



Lessons for Taadoud II: Improving Natural Resource Management

A Feinstein International Center Desk Study 

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Acronyms

CTA	Civil Transactions Act
DPA	Darfur Peace Agreement
DTR	Diurnal temperature range
FNC	Forests National Corporation
GDP	Gross domestic product
IDP	Internally displaced person
INGO	International non-governmental organization
ISI	Income Stream Index
IWRM	Integrated water resource management
NDVI	Normalized difference vegetation index
NGO	Non-governmental organization
NRM	Natural resources management
OR	Operational research
SES	Socio-ecological resilience
UNEP	United Nations Environment Programme

Executive Summary

The objectives of the desk review are to serve as a foundation and reference for the development of training materials, policy briefs, and research studies as part of the Taadoud II program. The desk review includes a short introduction followed by six sections, which were authored independently and are summarized here, including key points for Taadoud II.

Part 1. History and context of disasters and development in Sudan

This section provides a background on the Darfur context, including the history and context of disasters and development in Sudan from the 1960s to the present day. This reveals the endemic nature of shocks and disasters accompanied by an almost continuous cycle of short-term humanitarian response programs. Responses to disasters and development have shifted in the 1980s and 1990s from the primarily technological fixes for natural hazards in the 1960s and 1970s to a broader focus on reducing risk and vulnerability to disasters, linked with disaster mitigation and emergency preparedness. A new era of international engagement in the 1990s combined providing assistance with protection efforts within conflict-affected areas. More recently, early recovery and resilience building programs have featured as part of the humanitarian agenda. Two perspectives on resilience coincide with how Taadoud II applies the concept:

- **Development resilience** focuses on the social resilience of communities (household capacities, response to shocks, speed of recovery, etc.). This is the approach taken in the Taadoud II Income Stream Index (ISI) and the baseline survey.
- **Socio-ecological resilience (SE)** relates to the functioning of a socio-ecological system, in which conditions are unpredictable as a result of environmental variability. SE helps in understanding how natural resource systems work in practice and is therefore directly relevant to Taadoud II's work on natural resource management.

The majority of the population of Darfur continues to depend on the land and the resources on that land for their livelihoods. Nationally, relative to the crop sector, livestock is expanding in importance and is now by far the major component of Sudan's agricultural output despite little external investment. A continuing challenge is that much of the old thinking and stereotypes about drylands remain entrenched.

Key points for Taadoud II:

- Pastoralist and smallholder production is more important to the national gross domestic product (GDP) than oil, and therefore is of interest to politicians and policy makers.
- In the past, producers have been blamed for environmental degradation associated with overgrazing of livestock, or farmers for cropping without appropriate nutrient inputs, or both for overexploitation and clearance of forests and woodlands for firewood and charcoal making. The real problem lies in multiple governance failures across all levels.
- Taadoud should retain a focus on social vulnerability as well as resilience building, and the wider responsibilities for humanitarian action and development more broadly.

Part 2. Livelihoods, conflict, power, and institutions

Part 2 focuses on understanding how conflict, which has been a feature of the Darfur region, has affected people's lives and livelihoods, and the institutions and natural resources upon which the majority of livelihoods are based. A focus on livelihoods shows how livelihood assets influence power relations and are frequently the target of combatants or localized competition over resources. Such a

focus conversely shows that a lack of power and political status is linked to vulnerability, rather than simply economic status and livelihood material assets.

In the context of conflict, livelihoods are constrained by a loss of freedom of movement to access productive resources, employment, or markets, and increasingly coping responses are damaging and or unsustainable. Apart from the negative impacts of coping responses, more sinister behaviors linked to intimidation, coercion, protection payments, asset stripping, theft, and violence threaten or directly undermine livelihoods. In a context of impunity, such behaviors and maladaptive strategies serve to undermine customary law and local institutions. In the long term, these maladaptive strategies may result in the exclusion of those using these strategies from desired social and economic networks.

In the promotion of peace, it is important to understand the drivers of conflict and the scale at which they play out. International perspectives on the drivers of the wider regional conflict in Darfur have tended to polarize around two views: first, a focus on the social, political, and economic marginalization of Darfur; and second, the view that attributes the Darfur conflict to environmental factors, between tribes over land and natural resources made scarcer by a changing climate. While the former highlights the role of the centralized institutions, the latter puts the focus on the more local institutions; hence the question of scale and the interconnectivity across scales are important.

