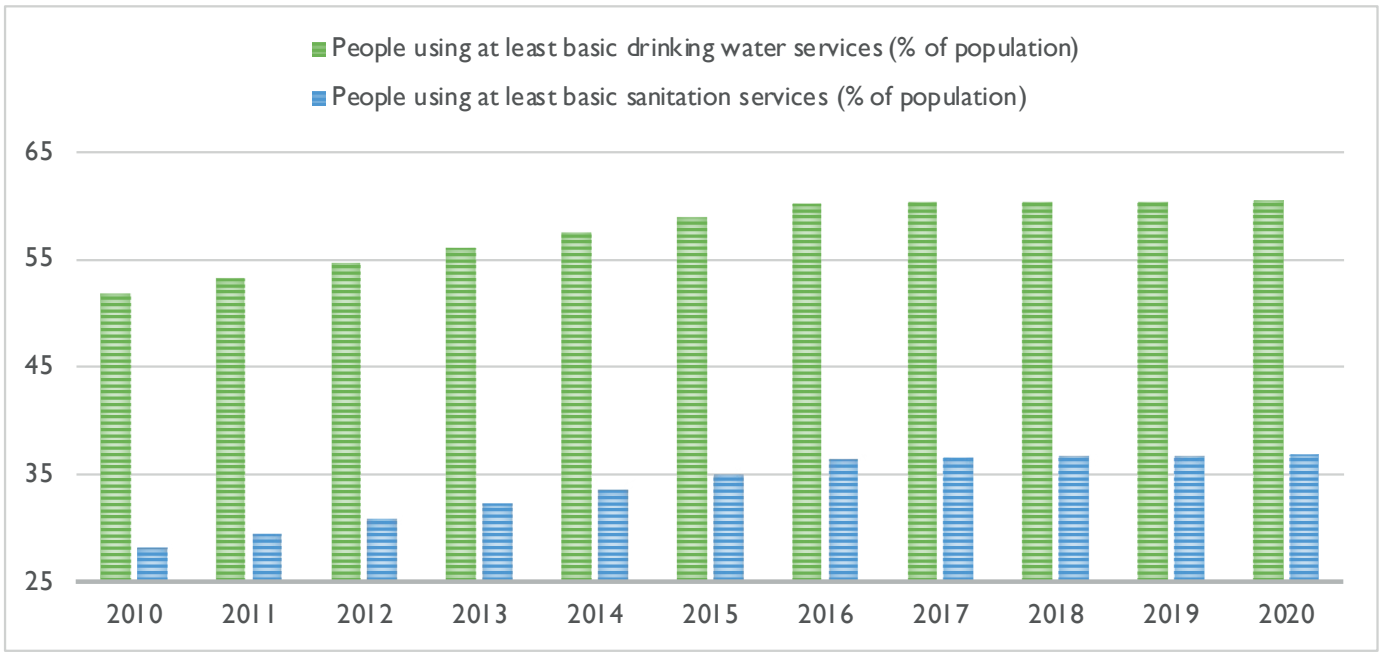


Source: RICARR

Economically, though GDP growth has been declining since 2017 (with contractions in 2019 and 2020) Libya experienced GDP growth of 31.4% in 2021. Since 2010, the trend of unemployment in Libya has not changed significantly. About 50% of the youth in Libya are unemployed (World Bank, 2022b), while just under 20% of the total labour force is unemployed (World Bank, 2022a).

Access to basic drinking water services in Libya has increased since 2010. In 2020, all of the Libyan population were using basic drinking water services, while 92% were using basic sanitation services (Figure 4).

Figure 4: Access to water and sanitation services



Source: WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply, Sanitation, and Hygiene

According to the INFORM Risk Index developed by the European Commission, Libya scores as a very high risk for hazard and exposure, which includes exposure to extreme weather events such as droughts, flooding, earthquakes, etc. It scores a medium risk in terms of vulnerability, which includes measurements of development deprivation, inequality and uprooted people.

The factors and concerns detailed in these sections formed the basis for study design and site selection in Libya. More information on these can be found in **Appendix 2: Methodology**. The next section presents the findings from this study.

3.2 Climate Change: Water and Waste Management Infrastructures

Detail on data collection sites, site selection rationale, data collection instruments and analytic methodologies can be found in **Appendix 2: Methodology**. In sum, data collection occurred in five sites in Libya: Tripoli, Tajoura, Kufra (among Tebu and Zuwayya communities), Jufra (Waddan) and Sebha (among rural agricultural and urban communities). The four sites outside of Tripoli were selected to examine the impact of long-standing intergroup tensions (Kufra), seasonal migration (Tajoura), water scarcity (Jufra), and alternative forms of conflicts *un*related to access to resources (Sebha) in relation to CCM dynamics. Instruments included Direct Interviews (DIs), Stakeholder Interviews (SIs), Focus Group Discussions (FGDs) and Quantitative Survey instruments. Conducting Ethnographic Walks (EWs) in the Libya Country Study was impossible due to security conditions in the selected communities. The following findings are organised thematically rather than by instrument due to the intended complementary nature of the tools, which were designed to surface different aspects of CCM Nexus and water scarcity dynamics. Though it is a core premise of this study that CCM Nexus dynamics are

inextricably intertwined – and much data illustrates how this emerges in the everyday lives of organisational and institutional stakeholders, community leaders, and ordinary citizens – each section is presented here separately for analytic ease. Overwhelmingly, data demonstrated an intense concentration of concerns about water and waste management infrastructures, governance and oversight.

Among the qualitative instruments, FGDs in Tajoura and Kufra surfaced the most productive discussions around the nuances of water access and water management infrastructure challenges faced in everyday life. Kufra FGD participants discussed their prompt related to a potential groundwater management system to be developed by a humanitarian aid agency and the Government of Libya (GoL). Separately, two FGDs – one all-male and one all-female – took place in Tajoura and prompted respondents to identify key challenges facing contemporary Libyans and residents in the country **(see Appendix 2 for the complete prompts in both cases)**. The purpose of the more open-ended prompt was to leave space for other issues outside the study themes to emerge, identifying whether the CCM Nexus Study framing unintentionally excluded vital matters. Nevertheless, 66% of all coded responses referenced environmental degradation as the key challenge. Economic development (17%), armed conflict and other forms of physical insecurity (12%) and demographic shifts (5%) accounted for the remainder of the responses at this site. The topic of water management challenges and consequences of poor availability, quality and management featured prominently in discussions. The data indexed specific systematic challenges that undermine policy and programme interventions designed to alleviate these issues. These commonalities across these FGDs in terms of challenges and their consequences are summarised in Table 1. No notable points of divergence surfaced among the various communities who participated in the discussions.

> *"We believe that conflict over water will be one of the causes of instability in the country."*
>
> Tripoli, Academic Sector SI Respondent

Table 1: Key water management challenges and related consequences

Causes of Challenges	Consequences
Insufficient investment in desalination plants, technologies and other alternative water sources	• Underutilisation of existing resources. • Absence of alternative water sources to groundwater that prevent unregulated digging (e.g., rainwater harvesting). • Obligation by citizens to purchase water from portable tanks at a high cost. • Inability to maintain and develop technical capabilities by the Water and Sanitation Company. • Increase in desertification.

Causes of Challenges	Consequences
Underdeveloped transparency practices, regulatory frameworks and enforcement mechanisms related to water management	• Individuals digging for water within the home, leading to water shortages in the aggregate. • Unsustainable agricultural practices, including excessive fertiliser use and exploitation of water resources. • Decline in groundwater quality because of non-conformity to regulatory frameworks. • Overall lack of water consumption among citizens, leading to large quantities of water wasted in the streets and alleys. • Pollution indicators that exceed the specifications for drinking water. • Individual refusal to cede land for public water use. • Underdeveloped documentation and litigation practices related to land use and ownership. • Favouritism, nepotism, and tribal politics in the bidding and contracting.
Need for more monitoring and maintenance of existing water management infrastructures and their related elements	• Exploded pipes, deteriorated physical infrastructure, and lack of replacement parts. • Frequent electricity cuts undermining water delivery systems. • Water stagnation that leads to the spread of diseases through mosquitoes. • Incomplete connectivity of households to river water and other reliable sources. • Class-based monopolisation of public resources. • Non-inclusive community oversight tendencies that maintain women and youth at the margins. • Systematic installation of non-regulation components in the water management infrastructure.
Low levels of awareness	• Lack of widespread social awareness about responsible water use and its importance. • Continuation of non-productive cultivation (e.g., grass). • Consumption of polluted water leads to illness, including skin diseases and adverse effects in children.

"We must equip society, environment, and climate to be accessible to future generations. We must not misuse all the resources we have. We leave nothing to our children and grandchildren except what benefits them. We must determine a policy for everyone to deal with the environment and nature. People should understand that it is not personal property but belongs to future generations. They must preserve them and develop them further."

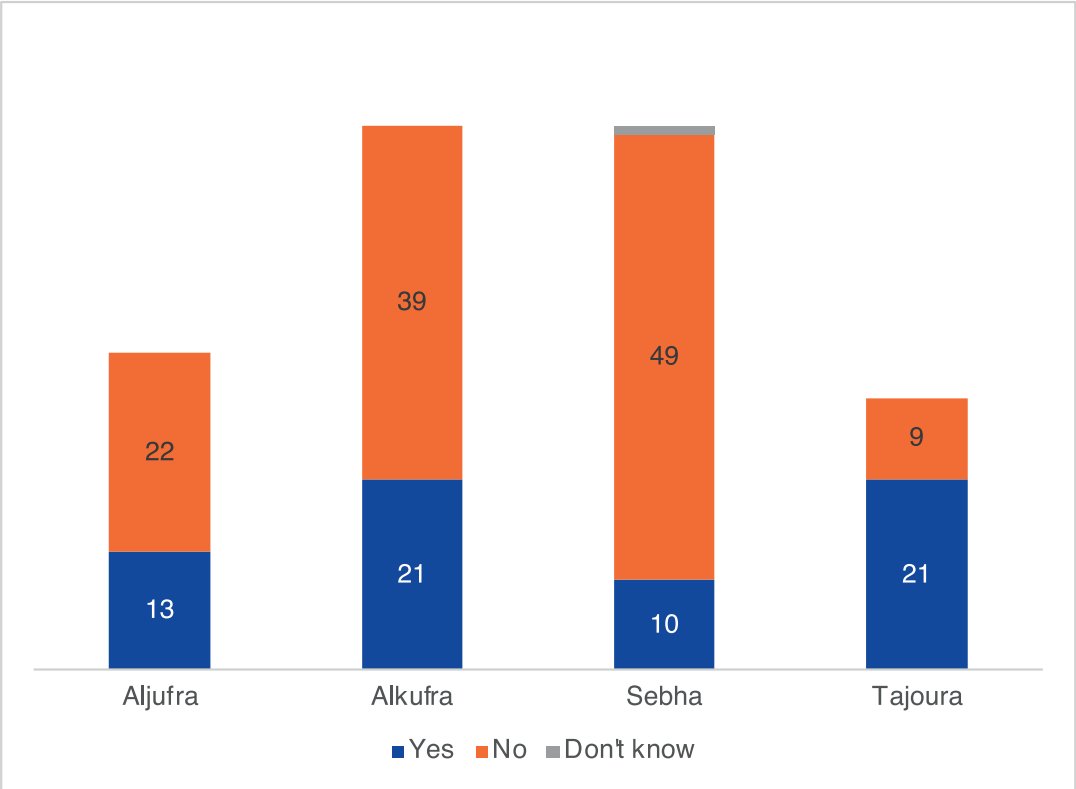
Tripoli, Public Sector SI Respondent

The Kufra FGDs revealed interesting findings when disaggregated by gender (the Tajoura FGD responses were largely consistent between male and female participants). All Kufra participants were largely in agreement about the need for the proposed water management project and the importance of multi-sector inclusive oversight committees and transparent contracting processes. Subtle nuances, however, did surface in the details of these structural recommendations. While male respondents tended to focus on the technical specifications for such a project – ideal farms:well ratios (5:1), availability of alternative energy sources and water pumps, and distinctions between water management infrastructure issues and water availability writ large – female respondents tended to emphasize the need for equitable access in any planning and land use arrangements. Furthermore, all FGD participants proposed some form of multi-sector, inclusive oversight committees over the long term. The main distinction between the male and female respondents was that the former tended to foreground the importance of including community elders and sheiks, whereas the latter the leadership of women and youth. Furthermore, one female responded noted that, if the community elders and sheiks were somehow opposed to such a project they would "need to be contained" and "could cause a strong obstruction" to community development. This evidences the need for highly inclusive consultative and oversight practices at the community level.

Separately, in the quantitative survey, households reported accessing their water through protected wells (40%), tap water (31%) and bottled water (23%), underscoring both the importance of maintaining clean wells and groundwater and also the implications of the above-described consequences of issues with water access and management in Libya. These shortcomings also have severe repercussions for the agricultural sector both in terms of availability of water as well as its quality: e.g., 94% of quantitative survey respondents who farmed (*n*=157) obtained water through irrigation systems. In Tajoura, for example, they have both high soil quality and a current abundance of water. However, agricultural practices occur in an uncoordinated and unsustainable manner. For instance, farmers use excess fertiliser and must apply updated irrigation systems and procedures to maintain their crops. This overwhelms the capacity of groundwater tanks, which pump out more water than they receive, and leads to rapid water depletion.

Despite the concentration of qualitative responses around the issue of water quality, access and management, quantitative survey data (n=185) suggests that roughly two-thirds of the population (64%) do not experience barriers to accessing water in their current location (see Figure 5: Barriers to access to water by quantitative survey site).

Figure 5: Barriers to access to water by quantitative survey site (n=185)



Of those who do experience difficulties accessing water, water quality (36%), scarcity (31%) and distance to source (23%) make up the majority of obstacles. The difference in the relative importance of barriers to water access between the quantitative and qualitative instruments can be explained by the fact that the quantitative survey sample focused on more narrow population groups (53% were farmers or other agricultural workers). In contrast, FGDs, DIs, and SIs drew on a broader range of participants, including community, organisational and institutional leaders responsible for addressing daily CCM Nexus and water scarcity concerns.

Among those who could speak to organizational-level responses across all sectors, several consistencies in practical solutions to the identified challenges tended to fall into participation, inclusivity and oversight categories. Participants agreed that multi-stakeholder involvement across all sectors is critical and recommended the following actors: residents of the affected communities, farmers and owners of commercial projects, public sector officials at the municipal and national level (e.g., Water and Sanitation Company, Public Facilities and Establishment Protection Authority, Security Directorate), private water companies, community elders, sheikhs, tribal leaders and other leaders (e.g., women and youth) and international development agencies. While there were mixed responses regarding whether public forces and security forces (including the Agricultural Police) should be involved – especially related to perceived issues with impartiality and efficacy – the balance of responses also fell in favour of engaging various actors from the security sector as well. As one SI Respondent asserted, "The initiatives committee should be assumed by people we can hold accountable to follow up."

Relatedly, waste management infrastructure and governance issues frequently surfaced in FGDs, DIs and SIs (no specific questions related to this topic were included in the quantitative survey). Inadequate waste management and water purification practices intersected to create multiple points of vulnerability. For example, citizens dump solid waste on the surface of the ground, either in landfills or unplanned dumps. This waste contaminates the groundwater, and these practices occur either on empty land near the seashore, along the roadside or in

public wooded areas – none of which are subjected to the regular enforcement of sanitation regulations. In this way, governance capabilities, citizen practices and environmental degradation create negatively reinforcing dynamics that contribute to poor water quality and its lack, impacting population health outcomes. The data indexed specific systematic challenges that both reveal shortcomings and undermine policy and programme efficacy. These challenges and their consequences are summarised in Table 2.

Table 2: Key waste management challenges and related consequences

Causes of Challenges	Consequences
Overutilisation of landfills or accumulation of waste resulting in an unplanned dump	• Contaminated groundwater. • Unsanitary living conditions for nearby residents. • Coastline pollution.
Lack of waste management infrastructure and sewage services	• Spontaneous in-house black wells, which contaminate groundwater and spreading diseases with disproportionately adverse effects on children. • Poorly treated sewage water that is not purified, feeds into agricultural production and pollutes the coastline. • Polluted drinking water.
Lack of adequate training, technical capabilities and oversight of waste management	• Lack of legislation to provide an overarching governance framework. • Insufficient research, study and reporting on the current environmental problems related to waste management.

"The challenges facing Libya in general, and especially the municipality of Tajoura, are many, and they are the result of the city's deteriorating security, health and environmental conditions and sanitation problems. Sewage is thrown directly into seawater, along beaches and some green areas. The water is not properly purified, causing many problems. This problem is exacerbated in the city centre and some connected residential communities because canals push water to tanks built as purifiers - but they have not yet been completed."

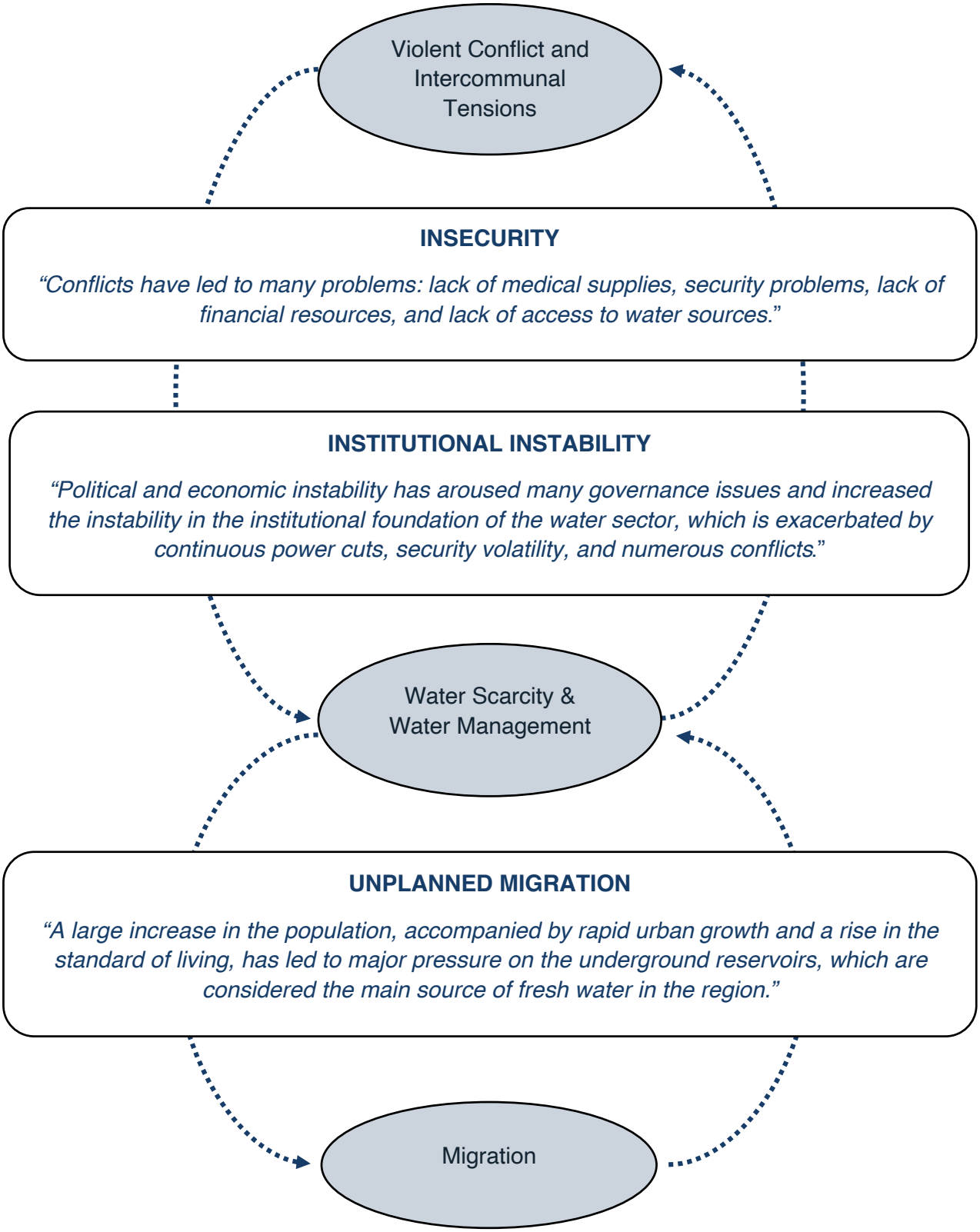
Tajoura, Female FGD Participant

Specific recommendations converged along the following lines:

1. Direct more investment into alternative renewable energy approaches to water management (e.g., solar pumps and diesel engines).
2. Diversify water sources – e.g., more desalination plants and rainwater harvesting projects.
3. Renovate and rehabilitate existing systems (e.g., idle desalination plants) rather than invest in new ones that use the same technologies and that lack maintenance and oversight.
4. Maintain and upgrade the Great Man-Made River network lines to ensure that all cities and villages are connected.
5. Initiate legal reforms that would result in more robust water and waste management planning. Ensure sufficient governance competencies to obtain compliance with those laws.
6. Implement inclusive oversight and accountability mechanisms (e.g., involve women, security forces, public officials, sheikhs, tribal elders and international organisations).
7. Ensure equitable distribution of water management resources across all neighbourhoods and farms.
8. Lead transparent contracting processes, potentially facilitated by disinterested outside parties.
9. Sponsor sufficient research and develop adequate planning capabilities to ensure evidence-based approaches to these challenges (including site selection for digging wells).
10. Develop public service and awareness campaigns using multiple forms of media to educate and inform the population on energy and water conservation practices (at home, in the office and in agricultural production) and responsible waste management.

Tajoura FGD participants' responses have been included in Figure 6 as an example of how CCM Nexus dynamics connect.

Figure 6: The CCM Nexus in Libya: Water Scarcity and Water Management – Causes, Consequences and Relationships according to FGD participants in Tajoura



3.2.1 Second- and Third-Order Effects of Environmental Degradation

"The excessive reliance on the oil economy revenues contributes to citizens' belief that their water consumption can be free and unmonitored."

Tajoura, Male FGD Participant

SI respondents spoke at length about how water scarcity, climate change and man-made environmental degradation have second- and third-order effects on citizens' lives beyond the primary consequences. Respondents across a variety of sectors tended to agree on the following five claims (elaborated in Figure 7):

1. Water scarcity leads to migration.
2. Desertification threatens livelihood options (e.g., agricultural production) and food security.
3. Water scarcity and water management infrastructures are multi-dimensional public health concerns.
4. Solutions to environmental degradation and climate change in one domain can have direct and deleterious effects in another.
5. Man-made environmental degradation significantly exacerbates the effects of climate change and water scarcity.

Predictions about second- and third-order effects among SI respondents were reasonably consistent across all sectors. When the topic surfaced in interviews, there was general agreement that the impact of climate change, environmental degradation and, especially, water scarcity will 1) have a severe negative economic impact, 2) contribute to various forms of conflict and overall instability, and 3) result in large-scale displacement.

"The water problem must be solved because it will lead to the displacement of locals within 15 years."

Jufra, Public Sector SI Respondent

Figure 7: Second- and third-order consequences of environmental degradation in Libya with supporting quotes

Water scarcity contributes to decisions to migrate.

- Water shortage has led to moving farms further and further away. Jufra, Grassroots Sector
- [Water scarcity] has led to people having to purchase water weekly. To reduce these expenses, many people in the region will spend their vacations in other areas. This is increasing displacement related to water. Jufra, Grassroots Sector
- Water scarcity has increased desertification and the number of displaced people. Jufra, Public Sector
- Climate change causes the continuous movement of farmers from one farm to another. Tripoli, Public Sector

Desertification threatens livelihood options (e.g., agricultural production) and food security.

- The recent lack of rainfall and rising temperatures have resulted in the desertification of many areas and the transformation of lands from dry to very dry, which will have a direct impact on agriculture, food security, and local population livelihood. Sebha, Academic Sector
- Climate change plays a significant role in drying crops. We seek to find solutions to eliminate this natural phenomenon in which humans play a major role. Jufra, Public Sector
- The effects of water shortage and climatic change have led to a deterioration in agricultural production and a reduction in plant cover. Tripoli, Private Sector

Issues related to water scarcity and water management infrastructures are multi-dimensional public health concerns.

- These challenges have increased because the well water in some areas has sulfate, is not suitable for drinking, and may lead to skin diseases for some people. Jufra, Grassroots Sector
- One of the most important programs is supporting the water company to maintain the underground water networks. Because the water network in the city is old and has been dilapidated for years, and has unclean water, people are experiencing kidney failure and other diseases. Kufra, Academic Sector

Solutions to environmental degradation and climate change in one domain can have direct and deleterious effects in another.

- There were several lakes in the city a few years ago, but they have all dried up, and this is likely due to the operation and withdrawal of groundwater by the Great Man-Made River (GMMR) system and the increase in the city's population. Kufra, Grassroots Sector

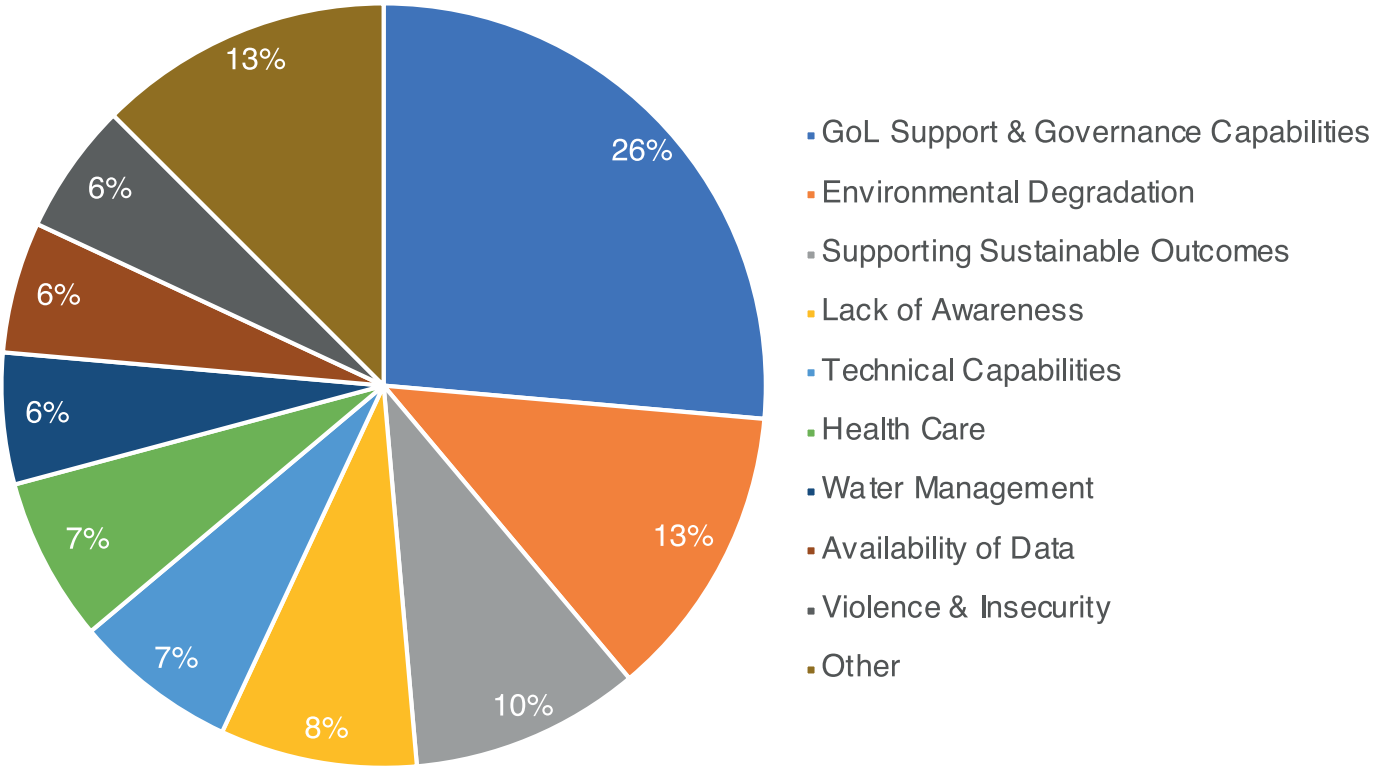
Man-made environmental degradation plays an essential role in exacerbating the effects of climate change and water scarcity.

- Farmers are engaging in excessive use of insecticides and chemical pesticides, which contaminate the soil. Also, the salinity of the water is a problem. The salt reaches the soil through the irrigation process, which leads to increased plant uptake of the moisture in the soil. This is one of the most important causes of agricultural damage. Tripoli, Private Sector
- Kufra is considered a city rich in groundwater, but the water level has dropped due to the excessive use of water by citizens. Kufra, Grassroots Sector
- The environmental factors we faced were water scarcity and a poor climate from burning garbage, which led to increased desertification and affected the economy in the region. Tripoli, Academic Sector

3.2.2 Systemic challenges to addressing CCM Nexus dynamics

SIs also asked respondents to elaborate on their challenges in addressing CCM Nexus and water scarcity concerns: 72 responses emerged. The breakdown of these categories of challenges can be found in Figure 8.

Figure 8: Systematic challenges for leading change in the domains of the CCM nexus and water scarcity in Libya



SI respondents identified governmental support and governance capabilities (26% of mentions) was the most pressing area of concern, followed by complicating issues of environmental degradation (13%) and policy and programme sustainability (10%). Specifically, existing cross-sector responses require "serious support and cooperation of government agencies on environmental initiatives," "government response to reported needs," "support from public authorities" to achieve intended goals and "interest from the state, ministries, and local councils in spending money to provide water to the region." In 12 instances, respondents identified a perceived lack of government support for CCM Nexus and water scarcity programmes and policies as a barrier to success.

"We need government support by providing electricity networks in isolated and remote areas, such as abandoned villages and untapped fertile agricultural lands."

Kufra, Private Sector SI Respondent

"The challenges are a complete lack of money and resources for the region's people, requiring state or organisational intervention to ensure comprehensive awareness and provide the necessary capabilities.

Jufra, Grassroots Sector SI Respondent

Coupled with concerns related to support, many respondents expressed concerns regarding the current governance capabilities of public sector officials and institutions (7 mentions). Such capabilities include planning, leadership, communication and coordination among government institutions, legislation and compliance, data-driven policy development and public service delivery (e.g., clean water and waste management). A Private Sector SI respondent in Tripoli identified the need for a "fixed vision" from the government towards which multi-sector actors might work concertedly.

"Decision makers must be made aware of the importance of developing a climate change response plan, incorporating gender policies into these policies, and the importance of technical and material support by facilitating the dissemination of this awareness among stakeholders and decision-makers."

Tripoli, Academic Sector SI Respondent

"Political action must be taken by establishing laws and signing solid agreements to implement solutions to reduce global warming, water scarcity and desertification and the incidence of severe humanitarian consequences."

Jufra, Public Sector SI Respondent

Compounding factors of man-made environmental degradation also present significant challenges to stakeholders in this domain. For example, a perceived lack of governmental support for water delivery in Jufra has led to individuals digging unplanned wells in areas with contaminants such as sulphate, which can lead to adverse health effects. In addition, a grassroots sector leader in Jufra also noted that the cessation of government-sponsored waste management services has led to the accumulation of garbage, contributing to pollution, the spread of diseases and increased temperatures resulting from trash burning practices. Separately, the erosion of trust between citizens and state institutions emerged as one of the most significant consequences of the perceived lack of capacity and sustainability for policy and programme implementation. Such dynamics are doubly problematic when considered alongside the finding from the first section of this analysis that participatory collaboration and cooperation are critical for intervention success.

3.2.3 Organisational and Institutional Responses

Fourteen SI respondents provided information on their organisation or institution's existing programming. They uniformly asserted that populations' relative awareness was low regarding the causes and coping mechanisms for dealing with climate change, environmental degradation and water scarcity. Key among water-related themes were conservation, responsible use, pollution, purification and sanitation practices and sustainable agricultural and industrial practices. Existing awareness-raising efforts included, but were not limited to, the following:

- World Water Day activities.
- Awareness raising activities around sewage problems and how to operate sewage treatment plants.
- Dedicated information seminars with targeted beneficiaries (including affected communities, public officials and government employees).

- Distinct awareness-raising activities for two classes of audience groups: 1) those who lack knowledge and understanding of specific topics but can address them, and 2) those who lack knowledge and understanding of specific topics but have neither the capacity nor interest to address them.

- (Social) media platforms and campaigns.

> *"Many awareness sessions and seminars are required to introduce these subjects to the beneficiary group. We can divide the beneficiaries into two groups here: The first category includes those who lack knowledge and understanding of specific topics but can identify them. This area can be expanded through workshops and educational field trips, which can begin at schools and colleges and progress from there. The second type includes people with limited awareness and who are uninterested in environmental concerns because they do not believe they are relevant, or this will not have a significant impact in the future.*
>
> *Sebha, Academic Sector SI Respondent*

Stakeholders spoke to coping mechanisms and contributors to success in 54 instances. Among those, nine distinct coding categories emerged (see Table 3).

Table 3: Coping mechanisms and success factors, categories and counts

Coping mechanisms and success factors	**Mentions**
Effective local administration (including the provision and development of adequate technical, relational, financial and physical capital)	18
Participatory cooperation and collaboration	10
Access to quality data	7
Raising awareness	5
Local ownership	4
Measurement, monitoring and evaluation	3
Sustainable solutions	3
Pursuit of Collective/Intergenerational Wellbeing	2
Advocating for gendered approaches	2
TOTAL	**54**

Effective local administration is the most frequently identified mechanism for addressing CCM Nexus and water scarcity dynamics. This feature can manifest along various axes and in multiple forms, including, but not limited to, providing and developing adequate technical, relational, financial and physical capital. Effective local governance capabilities can be supported by training and mentoring. For example, one academic sector SI respondent in Sebha identified their environmental workshops, courses and training seminars for state employees from the

Ministry of Agriculture, Ministry of Environment, General Company for Water and Sanitation and municipal authorities as generating the most significant positive outcomes. The training, mentoring and site visits were found to boost efficiency and benefitted officials' work in these domains.

Effective local administration only sometimes implicates public official involvement. For example, in one instance, a grassroots leader in Kufra reflected on a successful initiative that he participated in that reduced intertribal conflict, increased local security and supported more generative trade for all involved. Concerns about engaging with public officials led to the search for endogenous community solutions. To achieve this in Kufra, tribal leaders established charters and treaties and, importantly, agreed to stop protecting those tribal members who violated these agreements.

Lifting the [tribal/based] immunity was the most important thing that contributed to establishing security, as it is one of the most important means of ensuring transparent and visible monitoring. After implementing these initiatives, security was established, and internal and border trade flourished, which convinced everyone that security is the basis of life. Everyone reached a clear vision that the city is far from the cities of the North and the Centre of the State, so disputes that occur must be resolved and security established by itself and its residents.

Kufra, Grassroots Sector SI Respondent

Unsurprisingly, when required resources are unavailable, administrative capabilities decrease. For example, a reforestation project in Jufra intended to combat desertification secured donor funding for the initial 1,500 trees planted. However, as the public sector SI respondent noted during the interview, "the project has not continued because of the scarcity of water, as well as the fact that we could not maintain the irrigation process that we were in charge of providing. Buying water became unaffordable. Success requires a supporting entity."

The second most mentioned success factor that SI respondents said was how participatory cooperation and collaboration was critical, referring to the coordinated efforts of multiple stakeholders across multiple domains. For example, local community leaders worked with the Ministry of Agriculture to facilitate a water usage study and to implement sustainable water management practices. Participation represents a critical success factor for two reasons. First, it supports alignment between policy and programme design, resource provision and the needs of the intended beneficiaries. Second, it can lead to many other outcomes on the above list: sustainable solutions, local ownership, the pursuit of collective well-being, access to quality data and raising awareness.

The initiative meets all workers monthly to discuss the problems of drilling wells, gather information from the situation, discuss the difficulties during drilling, know the distances in which the surface water is located, share these problems and exchange solutions, as most of the old surface wells have been displaced from water which forced farmers to dig deep artesian wells.

Kufra, Private Sector SI Respondent

A private sector SI respondent in Tripoli working in water management and agricultural production noted that his most successful project "involved all internal and external entities within the framework of an integrated plan that linked climate change with the problems of water resources, water shortage, drought and desertification. It integrated the efforts of the private sector and civil society with the efforts of authority agencies in addressing these problems."

When there is a lack of participatory cooperation and collaboration, communities suffer. For example, one academic sector respondent in Tripoli noted, "It would be great if we could close the gaps between the decision makers and the studies that researchers and organisations are publishing related to climate change and water scarcity." In this instance, the gap in coordination capabilities undermined the state's ability to govern effectively due to a lack of quality data for evidence-based policymaking and implementation of sustainable solutions.

The third most common success factor identified was access to quality data. One academic sector respondent in Tripoli attributed project success to the fact that "a significant amount of data was gathered on the ground from trustworthy sources like The Public Services Company of Tripoli and numerous municipality members, so it was very beneficial to have such a wide range of data sources." However, such varied and relevant data sources are often difficult to find and coordinate. Another academic sector SI respondent in Tripoli noted that the institution usually must learn from experiences in Tunisia or Egypt when designing projects "because of a lack of Libyan researchers and studies in the environmental fields." He suggested such challenges might be improved with more significant support from developing specialists in the field of climate change and including the themes in the school systems. Examples of the remaining factors and supporting quotes can be found in Figure 9.

Figure 9: Additional coping mechanisms and success factors, supporting examples

Raising awareness of crisis.

> The best methods to confront these challenges are raising community awareness, rationalising water use and regulating pesticide importation. Private Sector, Tripoli

Local ownership.

> What is important is the acknowledgment of the challenges we face, the problems and the basic needs that benefit all citizens of the city. Public Sector, Kufra

> The area was divided along ethnic and tribal lines, and we helped to reduce the conflict between tribes… We presented a proposal to the authorities to restructure and reintegrate the police services, assign leaders from outside the region, and support the rehabilitation of the city infrastructure. Grassroots Leader, Kufra

Measurement, monitoring and evaluation.

> Success requires continuous monitoring of the project. Public Sector, Jufra

Sustainable solutions.

> To solve the problem of climate change and environmental conservation, we've done a number of reforestation initiatives. Public Sector, Jufra.

Pursuit of collective/intergenerational wellbeing.

> Success requires community solidarity. Public Sector, Kufra

> We must equip society, environment, and climate to be accessible to future generations. Public Sector, Tripoli

Advocating for gendered approaches.

> [We need to] pressure countries to make solutions that take into account the impacts of climate change on women and girls, especially in countries with conflict. Academic Sector, Tripoli

The SI also asked respondents to share information on their current measurement, monitoring and evaluation work. Only one respondent (Sebha, academic sector SI respondent) reported systematic monitoring and evaluation procedures. In their research on climate change, they draw from baseline, year-over-year change and environmental and population impact metrics.

Others could clearly articulate what success would look like for them in the field, despite not employing monitoring, measurement and evaluation (MM&E) protocols. For example, four stakeholders agreed that the following practices support achieving intended outcomes:

1. Delivering technical training and workshops to employees of state institutions who work in these areas (e.g., Ministry of the Environment, Water and Sanitation Companies, officials at the Municipal levels).
2. Ensuring adequate capital and technical requirements for executing environmental and resource management projects.
3. Increasing public awareness.
4. Identifying problems with the affected population, developing and implementing solutions to that problem, generating buy-in and ensuring sustainability.
5. Conducting beneficiary impact and satisfaction surveys to measure the effectiveness of initiative outcomes.

These direct training and field visits had a beneficial impact on the personnel. They boosted their efficiency because they were instructed on how to manage and create parks and vacant areas. This training programme contributed to understanding the value of green spaces in cities. We saw a noticeable difference in the area, and locals competed with local administrations to protect the green spaces in their localities, mainly after local councils were provided with agricultural tools to care for the trees and bushes within these green spaces.

Sebha, Academic Sector SI Respondent

Looking towards the future, SI respondents' visions included developing a systematic reforestation process throughout the region, building and sustaining an integrated soil study lab for the region and providing impartial, efficient, controlled and monitored water service delivery.

My measure of success is a network distributed to all houses in a very organised way for the neighbourhood. There is no waste and lack of water rationing, conservation and control, and the water company will follow up if there is water leakage or other problems that need to be fixed. Of course, I am ready for that with all my experiences in the water and drainage company because we desperately need someone to free the simple citizen from suffering. The complaints are frequent that the water is cut off in some neighbourhoods. Yes, I always felt that and more when complaints came from our citizens or through the radio.

Kufra, Public Sector SI Respondent

Little data emerged in terms of adjustments to programming according to gender and life cycle, despite including a specific question intended to capture data towards this end. Respondents acknowledged explicitly that customs and traditions in some areas of the country still represent significant barriers to women's participation in these domains. The Southern Region was identified as particularly shaped by traditions and tribal customs that can exclude women from critical sectors and spheres of influence. For example, one respondent from the grassroots sector noted that, though "the number of women and their participation in social and economic positions as increased due to the increased awareness of the importance of women and their ability to manage things, their barrier to participation [in some areas] is because of the customs and traditions."

In terms of the programming itself, one Sebha, academic sector SI respondent, noted that "most governmental entities involved in environmental projects lack a female component, as the majority of personnel are male, making gender equality difficult to achieve." One public sector respondent in Tripoli confirmed that gender was not factored into any of the public awareness campaigns that were carried out. Another academic sector respondent in Tripoli stated that they explicitly decided to leave a gender component out of their study because they felt that it would be "difficult to identify suitable people to interview" and "just complicate data collecting."

The sentiments regarding the role of women in organizational and institutional responses - as factors in program and policy design as well as employees of the institution - however, were mixed among stakeholders. For example, an academic sector SI respondent in a different institute in Tripoli stated that they had developed explicit programming elements that factored in the differential impacts of climate change on women and girls. Strong regional relations and a comprehensive understanding of the political landscape and technical issues facilitated greater inclusion of gender-specific policies in climate change planning at the regional level.

Nevertheless, there was widespread agreement among those respondents who spoke of the issue of gender that women's social, political and economic roles have significantly increased in recent years (e.g., presence in municipal councils and entrepreneurship). The general sense among respondents was that much progress has been made, but that there are still significant barriers to equitable participation, and that those barriers materialize differently according to region and sector.

By way of summary of the coded data on the topic of gender, 14 interviewed stakeholders (2 female, 12 male) provided reflections on the theme. Five male respondents stated that there was no difference between men and women in terms of working conditions or programming related to the CCM Nexus in Libya; no female respondents echoed this sentiment. Five male respondents stated that there was an increase in women's participation in professional roles, though simultaneously noted that those roles might be limited to "nursing, teaching, some handicrafts, and small projects," or that women were "primarily good at office work." As noted above, these same respondents noted that "as the majority of personnel [in governmental entities] are male, it makes gender equality difficult to achieve," that "the social and religious reality in our cities is very strict for women," and that "women's participation in leadership positions is very low due to the restrictions imposed on women in the city." Two respondents (one male, one female) named explicit initiatives that they were involved in attempting to raise the profile of women in these matters, though one noted that they still fell short. Finally, six separate interviewees stated that women were either not considered in policy or programme development or measurement (2) or explicitly excluded (4). Explicit exclusion was either due to the nature of the labour (e.g., digging wells and other physically demanding manual labour) (2) or because of socio-structural difficulties such as "a lack of independence for women in decision-making, movement, and travel" or the fact that "adding the gender component would just complicate data collecting".

3.3 Conflict: Tribal Divisions and Legacies of Civil War

Elements of armed conflict and other forms of insecurity are woven throughout the responses presented in the Climate Change and Migration sections of this analysis, making its separation into a distinct section less productive than the other two. A couple of points, however, warrant emphasis.

First, grassroots organisations and public institutions identified ways in which armed conflict and violent insecurity result in environmental degradation, complicate access to natural resources and exacerbate the effects of climate change. For example, one SI respondent in the grassroots sector in Jufra stated that "because of the conflicts, the largest agricultural project to combat desertification and improve the climate in the region was destroyed." Another SI respondent in the same sector in Kufra reflected on the human costs of violence: "The region has witnessed many tribal conflicts that led to the displacement of many citizens and the destruction of the region's infrastructure." A public sector official in Kufra elaborated on the environmental consequences of violent conflict: "The previous problems affected citizens' farms and damaged many water wells, power lines, animals and agriculture. They destroyed more than 200 farms due to the water cuts during the conflict, without regard to humanity, animals or plants." Thus, violence and insecurity damage critical natural resource management infrastructures, delaying or destroying vital private and public works projects with disastrous human consequences in addition to the vulnerabilities created by forced displacement.

> *Neighbourhoods in the city suffer from poor water networks and infrastructure, as they have deteriorated significantly. In addition, about 13 farms have stopped production due to the lack of water, the deliberate sabotage of wells, and the seizure of some of them by force.*
>
> *Kufra, DI male respondent*

A key question driving this study asked how factors including migration, climate change, environmental degradation, water scarcity and conflict give rise to vulnerabilities and interact with and influence community resilience against climate and conflict shocks. Though the issue of existing disputes over water access did emerge throughout the various methodological instruments, especially in the quantitative data, the potential for future conflict loomed large in respondents to the qualitative data collection tools.

To the first point, quantitative survey respondents in Jufra, Kufra and Sebha all stated that, among those who had migrated due to intercommunal clashes, access to natural resources was a reason for those tensions (see Figure 10). In all, 11.44% of respondents to this question (n=25) named natural resources as a reason for intercommunal tensions (see Figure 11). The resources in question tended to be either grazing land (58%) or water (33%). This was a small response pool, explaining the prevalence of future-oriented concerns.

Figure 10: Access to natural resources as a reason for inter-communal tensions by community (n=25)

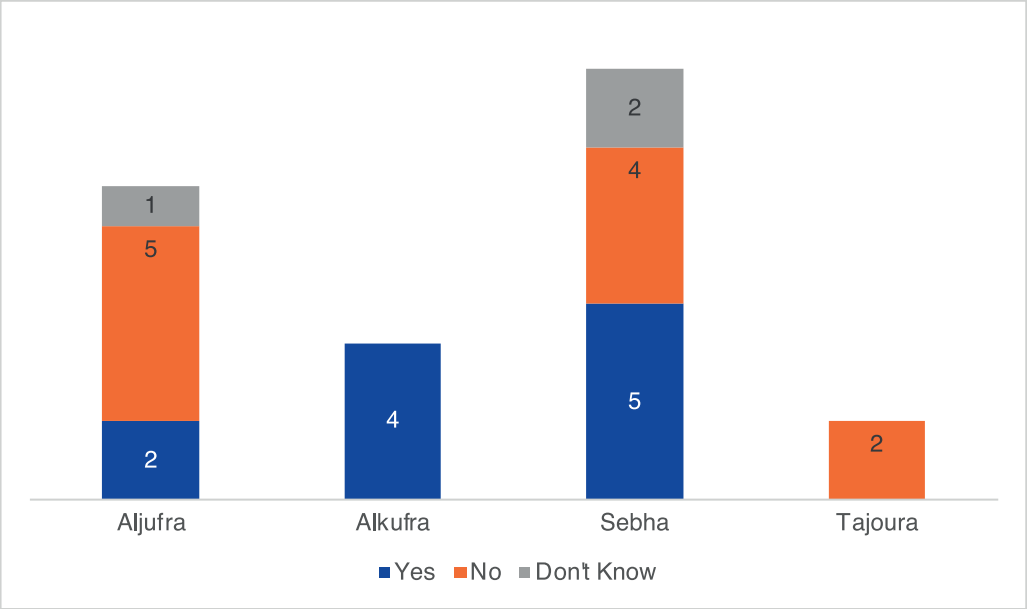
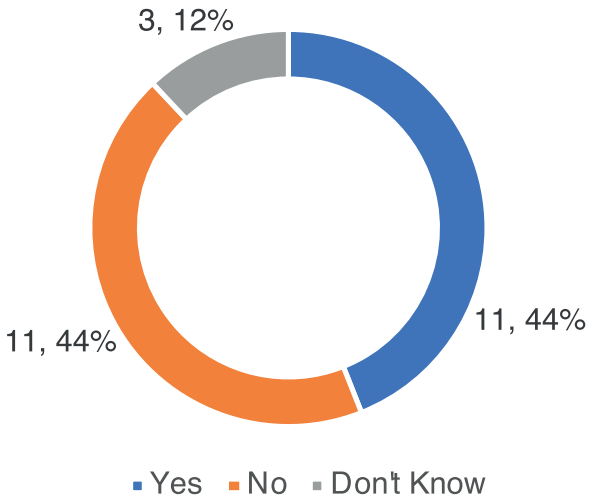


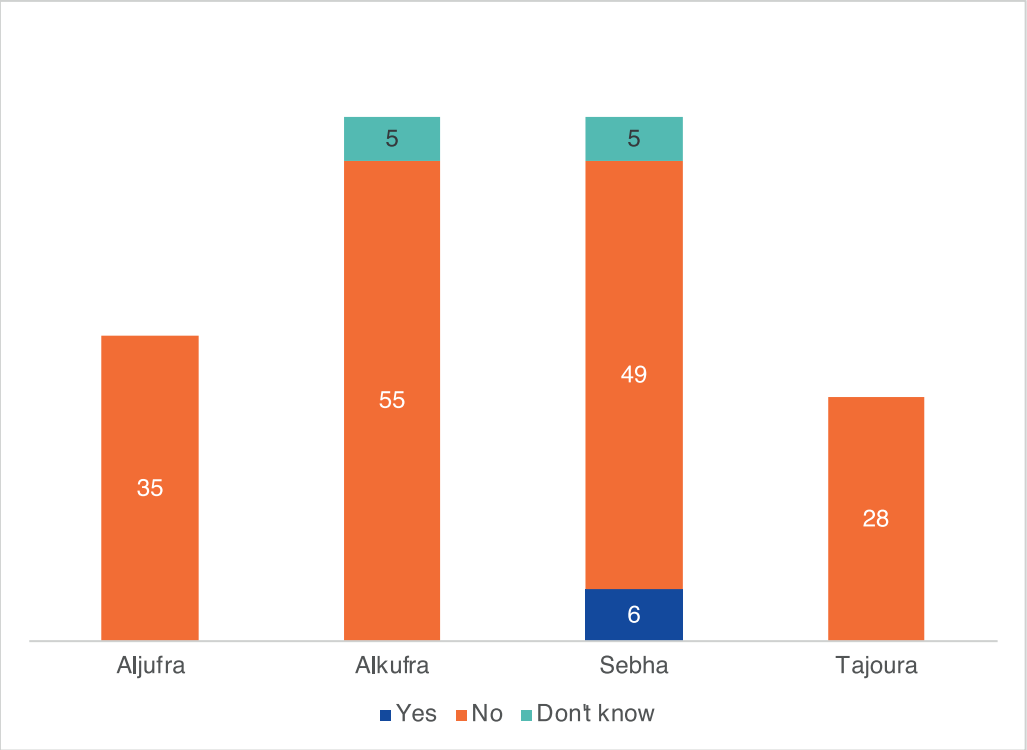
Figure 11: Access to natural resources as a reason for inter-communal tensions, total



Indeed, many DI and SI respondents were more preoccupied with the future. For example, one male respondent noted, "Water problems may lead to wars and affect agricultural livestock, but in Libya, there is no conflict regarding water resources. Therefore, the benefit from a proposed [water management] project will mainly be an economic one for farmers, owners of commercial projects related to water and citizens." Separately, in the FGD in Tajoura, one male participant stated that "there are no water disputes, and no clash has taken place over water. Many believe that all water resources within the municipality are groundwater from wells built at the local level or from reservoirs distributed to traditional houses or wells built in houses by the owners. There is no reason for conflict among them."

quantitative survey data supports these assertions. Among these respondents, 91% stated that they had not observed any conflicts over water between communities or groups in their current location (see Figure 12 for community breakdown).

Figure 12: Observed conflicts over water (n=185)



While other qualitative responses suggest that competition over resources ***does exist*** in some areas, an essential distinction in the Libyan context is the extent to which challenges to water access occur ***over*** vs ***as a result of*** armed conflict and other forms of physical insecurity. While both occur, responses suggest that the latter is more often the case.

> *Desertification may sometimes lead to conflict over already scarce water sources.*
>
> *Sebha, Academic Sector*

To complicate matters, introducing water management projects could also result in conflicts directly related to those projects. As one male FGD respondent asserted, "such a project will cause more problems for ethnic and racial reasons. [One tribe] will deliberately disrupt and delay projects located in the [other tribe's] area."

At the organisational and institutional levels, one SI respondent identified two dynamics that evidenced the extent to which attempts to address security concerns met with success. The first dynamic was the ability to monitor actions transparently across tribal divides, which contrasts against common occurrences of immunity granted according to tribal affiliation and protection from prosecution by the ostensibly offended party. Second, changes in the rate and ease of local and cross-border trade serve as a barometer for the relative presence of conflict or intertribal tensions in the area: i.e., when tensions were reduced, trade volume increased. Separately, this same SI respondent highlighted the importance of endogenous mechanisms for non-violent conflict resolution for those communities far from the urban centres of the country.

3.4 Migration: Diverse Origins, Shared Experiences

3.4.1 Heterogeneous motives and dispositions

Libya notably boasts a diverse population of migrants - over 40 nationalities - who have various motives, aspirations and dispositions related to their migratory movements.

The DIs asked respondents to narrate their migration histories with several factors in mind (catalysts, supports, challenges, current dispositions and aspirations – see **Appendix 2: Methodology** for more detail). Accounts surfaced a wide range of catalysts for migration, generally concentrated in frequency according to national origin. DI respondents from Kufra, Sebha, Jufra and Tajoura represented eight countries in the region, including those who had migrated internally within Libya: Chad (19 respondents), Egypt (4), Libya (55), Mali (1), Morocco (2), Niger (21), Sudan (9) and Tunisia (2). The top three catalysts for migration were violent conflict or other forms of physical insecurity (43%), the pursuit of improved economic conditions (39%) and climate change and environmental degradation (8%). Other factors included family and social connections, a lack of essential services in their point of origin and medical care. The main catalyst for internal displacement was conflict and insecurity, whereas for international migration, it was economic factors. Two respondents from Niger stated that they participate in seasonal migration to follow the rains and engage in sufficient agriculture to sustain their families. Coding counts for catalysts by origin can be found in Table 4.

As a complement to understanding the migration drivers from the origin point, the data were also analysed according to the concentration of these catalysts by selected study sites. Regarding destination communities, Zuwayya respondents in Kufra had settled primarily because of displacement due to violent conflict and other forms of physical insecurity (42% of responses) and the pursuit of improved economic conditions (31%). All Tebu respondents in Kufra had settled there due to displacement, violent conflict and other forms of physical insecurity. In Sebha, rural respondents in the agricultural sector reported a nearly even split between settlement for economic (48%) vs security (44%) factors. All but one urban respondent said they had moved there due to violent conflict and other forms of physical insecurity. Tajoura respondents arrived mainly in pursuit of better economic conditions (74%), though some specifically sought better access to environmental resources, especially water (15%). The primarily financial (50%) and security (29%) drivers also accounted for most of the respondents' motives in Waddan, Jufra. Most of the 125 respondents had migrated multiple times over the life course; only one Zuwayya respondent in Kufra had never migrated. Coding counts for catalysts by destination can be found in Table 5. These data confirm that Libyan internal migration main drivers are conflict and economic conditions. However, they provide essential nuance on how these motives first disaggregate according to national origin and then concentrate according to destination community.

Table 4: Catalysts for migration to and within Libya by origin, qualitative coding counts from Direct Interviews

	Chad	Egypt	Libya	Mali	Morocco	Niger	Sudan	Tunisia	Total
Violent conflict and other forms of physical insecurity	5	0	49	2	1	2	3	0	62
Pursuit of improved economic conditions	20	4	3	1	1	18	7	2	56
Climate change and other environmental factors	7	0	1	0	0	3	1	0	12
Improved medical care	1	0	4	0	0	0	0	0	5
Family and social ties	0	0	2	0	0	2	0	0	4
Lack of essential services and needs	2	1	0	0	0	1	0	0	4
Multiple reasons	0	0	0	0	0	1	0	0	1
SUM	35	5	59	3	2	27	11	2	144

Table 5: Catalysts for migration to and within Libya by destination, qualitative coding counts from Direct Interviews

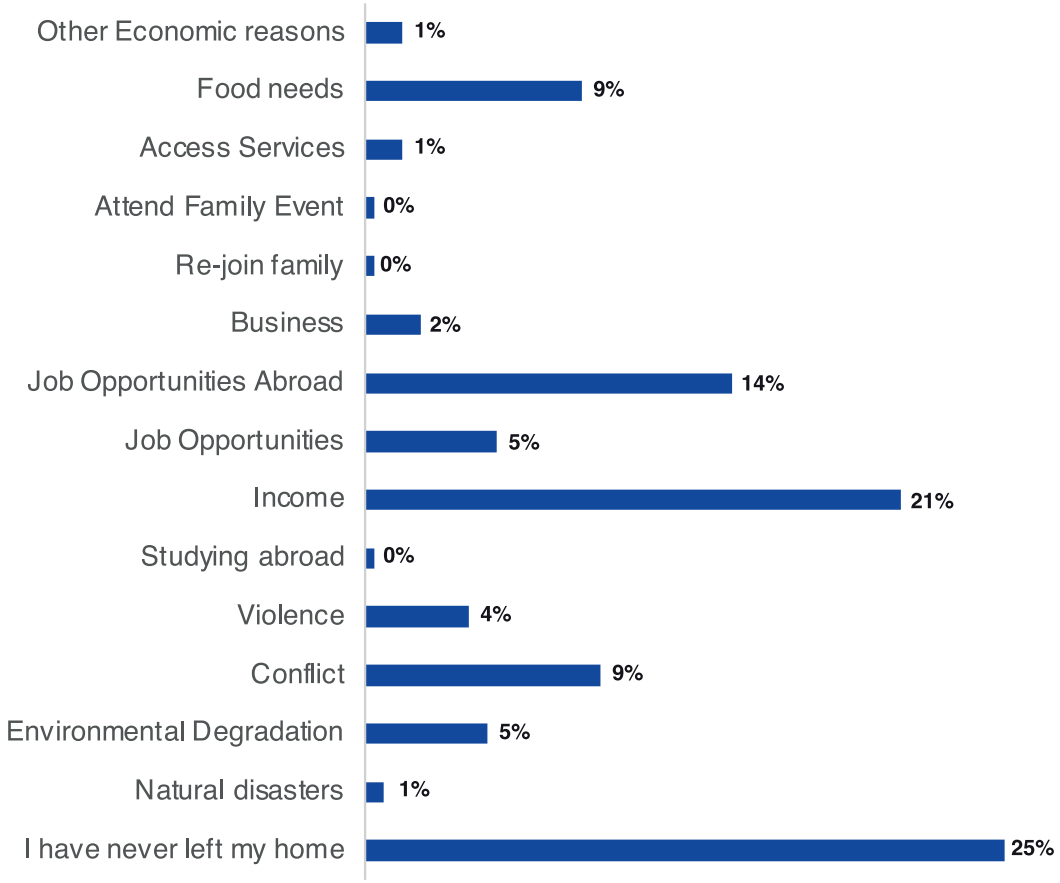
	Kufra-A-Zuwayya	Kufra-B-Tebu	Sebha-A-rural agri	Sebha-B-urban	Tajoura	Waddan-Jufra	Total
Violent conflict and other forms of physical insecurity	15	6	10	22	1	8	62
Pursuit of improved economic conditions	11	0	11	0	20	14	56
Climate change and other environmental factors	3	0	2	1	4	2	12
Improved medical care	5	0	0	0	0	0	5
Family and social ties	1	0	0	1	0	2	4
Lack of essential services and needs	1	0	0	0	1	2	4
Multiple reasons	0	0	0	0	1	0	1
SUM	36	6	23	24	27	28	144

Among those who had migrated because of climate change and other forms of environmental degradation, respondents from Chad, Libya, Niger and Sudan referred to these factors in recounting their migration histories and decisions to leave or remain in the community. In all but one instance, the effect of changing rainfall patterns on agricultural productivity was the key environmental driver of migration.

> *"I left with my siblings and some friends because of tribal problems and climate change – a lack of rain - which reduced production and affected my family's ability to do agricultural work alone."*
>
> *Niger-born migrant, DI respondent*

In the aggregate, these qualitative findings were confirmed by the Quantitative Survey, though economic reasons surfaced as more prominent when compared to those related to violence and security. Among those surveyed (n=185), 40% stated that their reasons for leaving home were associated with the pursuit of improved economic conditions (job opportunities, income, job opportunities abroad) and 13% for reasons of violence and insecurity. (See Figure 13.) This inversion of the top two migration catalysts between the DI and Quantitative Survey data could likely be explained by a couple of factors: first, the Survey focused on questions related to agriculture, livelihood, and access to water, which could prime respondents to speak to economic issues. Second, the DI protocols asked about migration histories, creating the space for responses to surface a wider range of relevant factors. In this way, the differences in the ranking of the top two items can be interpreted as an instance in which the qualitative and quantitative data tools complemented one another in developing a more complete picture of the diverse motives behind and experiences with migration.

Figure 13: Reasons for leaving home



DI respondents also expressed a range of dispositions related to their displacement or migration decisions. Fifty per cent (50%) desired to return to their places of origin. In comparison, 46% wanted to stay in their current communities. Most Libyan-born respondents (92%) wished to return to their home communities – though many had been destroyed in armed conflict or other violent clashes. Among the respondents from different countries of origin, all but one mention their dispositions regarding their current location indicated that they preferred to stay in Libya rather than return home.

Figure 14 illustrates the convergence of CCM Nexus and water scarcity issues in shaping migration decisions.

3.4.2 Multiple sources of vulnerability and support

DI responses were also coded for sources of vulnerability for migrants (118 instances), either leading up to, during or following their migration journeys. The top five most common points of vulnerability included the following: lack of documentation (15% of responses), lack of water and food (14%), inability to access humanitarian assistance (13%), insufficient employment opportunities to meet basic needs (12%) and lack of adequate housing (10%). Other issues included a lack of healthcare, weak governance capabilities, physical insecurity, effects of climate change and natural hazards, and challenges with infrastructure. Geographically, vulnerabilities tended to concentrate among the Zuwayya in Kufra (27% of responses) and the urban community in Sebha (38%).

Like migration catalysts, vulnerabilities concentrated around the national origin in several instances. For example, documentation issues were most acutely felt by Niger-born respondents (50% of mentions), followed by Chadian and Libyan respondents (both at 17%). However, documentation issues surfaced among migrants from all origins in the DIs. It is likely that these documentation concerns connected to identified challenges with (international) migrant expulsion from the country due to lack of identity documents as well as seizure of both international and internal migrants' identification during attempts to access public services (IOM, 2022b). This report understands internal migrants as comprising both internally displaced persons (IDPs) as well as those individuals engaging in planned migration. Replacing documentation in Libya has also posed historic challenges (Global Protection Cluster, 2022), positioning it as an ongoing concern. Libyans overwhelmingly felt the strains of insufficient food and water resources (88% of all mentions) and perceived lack of humanitarian aid or other assistance (100% of all mentions).