Key points for Taadoud II:

- There have been a wide range of conflicts, involving actors at the transnational, national, regional, and local level over the past 40 years and more. It is important to consider how the different conflicts have played out and affected communities at the local level.
- A key requisite for sustainable livelihoods and the peaceful co-management of natural resources is security and the ability of people to move freely to access productive resources, employment, and markets.
- A history of maladaptive strategies may result in the exclusion of certain groups from key social and economic networks and institutions.
- While it is important to understand the divergent views on the drivers of the wider Darfur conflict, the focus of Taadoud II should be on the institutions, governance, and power inequities within the local contexts where Taadoud is working.
- Pastoralism is unique in that it bridges multiple local environments, economies, and social structures, which has implications for the scale of analysis and the appropriate entry point for engaging with pastoralist institutions.
- Inter-tribal conflicts are sometimes confused with more localized farmer-herder conflict. The former are more likely to be linked to political capital often associated with land and are sometimes connected with national-level politics. The latter are more to do with grievances on the part of herders (expansion of rainy and dry season farms, blocking of corridors, access to dry season water sources blocked by farms) and farmers (livestock destruction of crops, not respecting the *talaig*).

Part 3. An examination of climate trends in Darfur and the Sahel: a matter of perspective?

This section examines trends in vegetation cover, precipitation, and temperature in the Darfur region based on analysis of available primary remote sensing data. Data on vegetation are frequently used as a proxy for land degradation and desertification. Our analysis shows that while there is large

decadal variation in the trends themselves, on average vegetation trends have remained stable in the Darfur region over the twentieth century.

Drawing a conclusion from trends in rainfall, on the other hand, proves to be more difficult. Long-term analysis (the past 100 years) shows that precipitation on average has likely remained stable; however, our primary analysis indicates a slight decline (possibly due to the inclusion of data from the past decade), though these findings are not consistent across the different available datasets.

There is far greater consensus in relation to changes in temperature. The literature reviewed and our primary analysis suggest that temperature in the Darfur region has significantly increased. However, the interpretation of the scale and even direction of changing Sahelian weather patterns at the local level depends on many different factors, such as the period under review, the season, the dataset used, and the region explored. Evidence from Darfur indicates the region experiences long-term oscillations in weather patterns based on decades, meaning that trend analysis needs to include the longest periods possible.

Analysis of climate trends is a relatively new field, and different models give different results; thus all interpretations and analysis should be taken with caution and replicated as more data become available.

Key points for Taadoud II:

- Interpretations of the scale and even direction of changing Sahelian weather patterns at the local level depends on many different factors, such as the period under review. Evidence from Darfur indicates the region experiences long-term oscillations in decadal weather patterns, meaning that trend analysis needs to include the longest periods possible.
- The literature indicates that vegetation cycles have remained stable over the twentieth century in Darfur.
- In the last 100 years, most Darfur states have experienced a long-term slight decline in mean annual precipitation. The greatest drying trend is seen in North Darfur State, with less pronounced drying in southern Darfur states.
- Temperature in the Darfur region has increased in the past 40 years, consistent with historic trends and the literature. Historically, the highest magnitude of increased temperature is observed in North Darfur State; however, in recent years, all Darfur states are experiencing higher temperatures.

Part 4. Natural resource systems and institutions

Most livelihoods in Darfur are linked to farming and pastoralism, which have co-evolved to adapt to the extreme rainfall variability and ecological diversity that are characteristic of the region. The integration between these two sub-systems as part of a wider regional system is critical to their peaceful co-management of natural resources. Their relationship and interactions have at times involved cooperation and complementarities and, at other times, competition and conflict. Both sub-systems have well-rehearsed strategies for dealing with the unpredictability of the rains.

Formal and informal institutions are the primary entry point for agencies to support livelihoods, promote peace, and resolve conflict. Institutions are critical for regulating and managing access to natural resources, which in turn helps create sustainable livelihoods, prevents depletion or degradation of resources, and contributes towards the peaceful co-management of common property resources. The inclusivity or exclusivity of institutions influences how effective they are in practice.

Lessons for Taadoud II
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The land laws in Sudan are an overlapping combination of legislation by the central or federal government, rules introduced by the judiciary, customary laws, and *Sharia* law. According to government law, the major division in land ownership is between land owned by the state (which includes all land not registered prior to 1970) and privately owned land. A new phase of land registration is underway.

Customary land tenure systems in Darfur, based on a redistributive usufructuary system, date back centuries. Although they persist, they have become strained as a result of changing land use and increasing population density. Recent studies suggest relatively little land is allocated by local tribal leaders or acquired through bush clearance, while acquiring land by other means (inheritance, land sale, and rent) is increasing. The arrangements (or property relationships) for accessing rangeland or pastoral property are different from the customary practices related to farming systems and resources. Pastoralist resources tend to be “open access,” while farm land is managed under customary rules and institutions.