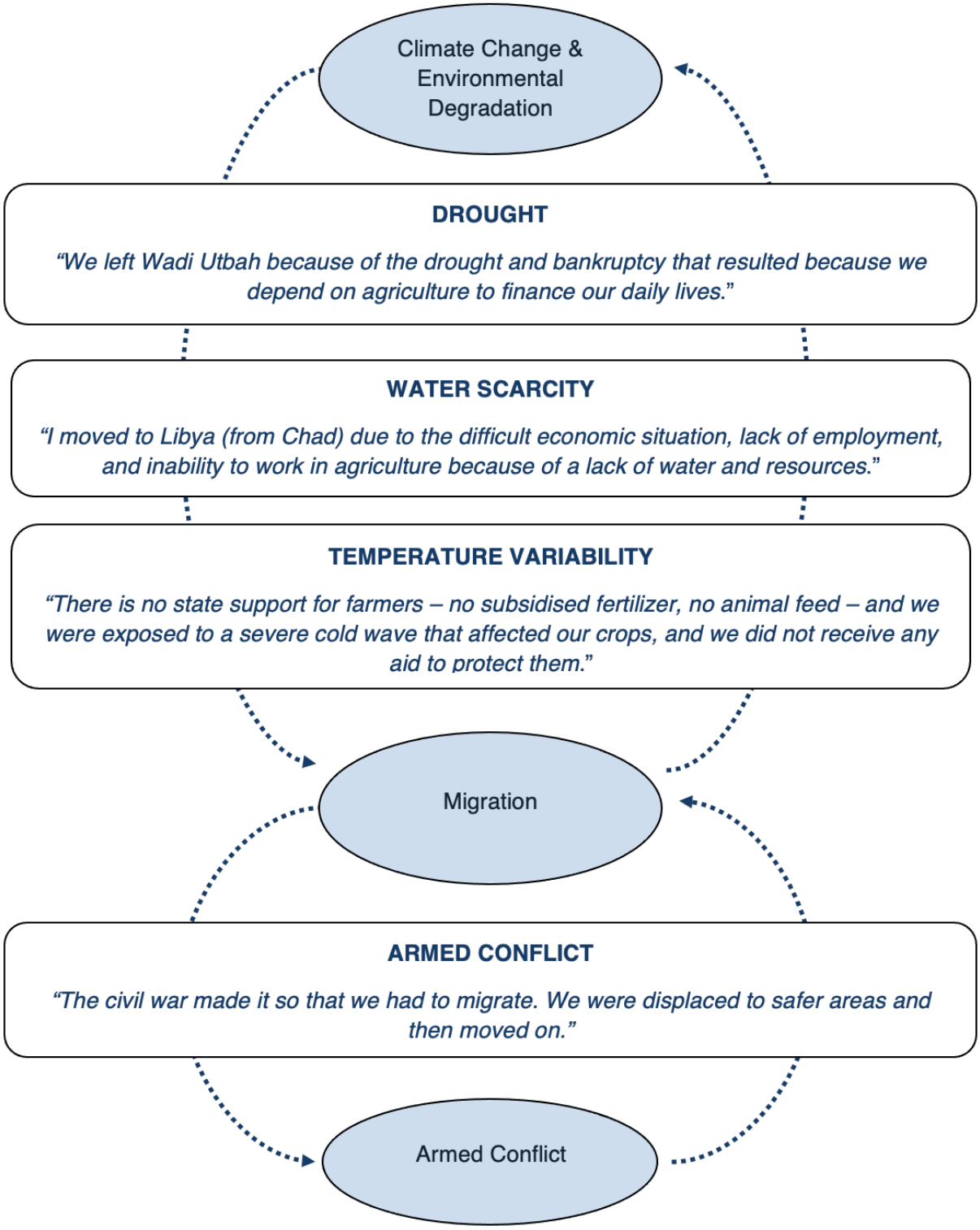
"I didn't bring my clothes or papers with me because of the clashes' intensity. I couldn't get near the house; some friends said there was smoke coming from my house, and I recently learned that they burned my house down completely."

Libyan-born migrant, DI respondent

"We need ID cards to facilitate movement between places without fear of being arrested by security forces."

Niger-born migrant, DI respondent.

Figure 14:The CCM Nexus in Libya: Climate Change,Water Scarcity and Conflict – Causes, Consequences and Relationships according to DI respondents in Sebha and Kufra



FGD participants in Jufra (one all-male group and one all-female group) discussed environmental migration at length (see Appendix 2 for FGD prompts). Specifically, the prompt presented a fictional, though plausible, scenario in which a significant flood in Al-Jabal Al-Akhdar (the Green Mountain) led to a large-scale displacement of residents towards Jufra and the potential challenges they might face and assistance they receive.

According to FGD participants, the environmentally displaced migrants could anticipate support from the inhabitants of the receiving communities, especially the youth who volunteer to organise food, water, clothing and shelter in local schools or other public facilities. Civil society organisations, local councils, public officials and international organisations would offer additional aid. However, these sources of assistance would be more readily given in the early stages of displacement.

"Jufra is considered a transit area for IDPs due to wars or conflicts and is not a destination area. It is small and difficult to provide basic items such as food and medicines there. Also, hospitals cannot accept this large number of IDPs. Moreover, IDPs would not find job opportunities, and there is no sufficient accommodation for renting, not to mention property owners requesting high costs for rent in similar difficult circumstances."

Jufra, Male FGD respondent

"Inhabitants cannot provide support to IDPs families for a long time because they already lack financial liquidity. There is a lack of acceptance of IDPs because inhabitants fear a longer stay in the region."

Jufra, Male FGD Respondent

Concerns about longer-term hosting requirements included high housing prices, water scarcity, increased living expenses for all region residents (including water, food and fuel) and potential implications for overall physical security. There was also agreement on economic concerns that the future migrants would face: they would arrive with a severe lack of job opportunities. Furthermore, the already-fragile healthcare system would face increased strains with public accessibility and vaccine availability. The effects of the healthcare shortages would also be expected to have a disproportionate impact on women and children.

FGD responses that touched on the topic of water scarcity converged on a few points: Jufra already suffers from water scarcity issues, the displaced would find that there was nowhere to host them, and the cost of water would be prohibitively high. Though there are not currently any large-scale displacements from water-related issues (but instead from wars and tribal conflicts), FGD participants noted that they expect displacements for this reason in the coming years. Seasonal migration related to water scarcity and the high cost of water in the summer months already occurs. Both the male and female FGDs on this topic were largely congruent in terms of their content and concerns.

"It is expected that the population of the region, especially Houn and Waddan, will be displaced in the coming years due to water scarcity."

Jufra, Female FGD respondent

"In the summer, many people leave their homes to spend holidays in cities with great water availability, such as Misrata and Tripoli. They will be able to reduce the financial cost they will pay when staying in their homes."

Jufra, Female FGD respondent

3.4.3 The environmental migration decision

FGD respondents in Sebha (two all-male groups and two all-female groups) responded to a different prompt asking them to advise a farmer whether he should move his family to the city after experiencing drought on his farm. They echoed similar concerns to the Jufra FGDs. Overwhelmingly, participants would urge the farmer to stay put (73%) rather than migrate (27%).

They identified the following pre-emptive actions and decision-making criteria for deciding whether to remain or migrate.

1. Conducting adequate research to identify the source of the water shortage (e.g., sudden vs gradual drought, infrastructure shortcomings, effectively maintained farm equipment, electricity outages)
2. Seeking assistance from all potential sources:
    a. …from the public sector to deepen existing wells or dig new ones.
    b. …from friends and neighbours who might be able to provide a temporary loan.
    c. …from the government or other entities that might be able to provide a loan.
    d. …from specialists in the field of agriculture and geology to identify the source of the issue.
3. Attempting to switch to less water-intensive crops.
4. Moving temporarily to generate sufficient income to return and restore farm operability. (Alternately, securing a supplementary source of income nearby rather than moving to the urban centre.)
5. Identifying alternate sources for water delivery (e.g., if, for example, the farm is close to a residential area).
6. Ensuring adequate skills to secure employment in the city (generally, carpentry, plumbing, blacksmithing and trade).
7. Securing sufficient financial capital (including transportation) to sustain oneself and one's family in the city, where living costs are significantly higher.

These criteria for decision-making connect to the principal concerns that participants had about the move, which fell into five categories: obtaining sustainable employment, multiple sources of insecurity, living conditions in the city, problematic reception into the host community and adjusting to social life and the differential impact on women and children. The key categories of concerns and aspects elaborated by FGD participants can be found in Table 6: Key areas of concern related to rural-to-urban migration and elements of each.

Table 6: Key areas of concern related to rural-to-urban migration and elements of each

Category of Concern	Specific Elements
Obtaining sustainable employment	• Low wages
	• Long working hours
	• Low availability of public sector jobs
	• Tribal controls over specific employment sectors
	• Other forms of favouritism and nepotism in the employment market
	• Significant experience required to secure existing jobs
	• Risk of exploitation by the employer, given the displaced status
	• Other forms of mistreatment in the workplace
Multiple forms of insecurity	• Dangerous commutes to the workplace
	• Proliferation of weapons
	• Theft
	• Kidnapping
	• Armed robbery
	• Homicide
	• Extortion
	• General crime
	• Psychological distress from constant fear and anxiety
	• Neighbourhood-level tribal wars
Living conditions in the city	• Frequent power cuts
	• High cost of living (rent, food, water, healthcare)
	• Exploitation by landlords
	• Seasonal challenges (i.e., higher prices in the summer)
	• Inadequate public healthcare
	• Costly private healthcare options
	• Lack of drinking water; high cost of purchasing bottled water
Problematic host community reception and adjustment to social life	• Tribal discrimination and disempowerment
	• Marginalization of certain classes of migrants
	• Lack of trust by residents
	• Need for family and social networks to secure employment
Gender and Life Cycle	• Challenges with enrolling children in public schools
	• Marginalization, bullying, and racial discrimination against children

By way of elaboration, while many technical, logistical and security elements are relatively straightforward, the issues of community reception and distrust were more nuanced. For example, one male FGD participant stated, "as soon as this person enters the city, he will be considered a suspicious person. He will be treated as a stranger and criminal who fled his village for unknown reasons." A female respondent added another dimension to the effects of suspicion and mistrust. "When looking for a job, he will face difficulty winning the employer's trust because he is a stranger to the region. He is unknown and suspicious, and it will be difficult to find someone to trust him." Another male respondent noted that "integration is not easy. He would need to have acquaintances and friends to build trust and credibility to find a suitable job." Thus, while technical capabilities and security considerations are critical, interpersonal, social and relational aspects of displacement also figure prominently in concerns about resettlement.

Closely related to this are tribal and other identity-based criteria for exclusion. One female respondent emphasised that "among the difficulties moving to the city will pose, the farmer and his family will face difficulty adapting to the surrounding environment due to the spread of racial discrimination and bullying. Also, there is a difference in social structures (in the city): IDPs will also face tribal disempowerment." This sentiment was echoed by many FGD participants, who generally agreed that there would be a high risk of tensions and issues along these lines. As one male respondent stated, "His family may face tribal discrimination and monopolisation of employment opportunities by some residents of the area, as they are likely to be marginalised and no one will support them." Migration and resettlement dynamics thus require attention to the different axes (race, tribal affiliation, social and familial networks) along which tensions may emerge due to population movements.

3.5 Key Findings, Implications and Recommendations

This section summarizes the key findings from the analysis in the previous sections. In sum, the Climate Change, Conflict and Migration (CCM) Nexus in Libya materialises as a convergence of the following:

4. Legacies of conflict violence have resulted in displacement and the destruction of resource management infrastructures, shaping migration decisions for both international migrants to and internal migrants within Libya.
5. Widely shared concerns surround the potential for future conflict and environmental migration as a result of water scarcity.
6. A multi-faceted, non-linear relationship exists between competition over access to resources because of both environmental degradation and demographic shifts and the possibilities for conflict.

In the section below, findings summarised from the prior analysis are included according to the specific element of the CCM Nexus that they address.

3.5.1 Libya Key Findings and Implications

The top challenges for water management in Libya represent systemic issues. They include: 1) insufficient investment in desalination plants, technology and other alternative water sources; 2) underdeveloped transparency practices, regulatory frameworks and enforcement mechanisms related to water management; 3) insufficient monitoring and maintenance of existing water management infrastructures and their related elements and 4) low levels of overall awareness about these issues. Among study respondents, 61% reported obtaining their water from wells and the tap, and an overwhelming 94% of water for farming comes from irrigation systems. Hence, water access and management infrastructure shortcomings have severe implications for population health outcomes and agricultural production.

Successful responses to the above issues require multi-stakeholder engagement, intentionally engaging those actors who can be held directly accountable for program and policy implementation, oversight and outcomes. Critical areas for investment include alternative, diverse and renewable energy approaches to water management, responsible waste management, transparency and accountability, governance and oversight capabilities, equitable and inclusive solutions, public awareness and evidence-based programme and policy design.

Governance capabilities, citizen practices and environmental degradation – both because of climate change and man-made factors –create negatively reinforcing dynamics that contribute to poor population health outcomes, issues with access to water and unplanned migration. This is illustrated by the intersection of citizens' solid waste dumping practices, inadequate provision of waste management services, weak enforcement of sanitation regulations and resultant contamination of water sources. Furthermore, among stakeholders interviewed, government support and governance capabilities combine with man-made degradation to create insurmountable obstacles to effective programme and policy implementation.

Second- and third-order consequences of CCM Nexus dynamics include threats to livelihood, public health concerns, emergent threats tied to a solution that increase vulnerability in another domain and the amplifying effects of man-made environmental degradation. Such intermeshed social, economic and political life domains require holistic approaches to addressing them with particular attention to a balance of awareness raising, policy and programme design and governance and oversight.

Overcoming data challenges such as accessibility and quality along with achieving inclusive practices that engage decision-makers from all affected population groups will pose significant challenges given the current political and governance climate. Programme and policy approaches that build on access to regularly collected, high-quality data and use participatory practices to strengthen local governance capabilities tend to achieve more sustainable success. However, strengthened local administration represents a critical success factor. Training, financial backing and programme relevance form the bedrock of success. Administrative capacities can draw from and contribute to technical, relational, economic and physical capital. It can also implicate non-state governance mechanisms, such as tribal councils, intercommunal compacts and other conflict-resolution mechanisms.

There exists a persistent under-awareness of women's experiences with the CCM Nexus and water scarcity at the organisational and institutional levels. As a result, women are underrepresented in the national dialogue around these themes. Identified contributing factors, according to respondents, include prevailing cultural practices and norms in some areas of the country, and difficulty in locating women for data collection efforts when those efforts concentrated around zones in which agricultural laborers transited, and a lack of political will to include them in research and policy design (with one notable exception among respondents).

In addition to initial violent displacement and related vulnerabilities, violent conflict results in environmental degradation and complicates access to natural resources, exacerbating the effects of climate change. This can occur through the destruction of vital infrastructures, delay in intended resource management projects and, as a result, destruction of livelihood options.

There is a complex and multi-faced (rather than unidirectional) relationship between competition over access to resources and conflict. Though there were some reports of inter-communal tensions over natural resources (11 out of 185 total quantitative survey respondents), destruction of infrastructure and threats to water access were reported in qualitative accounts to occur more often *because of* conflict, rather

than as the catalyst for the conflict itself. Nevertheless, the potential for future conflict related to water scarcity did feature prominently in study findings. This suggests an important point of intervention for security-building and stabilisation efforts in Libya moving forward. Caution must be taken to ensure that one policy or programme implementation does not trigger existing or emergent tensions when one population group perceives a disadvantage vis-à-vis the ostensible beneficiary group.

Conflict and economic conditions continue to be key drivers of migration in Libya. However, the relative importance of each depends on national origin and can concentrate differently depending on the destination community – as can vulnerabilities. For example, nearly all migrants in the urban community in Sebha arrived as a result of displacement due to violence and other forms of physical insecurity. Nearly all migrants who arrived in Tajoura, in contrast, had migrated in pursuit of improved economic conditions. Internal migration had overwhelmingly been catalysed by conflict, whereas most Chadian and Nigerian respondents had emigrated for financial reasons. Critical sources of vulnerability include lack of documentation, employment opportunities and essential needs (humanitarian assistance, food, water and housing). These tendencies should inform programme and policy initiatives in population- and site-specific ways.

While host communities may be disposed to helping those affected by environmental migration, resource strains (economic, security and water-related) could trigger tensions between migrant and host communities. Participants encouraged those considering environmental migration to exhaust all possible options before doing so. For rural-to-urban migration, areas of concern for the well-being of the migrant and his or her family included obtaining sustainable employment, insecurity in the cities, difficult living conditions, potential problems with community acceptance and disproportionate negative impacts on women and children in the family.

3.5.2 Libya Recommendations

In light of the above, the following policy recommendations are proposed:

3.5.2.1 General Considerations

1. **Strengthen local administration and governance capabilities to support coordinated responses to CCM Nexus dynamics**. This can include providing technical, financial and physical capital in addition to training and mentoring for local public officials. It also implies investing in capacity building at the local level, developing capabilities for coordination up and down institutional hierarchies for those communities far from governing centres. Opportunities for this present in multiple domains.
    a. **Develop comprehensive Whole-of-Society plans and Standard Operating Procedures** that integrate governance and response capability strengthening in the face of CCM Dynamics together with shared accountability and oversight mechanisms. These plans and procedures may contain legal reforms, reinforcement of existing legislation, and initiatives to improve transparency.
    b. **Strengthen existing practices and promote the development of further systems for the prevention and resolution of conflict to reduce the incidence of violence and insecurity as it relates to CCM Nexus dynamics**. Involve stakeholders such as residents of affected communities, farmers and owners of commercial projects, public sector officials, private water companies, community elders, sheikhs, tribal leaders, women and youth and international development agencies. Design oversight bodies that achieve alignment between stakeholders, programme content and intended beneficiary populations' needs. Provide sufficient technical

support to equip these committees and working groups with conflict resolution mechanisms. Draw from and prioritise existing best practices at the local level and, when relevant, support intercommunal compacts.

c. **Invest in infrastructure development to improve access to resources and services for host communities and their administration**. Among the primary concerns of host community members was the potential strain that migrant populations may place on insufficient water and waste management infrastructures. Focusing efforts on communities with high concentrations of migrant populations, such as those identified in this study, policies and programmes will achieve the simultaneous benefits of improved resource management and reduced risk for conflict among distinct population groups.

2. **Foster participatory cooperation and collaboration**. This entails supporting initiatives that promote the coordinated efforts of multiple stakeholders across multiple domains. For example, local community leaders work with the public sector to facilitate a water usage study and implement sustainable water management practices. Opportunities for this present in multiple domains.
    a. **Promote equitable and inclusive solutions to water management. Develop public service and awareness campaigns together with investing in education and skill-building programmes targeting both urban and rural populations**. Match calls for changes in private citizen practices (e.g., dumping, household and industrial water waste) with institutional capacity building to provide sustainable alternatives to those practices. Use these initiatives as opportunities to build social cohesion among groups that may otherwise potentially experience tensions related to access to resources by engaging representative leaders from communities in cooperative engagement from the earliest design phases of programming. Develop creative alternatives to involving hard-to-access populations (e.g., migrant women who work as domestic labourers) by engaging grassroots initiatives, community, and religious leaders who already engage with these individuals.
    b. **Promote community-level initiatives for social inclusion to reduce the risks of exclusion and marginalisation based on tribal or racial differences**. Recall that study findings suggest that, in Libya, resource-related conflicts tend to occur *intermeshed with existing conflicts* (e.g., intercommunal clashes destroying water management infrastructure) tensions rather than independently of them (e.g., engaging in a dispute over a specific water source alone). To mitigate the risk of tensions that may materialise along historic intergroup divisions, design policies and programmes intended to address the adverse effects of the CCM Nexus and water scarcity to foster inclusivity and social cohesion intentionally.
3. **Prioritise collection of and widespread access to quality data that is publicly available**. This involves providing resources to support efforts to find, coordinate and utilise relevant data sources. This can include baseline, year-over-year change, and environmental and population impact metrics. It should form the basis for evidence-based programmes and policy design over the long term and across institutions and sectors. Practical approaches to this recommendation could take multiple forms:
    a. Use a research and action approach to ensure data-driven solutions that support sustainability over the long term in multi-sector responses to CCM Nexus dynamics.
4. **Factor gender, life cycle and national origins into policy design and programming, including in the research, inception and decision-making phases**. This includes developing explicit programming elements that factor in the differential impacts of climate change, conflict and migration on women and girls. It also accounts for the differentiated experiences of CCM Nexus dynamics, its causes and its consequences depending on national origin and current community. Recommended approaches to implementing this recommendation are the following:

a. **Ensure diversity in messaging and programming design** according to gender, life cycle, national origin and use (household, agricultural and industrial water use, dumping and unplanned drilling of wells).
b. **Identify opportunities for more equitable distribution of natural resources across all neighbourhoods and farms**. Reduce the risk of conflict over access to resources by ensuring equitable access to neighbourhoods according to degrees of vulnerability to the adverse effects of the CCM Nexus and water scarcity.

4.0 Sudan: Country Study

4.1 A brief presentation of the country

The Republic of Sudan is a country located in North-eastern Africa, and it shares borders with the Central African Republic to the southwest, Chad to the west, Egypt to the north, Eritrea to the northeast, Ethiopia to the southeast, Libya to the northwest, South Sudan to the south and the Red Sea. Its population of just over 47.5 million people at the end of 2022 (World Population Review, 2023) primarily resides in rural areas (64%-70%), though nearly 3.0 million inhabitants live in the capital city and region of Khartoum (FAO, 2015; World Data, 2023).

4.1.1 The Climate Change, Conflict and Migration (CCM) Nexus in Sudan

Sudan is ranked 176 out of 181 on the Notre Dame Global Adaptation Index (ND-GAIN, 2022), indicating that the country is highly vulnerable and unprepared to contend with the devastating effects of climate change. The Sahel region of Africa, which cuts across Sudan, is particularly susceptible to the impacts of climate change, with rising temperatures, dwindling livestock sustainability, new instances of pests and diseases, and drought, threatening agriculture, pastoralism, and the relationship between the two critical economic sectors (Sisdoia, 2022). Climate variability in the Sahel has resulted in three decades of near-drought conditions, even though this is sometimes attributed to other factors such as overpopulation pressure and overgrazing (Young et al., 2009). Several vulnerabilities present as a result. For example, rainfed crops are the primary food source and are highly vulnerable to dry spells. Additionally, nomadic herders can find themselves in conflict over land and water resources due to their need for pastures. Sudan is also a net importer of staple foods, leaving it vulnerable to price volatility.

Climate change presents significant challenges to the ability of populations to adapt due to their dependence on natural resources, limited alternative livelihoods, political marginalisation and violent conflict dynamics (Seyuba et al., 2021). By way of example, increased competition over land and water between farmers and herders and exploitation of marginalised groups by elites and armed groups combines with political instability and shifts in power relations to contribute to a decrease in human security (Ovidie Grand & Tarif, 2021). However, it is essential to note that environmental degradation can be a relative term: what may be a negative outcome for some can be a source of livelihood for others.

Regardless of positionality, Sudan is already facing increasing natural hazards and conflict-related displacement (Schaar, 2015). Furthermore, people displaced by conflict and disasters in Sudan are also facing food insecurity and a lack of access to clean water (FAO, 2015), evidencing the amplifying effects of climate change and environmental degradation on human security. In 2007, then-UN Secretary-General Ban Ki-Moon identified climate change as a contributing factor to the conflict in Darfur (Moon, 2007). He argued that inter-group tensions were heightened due to rising temperatures, drought, and lack of food and water. Water scarcity is critical due to conflict, poor water management, over-exploitation, and lack of access or contamination. As climate change and extreme weather events continue to increase Sudan's climate risk, vulnerable populations, such as those whose livelihoods depend on the weather, are most at risk of resorting to force to protect their remaining resources.

Oil production can also contribute to instability. Leading up to the break-up of North and South Sudan in 2011, oil was a significant source of conflict between the (now) two countries. In 2008, oil had already become the most crucial export for Sudan, accounting for 95% of exports. However, the South was responsible for 70% of all oil revenues, while all the refining capacity was situated in the North (Sullivan & Nasrallah, 2010). Such unequal distribution of resources sparked the development of southern Sudan's People's Liberation Army (SPLA) and ultimately led to the region's autonomy in 2005 and independence in 2011. For example, in the contested Abyei region between North and South Sudan, local Ngok Dinka and Misseriyya Arab seasonal migrants have become embroiled in multi-scaled political tensions between transnational oil interests, the two Sudanese states, and the local population (Seyuba et al., 2021). The civil conflict from this split between the two countries has resulted in an estimated 400,000 deaths and displaced millions (IPCC, 2021).

4.1.2 Water Scarcity in Sudan

The complex interplay of climate change and social, political, and economic factors shapes the water crisis in Sudan. Drought and the expanding Sahara Desert have decreased rainfall by 40% over the past four decades (FAO, 2015). The country has also experienced significant floods, resulting in displacement and the destruction of over 60,000 homes (UNHCR, 2021). Transboundary water dependence represents a significant issue, affecting 11 countries, including Egypt to the North and Uganda, Rwanda, and Ethiopia to the South.

The current Nile Basin Initiative's (NBI) Cooperative Framework Agreement (CFA) outlines the rights and obligations for the development of the Nile River basin, and the agreements between Sudan and other countries are continually evolving. Regarding primary water sources, the Nile River basin has historically been governed by Egypt and Sudan due to their downstream position. However, in 2012 Sudan joined with upstream countries in hopes of benefiting from the development of the Ethiopian Renaissance Dam. Sudan has reverted to its earlier position and joined Egypt in dispute with Ethiopia over the potential environmental harms of the dam (BBC News, 2021). Separately, in May 2021, Sudan submitted a revised Nationally Determined Contribution (NDC) to promote low-emission and resilient, sustainable development in the energy, forestry, land-use, and waste sectors.

The construction of irrigation systems for farming has been a pivotal factor in Sudan's colonial and postcolonial development. During the British colonial period (1898-1956), large-scale gravity irrigation was initiated to produce cotton along the Nile. The Gezira Scheme, the oldest and largest gravity irrigation system in Sudan, began in 1925 and was followed by the New Halfa Scheme. These systems have been expanded in the postcolonial period and are regarded as the country's primary means of economic development. In the 1970s, oil-rich Gulf nations invested in these irrigation systems to transform Sudan into the "breadbasket" of the Arab World (Woertz, 2013). The Gezira Act of 2005 transferred the management of irrigation systems from Agricultural Corporations to smaller water user associations, creating more decision-making power for farmers.

However, if drought conditions were to worsen in the Sudano-Sahelian region, farmers have indicated a preference for migration in the search for more climate-resilient livelihoods (Mertz et al., 2011). However, if the climate scenario changed, the same farmers strongly desired to continue their agricultural practices. As this region has a long history of drought and seasonal migration, it is essential to understand how these factors interact with the climate change caused by greenhouse gas emissions and sudden crises. These dynamics, along with individual and collective decision-making factors in the face of these crises, feature prominently in the present study.

Flash flooding has caused significant food loss and threatened famine throughout Sudan, leading to forced migration (Nebehay, 2019). Subsistence farmers, who largely depend on rainfall and hafirs (small rainfed water reservoirs) for their livelihoods, have been significantly affected (FAO, 2015). Women, who make up 57% of rainfed agricultural labourers, have been particularly hard hit as subsistence farmers and 49% of wage labourers

in seasonal irrigated agriculture. The UN Environment Programme and the European Union have partnered on a project to increase agricultural yields in North Darfur by providing seasonal water supplies. As part of this initiative, water channels and reservoirs were constructed and rehabilitated with the help of community women leaders (UN Environment Programme, 2018). Separately, an IOM-supported project in the village of Jebel Kheir, South Sudan, has also successfully empowered women as community leaders by supporting the sustainable implementation of three communal water points (IOM, 2023b). However, further empirical research is required to understand better the gendered dynamics of subsistence farming, waged agricultural labour, migration, and climate change.

To tackle tensions related to the CCM Nexus in Sudan, a multi-dimensional approach is required. This should include climate-resilient strategies that take a long-term view to address the underlying causes of conflict. These strategies should include environmental management and other factors such as humanitarian aid, security, and governance. For example, local entrepreneurship initiatives in forestry and agriculture supply chains have had some success in addressing youth unemployment. This initiative and other recent studies have convincingly argued that leveraging regional institutions and engaging in cross-sector and inter-institutional collaborations can better equip Sudanese national leaders to adapt to climate change and its transboundary effects - including freedom of movement, disease monitoring and response systems, and pastoral preservation (Sisdoia, 2022).

However, humanitarian agencies' tendency to focus on emergency response, security threats, and uncertainty around governance and stabilisation limit responses that more systematically address root causes and engage in long-term sustainable solutions. Sometimes, emergency responses can even worsen the situation by creating a cycle of dependence that hinders sustainable solutions (UNEP, 2007). These dynamics must be addressed in tandem with climate-resilient development, which has a long-time horizon (Watts, n.d.). To achieve this, there is a need for empirical data on how these dynamics manifest in interconnected ways. For example, although the United Nations Interim Security Force for Abyei (UNISFA) is tasked with resolving local resource-related disputes, the potential threats to human security caused by climate change are rarely discussed in official mandates and program directives.

Nevertheless, national governments and international bodies are uniquely positioned to develop trade, border sovereignty, foreign direct investment and borrowing, and human development and security solutions. To make the most institutional potential, climate management needs to be effectively implemented into their policy planning for the short, medium, and long term.

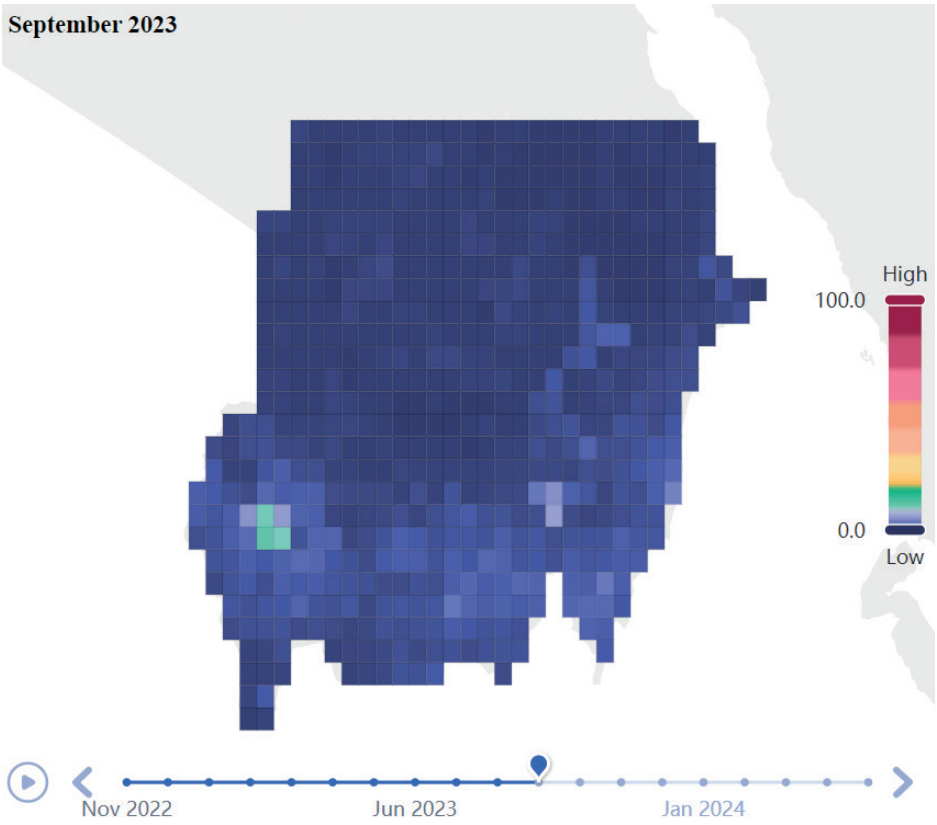
This study aims to understand better the complex interplay between environmental degradation, resource loss, and human-built elements and their contributions to water scarcity and migration. It identifies points of intervention that can support community resilience and address power asymmetries between multiple stakeholders that may contribute to environmental degradation and displacement. For additional findings in Sudan and other comparable settings, see **Appendix 1: Review of contemporary academic literature on the Climate Change, Conflict and Migration (CCM) Nexus**.