Successive development policies in Sudan have ignored pastoralism and tended to favor mechanized farms over rainfed farms. However, the latest Federal 2018 Livestock Policy recognizes the contribution of pastoralism to the economy, which represents a major shift.

Key points for Taadoud II:

- All natural resources co-exist within a single ecological system.
- Formal and informal institutions, layered from the national level to the local catchment and community, are the primary entry point for regulating and managing access to natural resources and promoting sustainable livelihoods.
- Pastoralist resources tend to be “open access,” while farm land is managed under long-standing customary rules and institutions, but both are affected by more recent state policies and institutions.
- The inclusivity or exclusivity of institutions influences how effective they are in practice. Hence an understanding of changes in institutions provides insights into barriers and opportunities for equitable and sustainable livelihoods.
- The unhelpful labelling of communities or groups as either “sedentary farmers” or “nomads” has enforced dividing lines associated with wider conflicts. This language continues to put people in opposition to one another. Taadoud should focus on what people do for a living and the integration between livelihood sub-systems.
- There remains a gap between policy and project implementation, with a wide array of stakeholders often unaware of changes in national policies or lacking the resources to apply them.
- Development of infrastructure needs to be linked to local institutions that manage them, and external governance and technical structures for sustainability.
- Livelihood strategies are transforming to adapt to a new context and new relationships among users. Institutions are also changing. Programming agencies should not assume old institutions function as they did in the recent past.
- Local institutions may need to be supported to ensure they are able to change in a way that ensures equitable access, regardless of livelihood specialization and gender.
- To be both effective and sustainable, an integrated catchment-based management system that connects with national policy and institutions needs to accompany any large-scale water-related infrastructure.

- Technical plans need to include larger, unintended impacts on the environment, while simultaneously the social aspects need to support equitable access and voice in management of the systems through the institutions regulating the water sources. For example, the increase in vegetable cultivation has led to friction between the vegetable cultivators and farmers as it has blocked paths to the wadis for pastoralists to water and feed their animals due to the clearance of trees for cultivatable land.
- A market has emerged to sell water for livestock through private boreholes, water yards, and truck delivery. This will have an impact on herd management strategies which may then affect areas under cultivation.
- Trees are a resource with different uses and values to different specializations. Institutions to manage trees may overlap with institutions with control over other resources, such as the type of land on which they are located and their proximity to water sources.
- Crop residues are a resource in which pastoralism, farming, and land management come together. The management of residues has changed significantly since the 1990s, negatively affecting land fertility and the cost of managing herds. Krätli (2013) estimates that most of the traded livestock feed comes from crop residues.

Part 5. Darfur's juridical systems: a context of legal pluralism

Darfur's juridical system is made up of three institutions: formal courts, local customary courts (under the Native Administration), and traditional (*judiya*) justice. These institutions operate very differently, sometimes complementing each other and other times competing with each other.

The formal and customary courts use statutory and *Sharia* law. *Judiya* (traditional justice) is the lowest level of jurisprudence and is a tribal reconciliation mechanism. It is comprised of *ajaweed* (mediators) who hear the case and recommend a settlement. *Judiya* plays a key role in settling disputes relating to access to natural resources. Customary justice is founded on compensation practices and the recognition of responsibility, which can lead to reconciliation. It can be ordered by the court, recommended by *ajaweed* or other mediators, or agreed by consensus by the parties.

Diya (compensation payment) varies from region to region and is used in cases of unintentional homicide, injuries, and damage to property. It is an important governance mechanism that relates to resource usage and the maintenance of socio-economic relationships.

Key points for Taadoud II:

- Darfur's juridical system is made up of three institutions: formal courts, customary courts (under the Native Administration or *idara ahalia*), and traditional (*judiya*) justice.
- *Judiya* focuses on reconciliations. It is evolving due to the conflict and wider socio-economic changes in Darfur. *Judiya* processes increasingly appear to be adopting court procedures such as calling witnesses or visiting incident scenes.
- Darfurians usually say that the first step in any dispute resolution should be a *judiya*. However, since the war began, customary courts and *judiya* have lost influence, and issues are ending up in courts more and more frequently.

Part 6. The transition from humanitarian action to early recovery and resilience programs

Humanitarian agencies face challenges when shifting from humanitarian to resilience approaches and/or incorporating resilience concepts into their humanitarian programs. We may need to consider these differences in principles and implications for ways of working, in order to develop a framework for resilience programming in protracted crises. A major part of the transition from

humanitarian to resilience agendas usually begins with training of staff to help them make the transition.

Key points for Taadoud II:

- Taadoud II could develop its own set of guiding principles and ethics through a participatory process. This would provide a platform for the consortium to discuss ethical challenges that may arise on the ground and then have clear guidance for decision-making as issues arise.
- The literature supports Taadoud II's focus on natural resource management as an important building block for resilience in Darfur and the facilitation role that it is taking.
- Resilience programming remains untested in protracted crisis contexts. Therefore, it is important for programming to be delivered in a way that builds local capacity and addresses issues of elite capture, conflict, and weakened institutions. Developing effective partnerships with governments, municipalities, traditional leaders, civil society organizations, and non-governmental organizations (NGOs) is imperative. As Taadoud II tests this way of engaging and building capacity, it has an opportunity to learn and document how to effectively conduct resilience programming in a protracted crisis environment.
- In the shift from humanitarian response to resilience programming, "beneficiaries" become partners and extend beyond households to communities and institutions. Analysis of how to engage with each target group should be shaped by the nature of the past conflict and consider how to facilitate increased capacity while tapping into the resources that partners bring to the efforts. Resilience building provides an opportunity for a two-way street in which INGOs (international non-governmental organizations) benefit from partner individuals, community, and institutions, and partners benefit from the INGOs.

Introduction

This desktop study supports the Taadoud II: Transition to Development project, implemented by a consortium of international humanitarian organizations and Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University. The consortium is led by the Catholic Relief Services (CRS) and is funded by UK aid. Together, the six implementing partners have activities in all five Darfur states, in which the contexts, opportunities, and challenges vary greatly.

The first phase of the program, Taadoud I, included a research component led by Tufts University. A major finding of this research was that access to natural resources was a major driver of resilience—in all four contexts included in the study¹—and access to these natural resources depended on local relationships and the power dynamics between users. The research also found that many of the traditional institutions regulating the management of local natural resources have been weakened or undermined by years of conflict and processes of social, economic, and political change.

The aim of Taadoud II is to promote resilient, sustainable livelihoods, transitioning from the provision of humanitarian inputs and services towards support of developmental processes. Though some humanitarian activities are incorporated in the program, the main focus has shifted to resilience-building approaches linked to natural resource systems, adaptive management, and environmental cooperation or co-management. As this paper explains, there is now increased recognition/acceptance and understanding of the importance of institutions, networks, governance, and policy related to natural resource systems, adaptive management, and environmental cooperation (Tompkins and Adger 2004).

The Taadoud I activities focused on “returnees,” or “returnee villages,” and therefore by default addressed the needs of the settled farming population. Although pastoralists living in the area were allowed to participate in Taadoud I activities, the activities were not designed to address the needs of pastoralists, and their participation was not actively sought, except in conflict-resolution activities. Taadoud has since recognized the role of pastoralism as part of the regional livelihoods system of Darfur and the importance of integrating both pastoralism and farming livelihood sub-systems into the program design. Taadoud II will target entire populations within catchment areas whose boundaries are determined by the sharing of multiple natural resources, including those populations that are present only seasonally. Taadoud II will work to support the sustainable, equitable access to local natural resources for all livelihood sub-systems.

Taadoud II, like Taadoud I, includes a research component with two distinct but related arms. One arm will further develop a measure of certain aspects of resilience, while the other arm will dig into multiple topics related to natural resources management (NRM) in Darfur, as needed to support the Taadoud II NRM activities. This desktop report is intended to inform the research and, more directly, the implementation of the Taadoud II activities.

The broad objectives of this desk review are:

- To serve as a foundation and reference for the operational research and research uptake, and for the development of training materials, policy briefs, and research

¹ Four general regions were included in Operational Research I (OR I): South Darfur, East Darfur, southern West Darfur, and northern West Darfur (Kulbus).

studies. For example, this study will help identify issues for Taadoud II training and debunk myths that may inhibit an accurate understanding of the situation.

- To promote a shared understanding within Taadoud partners and stakeholders of the livelihood systems and sub-systems, their traditional complementarity and integration, and the way they have been transformed as a result of a series of ongoing processes.
- To promote a shared understanding of the key policies and related processes and trends influencing access to and availability of natural resources.