4.1.3 The ViEWS-ESCWA & RICCAR Models Risk Assessment Report[1]

A 2020-2022 collaboration between the United Nations Economic and Social Council for West Asia (ESCWA) and the Violence & Impacts Early-Warning System (ViEWS) resulted in a forecasting model incorporating data of particular importance to the Arab states. In collaboration with this study, a Risk Assessment Report was prepared using the ViEWS-ESCWA model, which provides the probability of violence in Libya and Sudan (ESCWA, 2022). It also includes climate change projects using RICARR models, key developments and humanitarian trends.

The model predicts that in September 2023, the risk of 25 or more fatalities from state-based violence in Sudan is partially likely, meaning there is a medium level of risk (Figure 15: Predicted probability of state-based deadly violence in September 2023 (Sudan)Figure 15). The main areas in which this risk manifests are in the Central and South Darfur governorates.

Figure 15: Predicted probability of state-based deadly violence in September 2023 (Sudan)

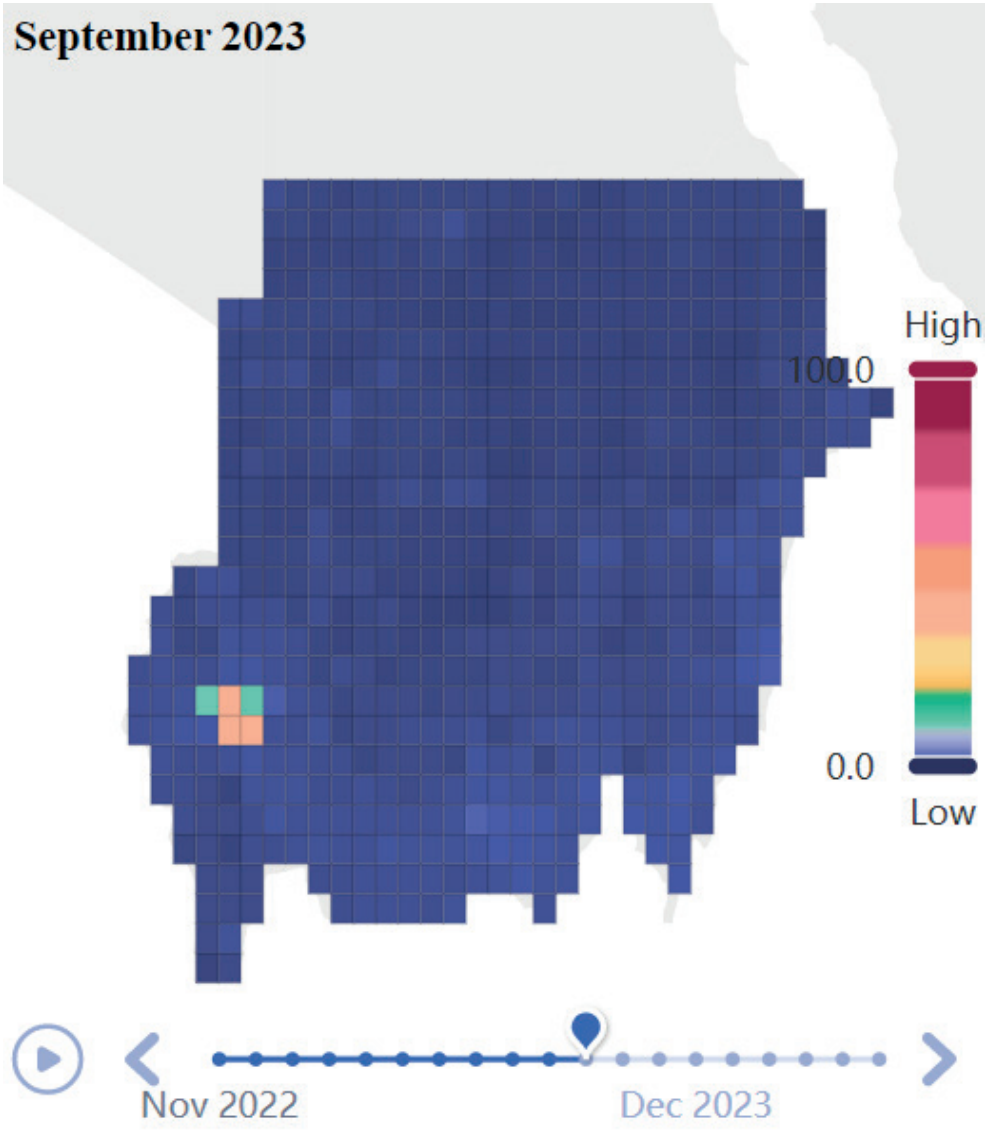


Source: The Violence Early Warning System (ViEWS-ESCWA) Dashboard. Accessed in August 2022. Note: the grid cells correspond to an area of approximately 55x55 kilometres at the Equator or 0.5x0.5 decimal degrees.

1) The analysis included in this section was prepared for this project by the United Nations Economic and Social Commission for Western Asia (ESCWA) (ESCWA, 2022). It is worth highlighting that this model was conducted in 2022 and does not have an updated accounting of civilian, militant and other fatalities.

The Nature and Social Geography model forecasts an elevated risk of violence in Central and South Darfur, namely in Zalingei and Nyala. Separately, the elevated risk areas, according to the drought and vulnerability sub-model, are mainly in Central Darfur, with some minimally higher risk in South Sudan over North Sudan (Figure 16).

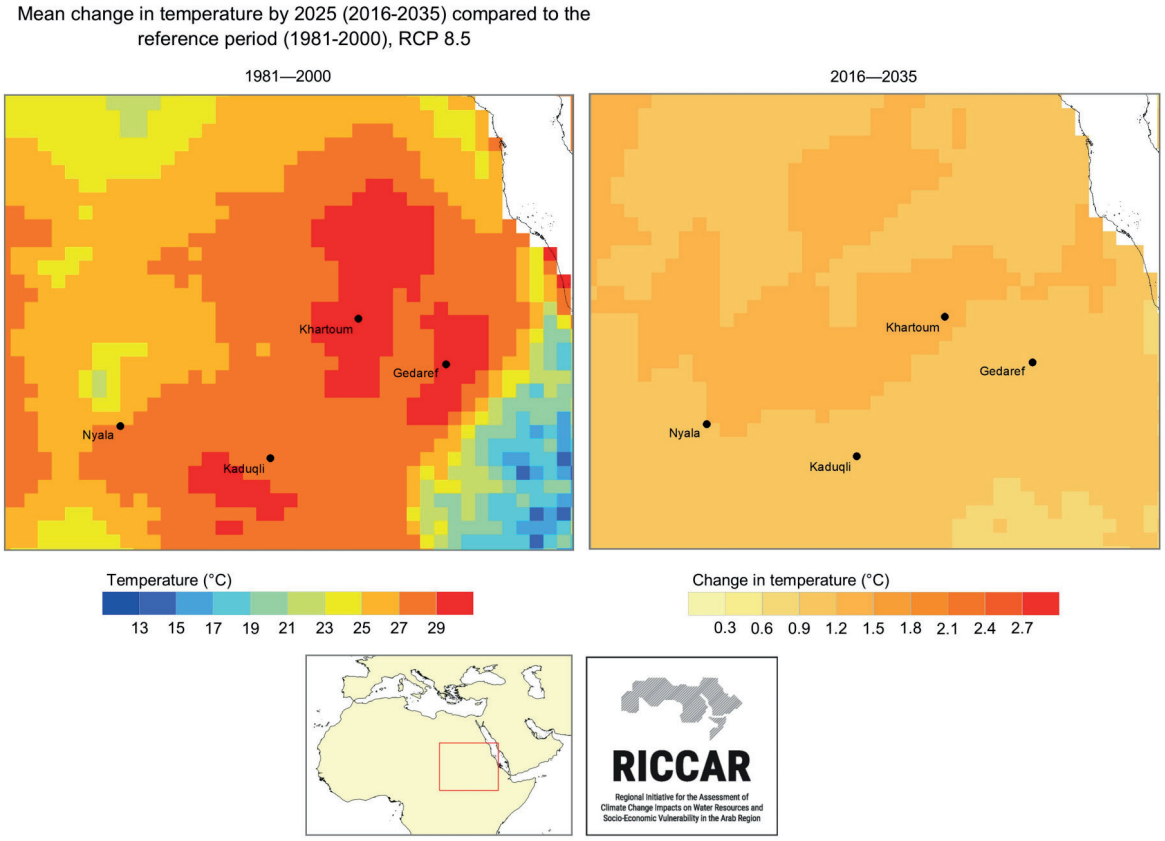
Figure 16: Predicted probability of state-based violence in September 2023 (Sudan) – Drought and Vulnerability



Source: The Violence Early Warning System (ViEWS-ESCWA) Dashboard. Accessed in August 2022. Note: the grid cells correspond to an area of approximately 55x55 kilometres at the Equator

In terms of climate change forecasts and according to the RICCAR models, mean temperatures in Sudan are projected to increase by about 1.1 degrees Celsius by 2025 compared to the reference period (1981-2000). Currently, the temperature is rising by >0.07 degrees Celsius per decade (Figure 17). Over the long term, rising temperatures will contribute to more extreme weather events, potentially worsening the flooding and droughts that have impacted Sudan in recent years.

Figure 17: Mean change in temperature in Sudan by 2025



Source: RICARR

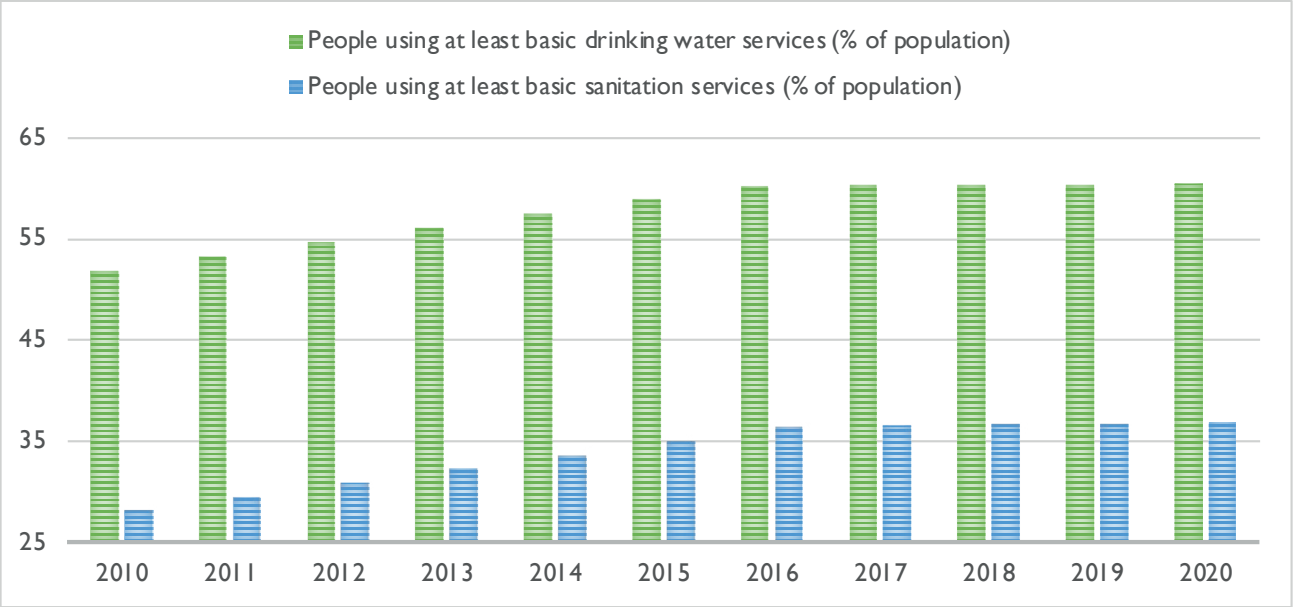
Precipitation is generally decreasing, particularly in the Blue Nile Basin. In the Sahara, sparse rainfall will become more sporadic. Over the long term, drought risks will increase in the northern Sahara area, while flood risks will increase in the Sahel.

The number of state-based fatalities in Sudan was high up until 2016, after which it decreased significantly. Although high fatalities were observed from 2010 to 2012 and 2015 to 2016, 2012 was a violence-intensive year with 1,411 fatalities. Fatalities have remained relatively minimal since 2019. However, Sudan has been experiencing disaster-induced displacements since 2010.

Economically, in 2021, minimal (0.1%) economic growth was observed in Sudan, with negative economic growth in the three preceding years. There was a significant 17% contraction in 2012, and GDP growth has not exceeded 4.7% (2014) since that time. Unsurprisingly, then, unemployment rates in Sudan have been increasing since 2010. Youth unemployment rates increased from 28% in 2010 to 36% in 2021, while total unemployment rates increased from 15% to 20%, respectively.

Critical for this study on water scarcity, a little over half of the Sudanese population has access to essential drinking water services. This number has increased since 2010 from 51% to 60% in 2020. However, a significant proportion of the population in Sudan needs access to essential sanitation services. The number of people using sanitation services increased from 28% in 2010 to 36% in 2020 (see Figure 18).

Figure 18: Access to water and sanitation services in Sudan



Source: WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply, Sanitation, and Hygiene

According to the INFORM Risk Index developed by the European Commission, Sudan scores at very high risk in terms of lack of coping capacity and vulnerability. It scores at high risk in terms of hazard and exposure.

The factors and concerns detailed in these sections formed the basis for study design and site selection in Sudan. More information on these can be found in **Appendix 2: Methodology**. The following section presents the findings from this study.

4.2 Climate Change: Natural and man-made environmental degradation

Detail on data collection sites, site selection rationale, data collection instruments, and analytic methodologies can be found in **Appendix 2: Methodology**. In sum, data collection occurred in five sites in Sudan: Melit-North Darfur, Reifi Nahr Atbara-Kassala, Basundah-Gedaref, Nyala-South Darfur and Khartoum. The four sites outside of Khartoum were selected to examine the impact of rural-rural migration, desertification, and international migration (North Darfur), seasonal migration and intergroup tensions (Kassala), seasonal rural-rural migration and conflict-related displacement (Gedaref), and forced migration and rural-urban migration patterns (South Darfur). Instruments included Direct Interviews (DIs), Stakeholder Interviews (SIs), Focus Group Discussions (FGDs), Ethnographic Walks (EWs) and quantitative survey instruments. The following findings are organised thematically rather than by instrument due to their intended complementary nature, which were designed to surface different aspects of CCM Nexus and water scarcity dynamics. It is a core premise of this study that CCM Nexus dynamics are inextricably intertwined, and much data illustrates how this emerges in the everyday lives of organisational and institutional stakeholders, community leaders, and ordinary citizens. Each section is presented here separately for analytic ease. Overwhelmingly, data demonstrated a notable concentration of concerns related to the overlap of natural and man-made environmental degradation and the effects on land, livelihood and human security that they pose.

4.2.1 Environmental Challenges and Degradation

Among stakeholders interviewed at the national and local levels, environmental concerns comprised 19% of all responses when coded by theme – the largest concentration of all categorical issues. These concerns were related mainly to general environmental degradation (9%), water scarcity and related topics (5%), and land use (5%). Remaining areas of concern include the following: economic issues (access to financial markets, programme funding and wages – 11%); policy and programme sustainability (continuity, monitoring, measurement and evaluation – 7%); transportation and infrastructure (vehicle suitability, availability and theft – 6%) and institutional and organisational technical capabilities (training, support, physical and intellectual capital quality and availability of data –5%). The subsequent two sections of this report analyse responses related to conflict (10%) and migration (4%).

Regarding the first sub-category of environmental concerns – overall general environmental degradation, climate change and extreme climate events – respondents reported contending with the following challenges: changing rainfall patterns, energy consumption practices and access, rising fuel costs, flooding, deforestation, environmental migration and disaster displacement, and a lack of data, reporting and response mechanisms in these domains. The second sub-category was water management-related issues and included struggles with poor water management infrastructure, unsustainable farming practices, contaminated water and related illnesses and communities either engaging in conflict over water resources or outright rejecting possible solutions. Land use represented the third sub-category of environmental degradation concerns. Respondents named a mix of factors concerning governance (existence of relevant policy frameworks and enforcement mechanisms, competing interests, bureaucratic delays and unchecked illegal mining), conflict (growing competition between pastoral and sedentary populations, redirecting resources from one community to another) and demographic shifts (unplanned migration, reduced interest in agricultural sector).

DIs and EWs confirmed the salience of water-related issues to the everyday lives of Sudanese. The top five challenges related to water access, quality and management among DI respondents and supporting quotes can be found in Figure 19.

Figure 19:Top five environmental challenges in Sudan with supporting quotes

Changing and unpredictable rainfall patterns (55% of DI categorical responses)

- The amount of rain has increased and it is cloudy for longer during the year. This year, the rain went until September. If anything, in the past you would have too little rain. Gedaref, Male
- In the past we would plant from May. But this year, we were not able to plant until June because there was no rain. Kassala, Male

Flooding (22%)

- I have seen many seasons in my long life here. Now, there is a lot more water and the villages are being submerged and flooded. Kassala, Male
- The increased floods is because of the sugar factory nearby. They shouldn't have built it here in the farming areas. Now, the water and flooding has no where to go and it all flows back into the living areas. Kassala, Male
- Flooding last year ruined my entire crops and I still haven't recovered from that. Gedaref, Male

Drought and desertification (15%)

- The grazing land is becoming poor every year and we have to move farther with the livestock to find good pasture. North Darfur, Male
- We were displaced from Allaeet to Alhasbaba due to desertification. North Darfur, Male

Man-made factors (10%)

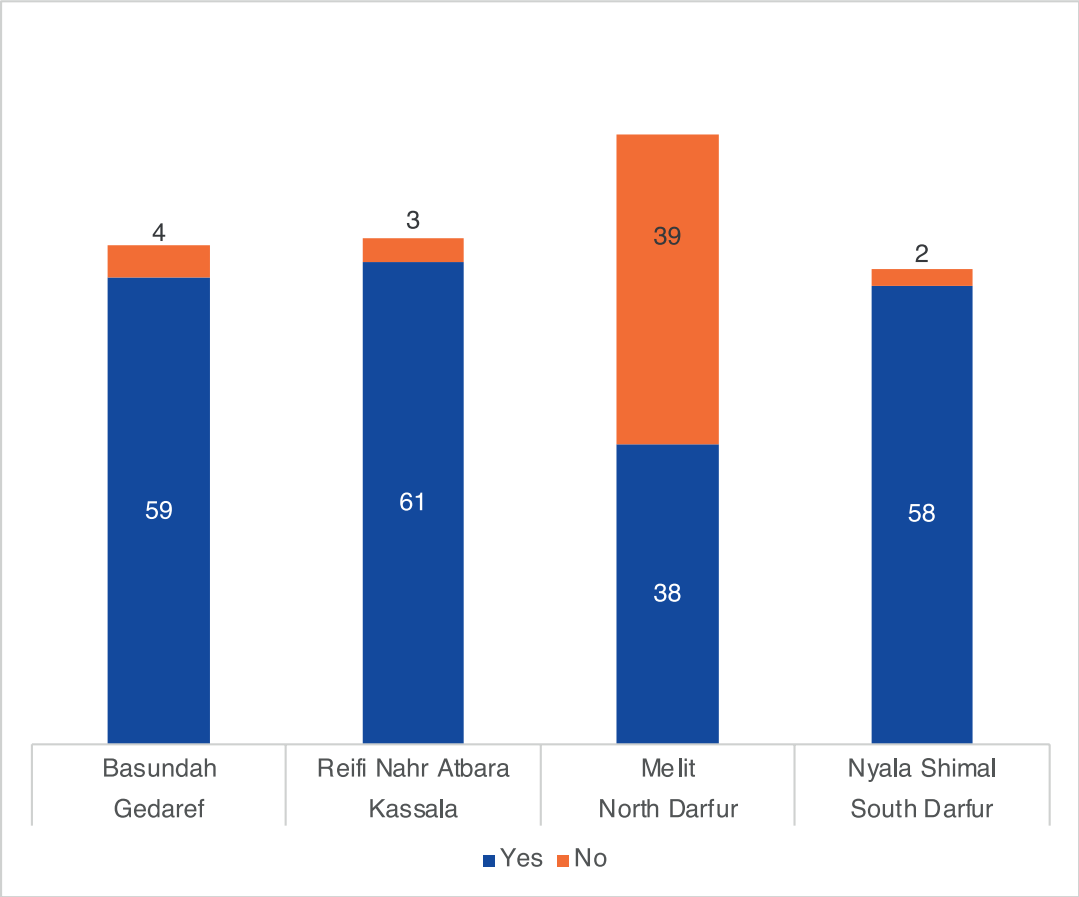
- The runoff water from the farming project next to us increased the floodings. So now the water comes from their runoff water and from the rain above. Kassala, Male
- Qunduwa forest has been depleted by the IDPs in Kalama camp because they cut down the trees. The National Forestry distributed the forest to farmers, who agreed to protect 100 trees. But the farmers have expanded their farming land faster than they've replanted tress. South Darfur, Male

Greater temperature variability (5%)

- Climate change has made winters colder. Gedaref, Male
- I noticed a change in the weather. The heat in the summer is so much more. Kassala, Male

Quantitative urvey data further triangulated these responses. Among respondents (n=264), 82% stated that they experienced barriers to accessing water, which occurred in all participating communities (Figure 20).

Figure 20: Percentage of total respondents who experience barriers to water access by site (n=264)



4.2.2 Threats to Land, Livelihood, and Human Security

Across all instruments, respondents agreed that loss of land and livelihood was the most significant threat posed by climate change as well as natural and man-made degradation. Table 7 breaks down the top five consequences of environmental degradation named by DI respondents.

Table 7: Top 5 consequences of environmental degradation among DI respondents by category and count

Consequences of environmental degradation	Mentions
Fewer or otherwise altered harvests (including from blight and water supply irregularities – drought, flood)	31
Destruction of housing	7
Loss of livestock (including from disease and destruction/reduction of pastoral lands)	7
Health concerns (disease and illness related to unsafe drinking water and insufficient food supply)	7
Issues with transportation and access to markets	3
TOTAL	**55**

"We moved because there was dryness in Atbara. We had to come here with our livestock because there was no water or food."

Kassala, Male DI Respondent

"Before, the rain wasn't as heavy as this. It's become a danger for farming and houses. Maintaining the crops is difficult because the water doesn't drain. Now, the timing of the rainy season changes every year: you are surprised, and you can't plan. Rain in the past would pour over 3-5 months. But now, it comes as a large amount all at once. You can't even reach your farm to maintain the crops to clean and such. The farmer needs help and support to be able to produce crops."

Kassala, Male DI Respondent

Quantitative survey data confirm the critical state in which many respondents find themselves with respect to loss of livelihood in their current communities. Respondents and their households had experienced a loss of crop production or an increase in animal deaths due to environmental factors 63% of the time (n=264). Among those who suffered issues with their food crops (n=264), the top three factors were crop diseases (32%), floods (17%) and drought (9%) (Figure 21: Food crop problems). Those who manage livestock have also had to contend with several challenges related to water availability and management (41% total, including drought, floods, and water scarcity) (Figure 22).

Figure 21: Food crop problems

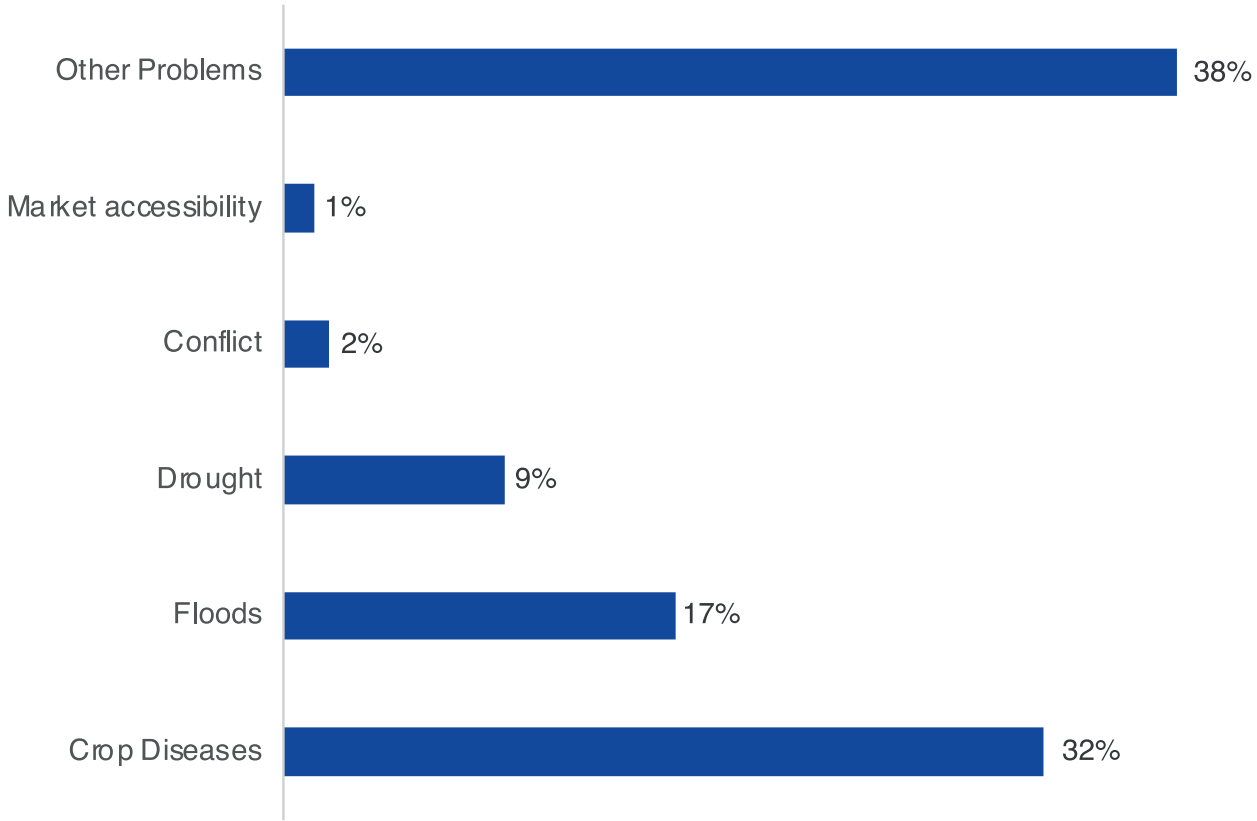
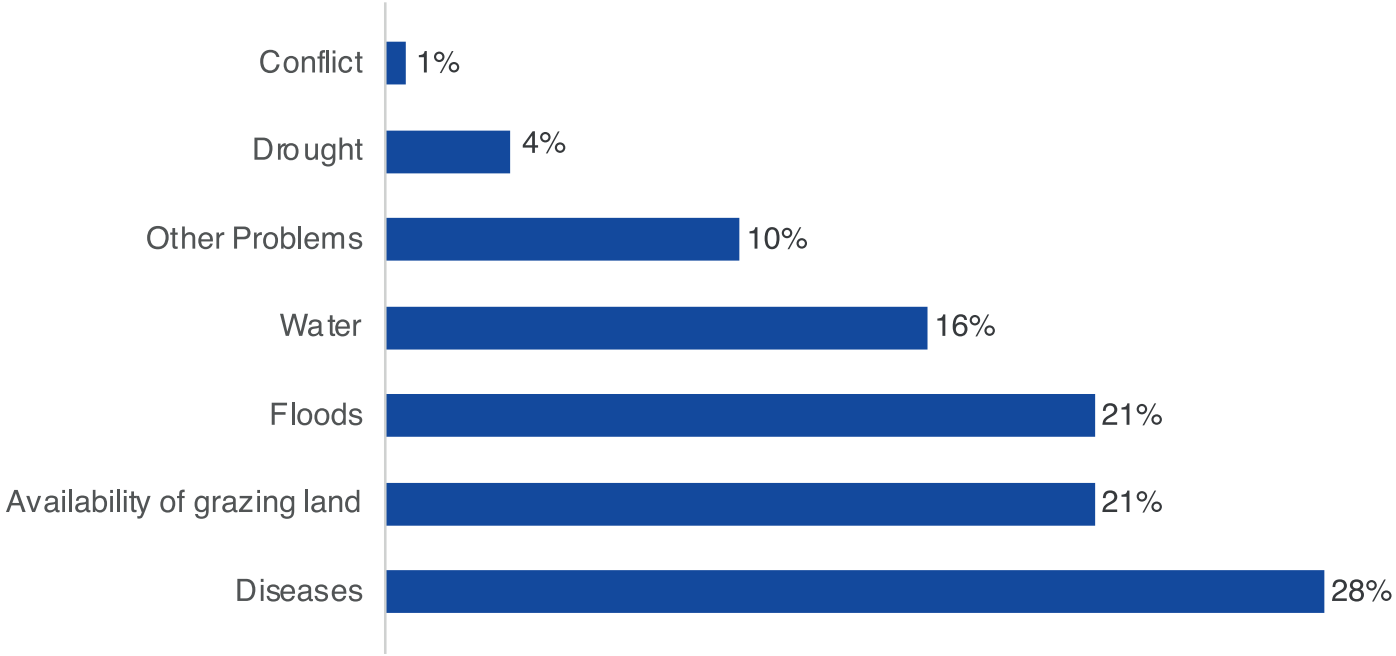
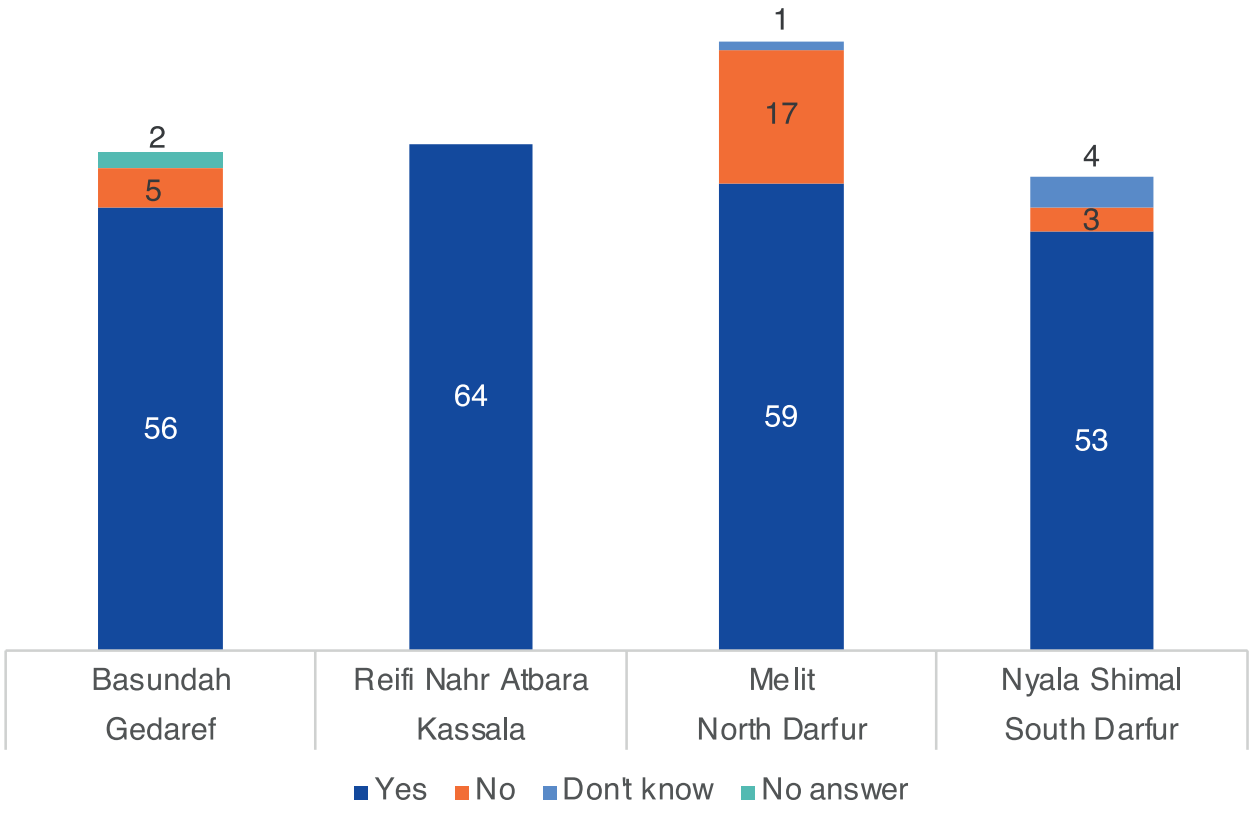


Figure 22: Livestock problems



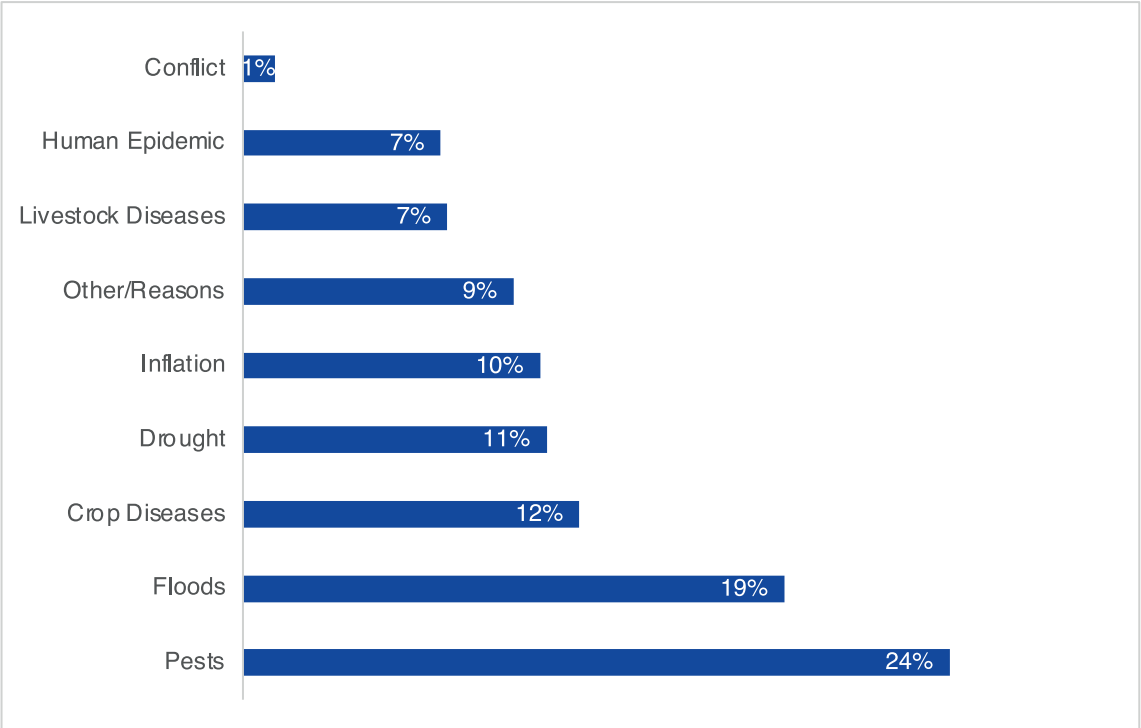
Overwhelmingly, quantitative survey respondents stated that they had experienced livelihood shocks in the last two years (88% of total, n=264), consistent across all study sites (Figure 23).

Figure 23: Experiences of livelihood shocks in the last two years by site (n=264)



Among all causes of livelihood shocks, after pests, climate change-related exposure to floods (19%) and drought (11%) feature among the top five (Figure 24).

Figure 24: Livelihood shocks in the last two years by type



These threats and shocks to livelihood are only accelerated and amplified by man-made factors. Several DI respondents in Kassala spoke vividly about this issue. For example, one male DI respondent stated, "the flooding is bad, but that's because of bad planning, and the water has nowhere to go." Another male DI respondent spoke about a frequent issue of heavy rain and flooding destroying housing: "when the rain happened, houses collapsed, and livestock died. Some livestock drowned, and some had houses collapse on top of them." A vast swathe of respondents mirrored this account.

Issues with general transportation infrastructure and engineering also lead to conditions where "during the rainy season, you cannot even reach the market. People die on the journey to the hospital because an adequate one is far away." The male DI respondent continued, noting that such conditions "make people leave, but people don't want to move. We are now living in the highest part (of the village). But the market is at the lowest part. This is all because of the engineer who planned it." And finally, solutions to one structural and environmental concern can lead to vulnerabilities in the face of another. As one IDP camp resident in South Darfur shared, "most camp residents try to build their houses from mud to avoid fire incidents, but with heavy rains since last year and this year, in particular, many areas were flooded, and the mud houses are more vulnerable to floods."

These and other dynamics illustrate the CCM Nexus: armed conflict leads to large-scale forced displacement and the formation of IDP camps. Residents of these camps, faced with little in the way of livelihood options, turn to woodcutting as a source of income, accelerating existing desertification trends and creating additional strains for farmers and pastoralists. The farmers, in turn, contribute to accelerating deforestation to clear land for an increased farming activity to compensate for the reduction in harvests. Deforestation was a recurring theme among policy and programme priorities discussions related to the CCM Nexus in Sudan.

"The areas that once were green are all cut right now, and this is becoming a common feature. This activity is driven out of necessity to survive the rampant unemployment rates. If people thought strategically, they could have planted trees ages ago."

South Darfur, FGD Participant

"Most people depend on agriculture; hence, the vast majority of trees have been cut down to prepare the area for cultivation."

North Darfur, FGD Respondent

Ethnographic Walk participants provided video support from their communities on how these dynamics manifest in everyday life in addition to flooded crops, limited water availability and loss of housing: e.g., impacts on education, health and access to essential goods and services. Of the responses that spoke to these concerns, 53% of EW respondents referred to the impacts of flooding: damages to homes, schools, and water sources (e.g., through contamination or infrastructure destruction). More significant infrastructural concerns, such as collapsed dams, unusable roads due to flooding and insufficient traditional dam structures, occupied the next largest category (35%). The remaining responses (12%) identified water scarcity as an issue that led to unsanitary conditions (open wells shared by animals and humans) and crop failure.

Collapsed environmental management infrastructures can also disrupt human ecology and threaten human security. For example, flooding can result in long-term road closures, limiting overall mobility (e.g., to schools and health care facilities) and, importantly, preventing access to critical markets. A male EW participant in Gedaref also showed an area that was once the site of a dam that had collapsed many years prior. "This dam had many benefits. You used to be able to catch fish by the bag full," he stated. "But it collapsed seven years ago, and now there is no benefit."

Environmental concerns, however, affect more than just this study's themes of conflict and migration. They also play a significant role in well-being and social cohesion. Among EW participants, 73% identified trees and gardens in their homes and communities as their favourite places to spend time. Another 50% stated that community problems are addressed, debated, and resolved under a tree or in other natural settings. This is a critical finding when considering the implications of natural environments for social cohesion beyond the mere provision of livelihood.

"This tree is a suitable place for us to spend our time during the day. We chat and laugh together and have food and tea. I come out and sit under the tree if I am alone."

North Darfur, Female EW Participant

"There is a stream, mountain, wells, and trees. This is the place where I come to relax and spend time. During school, I would come and study here between the trees and rocks."

Gedaref, Male EW Participant

"This [tree] is the place where the elders sit and solve [the community's] problems."

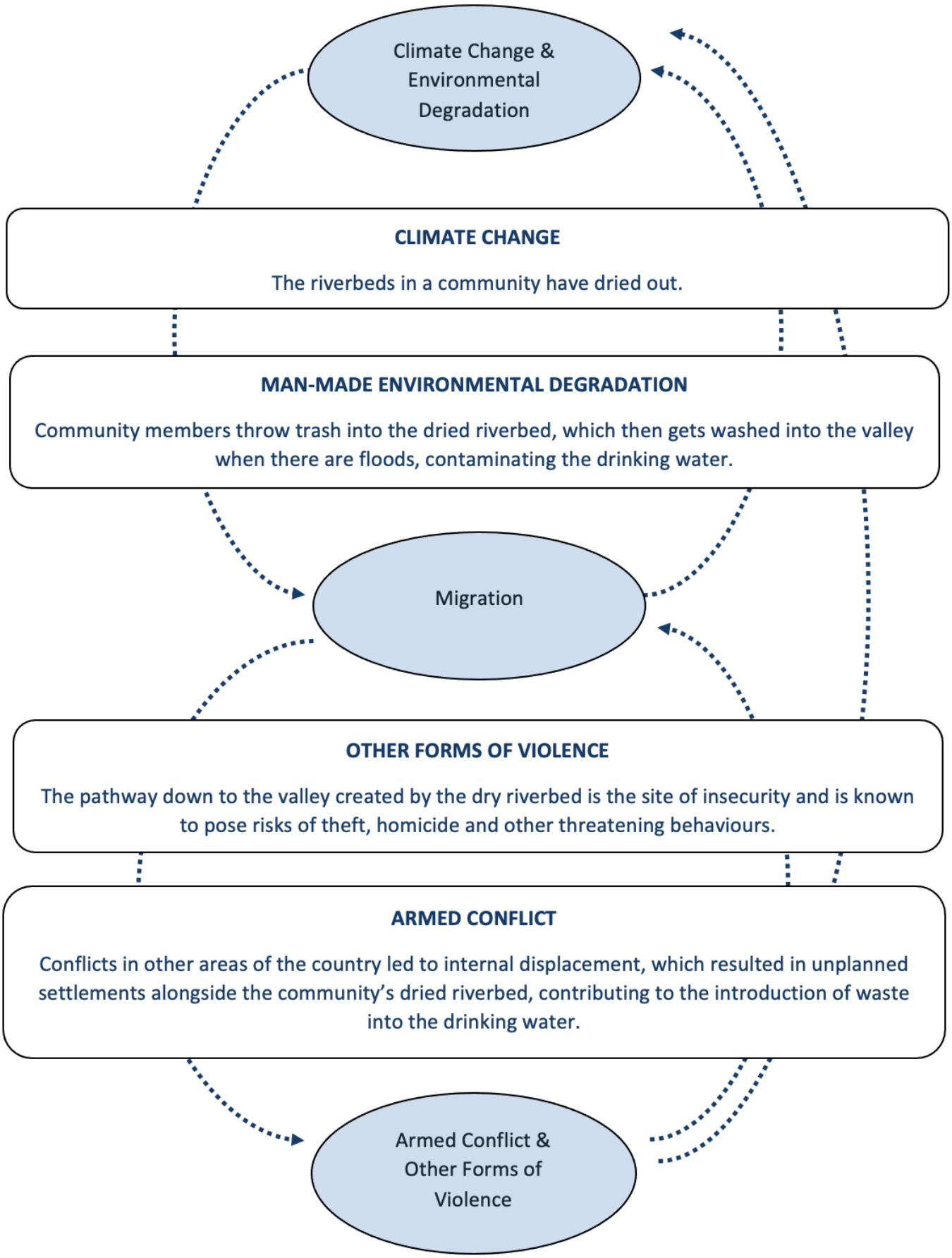
North Darfur, Female EW Participant

"This is the tree we meet under to solve our problems. This is our community sheikh. We sit here with people from the neighbourhood and the youth to see what the problems are and solve them."

Gedaref, Female EW Participant

Figure 25 illustrates how the dynamics of climate change, man-made environmental degradation and insecurity manifest in context, with details provided by one EW participant video.

Figure 25:The CCM Nexus in Sudan: Climate change, man-made environmental degradation and insecurity



4.2.3 Differential Impact According to Gender and Life Cycle

Across the qualitative instruments, there was a shared sense of how the effects of environmental degradation are experienced differentially according to gender and life cycle. Although it was previously established that critical impacts of both climate change and poor resource management manifest as the destruction of livelihood options, the role of women in adjusting to these changes is both evolving and contested. For example, one female DI respondent in Kassala reflected on moving from pastoralism to farming as a form of livelihood due to increased challenges to access to grazing land: "We expected that it would be easy, but actually, it has become too difficult. That's why we have settled here now. It isn't easy to travel every year. Now the youth take the herds. The women and old people now stay behind." Another female DI respondent in Kassala also identified the fact that gendered roles are changing in different ways as communities adjust their forms of livelihood resulting from pressures from environmental degradation. "The rural woman is productive: she leads the livestock, collects the wood, and collects the fodder. In addition, she now stays the longest in the area when the men go to graze."

Tensions along gender lines also emerge. One Public Sector stakeholder interviewed for this study spoke to the challenges faced in implementing a sustainable agriculture initiative among rural women. "The men don't want the women to participate in agricultural activities. After the successful onion and okra crops, the women pushed themselves harder to succeed because of the cultural aspect imposed by the men and the belief that they would not be able to do so."

The consequences of climate change and related environmental concerns also have distinct impacts on Sudanese youth. Youths sometimes cannot continue attending school when flooding damages transportation infrastructure and educational facilities. Girls are among the first to be withdrawn from school when families face livelihood and income loss and when transportation options to educational facilities become limited due to inaccessible roads. Additionally, several female DI respondents referenced the fact that their children must go to market each day to try and earn a living, as cobblers (boys) and tea women (girls), beginning from as young as eight years old. This limits their access to education, in turn.

In the DIs, female respondents tended to reference challenges with education more than did the male respondents. For example, in Nahr Atbara, the one female respondent noted that she worked as a teacher. As such, she identified the presence of job opportunities in schools as a key driver for migration decisions for both her and her sister. This respondent also referenced the precarity experienced in the education system: the members of her village do not allow girls to pursue education, and when students are wounded, they only have access to salt to try and sterilize the wound. The issue of education was mentioned by two female respondents in Gedaref: first, to call for the construction of a high school for girls in the area, and second to name the shortage of teachers in general.

"After I came to the city, I would tell people to come to Nyala – there are more services in the city while there are no services provided in the rural areas. People don't get educated because there are no school services. The children do not receive any education. We at least got educated here as children who came early and were later displaced."

South Darfur, Female EW Participant

"My family and I are thinking of leaving the village [because of flooding and loss of livelihood]. It costs 10,000 a week to send your daughter to school. That's 40,000 a month. Some people don't have that."

Kassala, Female FGD Participant

"But sometimes schools are far, and you need the girl at home for any reason that might come up."

Kassala, Female FGD Participant

4.2.4 Policy and programme success factors

Stakeholders and FGD participants identified two approaches that tended to support success in policy and program interventions designed to address the abovementioned challenges. The first is intentionally and strategically combining varied sources of financial, technical and political capital. The second is focusing on governance and adaptation capabilities.

To the first point, SI respondents asserted that combining various forms of capital - rather than simply injecting financial capital without technical support and political backing - led to more successful outcomes. Interviewees and participants across all data collection instruments emphasised the need to make alternative resources available, like fuel-efficient stoves (rather than wood-burning) and more durable building materials that can withstand flooding without contributing to environmental degradation and contamination. Interviewees also called for coordination of capital to prioritise water management resources – i.e., creating rainwater harvesting opportunities, repairing damaged water management infrastructures and building new dams using a community consultative process. Awareness raising about environmental issues is also critical, as is developing the technical capabilities of those charged with addressing these problems. Respondents identified a need for ensuring architects and civil engineers are qualified and educating and informing about climate change, environmental degradation and sustainability more broadly throughout organisations, institutions and society.

"The farmers understand changes in the weather as just luck. As an association, we want to fight this by raising awareness of climate change."

Gedaref, Grassroots Sector SI Respondent

"Building a few check dams will enhance groundwater recharge, making it possible for the local people to grow fruit trees and engage in irrigated farming."

North Darfur, FGD Participant

To the second point, SI participants agreed that successful programs and policies related to environmental degradation focus on governance and adaptation capabilities. Such approaches include climate adaptive approaches, such as improved seeds and early warning and response systems. They also take advantage of economies of scale, supporting the development of advanced production techniques and significant capital investments. The development, dissemination and ongoing support of sustainability practices – crop diversification, reforestation, renewable energy sources – has also met with some success. Water and land management, legal frameworks and oversight can also support necessary infrastructure construction, as can the distribution of rain gauges to relevant populations.

4.3 Conflict: Multiple dividing lines and local conflict resolution mechanisms

4.3.1 Tensions over access to resources

SI respondents tended to agree that existing and potential sources of conflict, violence and other forms of insecurity tend to emerge around competition and other tensions over access to natural resources. Land disputes comprise one possible source of tension. Conflict can also occur during policy and programme implementation – e.g., when one group feels disadvantaged or is not equally benefitting from a given policy or programme – and it can exacerbate or materialise along inter-tribal or other group identity lines, escalating when local conflict resolution mechanisms or public forces capabilities fall short. Accordingly, stalled policy implementation, theft of various forms of capital, gender-based violence and violence against children are frequent outcomes of these events. Among the attributions for these challenges is a lack of diversity in decision-making bodies managing resource allocation decisions.

> *"The communities are experiencing a great deal of hardship due to the effects of climate change. It leads to a rise in temperature and human movement, which can cause conflict; it also leads to a decrease in the quality of grazing land, leading to conflict between different communities. In certain years, nomads shift their migratory origins in response to climate change and its consequences on grazing pastures. Additionally, a lack of water intensifies disputes between farmers and nomads."*
>
> *South Darfur, Academic Sector SI Respondent*

Quantitative survey data supports SI findings that lack of access to environmental resources connects to conflict. Among the respondents who cited intercommunal clashes as the reason for leaving their former homes (n=10), 100% identified contests over natural resources as the reason for those tensions. Table 8 details the breakdown by state and resource type.

Table 8:Tensions over access to natural resources by state and resource type

	Which ones			
STATE	Grazing land	Water	Other/Politics	Total
Gedaref	2	3	1	6
Kassala	0	0	0	0
North Darfur	2	0	1	3
South Darfur	0	1	0	1
Total	4	4	2	10
%	40%	40%	20%	

From the outset, it is essential to distinguish between access to resources as a *cause of new forms of conflict* versus a *catalyst of existing intergroup divides*. It would be misleading to state that one or the other is the only dynamic occurring in the Sudanese context: both are present. Therefore, any contextual analysis of these themes should bear these distinctions in mind and conduct highly localised and participatory assessment

processes, given the importance of the differences between the two and their implications for policy and program implementation.

> *"The beginning of the conflict was with water. The tribes used to organise themselves by resource."*
>
> *North Darfur, Public Sector SI Respondent*

To illustrate, DI respondents noted how climate change and other forms of environmental degradation amplify (rather than create new) vulnerabilities related to the history and condition of violent conflict and intergroup tensions. These circumstances have already resulted in particular vulnerabilities among affected populations (e.g., destruction of livelihood, forced displacement, physical injury, and loss of loved ones). Adding to that, the effects of climate change and environmental degradation result in conditions such as unpredictable rainfall, flooding, water scarcity and issues with accessing land. In turn, affected populations experience a compounded suite of vulnerabilities: resulting resource and infrastructure strains create and renew intergroup conflicts and tensions.

Figure 26 illustrates this amplifying dynamic.

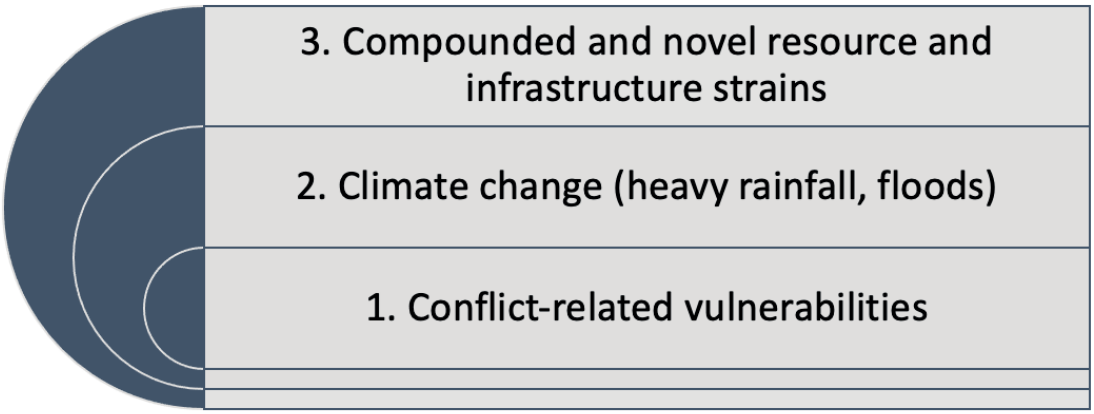


Figure 26: Relationship between climate change and environmental degradation dynamics as amplifiers of existing vulnerabilities related to violent conflict and intergroup tensions

Several examples of this amplifying dynamic emerged among DI and SI participants. For example, a Public Sector SI respondent in North Darfur asserted that violent displacement resulting in IDP camps combined with the deterioration of grazing pastures produced a higher risk scenario for conflict over land holdings. "Most of the conflicts in El-Fashir occur because most of the IDPs used to cultivate in the surrounding areas while the nomads also are coming closer to town, which is creating pressure on the land around the main town and leads to conflicts over land." Another Public Sector SI respondent in South Darfur reflected on how increasing water scarcity had activated conflict along pre-existing dividing lines when he stated that "there was intertribal conflict, which has now erupted again due to competition over water resources - an impact of climate change because of poor grazing lands leading to conflicts between farmers and nomads." Similarly, a Public Sector

official in Kassala noted that, because "the people mainly depend on agriculture" the changing rainfall patterns "bring in resource competition and tribal conflict, which has happened recently." Tribal conflict is not a new phenomenon, but histories of conflict and precarious circumstances can re-emerge and intensify when climate change and environmental degradation result in an increased strain on already stressed infrastructures and resources.

4.3.2 Risks of forced migration and other forms of insecurity

Respondents consistently identified three pressing consequences of armed conflict, intertribal and intergroup violence. The first occurs on the migration journey itself, and can materialize along gendered lines. For example, among the DI respondents in Melit, North Darfur, eight of the twenty-one respondents were female. Among the violences experienced on the migration journey, one woman reported both her husband and brother were killed by attackers along the way. Others reported multiple instances of sexual assault, removal of clothes and valuables. Female respondents in Nyala also identified the issue of targeted attacks of male members of the migrating party – some killed, others arrested – in addition to the many other difficulties encountered on the journeys, the majority of which were made on foot.

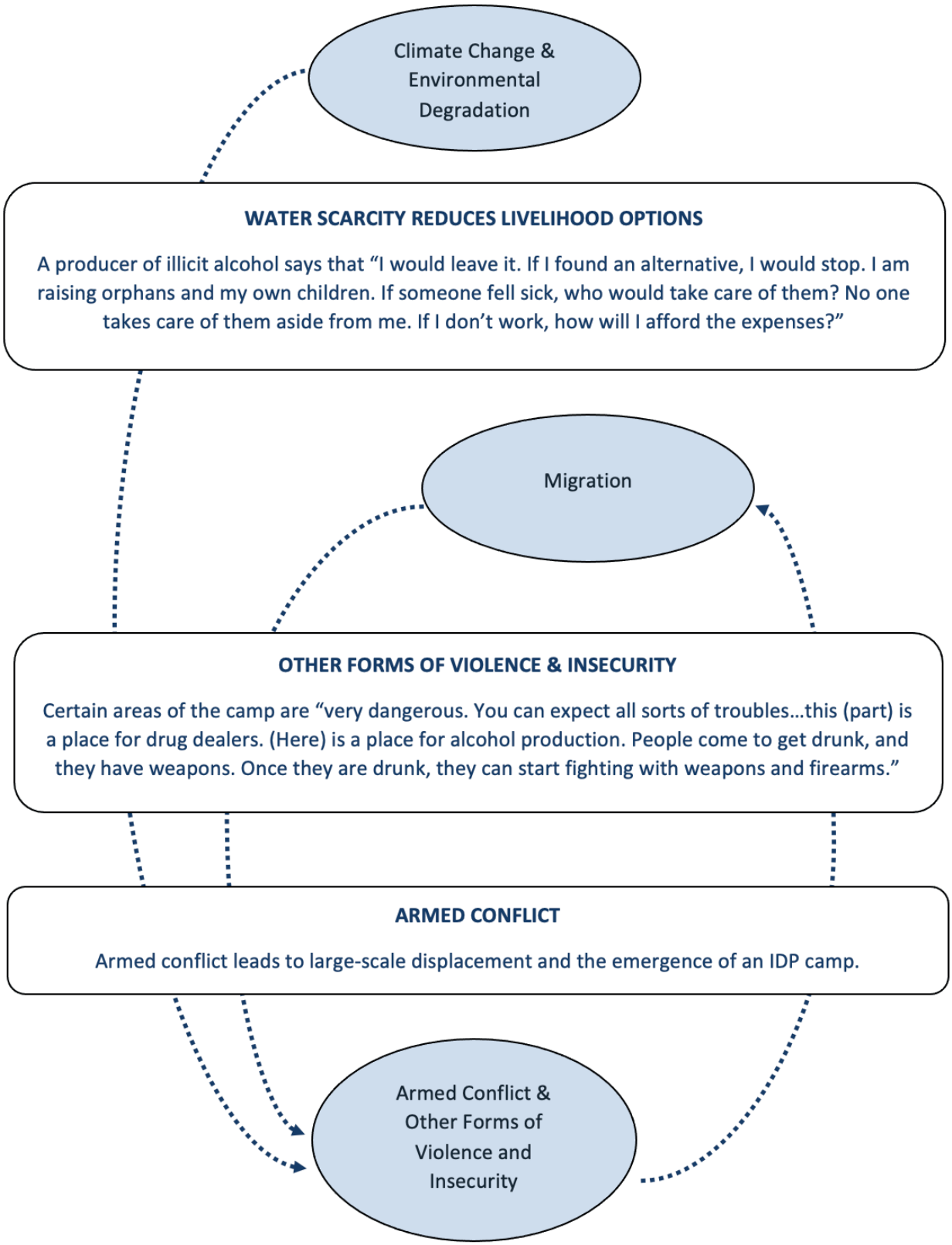
A second consequence of armed conflict and intergroup tensions and violence is economic in nature. For example, migrants displaced from internal conflicts are believed to work for lower wages than other area residents, which places downward pressure on wages and further exacerbates tensions between migrants and host communities. A third consequence of insecurity is the disruption or relocation of critical development projects. In Abuzeriga, for example, drilling activities were halted due to the conflicts in the area.

However, conflict over natural resources is not the only concern threatening the physical security of study participants. Most notably, in the Ethnographic Walks, respondents elaborated on how more localised conflicts connect to drug and alcohol abuse and other public order concerns. These dynamics have a disproportionate effect on children and youth. Facing a town square between three schools, one female EW respondent indicated a corner "famous for drunks. There are conflicts daily. We have lost a lot of youth in the area due to drinking and criminality. They get drunk and fight each other." Drug and alcohol production, sales, and the availability of illicit arms also featured as security concerns at the community level. Figure 27 illustrates how these dynamics interact with the limited alternative options resulting from water scarcity.

4.3.3 Coping and Adaptation Mechanisms

The EW data offered meaningful insight into existing conflict resolution and justice mechanisms at the community level. Evidencing the prevalence of forms of regular deliberation and collective problem-solving referenced in the above section, 100% of respondents identified a public space in which organised problem-solving committees meet regularly to address social issues – e.g., housing, interpersonal conflicts, and social issues. In each instance, these problem-solving and conflict-resolution mechanisms integrated some combination of residents, community leaders, religious leaders, and local native administration officials to varying degrees of representativeness. Respondents noted that these committees had filled the gap of formal judiciary sector shortcomings when necessary.

Figure 27:The CCM Nexus in Sudan: Migration, conflict and limited livelihood options in an IDP camp as narrated by EW respondents



"This is where we have sessions to discuss all issues like health, water, food, conflict, and education.

In this session, we solved a big problem, so it did not become a tribal conflict.

Goats were stolen that were owned by the Arab tribe…The case was brought forward, and they chased the three suspects in coordination with the police and the camp administrators...They did not go through the legal route; they sat with the leader of the Arab tribe and the camp leader and returned the goats. They also realised the thief was from the Arab tribe. The Arab tribe leader swears by the Quran that he will not hurt the camp's residents or escalate the situation."

South Darfur, Male EW Participant

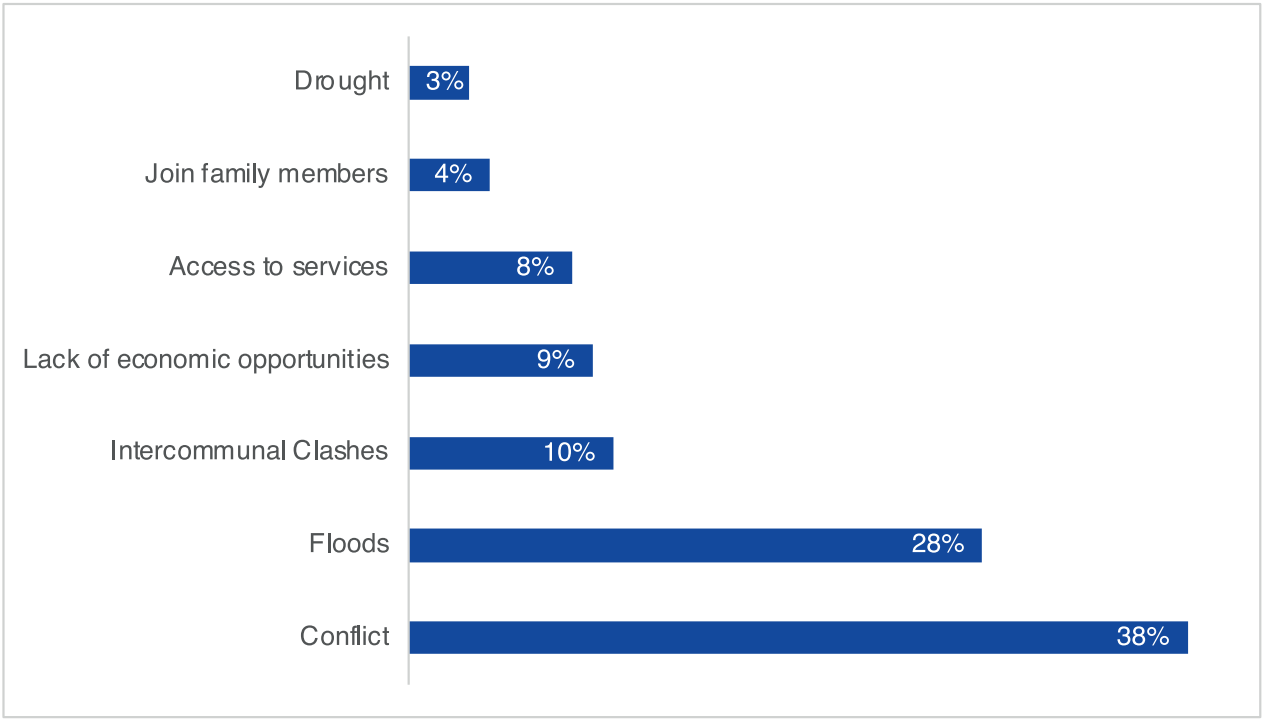
Across communal, organisational, and institutional respondents, there was agreement that those policies and programs that focused on governance and adaptation capabilities were better positioned for success when they bore the following three characteristics: 1) they used inclusive approaches, 2) they addressed population management issues, and 3) they built upon existing capabilities. Inclusive approaches might include ensuring diversity in leadership demographics – gender, life cycle, nationality, tribal affiliation – and were thus better positioned to develop and implement solutions that benefitted multiple stakeholders. This last point was crucial when marginalisation could result in renewed or emergent conflict. Also, population management efforts were more effective when based on in-depth knowledge of and sensitivity to local conflict dynamics and intergroup tensions and divisions. And finally, strengthening community capabilities for non-violent conflict resolution and internally developed transitional and restorative justice strategies also supported adaptive capabilities and resilience.