Roadmap

This study is organized into several sections, covering differing topics. Part one provides a background on the history and context of disasters and development in Sudan, complemented by a review of vulnerability and resilience and how this has evolved in the Sudan context. Part two focuses on understanding how conflict has affected livelihoods, and the institutions and natural resources upon which the majority of livelihoods are based. Part three presents original analysis on climate and vegetation trends in Darfur and the Sahel more broadly, based on available remote sensing data. Natural resource systems and institutions in the Darfur context are covered in Part 4. The particular natural resources of focus in this review are those most critical to different livelihood production systems or are of particular relevance to Taadoud. Institutions related to Darfur's juridical systems are reviewed in Part five. The final chapter, Part six, reviews the transition from humanitarian action in protracted crises to early recovery and resilience programs.

Methods

This desk study builds on a large body of earlier work conducted by the Feinstein International Center on livelihoods in protracted conflict settings, including a long history of research in Sudan (see Annex 1). The Tufts Taadoud team reviewed the conclusions and recommendations of the Taadoud I Operational Research (OR I) alongside the Taadoud II's new NRM approach and issues that emerged during the Taadoud II design workshops. From this review, the team developed an outline of specific areas to research, which are reflected in the Table of Contents.

Building on our existing bibliographic databases, we commissioned a literature search focusing on social institutions regulating natural resource use in Darfur. In addition, the Tufts Taadoud team conducted a literature search for each of the other issues included in the outline. The review began with the existing extensive bibliographic library. As new, related issues emerged from the literature, they were added to the outline. Past publications from the Feinstein International Center and peer-reviewed journals were prioritized, followed by unpublished literature and reports where there were gaps or where these documents added depth or specific examples.

One of the issues that emerged was the competing narratives of climate change and desertification. For this, a secondary data analysis was conducted. We compared historic and recent trends for three environmental variables: mean monthly temperature, mean monthly precipitation, and mean monthly normalized difference vegetation index (NDVI). We downloaded each of these datasets from the source in netCDF or GeoTIFF raster format and subset to Darfur states. We also extracted state-wide mean monthly values for all three variables to compare trends across the Darfur states. Then we constructed an additive time series model for state-averaged data for each environmental variable and removed the seasonal component of each time series to assess overall trend for each state during the study period. Trend maps were constructed for each dataset using a simple linear

regression model, with the environmental variable as the dependent variable and time as the only independent variable. The slope of this regression equation was used to determine the magnitude and direction of change over time. Rasterized trends were smoothed using bivariate interpolation for the study extent—final maps included in this report thus provide smoothed contours of trends extracted from monthly mean environmental data. Change in mean and variance was utilized to compare GPCC, TRMM, and MERRA precipitation datasets. This change point detection was accomplished using the At Most One Change (AMOC) method and a modified Bayes Information Criterion penalty.

Part 1. History and context of disasters and development in Sudan

By Helen Young

This section provides a brief background on the Darfur context, including the long narrative of disasters and the protracted nature of the ongoing humanitarian response. It also reviews relevant theory on reducing vulnerability to disasters and building resilience in conflict-affected dryland environments. For practical purposes, we revisit and challenge some of the widely held narratives about drylands that are regularly aired and fostered even today.

The region of Darfur has continuously suffered humanitarian crises since the start of the Darfur conflict in 2003. Before that, in the 1970s, 80s and 90s, Darfur was regularly affected by a number of droughts and even persistent drought lasting two or even three years. Duffield (1993) refers to the increasing frequency of large-scale, complex disasters and *“the unbroken line of emergency operations that now span nearly a decade”* (p. 132). An historical timeline chronicling climate, conflict, and other crises in Darfur at both the regional and community level indicates that climate, conflict, and other shocks and hazards have regularly affected communities for more than a century (Young and Ismail 2019b).

As a result, international humanitarian action has become an almost permanent feature in Sudan. However, this intervention is based on short-term funding cycles combining both acute and protracted humanitarian response, which has generated an unending cycle of short-term humanitarian programs trying to address needs arising from a complex protracted crisis. Duffield argues that this has created an exclusive parallel response system—acting to separate government and citizens, creating a reliance on external structures, and weakening indigenous structures rather than strengthening them (Duffield 1993).

This continuing catalogue of disasters and a focus on vulnerability has generated a powerful crisis narrative, with multiple implications:

- It has generated a short-term approach in which crises are addressed as individual, unrelated events, referred to as crisis thinking: *“based on an inadequate understanding of local livelihoods and the causes of vulnerability”* (Longley et al. 2006, 1).
- It has entrenched simplistic categories of victims (refugees, long-term displaced, returnees, seasonally affected) who are exclusively worthy of humanitarian aid.
- The focus on individual crises lends itself to programming that addresses the immediate vulnerabilities and effects of those most directly or visibly affected by a particular crisis without seeing it within its larger framework of systemic or structural vulnerabilities.
- Humanitarian response has failed to address persistent global acute malnutrition (GAM)—emergency levels of acute child malnutrition (i.e., above 15% prevalence weight-for-height)—that persist for years and sometimes decades (Young and Marshak 2018).