4.4 Migration: Conflict, climate change and amplifying factors

4.4.1 Conflict and insecurity and changing patterns of youth migration

DI participants and quantitative survey responses converge in claiming that **violent conflict and intercommunal clashes constitute the single most significant driver of decisions to migrate**. Among DI respondents, 36% of references to migration catalysts identified conflict as the reason. According to quantitative survey responses, the top three reasons for displacement (n=78) were conflict (38%), floods (28%) and inter-communal clashes (10%) (Figure 28). Compounding the harmful effects of conflict-related displacement, respondents noted that once the land has been abandoned, it can be subsequently occupied and then violently retained by a wide array of armed actors – organised or independent.

Figure 28: Reasons for migration or displacement



However, only 30% of quantitative survey respondents (n=264) had experienced migration or displacement in the five years before the study. The site-specific breakdown can be found in Figure 29. Among those populations who had migrated, respondents spoke about their dispositions towards their migration histories in 21 instances. Figure 30 elaborates on the proportion of each disposition, with experiences of community rejection and not being able to migrate despite a desire to do so occupying nearly 50% of all responses.

Figure 29: Reported migration or displacement in the last five years by site (n=264)

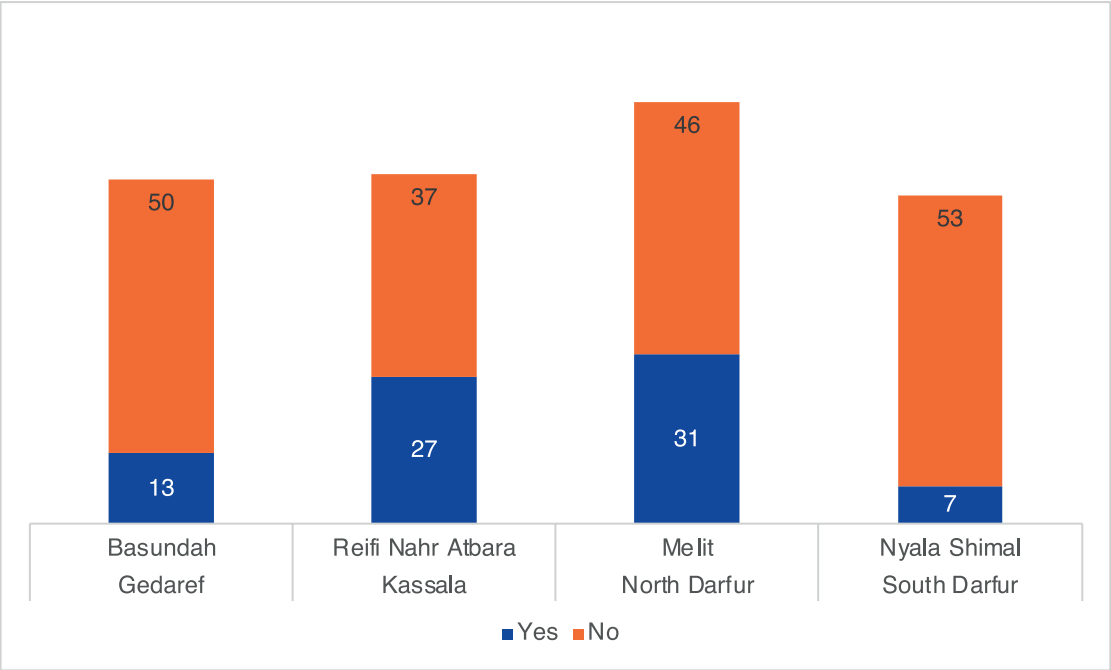
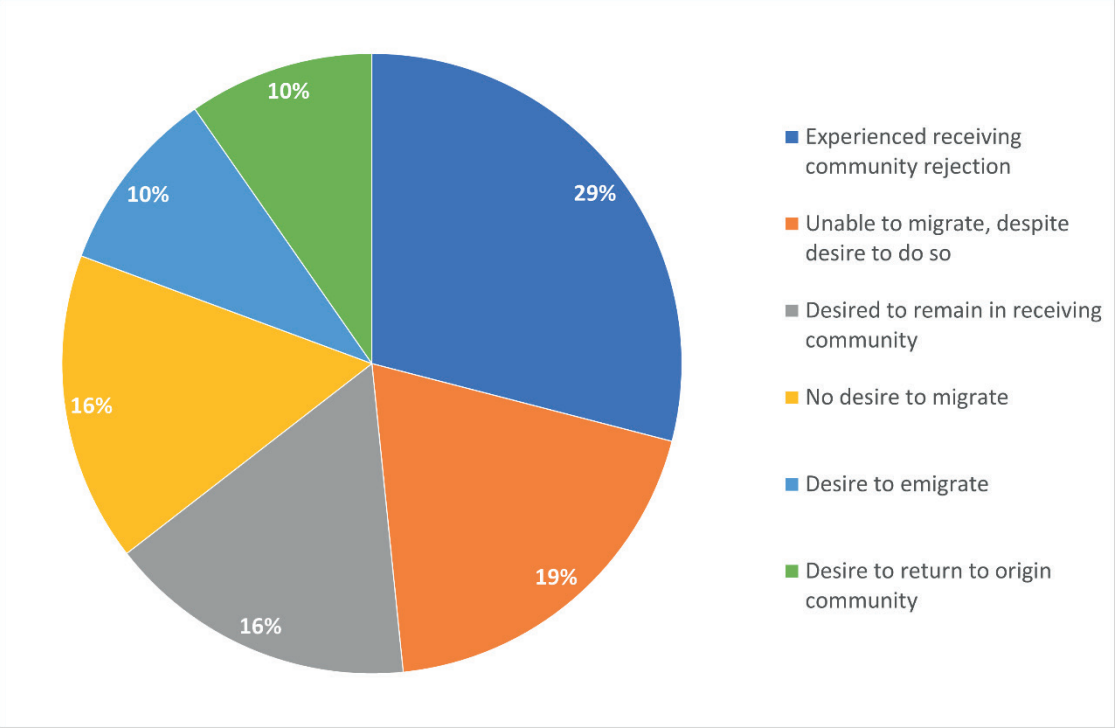


Figure 30: Dispositions towards most recent migration and receiving community



"If it weren't for the lack of job opportunities, I wouldn't have to leave."

Kassala, Male DI Respondent

"I hope to return to my village, but the general security and other difficulties - like basic services (water, school, clinic) - prevent me."

South Darfur, Female DI Respondent

"I faced many difficulties. But then, comparing it to the difficulties here, it is more difficult. I didn't want to move back here regardless."

Kassala, Male DI Respondent

Of note in the DI data, youth migration patterns related to employment and livelihood have been changing distinctly from those of adults in terms of frequency, age, relationship to the rest of the family and available income-generating options. Figure 31 summarises these changes and offers supporting quotes.

4.4.2 Tensions and amplifying factors in the CCM Nexus

Regarding managing migratory flows, SI respondents at the national and local levels identified issues related to physical infrastructure: already strained and poorly maintained resource and public service systems become overburdened in the face of unplanned, rapid population expansion. These conditions can lead to significant deleterious environmental effects, as is the case with unmanaged deforestation practices. Additionally, water management infrastructures that cannot handle the additional population demands fall short, leading to an increase in water scarcity and the spread of disease due to the consumption of contaminated drinking water.

"When people migrate because of conflict, they will rely on scarce resources, such as firewood, which will lead to deforestation and desertification due to the massive cutting down of trees."

South Darfur, NGO Sector

Figure 31: Changes in patterns of youth migration in Sudan with supporting quotes

Youth constitute a significant portion of migrants and their movements are increasing.

- We have much migration by our youth. From those employed and unemployed. I have noticed that this has increased so much. Back in the day, when someone came back to the village after migrating, it was a big thing, and the whole village would go to greet them. But now you don't even flinch when they tell you someone came back. Kassala, Male DI Participant
- We need to raise awareness among youth about irregular migration. North Darfur, FGD Participant
  Because of the lack of livelihood opportunities, youth are engaging in migration the most. North Darfur, FGD Participant

Youth are staying at or returning home at a later age.

- I went to look for gold for 11 months in al Nimr mountains in the Northern State. I had some luck but not what I wanted. Then I moved back to the village again. I hate that I still rely on my parents for my expenses. I shouldn't do that as a 26-year-old. Kassala, Male DI Participant

Young people are splitting from their families.

- Back in the day, the whole family would travel. Now the family splits, the youth go and then come back for the harvesting. Half the family stays behind to plant, and the youth travel with the livestock. Kassala, FGD Participant

Youth involvement in illicit activities is increasing.

- A new negative situation that I have noticed is the increase in use and dealing of drugs by youth - even trafficking and trading in people. Gedaref, Male DI Participant
  A substitute should be provided to these youth who do woodcutting. The government should enforce policies – these people are forced to resort to this. The government should provide opportunities or else these harmful environmental practices will continue. South Sudan, FGD Participant

Pastoralist responses to the reduced viability of historically employed grazing lands included moving towards other sites and straining fodder resources for the host population's livestock. Both farmers reported feeling that pastoralists are overrunning their lands, and pastoralists reported feeling that farmers are encroaching on their routes. When each understands the others' movements as trespassing, it leads to conflict. Additionally, issues related to human trafficking, arms smuggling, narcotics, capital goods, and family separation created additional concerns around the issue of human security. In light of these factors, the risk of inter-tribal and other inter-group conflicts also increases.

"We suffer from the pastoralists that come from outside. They create fodder gaps, affecting the pastoralists who stay here."

South Darfur, NGO Sector

"There will be issues between the farmers and the pastoralists because good farm and grazing land not affected by the floods is limited."

Kassala, FGD Participant

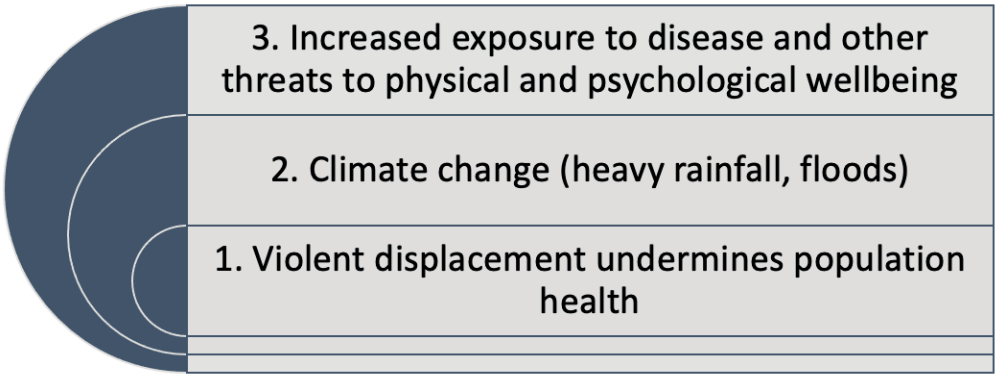
Such emergent tensions have concerning effects on economic production and viability. For example, farmers moving to urban areas to find more sustainable livelihoods result in an overall reduction in the country's agricultural production capabilities. The previously mentioned downward pressure on wages has increased the relative cost of living for all residents, resulting in tensions between host and migrant communities. Those tensions, should they escalate, can deter business and development agencies from implementing projects in those sites, creating a doubly negative feedback loop that further exacerbates existing vulnerabilities.

There is a high demand for local commodities, and we host communities get negatively affected. When there is migration, the small-scale farmer gets affected because it creates resource competition. A sack of bread used to be 10,000 SDG, and now it's 35,000 SDG.

Kassala, FGD Participant

Other negative impacts on human security of unplanned migration resulting from CCM Nexus dynamics emerged. FGD participants tended to agree that these dynamics converge to increase the risk of gender-based violence, loss of life to armed violence, the dangers of the migration journey itself and increased risk of human trafficking and other forms of smuggling. Referring to seasonal migration and its challenges, one FGD respondent in South Darfur asserted that "every harvest season we go, and we come back with dead bodies. There is a neglect of security issues." Figure 32 illustrates how these CCM Nexus dynamics amplify one another.

Figure 32: Relationship between climate change and environmental degradation dynamics as amplifiers of amplify existing vulnerabilities related to adverse health outcomes and violent displacement



Several examples of the above amplifying dynamic emerged throughout the qualitative data instruments. For example, one male DI respondent in Kassala explained how flooding added additional layers of insecurity to existing challenges to mobility. "During the rainy season especially, health becomes a big problem. Women who are giving birth and people that are sick: we can't get them to the health centre. There's no health centre nearby that can help." Separately, five respondents in Kassala across three data collection methods raised the issue of malaria related to flooding. One male DI participant highlighted how already vulnerable healthcare conditions in the IDP camps were exacerbated by regular flooding. "The flooding brings mosquitos and malaria and various diarrhoea-related diseases. The spread of diseases in camps and, by extension, to neighbouring communities is also dangerous and affects everyone."

In terms of human mobility, such amplification effects are also present. Farmlands already hard to access are made unreachable due to heavy rainfall, leading to environmental displacement. Climate adaptive solutions, such as improved seeds, struggle to reach intended beneficiaries when distribution vehicles cannot reach their destination due to washed-out roads. And the reduction in productive farming and grazing land puts populations at odds with one another to survive. As one male DI participant in North Darfur summarised, "Pastoralists have to move farther every year to find good pasture. Most camp populations depend on charcoal or firewood, which has led to the removal of most of the forest, and desertification will increase, further affecting the farming and grazing land."

4.4.3 Challenges and migration decision-making factors

Individuals impacted by CCM Nexus dynamics who participated in this study tended to make decisions to migrate according to a combination of the following criteria:

1. **Presence of violence and other tensions**. Generally, the presence of an immediate existential threat.
2. **Economic viability**. A lack of economic viability in the place of origin may necessitate migration. However, when survival is not the primary driver, other factors come into play, such as the ability to secure required transportation, the ability for the individual, spouse and children to work in the destination community and the comparative availability of essential services in the destination community. Aspects of securing livelihood include alignment of skill sets with the destination community's job market and the ability to sustain oneself if there is an increase in the cost of living.
3. **Socio-familial ties**. The presence of family or friends in the destination community was an overwhelming factor in decisions about whether to go and where to migrate. Additionally, FGD participants reflected at length on the risks posed by hostile community reception or outright rejection upon arrival and their corresponding psychological and economic consequences.

The FGD participants in both Kassala and South Darfur spoke at length about the relative benefits of rural-rural vs rural-urban migration resulting from CCM Nexus dynamics. Decisions were made in light of a confluence of individual, familial, social and structural factors. Opportunities in urban settings include acquiring new, marketable labour skill sets, better access to essential services (e.g., water, education, healthcare, and food – including more diverse nutritional values) and the option to migrate seasonally between rural and urban settings depending on climate considerations.

However, serious concerns were identified. First, respondents stated that urban contexts suffered from high levels of unemployment, strains on resource management infrastructures and availability, weaker family, social and community ties, various forms of urban insecurity and relatively expensive housing compared to wages. Second, large-scale rural-to-urban migration could reduce national agricultural production, a critical economic sector in Sudan. And third, racial or tribal discrimination, suspicion or perceived threats to resource access increases the risk of rejection of the individual and his or her family by the receiving community.

4.4.4 Successful approaches to orderly and dignified migration

DI respondents were asked to identify the sources of support they received during their migration journeys, including resettlement. Most used adaptive strategies involved deploying familial and social networks as well as and local conflict-resolution mechanisms for support. For example, due to the frequent flooding, family and communal networks often mobilise to receive temporarily displaced relatives. Additionally, communities have existing mechanisms and practices to cope with flooding: e.g., a designated member to stay behind and save what they can, information sharing networks and methods between communities and temporary shelter practices. Finally, communities – both origin and receiving – are already organising to address energy and environmental issues and have existing mechanisms for conflict resolution.

However, significant needs and vulnerabilities remain. Facilitating regular, orderly and dignified migration tied to CCM Nexus dynamics requires additional support in terms of issuing documentation (birth certificates, identification), addressing widespread discrimination against certain groups of migrants, fostering multilateral cooperation with bordering nations and raising awareness about the risks and consequences of irregular migration, especially among youth.

"If a woman gives birth here, they do not get a birth certificate, and their marriage certificates are also absent. There's a big issue with birth certificates. So many people left schools because of this issue. Some of my Sudanese friends and others are doctors and educated. We are willing to learn but don't have the papers to enroll."

Gedaref, FGD Participant

"We (Ethiopians) are born here and are not given papers or cards. We do not benefit from Ethiopia or Sudan because we don't have papers for either (caught in limbo). They say you're not Sudanese in Sudan as you don't have papers. I am told I am not Ethiopian in Ethiopia as I don't have papers."

Gedaref, FGD Participant

According to stakeholders across all sectors, policies focused on migration governance and risk mitigation tended to meet with greater success. In terms of governance, respondents emphasised the need to enforce both international migration laws and comply with international labour agreements as well as reinforce the implementation of national labour laws and strengthen internal migrants' access to services. Risk mitigation is built off these governance capabilities, and dedicated efforts to family reunification should be developed, especially to mitigate the risk of exploitative practices, including various forms of smuggling and trafficking.

4.5 Key Findings, Implications and Recommendations

This section summarizes the key findings from the analysis in the previous sections. In sum, the Climate Change, Conflict and Migration (CCM) Nexus in Sudan materializes as a convergence of the following:

3. Climate change and environmental degradation represent the most consistently voiced concern among migrant and host communities and stakeholders across all sectors.
4. Violent conflict and intercommunal clashes are key drivers of migration, and environmental degradation can amplify vulnerabilities related to these forms of insecurity.

In the section below, findings summarised from the prior analysis are included according to the specific element of the CCM Nexus that they address.

4.5.1 Sudan Key Findings and Implications

Environmental degradation and its consequences represent the most significant concern among study participants across all instruments. These findings suggest that environmental degradation is an urgent issue that must be addressed. Sustainable water management strategies are urgently needed to improve access to clean water and protect the environment.

Loss of land and livelihood is the most significant threat posed by climate change and natural and man-made degradation. Climate change-related exposure to floods and drought were among the top five causes of livelihood shocks. However, man-made factors such as deforestation and poor infrastructure and engineering have exacerbated environmental degradation. These conditions can also pose adverse effects on well-being and social cohesion.

Environmental degradation is experienced differently according to gender and life cycle. Women are often responsible for adjusting to the changes brought on by climate change. Still, programmes targeting them may sometimes be met with resistance from men (examples of men's support for such programmes were also found). Youth are also particularly affected by the consequences of climate change, as flooding and other forms of environmental degradation can limit their access to education – especially for girls. This highlights the need for policies and initiatives that address the gendered impacts of environmental degradation on adults and youth.

Combining financial, technical and political capital and focusing on governance and adaptation capabilities are two approaches that tend to support success in policy and programme interventions designed to address environmental degradation challenges. In the Sudanese context, this requires awareness raising, the availability of alternative resources, such as fuel-efficient stoves and alternative building materials, prioritisation of water management, support infrastructure construction, update and improvement, development and dissemination of sustainability practices and development, application and enforcement of related legal frameworks.

Climate change and other forms of environmental degradation amplify pre-existing vulnerabilities related to the history and condition of violent conflict and intergroup tensions. Multiple data sources confirmed that existing and potential sources of conflict, violence and other forms of insecurity tend to emerge around competition over access to natural resources. Additionally, conflict over natural resources is not the only security concern for study participants, as drug and alcohol abuse and other public order concerns are also present.

Joint problem-solving committees are an essential form of conflict resolution. Those policies and programmes that focus on governance and adaptation capabilities are more successful when they are inclusive, address population management issues and build upon existing capabilities. Thus, promoting non-violent conflict resolution and justice mechanisms at the community level is crucial, ensuring diversity in leadership demographics and building upon an in-depth understanding of local histories of conflict dynamics.

Violent conflict and intercommunal clashes are the most significant catalysts for migration. Additionally, among those who had migrated, community rejection and inability to migrate despite a desire to do so were the most prominent dispositions held by respondents. Finally, youth migration patterns related to employment and livelihood have been changing distinctly from those of adults. They are more likely to migrate in search of employment and livelihood opportunities. These implications point to the need for more robust solutions to reduce the prevalence of violent conflict and intercommunal clashes and mitigate the effects of displacement on youth.

Unplanned migration due to CCM Nexus dynamics has far-reaching implications, including expanded environmental degradation, water scarcity, increased risk of conflict, public health risks, increased exposure to threats of gender-based violence, armed violence, human trafficking and family separation. These issues are further amplified by environmental factors such as heavy rainfall, leading to environmental displacement, reduced access to farmlands and destruction of housing. These findings suggest an urgent need for policies and strategies that consider the complexity of the CCM Nexus and its effects on migratory flows.

Individuals impacted by CCM Nexus dynamics make migration decisions based on violence-related factors, economic viability and socio-familial ties. The urban contexts associated with migration present both opportunities and risks. Programme and policy designers should thus be aware of the complex factors influencing decisions to migrate due to CCM Nexus dynamics. Policies should reduce the risk of violence and other tensions, improve economic viability in migrants' places of origin and mitigate potential risks associated with socio-familial ties. Additionally, policymakers should be mindful of the economic impacts and other risks associated with large-scale rural-to-urban migration.

Familial and social networks, existing practices for coping with flooding, non-violent conflict management capabilities, adequate documentation, initiatives to address discrimination and risk mitigation are essential for facilitating regular, orderly, and dignified migration tied to CCM dynamics. Achieving these conditions requires understanding migrants as individuals embedded in social networks and implicated in social dynamics, building holistic solutions to support them in this way.

4.5.2 Sudan Recommendations

1. **Design policy and programme recommendations that strategically combine different sources of financial, technical and political capital to address CCM Nexus dynamics**. This requires multi-stakeholder, cross-sector coordination led by the Government of Sudan (GoS). Technical support should strengthen GoS capabilities to design and execute such collaborations, national and state-level coordinated governance, technical training in CCM Nexus dynamic actions, consistent quality data collection, monitoring and knowledge exchange. Some examples of policy and programme initiatives that might support this recommendation include the following:
    a. **Work across sectors and stakeholder groups to advance initiatives that prioritise water management resources, physical infrastructure improvements and climate adaptive**

approaches as an opportunity to promote social cohesion and reduce unplanned migration – e.g., rainwater harvesting, and building new dams using community consultative processes. Include elements that address land management, transportation infrastructure and existing limitations and vulnerability to floods in the design phase. Engage intended beneficiary communities, academic, (I)NGO, grassroots and private sector partners from the outset and develop implementation plans that draw from the complementary strengths of each to avoid redundancy. Develop strategies to reduce environmental degradation, improve access to farmlands and support vulnerable populations, such as women and children, who are particularly affected by CCM Nexus dynamics.

b. **Use a research and action approach** to ensure data-driven solutions that support sustainability over the long term. Make resultant data sets publicly available and disseminate information about their availability widely.

2. **Strengthen implementation, oversight and enforcement of existing legal frameworks and other governance and conflict resolution mechanisms**. This will require supporting the GoS in the form of technical, financial and physical capital and training and mentoring for public officials. Institutional memory will pose a particular challenge given the high turnover of government officials in recent years. Working in conjunction with stabilisation programmes can reinforce and contribute to the success of efforts in this regard. When relevant and possible, develop new policies and initiatives that address in the aggregate multiple dynamics within the CCM Nexus. Equally, strengthening existing adaptive approaches to conflict resolution outside of government entities will provide a necessary complement. To support this recommendation, the following actions can be taken:

   a. **Develop inclusive decision-making bodies that reflect the diversity of and include representation from all affected groups to reduce the risk of conflict, violence and other forms of insecurity in Sudan related to access to natural resources.** These require in-depth knowledge of localised dynamics around gender and potential intergroup and identity-based divisions and should build upon existing site-specific efforts rather than imposing externally developed approaches. Key among considerations should be the effects of climate change and environmental degradation, which can amplify pre-existing vulnerabilities related to the history and condition of violent conflict and intergroup tensions.

   b. **Design and implement strategies that strengthen local inclusive approaches and address population management issues to promote successful justice mechanisms at the community level.** Ensure an in-depth understanding of local conflict dynamics to better promote non-violent conflict resolution and legal justice. Focus on transitional and restorative justice strategies to support adaptive capabilities and resilience. Leverage various mechanisms, such as community education and outreach, capacity-building programmes and legal reforms.

   c. **Support the GoS in developing and implementing policies to reduce the prevalence of violent conflict and intercommunal clashes**, as these are the most significant catalysts for migration together with economic considerations and the compounding effects of climate change and environmental degradation. Include measures to mitigate the effects of displacement on youth, such as providing access to education, employment and other livelihood opportunities. Additionally, introduce policies to reduce the likelihood of community rejection of migrants and to facilitate safe and secure migration. Integrate climate change recommendations as a measure to promote social cohesion by involving potentially conflicting communities in design and decision-making throughout.

3. **Conceptualise CCM Nexus and water scarcity dynamics as integral elements of security-building**. Much political, economic and international support capital in Sudan prioritises security-building and stabilisation initiatives. However, as this study shows, addressing CCM Nexus and water scarcity issues are the *sine qua non* of security and stability in the Sudanese context. Two clear findings emerged: insecurity exacerbates the adverse effects of CCM Nexus and water scarcity dynamics, and the negative impact of CCM Nexus and water scarcity dynamics inflame historically divisive intergroup tensions. Conceptualising these factors as integral to security can draw critical actors into dialogue and implementation efforts who might otherwise be tempted to sideline them as seemingly secondary concerns.
    a. **Reduce deforestation as part of a multi-pronged approach to addressing environmental degradation and easing tensions between migrant and host communities**. Provide alternative resources such as fuel-efficient (rather than wood-burning) stoves, especially for those whose wood-cutting activities directly affect the environment and surrounding populations. Make more sustainable housing materials available in terms of ecological impact and resilience to heavy rains and flooding. Couple this with programming that works to reduce the risk of rejection of migrants by receiving communities – i.e., through promoting cultural understanding, community improvement projects, and shared improvements in access to natural resources.
    b. **Develop awareness-raising campaigns about environmental issues that support social cohesion**. Educating and informing society about climate change, environmental degradation and sustainability are critical for successful interventions. Ensure targeted, location-specific messaging according to gender, life cycle, national origin and resource use (household, agricultural and industrial water use, dumping and deforestation). Focus on initiatives that target women and youth in particular. This could include initiatives that support women in adjusting to new livelihoods, as well as programmes that provide access to education for youth affected by environmental degradation. Additionally, stakeholders working on environmental issues should consider the potential gender-based tensions that may emerge during implementation and take steps to address them.
    c. **Provide education and awareness-raising activities in communities vulnerable to the risks associated with migration, such as increased exposure to gender-based violence, human trafficking and exploitation**. Promote awareness and understanding of the dangers and consequences of irregular migration, especially among youth, and work to develop dedicated efforts for family reunification to mitigate the risk of exploitative practices. Along with this, develop proactive approaches to migration management, such as developing early warning systems and providing access to accurate and timely climate, conflict and climate-related information.
    d. **Develop initiatives to reduce the risk of violence and other tensions and improve economic viability in migrants' places of origin.** Include initiatives to promote economic development and job creation in these communities, including addressing environmental degradation, and provide incentives for retaining family and social networks and support efforts to build bridges between tribes and communities.

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Appendix 1:

Review of contemporary academic literature on the Climate Change, Conflict and Migration (CCM) Nexus

Paper & Sites	Focus of Study	Data	Main Findings
(Linke et al., 2018) (Kenya)	Climate change and insecurity	• Individual attitudes and experiences (survey): precipitation change, violence, rules of resource use • Satellite images of vegetation: Standard precipitation index • Precipitation data: Standard precipitation index • Violent events reported in the media	• Drought modestly increases support for the use of violence • Local official and unofficial rules, as well as an increasing number of such rules during the last decade, eliminate these harmful effects in our preferred models and in many extended analyses
(M. B. Burke et al., 2009) (Sub-Saharan Africa)	Climate change and conflict incidence	• 18 climate models running the A1B emissions scenario (projected changes in temperatures and precipitation) • Alternative A2 and B1 emissions scenarios (robustness check) • Incidence of past internal conflicts (historical panel) • Political regime and per capita income (controls)	• Historically temperature variables are strongly related to conflict incidence • A 1 °C increase in temperature leads to a 4.5% increase in civil war in the same year and a 0.9% increase in conflict incidence in the next year • When conflict trend combined with future climate projections: 54% increase in armed conflict incidence by 2030 (additional 393,000 battle deaths)
(van Baalen & Mobjörk, 2018) (East Africa)		Climate change, conflict incidence and conflict dynamics	• Environmental change severely affects people dependent on renewable natural resources for their livelihoods. (Freshwater, grazing lands, livestock, cropland) • Those unable to sustain themselves may join an armed group • Internal migration leads to pressures on the economic resource base, increasing the risk of local resource conflicts. Migration can also lead to ethnic tensions that result in violent conflict. Moreover, changing pastoral mobility patterns bring communities together that may lack shared conflict resolution institutions • Armed groups act on the opportunities afforded by climatic conditions. Weather patterns and climate variability affect tactical considerations since they determine the level of camouflage and the mobility of forces and material

			• Antagonisms between groups (due to resource scarcity, migration) are exploited by elite political entrepreneurs. Local elites are likely to seek alliances with national elites in order gain the upper hand in local conflicts. • While resource scarcity is by no means the only cause of local conflict, three quarters of all communal conflicts in Africa between 1989 and 2011 included land as an important source of contestation • Ambiguity of temporal distribution of violence: Lower monthly rainfall and the number of battle-deaths can be consistent with both support *for* and *against* the hypothesis that environmental change increases the risk of violent conflict • Resource scarcity should not only be considered in absolute terms (having less than before) but also in relative terms (compared with other individuals, groups, or areas) • Violent conflict resulting from climate-related environmental change doesn't emerge in a political vacuum and environmental changes do not mechanically determine human behaviour. Namely, even if resources are scarce, violent conflict only occurs under challenging governance conditions
(Abel et al., 2019) (Global)	Climate change and forced migration incidence	• Bilateral data on asylum seeking applications for 157 countries (2006–2015)	• No empirical evidence backing the existence of a robust link between climatic shocks, conflict and asylum seeking for the full period 2006–2015 • Model supports causal linkages for the period 2010–2012 when refugee flows emerged from Syria, Arab Spring affected countries and war episodes in Sub-Saharan Africa. The observed link between climate shocks, conflict and subsequent migration flows may be interpreted as a local phenomenon, which occurred specifically in these regions • Drought episodes can drive outmigration by exacerbating conflict in a country with some level of democracy • Climate contributes to conflict only in a specific period of 2010–2012 and specifically to certain countries, particularly those experiencing the Arab Spring. Climate change thus will not generate an outflow of asylum seekers everywhere but likely in countries undergoing political transformation where conflict represents population discontent towards inefficient government responses to climate impacts

(Raleigh & Urdal, 2007) (Global)	Climate change and insecurity	• Georeferenced version of the Uppsala/PRIO armed conflict data (internal armed conflicts with at least 25 battle deaths annually between two or more organised parties, of which at least one is the government of a state) • Multi-source data with indicators of freshwater scarcity, land degradation, and population growth and density	• Demographic and environmental variables only have a very moderate effect on the risk of civil conflict • On the global scale, medium to high levels of land degradation are related to increased conflict, as are very high levels of water scarcity • High population density, measured locally, is a consistently strong predictor of armed conflict • Lower levels of GDP are the most important predictor of armed conflict, with the exception of wealthier states where it exhibits an insignificant effect. States with low GDPs will depend more on their environment for individual and state income than states with higher GDPs. A poor state's inability, due to lower capacity as a result of lower national income, to attenuate tensions over degradation may quickly lead to violent conflict • Environmental and demographic factors may be second to other drivers of armed conflict. This could imply the importance of the state's role
(M. Burke et al., 2015) (Global)	Climate change and conflict incidence	• 50 quantitative studies that examine the link between climate and conflict (political science, economics etc.)	• Adverse climatic events increase the risk of violence and conflict, at both the interpersonal level and the intergroup level, in societies around the world and throughout history • Contemporaneous temperature has the largest average effect by far (2.4% per σ (1 change in climate variables) for intergroup conflict, 11.3% per σ interpersonal conflict), cumulative effect of rainfall on intergroup conflict is also substantial (3.5% per σ)
(Burrows & Kinney, 2016) (Global)	Climate change and conflict/forced migration incidence	• The available literature on the climate-migration-conflict nexus, including some of the key case studies in recent literature since 2000	• Scholars generally agree that climate change has the potential to increase migration and conflict risk • There has been increasing recognition of the complexity of the systems linking climate, migration and conflict, and the extent to which this system depends on social, demographic, economic, and political drivers that interact with climate variability and change. All of these are very location-dependent
(Biermann & Boas, 2008) (Global)	Environmental migration and global governance	• International treaties/charters codifying global refugee governance	• A new legal instrument specifically tailored for the needs of "climate refugees" is needed (Protocol on Recognition, Protection, and Resettlement of Climate Refugees to the United Nations Framework Convention on Climate Change) including a separate funding mechanism, the Climate Refugee Protection and Resettlement Fund • Reforming global refugee governance has many practical and political hurdles: Considerable financial burden on donor countries, climate change impacts are less prominent now than in the future, current efforts cannot predict what governments will do should the scenario predictions on environmental migration hold

(Jakobeit & Methmann, 2012) (Global)	Climate change and forced migration incidence	• Existing scientific literature on environmental and climate refugees • Reports from international organisations and NGOs	• The dominant quest for number estimates of refugees is flawed with conceptual problems regarding definition, causation, and prediction. It neglects the intense web of social, economic, and political factors in which climate change impacts are embedded and tends to present an oversimplified influence of climate change on flight and migration • The scientific debate on environmental and climate refugees is inherently politicized. Different ways of framing the climate–migration nexus might lead to different political responses • If research on the climate-refugees nexus overvalues ecological drivers of flight and migration if it takes no account of the contextual social, economic, political and institutional structures, which might have severe political consequences for the affected population • There is a complex interaction between social and environmental factors. Environmental and climate-related migration is an issue of multi-causality and can hardly be translated into the stages of a linear model. Therefore, a contextually nuanced framework is needed
(Busby et al., 2014) (Africa)	Climate change and regional vulnerabilities	• Mixed-source data on (i) Physical exposure to climate-related hazards (ii) Population density (iii) Household and community resilience (iv) Governance and political violence	• Adding in governance and political violence enhances the vulnerability of some places while decreasing the vulnerability of other places, including relatively well-governed countries. • Governance improvement is paramount. More accountable, responsive, and capable governments are integral to reducing household and community vulnerability, adapting to changing environmental conditions, and responding to inevitable extreme weather events
(Njiru, 2012) (Kenya)	Climate change and conflict incidence	• Qualitative data from the pastoralists and key informants from the Namanga location of Kajiado County and the Matuu location of the Machakos district • Literature from Kenyatta University Library, University of Nairobi and the internet	• Increasing global temperatures are having adverse socioeconomic effects on pastoral communities in Kenya • Climate change plays a crucial role in resource-based and interethnic conflicts among the pastoralist communities in northern Kenya
(Ubhenin, 2012) (Nigeria)	Climate change and conflict incidence	• Theoretical literature on relative deprivation and human needs theory • Current empirical literature on environmental change in Nigeria • Assessments of international organisations and NGOs	• The theories of human needs and relative deprivation were found useful for investigating the emerging 'climate conflict' in the country (climate as a catalyst of violence)

(Mach et al., 2017) (Global)	Climate change and conflict incidence	• 6-8 hours of individual expert-elicitation interviews (65 in total) and a subsequent two-day group deliberation	• There is agreement that climate variability and change shape the risk of organised armed conflict within countries. However, the role of climate is small compared to other drivers of conflict, and the mechanisms by which climate affects conflict are uncertain • As risks grow under future climate change, many more potential climate-conflict linkages become relevant and extend beyond historical experience
(Barrios et al., 2006) (Sub-Saharan Africa)	Climate change and urbanisation	• Cross-country panel data set that allows to estimate the determinants of urbanisation: (i) IPCC precipitation data (ii) Urbanisation data from UN World Urbanisation Prospects (iii) Controls from various sources including World Penn Tables (WPT) and POLITY	• Climatic change in terms of decreasing trends in rainfall provides some explanation towards the very different urbanisation patterns that have taken place in sub-Saharan Africa compared to other developing countries over the last several decades • While shortages in rainfall have acted to increase rates of urbanisation on the sub-Saharan African continent, there is no evidence of such for the rest of the developing world • This link was reinforced after the colonial independence of sub-Saharan African countries, which often resulted in the simultaneous lifting of legislation prohibiting the free internal movement of native Africans
(Bergholt & Lujala, 2012) (Global)	Climate change, economic growth and conflict incidence	• Panel dataset covering the period 1980–2007 and including 171 independent countries (4,455 country-year observations)	• Climate-related natural hazards have an impactful negative effect on growth • If climate change increases the frequency or makes weather-related natural hazards more severe, it is an economic concern for countries susceptible to these types of hazards • More frequent and severe climate-related disasters will ***not*** lead to more armed conflicts through their effects on GDP growth
(Couttenier & Soubeyran, 2014) (Sub-Saharan Africa)	Climate change and conflict incidence	• Large data set of Palmer Drought Severity Index (PDSI) values (1945–2005) • UCDP/PRIO Armed Conflict Dataset (1945–2005)	• The link between rainfall, temperature and civil war found in the literature may be driven by aggregate climate-related shocks that were not accounted for • Evidence for a positive link between drought and civil war is weak. Richer data are needed to obtain firm conclusions regarding the climate-conflict relationship
(L. Perch-Nielsen et al., 2008) (Global)	Climate change and forced migration incidence	• Conceptual models constructed with the existing scientific literature on the effects of sea level rise and floods	• The models show that the linkage between climate change and migration can be made explicit and that the 'common sense' (anecdotal evidence) approach can be expanded • The most important new variables were those added adjacent to migration, i.e., the various alternative adaptation options. It is the importance of these that is underestimated by the 'common sense' approach. It is shown that migration cannot be looked at separately but must be analysed in the context of its alternatives • Overall, the results suggest that floods will not likely be a major mechanism by which climate change will trigger mass migration • The overall connection between climate change and migration is stronger because sea level rise is caused to a large extent by climate change (in contrast to floods), and the link between the loss of land and migration is strong

(Raleigh et al., 2008) (Global)	Climate change, conflict/forced migration incidence and adaptation	• Data on the numbers of affected people by disaster and region (1968-2007) [Emergency Events Database (EM-DAT)] • Estimated risk of future environmental crisis within and across countries by tabulating future hotspots based on disaster risk, population density and subnational GDP	• Disasters vary considerably in their potential to instigate migration. Moreover, individual, community, and national vulnerabilities shape responses as much as disaster effects do • Individuals and communities in the developing world incorporate environmental risk into their livelihoods. Their ability to do so effectively is contingent upon their available assets • During periods of chronic environmental degradation, such as increased soil salinisation or land degradation, the most common response by individuals and communities is to intensify labour migration patterns • With the onset of a sudden disaster or the continued presence of a chronic disaster (i.e., drought or famine), communities engage in distress migration patterns. The characteristics of distress migration are quite different within and across countries as they are shaped by the severity and geography of a crisis, the ability of a household to respond, evacuation opportunities, existing and perpetuating vulnerabilities, available relief, and intervening government policies • As environmental migration is typically internal and short-term, the potential for instigating conflict is quite minimal. However, unstable urban and rural demographics are related to higher risks of civil war and low-level communal conflicts during periods of environmental stress are common
(Kartiki, 2011) (Bangladesh)	Climate change and forced migration incidence	• Literature on environmental migration • Fieldwork (101 household surveys, 22 expert interviews) carried out in rural Bangladesh in five villages in the districts of Satkhira and Khulna and slums in Khulna city, in the wake of cyclone Aila (2009)	• Migration in response to climate change should not be seen as a failure to adapt but as a strategy undertaken to increase household resilience. This will, however, happen when migration is planned and supported and not under distress: Resource scarcity at their destination, conflict with existing population, lower income and/or loss of rights during the process of resettlement in a new area

(Salehyan, 2008) (Global)	Climate change and conflict/ forced migration incidence	• Existing scientific literature on CCM Nexus	• (Environmental) conflict research has been overly reliant on measures of central government institutions and has overwhelmingly focused on indicators of democracy • Many environmental degradation indicators – such as soil erosion, clean water availability, and land degradation – are probably endogenous to human activity and failures of governance; the causal arrow may run the other way • Climate change, environmental degradation, and conflict relate to how environmental pressures and political failures reinforce one another. There may be multiple feedback loops by which environmental change weakens the state and fuels conflict, while governance failures make environmental conditions worse • Resource scarcity and environmental degradation may well lead to conflict, but such direct effects may be mitigated (or exacerbated) by other social and/or political factors. Therefore, rather than looking for direct effects, it is important to model contingent effects
(Raleigh et al., 2008) (Global)	Climate change and insecurity	• Existing scientific literature on the impact of climate change on armed conflict	• The hardships of climate change are particularly likely to add to the burden of poverty and human insecurity of already vulnerable societies and weak governments. Thus, climate change can be seen as a security issue in a broad sense. However, the conjecture that climate change might pose a threat to security in the narrower sense is far less certain • So far, the evidence is mixed whether there will be an increase in armed conflict as a result of climate change, and if so what types of conflicts are expected. Assuming such a link without the necessary evidence may lead peacemaking astray and can eventually also undermine the credibility of the IPCC and the efforts to reach a consensus of knowledge about human-made climate change and a concerted global effort on mitigation and adaption
(Barnett & Adger, 2007) (Global)	Climate change and insecurity	• Existing scientific literature on the impact of climate change on armed conflict	• Climate change undermines human security by reducing people's access to natural resources that are important to sustain their livelihoods. • Climate change is also likely to undermine the capacity of states to provide the opportunities and services that help people sustain their livelihoods and maintain and build peace. In certain circumstances, these direct and indirect impacts of climate change on human security and the state may in turn increase the risk of violent conflict

(Bernauer et al., 2012) (Global)	Climate change and conflict incidence	• Scientific literature on whether and how environmental changes affect the risk of violent conflict	• The available evidence from qualitative case studies indicates that environmental stress can contribute to violent conflict in some specific cases • Results from quantitative large-N studies suggest that conclusions have to be drawn carefully. The most sophisticated ones obtain results that are not robust to alternative model specifications and, thus, have been debated. This suggests that environmental changes may, under specific circumstances, increase the risk of violent conflict, but not necessarily in a systematic way and unconditionally. Hence there is, to date, no scientific consensus on the impact of environmental changes on violent conflict
(Peters, 2022) (South Asia, the Middle East, and Africa)	Natural hazards and conflict management	• In-depth interviews with disaster risk reduction (DRR) professionals in 25 disaster- and conflict-affected countries in South Asia, the Middle East, and Africa	• Disasters and disaster-related activities influence both conflict risks and peace potential through diverse and intersecting pathways that may occur simultaneously and restrain or catalyse each other, potentially stimulating uneven or even unexpected outcomes • DRR can contribute to conflict risk and peace potential at different institutional scales. For example, different social groups may act cooperatively to reduce their shared disaster risks where state-sponsored services are limited, which could ameliorate communal conflict while magnifying conflict risk between civil society and the state • DRR can actively encourage pathways to peace potential through activities taken before, during, and after disasters that reduce vulnerabilities, improve equitable resource distribution, encourage cooperation, and, in some cases, find opportunities for social and/or political (re)integration
(Bakaki & Haer, 2022) (Global)	Climate change and child soldier recruitment	• Non-State Actors in Armed Conflict Dataset: Rebel group-government dyad per conflict period resulting in at least 25 battle-related deaths in 1989–2010 • Child Soldier Data Set (CSDS) by Haer & Böhmelt (2018) 3) Mixed-source data on temperature and precipitation (1948-2011) • Mixed-source control data: GDP per capita, Conflict duration, Population size, Territorial Control (Yes/No), Secessionist conflict (Yes/No)	• Climate variability affects the recruitment of children in two ways: First, economic and social pressures resulting from climate variability influence the supply of children willing to join these groups and their vulnerability for recruitment. Children are withdrawn from school and have fewer economic opportunities, and families are less able to protect them. Second, climate variability also increases the demand for children by rebel groups. Children are generally cheaper and demand less revenue • There is a significant association between positive temperature deviations and the recruitment of children by rebel groups. More importantly, we demonstrate that these shocks especially affect the recruitment of girls (in addition to boys)

(Fröhlich, 2016) (Syria)	Climate change and forced migration incidence	• 30 semi-structured interviews conducted in September and October 2014 in the Jordanian refugee camps Azraq and Zaatari as well as in the northern Jordanian cities Irbid and Ramtha	• Environmental factors were only one and certainly not the decisive element of individual migration decisions made in pre-revolutionary Syria. Orchestrating a protest of the scale, intensity and permanence of the one in Dar'a was well beyond the migrants' social capacities and resources. The majority of interviewees, however, saw the protests as a reaction to state repression and mismanagement. The drought and its consequences only added to their sense of the increasing decline of the social contract between the government and the population
(Abrahams, 2020) (Global)	Climate change, conflict and development policy	• Mixed-methods and multi-sited data collection, including nine months of participant observation, interviews, a survey of local government officials and a document review (Mainly from two particular programs being implemented by Mercy Corps, an international humanitarian and development NGO, in Karamoja, Uganda)	• The "threat multiplier" discourse is, to a certain extent, empirically backed but also limiting: In framing the climate-conflict relationship as one where climate change primarily drives conflict, policy-making institutions risk missing opportunities that leverage climate change as a means of peacebuilding. Development programming framed around the identification of peacebuilding opportunities created by climate change can better account for the context-specific realities that shape the climate-conflict relationship • The impacts of climate change on conflict outcomes always come through complex, locally specific biophysical and socioeconomic processes. These processes and impacts, however, are not confined to a particular place. Yet the dominant discursive frames the climate-conflict relationship as one where causes and outcomes are viewed as both spatially contained and overlapping
(Ide et al., 2020) (Global)	Climate change and conflict incidence	• Dependent variable is the occurrence of a climate-related disaster according to MunichRE's (2019) NatCatSERVICE database, including the categories meteorological events (e.g., droughts), hydrological events (e.g., floods), and climatological/extreme temperature events (e.g., heat waves) • Independent variable: Onset of an intrastate armed conflict according to the widely used UCDP/PRIO Armed Conflict Dataset (Gleditsch et al., 2002) (involvement of at least one government of a state and more than 25 battle-related deaths per year)	• There is no deterministic or generic relationship between disasters and conflict. But in countries characterised by the political exclusion of ethnic groups, low levels of economic development and large populations, climate-related disasters significantly enhance the risk of conflict onset in the subsequent 7-day period. Contrary to the findings of other studies, this effect is largely independent of the severity of disasters.

(Black et al., 2011) (Ghana and Bangladesh)	Climate change and forced migration incidence	• Existing scientific literature on climate change as a driver of migration; literature and migration and demographic statistics on Ghana and Bangladesh	• There should be caution toward predictions of future migration at a global level. The paper's framework provides a basis for a more detailed assessment of particular case-study contexts to directly test the sensitivity of specific drivers to anticipated climate change impacts. Such an assessment is likely to require detailed field verification to ensure that drivers are properly understood and climate change impacts on these drivers are correctly specified • In addition to understanding migration drivers, there is also a significant gap in understanding of the likely trends of climate change that will influence these drivers, requiring input from natural as well as social scientists • Environmental migration linkages have to be understood at a variety of spatial and temporal scales. It is important to provide a corrective to mainstream policy thinking that migration is by definition international and/or long-term or permanent, even if internal migration is usually less politically and ethnically charged and requires more national than international policy responses

Appendix 2:

Methodology

1.0 Overview

1.1 Site Selection

Sudan and Libya represent the two case studies under specific examination in this study. Nevertheless, the findings of this work are intended to speak to the regional needs and interests related to the Climate Change, Conflict and Migration (CCM) Nexus and the issue of water scarcity. To ensure their complementarity, rather than redundancy, the study design includes components that are shared across all respondents (Stakeholder Interviews-SIs, Direct Interviews-DIs, quantitative survey questions) and a component that is adjusted to the relative focus on either migration (Sudan) or water scarcity (Libya) (Focus Groups Discussions-FGDs). This supports both comparability as well as a greater degree of generalizability at the regional level. The DIs and FGDs foreground community cohesion and conflict dynamics. Specific site selection for data collection emerged through close conversation with each Mission to ensure variability in the relevance of each of these dynamics. Originally, Ethnographic Walks formed part of the shared instruments, but due to security concerns, they were not conducted in Libya. Findings from the EWs in Sudan were included in the Country Study section of this report.

The sites in each country along with their rationale for selection can be found in Table 9.

Table 9: Data collection sites and rationale for selection

Libya	
Sites (State – Community)	*Rationale*
Kufra – Tebu & Zuwayya Communities	Foreground the role of long-standing tensions in impacting migration patterns and mobility decisions in a context with relative environmental stability. The consistent resurgence of tensions between the Zuwayya (community 1) and Tebu (community 2) foreground conflict and migration as particularly salient.)
Tajoura	Examine the differential ways in which more Libyan-concentrated versus more migrant-dominated communities engage in seasonal migration, the extent to which these challenges connect to issues of water scarcity, and the distinction of operating in a coastal border region.
Jufra - Waddan	Foreground the role of water scarcity in Waddan, Jufra and the way that it shapes conflict and migration decisions and dynamics when it threatens the primary form of livelihood (agricultural production). Distinguish between migration that occurs as a result of broader humanitarian crises from those that are more predominantly motivated by water scarcity in the Libyan context to better illuminate the specific dynamics tied to the latter.

Sebha – Rural agricultural and Urban communities	Research the tensions that emerge in a context in which there ***should*** be conflict over access to water and resources, but there are not. Better understand the root causes and manifestations of the alternative conflicts that surface both in rural agricultural (community 1) and urban (community 2) contexts.
Tripoli	Understand what aspects of individual and collective decision-making transcend issues of conflict-climate change-and migration (i.e., what might be understood as "regular cultural norms" about how people make decisions in context). Identify whether CCM issues emerge during individual and collective decision-making processes when FGD facilitators use a prompt that does not mention these topics.
Sudan	
Sites	*Rationale*
North Darfur - Melit	Identify the decision-making criteria that shape decisions to migrate (and the various forms of migration) under conditions of climate change, extreme climate events, and/or conflict – especially rural-rural migration and under the pressures of desertification. Elicit factors that shape decisions to resettle versus continue. Focus on foreign migrants who have entered Sudan via land borders in search of job opportunities and/or to join family members. Identify the relationships between different forms of migration and inter-group tensions in the city.
Kassala – Nahr Atbar	Identify what contributes to the emergence of violence among some populations over others in conditions of climate change, migration, and extreme climate events such as flooding. Focus on the ways in which historically cyclical movements have changed due to climate change and how these changes have affected conflict dynamics.
Gedaref – Basunda	Include agricultural populations who practice seasonal rural-rural migration and who are experiencing pressures from climate change and conflict. Here, focus on the Ethiopian migrants and refugees from the Tigray crisis to capture dynamics around international migration, crises, and foreign labour.
South Darfur - Nyala	Distinguish between forced / irregular / corridor / transitory rural-urban migration and in terms of their relative relationships to conflict and climate change. Here, focus on South Sudanese refugee populations.
Khartoum – Khartoum	Due to security conditions, community-level data collection could not take place in Khartoum. Only Stakeholder Interviews were conducted in Sudan´s capital city.

1.2 Research Approach

The study design used a mixed-methods approach to assess the Climate Change, Conflict and Migration (CCM) dynamics in Libya and Sudan, with a heavy weighting of qualitative content. The decision to rely more heavily on qualitative data rested on two premises: 1) much work on the CCM Nexus has been largely conceptual and thus requires more exploratory approaches to begin producing robust bodies of empirical data upon which other mixed methods and more quantitatively-centric studies might build; and 2) it offers novel insights into a systems-level perspective from the ground up of how CCM Nexus dynamics materialize in the lives of policy makers, stakeholders, community leaders and everyday citizens in the study's countries. The following two complementary approaches comprised the data collection instruments:

1. Quantitative data collection consisting of a household survey.
2. Qualitative data collection consisting of Stakeholder Interviews (SIs), Direct Interviews (DIs), Focus Groups Discussions (FGDs), and (in Sudan only) Ethnographic Walks (EWs).

Table 10 presents an overview of the methods and sources used for each data collection tool.

Table 10: Data collection methods and sources

	Data Collection Method	Source
1	Quantitative Household Survey (quantitative)	• Qualitative survey applied to a representative sample of heads of household per site that included migrants, displaced persons, and host community members. o *N*=264 respondents in Sudan o *N*=185 respondents in Libya
2	Stakeholder Mapping Interviews	• Semi-structured interviews conducted with stakeholders across multiple sectors whose work relates to the CCM Nexus and water scarcity: international organizations, public sector officials, cross-sector alliances, private sector representatives, (international) non-governmental organizations, religious leaders, and grassroots organizations and community associations. o *N*=23 respondents in Sudan o *N*=14 respondents in Libya
3.	Focus Group Discussions	• Prompted and facilitated discussions of 6-8 individuals designed to promote collective deliberative processes and decision-making: 1 male group, 1 female group per community, with diversity according to life cycle, ethnicity and other context-relevant criteria (e.g., livelihood, tribal affiliation). o *N*=7 groups in Sudan o *N*=12 groups in Libya
4.	Ethnographic Walks (Key Informant Social Mapping)	• Participatory exploratory exercises with cursory prompts and led by community leaders and key informants in the community who exercise some degree of influence and decision-making power in the domains covered by the study. Videos produced independently of enumerator presence and submitted to study author. o *N*=21 walks in Sudan o None conducted in Libya due to security conditions.
5.	Direct Interviews	• Semi-structured interviews with a short quantitative questionnaire to capture demographic data conducted with an inclusive sample of community members according to gender, national origin, and tribal affiliations, when relevant). o *N*=82 respondents in Sudan o *N*=113 respondents in Libya

This study also benefitted from a desk review conducted at the outset and in close collaboration with the Regional Office and Country Missions, as well as the generous analytic support of the United Nations Economic and Social Commission for Western Asia and their Risk Analysis of the Arab Region, with a focus on Libya and Sudan (ESCWA, 2022). It also drew from data published by the Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR) to triangulate findings.

1.3 Research Questions

The main objective of this study was to contribute to the development of public policies that address issues related to conflict, migration, environment and climate change in Libya, Sudan, and the Region. It also sought to equip key actors and institutions with the evidence and analysis necessary to implement public policies and design programs that take into account the CCM Nexus with a focus on issues of water scarcity. To achieve these objectives, the data collection instruments' designs factored in X research questions:

1. How do climate change and climate-related disasters (e.g., flooding, drought) impact livelihood, security, well-being, and resilience?
2. How do factors including migration, climate change, environmental degradation, water scarcity and conflict give rise to vulnerabilities and interact with and influence community resilience against climate and conflict shocks?
3. What are the qualities of effective institutional, collective, and individual adaptation strategies currently in place?
4. What are the differential experiences and impacts of CCM Nexus and other dynamics according to gender, life cycle, national origin and tribal affiliation?
5. What are the current risks related to access to resources and resource management that relate to or are anticipated to cause intergroup tensions and unplanned migration?

Since the research questions target the individual, community, and national levels, the EWs and DIs focused on individual experiences-in-context, the FGDs on community and collective level processes, and the SIs on multi-sector organizational and institutional responses and lessons learned. The quantitative survey supported understandings of differences in individual experiences along with community and national-level trends.

2.0 Quantitative Research

2.1 Quantitative Survey

The Regional Data Hub for Middle East and North Africa led the collaborative effort to integrate this quantitative element into the CCM Nexus study. Survey questions captured the following:

- Reasons for population displacement in the area.
- Role of access to natural resources in intercommunal clashes.
- Sources of livelihood (including livestock, agriculture, fishing)
- Recent experiences with livelihood shocks (livestock, agriculture, fishing).
- Sources of, barriers to access to, and conflicts related to water

The data provides a representative sample a representative sample of heads of household per site that included migrants, displaced persons, and host community members. The sample sizes per site are included in Table 11: Quantitative sample size per site in Libya and Sudan. The limited representation of females in Libya is addressed in the Limitations section of this report.

Table 11: Quantitative sample size per site in Libya and Sudan

Libya Sites	*N*	*N*	**Sudan Sites**
Jufra	35	63	Gedaref
Kufra	60	64	Kassala
Sebha	60	77	North Darfur
Tajoura	30	60	South Darfur
TOTAL	**185**	**264**	**TOTAL**

Quantitative Survey enumerators followed the institutional standards as set forth in the ***Methodological Framework*** (IOM, 2022c) including data protection and ethical data collection practices. Questions built off of and extended existing large-scale IOM quantitative data collection efforts, thus ensuring high-quality data collection processes, cleaning and verification. As with all instruments, enumerators received project-specific training on the ethnics of data collection. Training included content on the right of respondents to withdraw at any time, transparency regarding the subject and purpose of data collection, and anonymity of answers. Key demographic characteristics for Libya (Figure 33, Figure 34, Figure 35) and Sudan (Figure 36, Figure 37, Figure 38) can be found below. Data from the quantitative survey is included as one of five sources – i.e., as it relates to the other themes surfaced in the qualitative instruments. For this reason, there exist some differences in variables reported in the analysis of each country: different contexts reported on different dynamics.