Disasters in Sudan are endemic and persistent, which strongly suggests that the structural causes of vulnerability have not been addressed and also raises questions as to how these persistent crises have transformed communities, their livelihood strategies, and their current capacities and resilience. (Adger 2000).

1960s and 1970s

In the 1960s and 1970s, responses to disasters and development were primarily technological fixes to natural hazards, e.g., fighting hunger and famine with the green revolution.² Mainstream thinking at that time sought to tackle these problems by changing the systems of land tenure and livestock management in order to optimize “carrying capacity,” a paradigmatic approach that has since been discarded. This period also spawned the desertification narrative, blaming smallholder farmers and pastoralists for land degradation (Swift 1996).³ Modernization at that time was also seen to require settlement of pastoralists, which generated explicit policies of sedentarization (Krätli and Swift 2014) in multiple contexts, including in Sudan (El Sammani and Salih 2006). In Sudan, grand technical solutions were reflected in the huge hydro-agricultural schemes and expansion of mechanized and irrigated farming, linked with the notion that Sudan was going to be the breadbasket of Africa. Government policies and subsidies were skewed in favor of big farms, while traditional farmers and pastoralists were driven off their land, lost their grazing pastures, and/or saw their migration corridors blocked (Verhoeven 2011). The construction of the Jonglei Canal is an example of a hydro-engineering technical solution to the environmental problem of water scarcity.

Technical advances and solutions are obviously important. However, on their own they are high risk, and the lessons from this era regarding the risks of capital-intensive farming remain relevant today (for example: depleting soils, using up groundwater, clearance of natural vegetation, relying on monocultures, and favoring export or potentially cash crops over domestic food production) (Sulieman and Ahmed 2013; Verhoeven 2011).

The impact of these technical solutions often negatively affects many of the individuals most closely concerned. For example, in the Gezira mechanized/irrigated agricultural scheme, having lost access to the resources necessary to sustain their livelihoods, the farmers and pastoralists formerly dependent on the appropriated land were then forced to seek low-wage work on the large farms, or even to rent their own land back once the schemes began to collapse (Ijaimi 2006; Pantuliano 2005). In eastern Sudan, drastic conversions of natural vegetation areas into large-scale mechanized agricultural land resulted in a progressive loss and degradation of grazing area in the entire region (Sulieman and Elagib 2012). Although there were only very limited attempts at modernizing traditional agriculture in the Darfur region as part of the Jebel Marra Rural Development Scheme and the Western Savannah Development Corporation in South and West Darfur, it is important for the current generation of resilience programmers to keep these concepts in mind when designing large technical solutions to what may in fact be a social or governance problem of management (Abdul-Jalil 2006).

1980s and 1990s

In the 1980s, following two epic Sahelian famines and emergency response programs (1972–73 and 1983–84), international attention turned to reducing risk and vulnerability to disasters, linked with disaster mitigation and emergency preparedness; for example, intense activity on developing famine early warning systems and promoting household food security (Davies et al. 1991). The introduction

² New technologies aiming to increase crop production in developing countries, including artificial fertilizers, pesticides, and high-yield crop varieties.

³ Note that even in 1984 livestock overstocking was estimated between 30 and 80% (Ibrahim 1982), which, given the growth in human and livestock populations in more than 30 years since then, was clearly false.

of the Sustainable Livelihoods Framework in the early 1990s broadened international perspectives from a narrower food security focus.

The early 1990s also heralded a new era of international engagement by humanitarian agencies in complex political emergencies (de Waal 2000; Macrae et al. 1994). This marked a shift towards providing assistance and protection efforts within areas affected by conflict and political instability rather than on the peripheries (Collinson 2003). The North/South civil war in Sudan, which raged for more than two decades, was an example of this and led to a protracted international humanitarian response in combination with a tough international sanctions regime and national political climate that resisted or constrained international humanitarian action. With the international peace agreement between North and South Sudan that was signed in 2005, conflict in the Darfur region surged, in part because the Darfur rebels were excluded from the North-South peace processes. The conflict in Darfur became the world's largest humanitarian crisis at that time and evolved into a protracted crisis that has endured for more than a decade.