Figure 33: Quantitative Survey respondent profile by gender, Libya

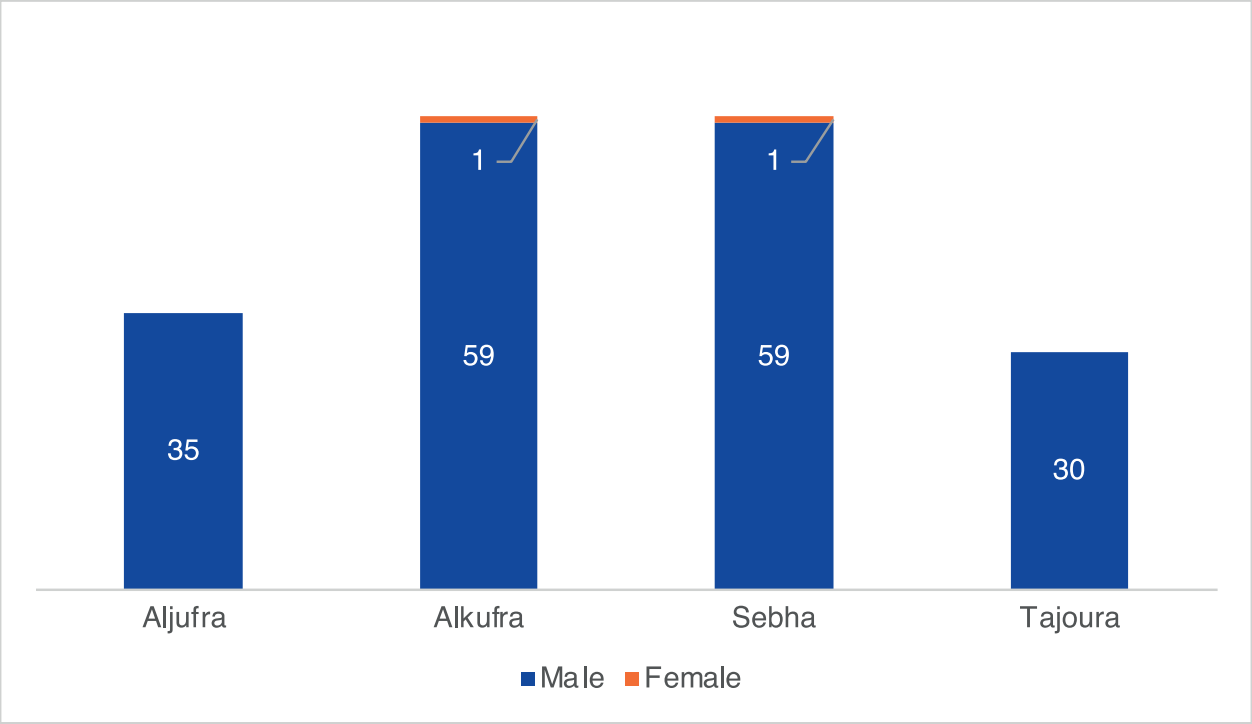


Figure 34: Quantitative Survey respondent profile by age, Libya

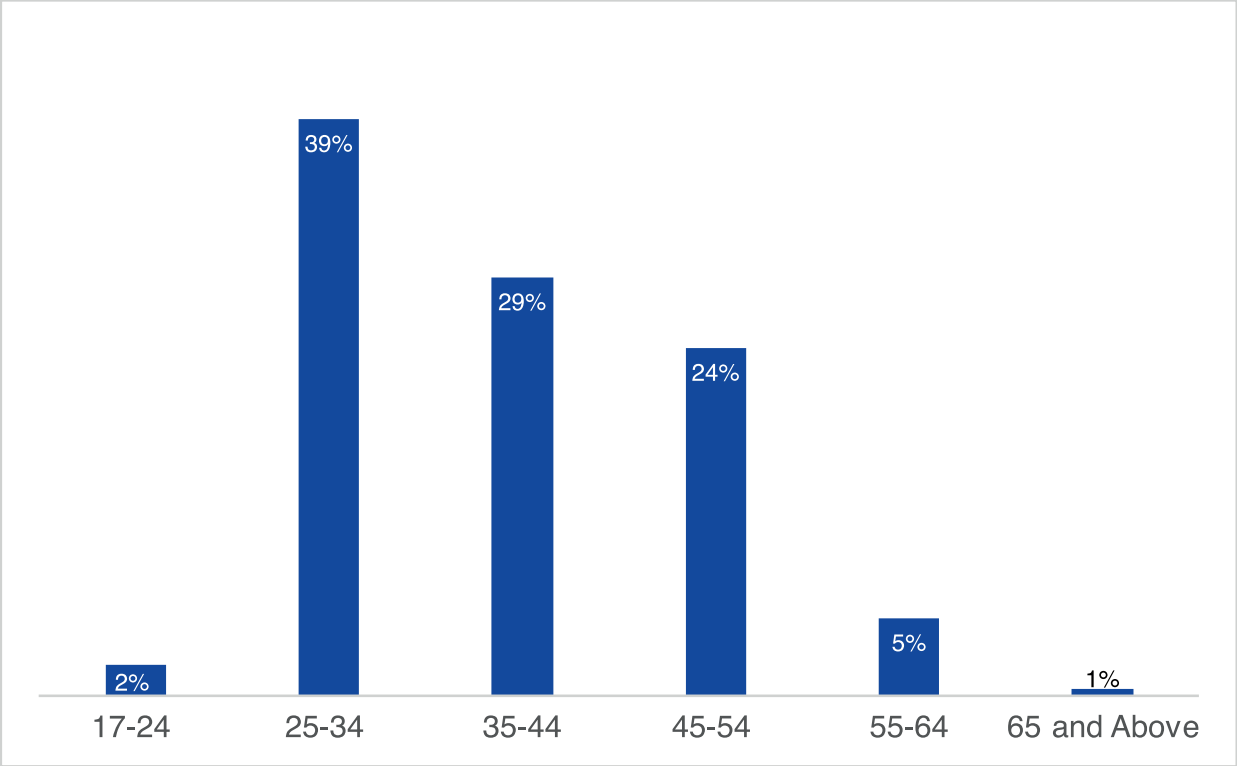


Figure 35: Quantitative Survey respondent profile by source of income, Libya

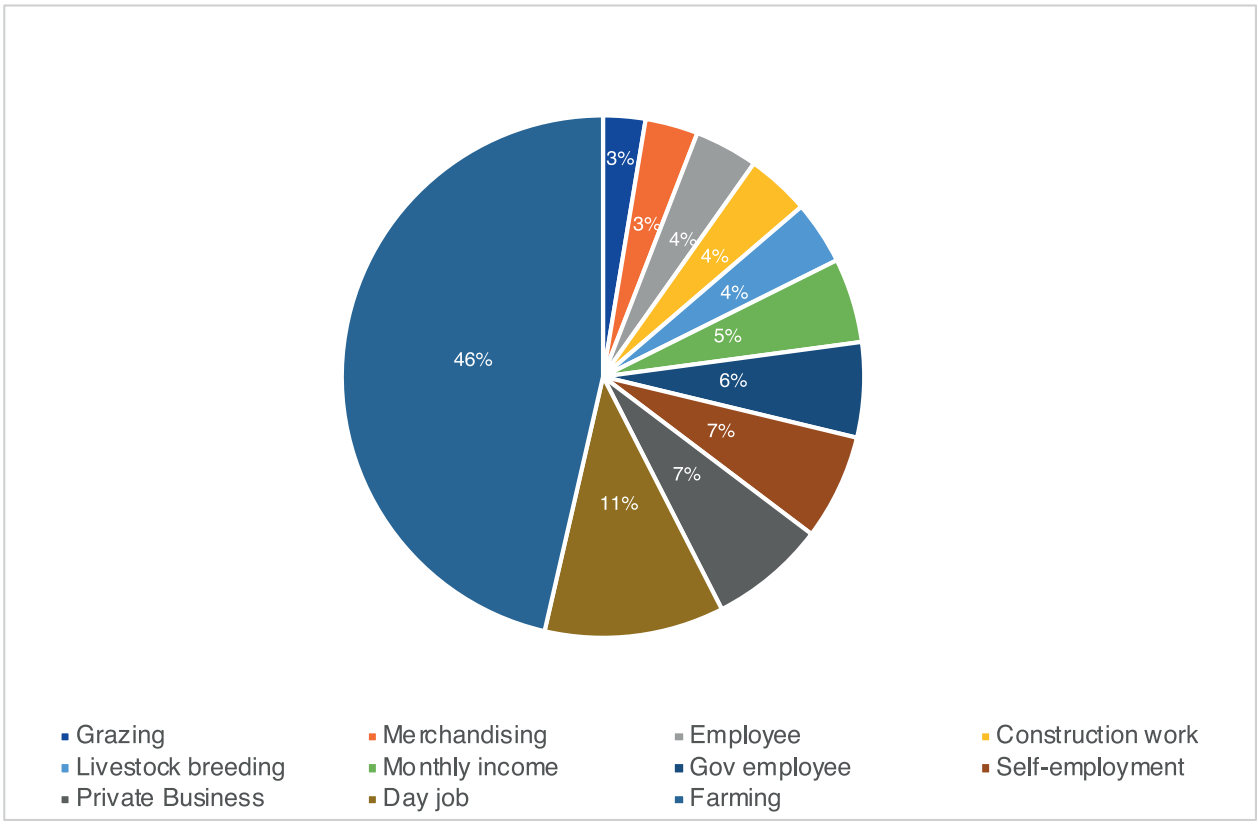


Figure 36: Quantitative Survey respondent profile by gender, Sudan

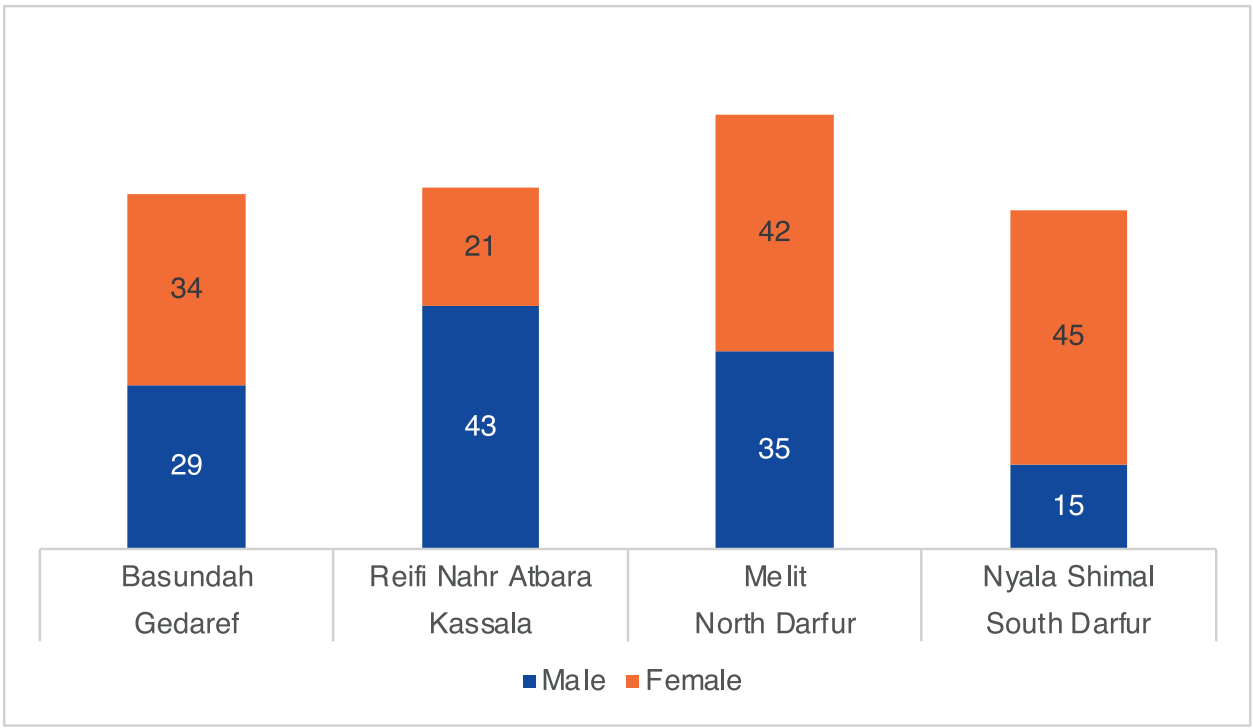


Figure 37: Quantitative Survey respondent profile by age, Sudan

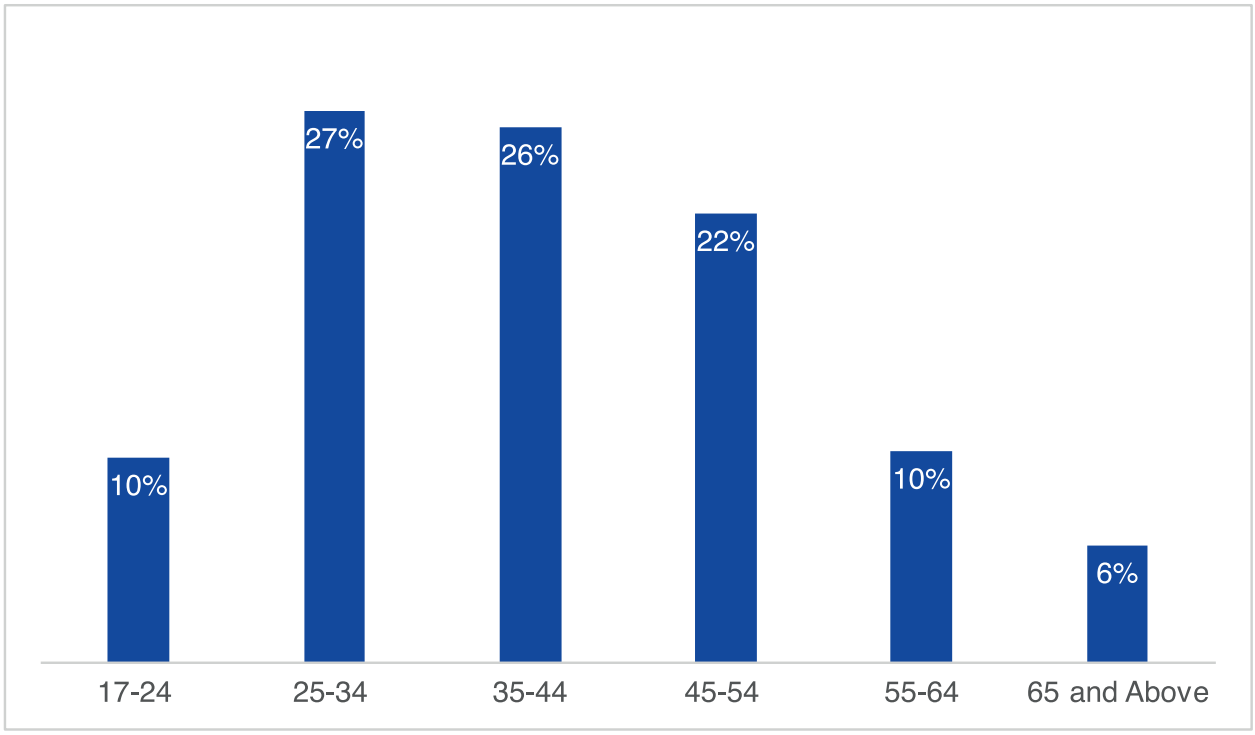
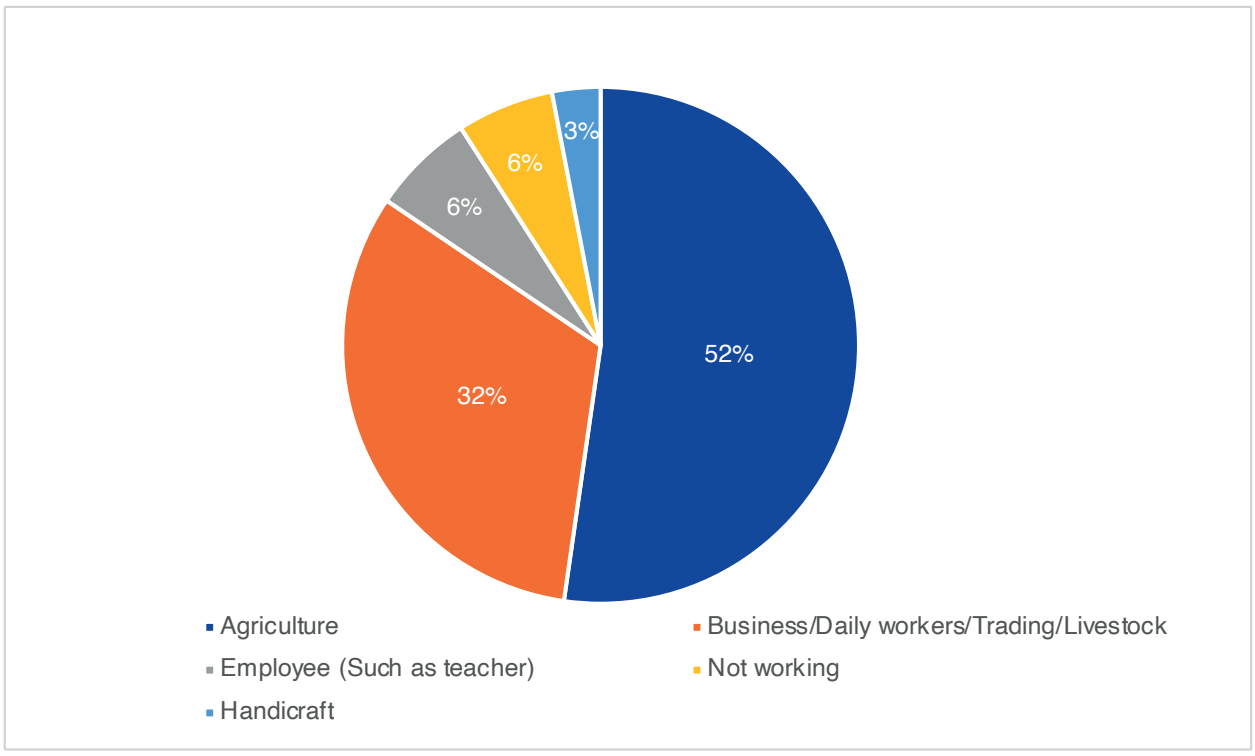


Figure 38: Quantitative Survey respondent profile by source of income, Sudan



3.0 Qualitative research

3.1 Stakeholder Interviews (SIs)

The purpose of the SIs was to identify the different actors in the region who work to mitigate the negative effects of the CCM Nexus and water scarcity. In each country, the list of interviewees was developed collaboratively with representatives from each mission. Missions also provided feedback on the semi-structured interview protocol, which was then used to conduct the SIs with officials and professionals from the following sectors on their roles and direct experiences with the study topics: 1) international cooperation (including other UN agencies and donors), 2) public sector (regional, national, local), 3) cross-sector alliances, including the private sector, 4) non-governmental organizations (regional, national, local), and 4) grassroots organizations, associations, and initiatives (e.g., youth, women, religious actors, community associations).

3.1.1 Semi-Structured Interview Protocols

The interviews were intended to surface the activities, priorities, and mid-term programming aspirations for stakeholders at all levels (local, national, regional, thematic) to 1) develop a comprehensive understanding of the constellation of actors operating in these fields, 3) develop a more systematic understanding of lessons learned, best practices, and remaining challenges, and 2) identify opportunities for collaboration moving forward.

Those conducting the SIs used an interview protocol, which was similar in both countries, with minor adjustments for contextual nuance that resulted from conversations with the Missions. The protocols included questions related to the following topics:

- Elaborating on existing programs, initiatives, policies, or actions related to the CCM Nexus and water scarcity.
- Identifying success factors and narrative accounts of how the interviewee knew the initiative was successful.
- Detailing significant and frequent challenges faced in realising intended changes in these domains.
- Developing a narrative understanding of gender components of existing programmes and policies and challenges related to how CCM Nexus and water effects are experienced differentially depending on gender and developing policy and programme initiatives in this regard.

3.1.2 Sampling Method and Characteristics

The sampling methodology was purposive. Key stakeholders were mapped in early conversations with the Missions and enumerators and further expanded during enumerator training for the study. The list of Libya SIs by sector is in Table 12. The list of Sudan SIs by sector is in Table 13.

Table 12: SIs in Libya by sector

	Academic	Grassroots	Private	Public	Total
National-Level	2	0	1	1	4
Jufra	0	2	0	2	4
Kufra	0	2	1	2	5
Sebha	1	0	0	0	1
N = Documents/Speakers	3	4	2	5	14

Table 13: SIs in Sudan by sector

	Academic	Grassroots	NGO	Pri-vate	Public	Total
North Darfur	1	0	1	0	3	5
Khartoum	0	4	0	0	2	6
South Darfur	1	0	2	1	1	5
Kassala	0	1	0	0	3	4
Gedaref	0	0	1	1	3	5
N = Documents/Speakers	2	5	4	2	12	25

The names of stakeholder institutions in Libya were withheld. The list of participating institutions in Sudan includes the following (there are fewer institutions than interviews because interviews took place with the same institution in multiple study sites):

- Ministry of the Interior
- Farmers & Animals Resources Association
- Higher Council for Natural Resources
- Human Rights Defenders Network
- Humanitarian Aid Commission
- Intergovernmental Authority on Development
- Ministry of Economic and Natural Resources – Agriculture Department
- Ministry of Economic and Natural Resources – Animal Resources Department
- Ministry of Health
- Ministry of Social Affairs
- Murtada
- Nyala University Peace Centre
- Peace Studies Centre
- Private Sector Large-Scale Farming (name withheld)
- Private Sector Medical Professional working on climate change (name withheld)
- Sudan Youth Parliament for Water
- Water and Environment and Sanitation Corporation
- Youth Resistance Committees
- ZOA International

3.2 Direct Interviews (DIs)

The purpose of the DIs was to generate the qualitative basis for analysis of the relationship between the dynamics that are the focus of this study, criteria for mobility decisions, and individual differences.

3.2.1 Semi-Structured Interview Protocols

To ensure equal capture of a wide range of backgrounds and experiences, the interview protocols were written at a 6th-grade reading level. DI participants were asked to narrate their life histories according to migration milestones. In each instance of migration, for whatever reason, participants were asked to share narratives about the following qualities of their journeys:

- Catalysts for migration.
- Route that was taken.
- Sources and forms of help on the migration journey itself.
- Challenges faced along the way, including those that were surprising and those that were anticipated but never materialised.
- Sources and forms of support during resettlement.
- An opportunity to discuss other important factors not already covered in the protocols.

3.2.2 Sampling Method and Characteristics

Given that EWs and FGDs specifically targeted local organisations, grassroots and other forms of community leaders, enumerators were instructed to select DI participants who fell outside of those categories. Instead, they selected a representative population (of the state) according to gender and whether the individual was the head of the household. The quantitative survey was conducted at different moments from when the DIs took place. Although there were no explicit instructions to engage only novel respondents, the significant difference in sample sizes and different scope of questions ensures their complementarity over any possible redundancy.

In all, DIs had 113 participants in Libya and 82 participants in Sudan. No gender data was available for the Libyan DI respondents. Table 14 provides the total responses by study site.

Table 14: DIs in Libya by study site and community characteristics

	Total Count
Kufra-Zuwayya	25
Kufra-Tebu	5
Sebha-Rural agricultural	23
Sebha-Urban	25
Jufra-Waddan	17
Tajoura	18
N = Documents/Speakers	113

In Sudan, 74% of respondents were male (61) and 26% (21) were female. The disproportionate representation of males is partially due to the concentration on the experience of agricultural workers and farmers, which led to the heavier weighting of male respondents in Kassala and Gedaref (see Table 15).

Table 15: DIs in Sudan by study site and gender

	M	F	Total Count
North Darfur	67%	33%	21
South Darfur	62%	38%	21
Kassala	95%	5%	20
Gedaref	80%	20%	20
N = Documents/Speakers			82

3.3 Focus Group Discussions (FGDs)

The purpose of the Focus Groups Discussions (FGDs) was to better understand how groups of individuals in the same geographic community organise, prioritise, evaluate, and debate factors related to mobility decisions at the collective level in the face of challenges related to conflict and climate change. The data was analysed alongside the Direct Interviews to better understand how group dynamics may inform collective decisions to migrate or remain in each location in a way that either mirrors or contrasts with individual-level decision-making processes.

3.3.1 Focus Groups Discussion Prompts

Focus groups will be facilitated with prompts that provide a community-level challenge and guide them in engaging in collectively addressing that challenge and solving problems related to it. The specific details of the challenge will be developed together with enumerators and IOM local officials to ensure salience to the lived experiences of the FGD participants. No matter the specific details of each case, FGD prompts drew in elements of all three project themes: conflict, climate change, and migration, including water scarcity.

Each Mission adapted a set of prompts related to the dynamic of interest in the community. The final prompts for each country are in Table 16. The original control FGD scheduled for Khartoum in Sudan could not take place due to security concerns.

Table 16: FGD Prompts by country and community

Sudan	
Site	**FGD Prompt**
Kufra	A humanitarian aid agency in coordination with the Libyan government is planning a project to conserve and distribute groundwater in an area that is inhabited by more than one tribe. How could this project benefit the people living in the area? How could it disrupt existing agreements and practices? If you could design a plan for how to live beside the groundwater extraction project in peace for 100 years, what would you consider? Who would you choose for your water protection committee?
Jufra	Imagine a scenario in which there has been a major flood in the Green Mountains that led a big group of people to move towards Jufra. Who can they expect to help them along the way and when they arrive? Who might be angry or inhospitable towards them? What would be some of the difficulties they would encounter? What do you think would lead them to stay in Jufra, and what would lead them to return home? What role, if any, does water scarcity play in people moving towards Jufra? Is this causing more problems in Jufra than it did in the past? Is it the main reason people leave their homes to live elsewhere? What are some of the other reasons?
Sebha	A family member from the rural villages has contacted you for advice about what to do. He has not been able to sustain his small farm due to drought. He is a man in his 40s with a wife who has been able to sell her embroidery work, but it is not enough to sustain the family. They have two children, 12 and 8 years old. What would you advise? What kinds of questions would you ask him? What would be your concerns? Consider the range of options this family has, and specifically the positive side of looking for work in Sebha, vs. the kinds of difficulties that migrating to the city might pose. Consider also how his wife will make a living, and the well-being of the children and their extended family. What are some of the tensions that might arise as they make their way to the city?
Tripoli	You have been selected to make recommendations to an international organization working on a community improvement program to address the top five challenges facing Libyan people today. What would they be? Put them in order of first priority to last. Name the people who are most affected by each challenge.
Libya	
Site	**FGD Prompt**
North Darfur	A humanitarian aid agency in coordination with Sudan's Sovereignty Council is planning a project to support those communities affected by desertification in Melit. How could this project benefit the people living in the area? What are the three most important priorities for this project? How could it disrupt existing agreements and practices? If you could design a plan to support orderly migration for 100 years, what would you consider? Who would you choose for your leadership committee and why?

Kassala	There has been a major flood that led a big group of people to move to another village. Who can they expect to help them along the way and when they arrive? Who might be angry or inhospitable towards them? What would be some of the difficulties they would encounter? What do you think would lead them to stay in the other village, and what would lead them to return home? Are floods causing more problems in Nahr Atbara than they did in the past? Are they the main reason people leave their homes to live elsewhere? What are some of the other reasons?
Gedaref	You have been elected by the people of Ethiopia and Eastern Sudan to create a policy about the rules of international border-crossing. Some of you have to represent the interests of people of Eastern Sudan, others have to represent those of Ethiopian migrants and refugees. What would be your arguments? What compromises would you make in order to come to an agreement?
South Darfur	A family member from the rural villages has contacted you for advice about what to do. He has not been able to sustain his small farm due to drought (due to intertribal conflicts). He is a man in his 40s with a wife who has been able to sell her embroidery work, but it is not enough to sustain the family. They have two children, 12 and 8 years old. What would you advise? What kinds of questions would you ask him? What would be your concerns? Consider the range of options this family has, and specifically the positive side of looking for work in Nyala, vs. the kinds of difficulties that migrating to the city might pose. Consider also how his wife will make a living, and the well-being of the children and their extended family.

3.3.2 Sampling Method and Characteristics

Two focus group discussions were to be held in each of the selected communities with individuals who were not a part of the DI sample pool. However, final counts diverged slightly from this target due to logistical constraints. Each focus group contained 6-12 people.

Focus group facilitators were instructed to select members of the community who were in positions to participate in collective deliberative processes at some level concerning mobility decisions in the face of different contextual factors. Diversity according to gender, life cycle, ethnicity, socioeconomic conditions, and other relevant characteristics was identified as a priority; how to organise the groups was determined with each mission according to their knowledge of the socio-political dynamics on the ground.

Once the specific content of the FGD scenarios was developed together with the country offices and enumerators, the criteria for FGD community leaders that span the relevant conflict, climate change, community cohesion, and mobility elements was determined on a site-specific basis.

In Libya, 50% (6) of the focus groups were all-male, and 50% (6) were all-female. Twelve total FGDs took place, and the breakdown by gender and site can be found in Table 17.

Table 17: FGDs in Libya by study site and gender

	Male	Female	Total Count
Kufra	2	2	4
Sebha	2	2	4
Tajoura	1	1	2
Jufra-Waddan	1	1	2
N = Documents/Speakers	6	6	12

The breakdown of FGDs by site, gender, average age and age range for Sudan can be found in Table 18. No data was available for the FGD that took place in Melit.

Table 18: FGDs in Sudan by study site, gender, average age and age range

	Males	Females	Total	Average Age	Youngest Participant	Oldest Participant
Nyala, South Darfur - Host Community	5	3	8	38	27	52
Nyala, South Darfur - Mixed Displaced Community	4	4	8	44	32	67
Nahr Atbara, Kassala - Arab Village 6	4	4	8	41	18	62
Nahr Atbara, Kassala - Arab Village 3 & 4	8	1	9	35	16	58
Basunda, Gedaref - Mixed Migrant and Host Community	2	7	9	28	17	60
Basunda, Gedaref - Host Community	10	2	12	50	20	72
N = Documents/Speakers	33	21	54			

3.4 Ethnographic Walks

The purpose of the Ethnographic Walks with Key Informants was to elicit narratives and videos from community leaders and local grassroots and NGO professionals that illustrate the daily lived experiences of the intersection of the study's dynamics in context. This methodology not only provide rich multi-media content to complement the other community data collection activities (excluded from this report to maintain respondent anonymity), its more exploratory, participant-led nature was intended surface other variables that outsiders may not have even thought to consider – in their own words and independently of enumerator accompaniment.

This methodology is a remote participatory method that helps to empower research participants in the process of knowledge production and provides remote researchers insight into the complexities of the realities, priorities, and values important in people's everyday lives. An additional value add of this methodology is that it allows for a visual record of different kinds of climate conditions, supporting our effort to ensure the relevance of data at the regional level (e.g., among other communities that have experienced floods or other populations experiencing severe drought).

Given the more intimate nature of this activity, participants were prompted to minimise showing the faces of others, especially in the case of minors. A separate data management plan for all video archives was also created to protect data and identity.

3.4.1 Ethnographic Walk Prompts

Individuals were prompted to record a video, taking a walk of their community, stopping at six places along the way and sharing what is significant about that place to them. Prompts included: your favourite place to spend time, your work, something you miss and/or remember, places where people get together to solve problems, something you'd like to improve and something that has been impacted by or impacts the effects of climate change, conflict and mobility.

3.4.2 Sampling Method and Characteristics

Enumerators were instructed to identify a diverse range of individuals who were leaders in different areas of community life, ranging from more formal (e.g., public forces, public officials, NGO or grassroots leaders) to less formal (e.g., religious leaders, teachers, neighbourhood association leaders). Due to the more visible nature of this method, security considerations came to the fore. As a result, fewer walks than were initially intended occurred, and none occurred in Libya. However, the data listed below proved highly productive in achieving the intended aims in Sudan. Table 19 provides the sample characteristics.

Table 19: EWs in Sudan by study site

	Total Count
Nyala-South Darfur	9
Melit-North Darfur	5
Basunda-Gedaref (host community)	3
Basunda-Gedaref (migrant community)	4
N = Documents/Speakers	21

4.0 Analysis

Due to the mixed-methods approach used, both quantitative and qualitative analytical methods were used. Quantitative data were analysed using descriptive and crosstab methods by the IOM data collection team. The qualitative analysis comprised thematic content analysis using MAXQDA software and triangulation between sources. This allowed trends to be identified and quantitative findings to be contextualised. To ensure the robustness of qualitative data thematic coding, the study author engaged two research associates to calibrate and refine the coding categories and develop a Code Book to guide coding. One research associate coded four SIs (two from each site), four FGDs (two from each site), and two EWs (one for each gender) and the study author simultaneously coded the same transcripts. A second research associate received 20 DIs (10 from each site) and coded those. Different code books were developed for each instrument and the team met and refined the coding categories and descriptions over three iterations until an interrater reliability of 0.85 was achieved (Tinsley & Weiss, 1975). The remaining qualitative was coded by the study author.

5.0 Quality Control

All individuals collecting data for this study participated in a two-day training on the study purpose, design, instruments, methods, data quality and ethical concerns related to qualitative data collection in the field (i.e., human subjects training). In Libya, the training comprised two days of a three-day certification course on qualitative methods and data collection. Data were translated and reviewed for quality by dedicated focal points in each mission according to instructions provided by the study author. Furthermore, each data collection instrument included an opening script that provided information on the purpose of the study, the anticipated use of the data, and various elements of informed consent.

When directly quoted in the text, some citations from the qualitative instruments may be edited for grammar and conciseness. These minor adjustments, however, do not change the meaning of the quoted material. Though not all assertions were agreed upon unanimously, all quotes included in the analysis are illustrative of generally agreed-upon discourses.

6.0 Limitations

The following were the primary limitations to the study that the researcher and country enumerator teams worked to overcome as much as possible:

1. Gender Bias:
    a. Libya. The underrepresentation of women in the quantitative survey data in Libya represents one study limitation. The enumerators in the field included both male and female professionals. However, the standard approach to conducting these surveys is at gathering points where migrants (almost exclusively male) collect to seek daily work opportunities. These points provide access to migrants from a wide range of nationalities, many of whom have just arrived in Libya and are looking for a job. Female migrants are difficult to locate because they typically remain within homes working as maids. Furthermore, the study focused on water scarcity and other issues related to climate change; for this reason, it was critical to engage with farmers, who are all male in Libya. Future iterations of this study will develop explicit strategies to increase women's representation when similar gender dynamics and survey participant recruitment approaches converge.
    b. Sudan. The Kassala and Gedaref sites in Sudan also proved difficult to have adequate representation of women in the data set. This is partially attributable to similar reasons as above: the dynamics of focus were pastoralism and agricultural work, which are male-dominated domains. Future iterations of this study should develop more intentional strategies to engage with women in these areas, even when their daily work may not be so directly tied to study themes. This will provide a more robust understanding of the second and third-order effects of the CCM Nexus and water scarcity as well as likely surface challenges that are currently underexplored due to the difficulty in accessing women in data collection efforts. Fortunately, in the instance of Sudan, the FGDs provided more opportunities for women to engage.
2. EWs represent an innovative remote participatory methodology. However, several challenges emerged in terms of implementation. Security figured principally among those challenges. For this reason, there were fewer walks conducted than initially anticipated, and Libya was unable to participate. However, the EWs that did occur were rich sources of novel data that provided a robust complement to the remaining instruments and did surface aspects of how the CCM Nexus and water scarcity affects everyday lives that other instruments did not. Enumerators agreed that the exercise was extremely valuable, and extensive conversations between the study designer and field teams resulted in a detailed set of recommendations and protocols for the process in future iterations of this study.