In the past ten to fifteen years, new modalities of international response to the Darfur crisis have emerged, including peacekeeping, peacebuilding, disarmament, demobilization and re-integration (DDR), and INGO/UN early recovery and resilience building programs as part of the humanitarian agenda. This has generated a complex institutional environment that interfaces with similarly complex government and civil society structures that span multiple levels, connecting the local to the international.

A shift from what makes communities vulnerable to what makes them resilient

Despite the current Taadoud II focus on resilience, vulnerability remains extremely relevant in the Darfur context, given the incomplete recovery of some groups, and the shifts in inequalities and relationships as a result of crises and conflicts. For example, the conflict has exacerbated inequities in access to and social distribution of natural resources and therefore has undermined social justice.

More broadly, international views on vulnerability have evolved, from the focus on the disaster event itself and technical solutions, to understanding why people are vulnerable or what made some people more vulnerable than others. An example of this is Amartya Sen's entitlement theory of famine, which explained that famines are caused by a loss or failure in entitlements to food, not because of an absolute shortage of food (Sen 1981). He recognized the vulnerability of landless laborers to famine, as they could not command food through either their own production or through market exchange. In Sudan, severe drought or persistent drought directly affects production strategies (farming and herding) and entitlements linked to this. While an understanding of how people access food and income (their entitlements) is crucially important, it does not explain why some people are more vulnerable than others as a result of the historical processes contributing to the vulnerability to food insecurity and famine; for example, the institutional and policy neglect of rainfed farming and pastoralism, which is the mainstay of the majority of the rural population in Sudan. Simple understanding of how people access food and income also fails to grasp important processes of change that will have huge implications for food security and other factors affecting future generations. For example, the famine in Darfur during the 1980s triggered the migration south of some pastoralist communities, including Zaghawa from the northwest who began to settle in South Darfur and the diversification of nomadic livelihoods into farming, which was the beginning of

a slow process of sedentarization, one that has continued up to this day.

What makes people unequal?

There are two sides to vulnerability: an external side of risks and shocks and an internal side associated with a lack of means to cope without incurring damaging loss (Chambers 1989). The latter is associated with social factors, so what makes a household unsafe is usually related to their social position and the way this gives them either a relative advantage or disadvantage as determined by their gender, ethnicity, income, etc. Disaster risk therefore depends fundamentally on how social systems and their associated power relations impact on different social groups (through their class, gender, ethnicity, etc.) and not on natural forces (Blaikie et al. 1994). This confirms that **there is nothing natural about natural disasters**. An analysis of vulnerability from this perspective potentially allows an analysis of the status quo within and between communities, and what makes people unequal (their power relations) (Bankoff and Borrinaga 2016).

Linking relief and development and the shift to resilience thinking

In the early 1990s, the debate about how relief and development should be linked gained ground (White and Cliffe 2000). This contrasted with much of the earlier thinking that viewed humanitarian action and development as distinct and entirely different, separate activities (White and Cliffe 2000; Buchanan-Smith and Maxwell 1994). The relief-to-development continuum was originally conceived as a *“linear progression from a state of crisis, through rehabilitation and development,”* as part of which humanitarian assistance helped to sustain people during the crisis, and then development activities would reconstruct “normal” life (Macrae et al. 1997, 225).

Even today, there remains a tension in the relationship between humanitarian and development priorities and activities, which coincide most obviously during protracted crises. Increasingly analysts believe that resilience analysis and programming is the way to close the divide (Donini and Maxwell 2016). Similar to earlier efforts to reduce vulnerability, resilience purports to hold the key for overcoming the cycle of recurrent crises and humanitarian response (Barrett and Conostas 2014), yet there remains a dearth of practical examples.

Resilience as a concept has been applied in multiple fields ranging from psychology to engineering. In relation to development, there are two broadly distinguishable perspectives on resilience (Bousquet et al. 2016), that coincide with the different ways that Taadoud II is looking at resilience. These two perspectives include:

1. **Development resilience:** The development approach to resilience focuses mostly on the social resilience of communities, on recovery after the shock, on the speed of recovery, and on the ability of households to respond to unanticipated variability and to learn how to recover quickly from shocks. It is strongly related to the social capital of societies and communities (Adger 2000). This is the approach taken in the Taadoud II Income Stream Index (ISI) and the baseline survey, which surveyed household capacities (in the form of assets, access to essential services, and their livelihood activities), response to shocks, stress, and their resilience.
2. **Socio-ecological resilience (SE):** The experiences and thinking focused on the issue of resilience through a social and ecological system perspective. This relates to the functioning of a socio-ecological system in complex settings, where conditions are unpredictable as a result of extreme environmental variability (Bousquet et al. 2016; Adger 2000; Folke 2006). SE is most directly relevant to understanding how natural resource systems work in practice and therefore is directly relevant to Taadoud II’s work on natural resource management. The

emphasis in SES resilience is more on how to be prepared—how livelihood systems manage the unpredictability and buffer the shock, and how to develop in a way that the system maintains its functions and identity (Bousquet et al. 2016).

SE has its roots in the science of complex adaptive systems and the original work of Holling (1973), which, in contrast to earlier approaches, emphasized the uncertainty and unpredictability of future events. This uncertainty is particularly evident in complex dryland settings like Sudan where there has always been extreme environmental variability, and so uncertainty has always been part of day-to-day life and survival (Scoones 2004). This non-equilibrium thinking challenges widely held western assumptions about the stability of a system and expectations that a system will quickly return to its equilibrium position following a disturbance (Holling 1973). Holling defined resilience as a

measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables. (Holling 1973, 14)

A management approach based on resilience...would emphasize the need to keep options open, and the need to emphasize heterogeneity...and the recognition of our ignorance: not the assumption that future events are expected, but that they will be unexpected. (Holling 1973, 21)

In the context of drylands, the emphasis on socio-ecological resilience is on a management approach that enables pastoralists and farmers to live with uncertainty and unpredictability. As Scoones points out, “*cyclical patterns of rainfall availability allowed periods of drought to be offset by periods of plenty, when herds and flocks grew again and stores of grain were established*” (Scoones 2004, 116). This was also a finding under Taadoud II; Darfur farmers manage their production and storage in the medium term, allowing one year’s shortfall to be compensated by a year of better harvest.

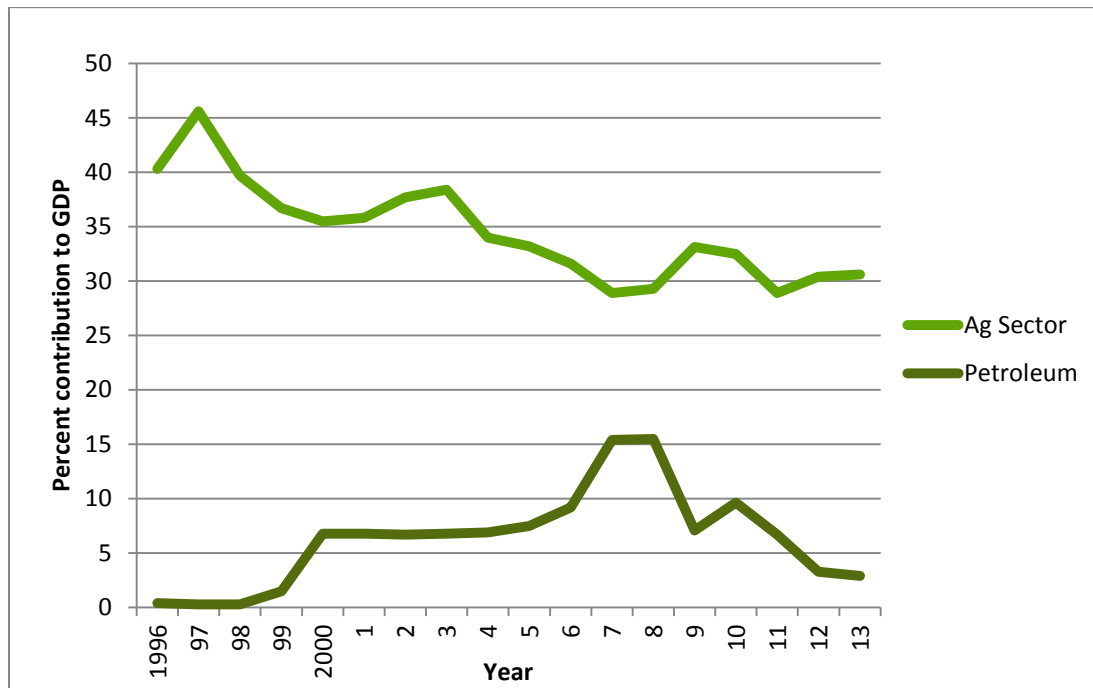
There is also considerable evidence that dryland producers have well-rehearsed strategies for responding to drought. In dryland contexts, flexible responses to variability allow optimal use of available water and pasture by livestock. Because of this unpredictability, “*prescriptive planning and imposed solutions will not work and locally derived responses are key to success*” (Scoones 1996, 3). In other words, dryland production systems, including both farming and pastoralist production systems, manage this variability through their own initiative and practices (Mortimore 2009).

There are many examples of these flexible management strategies—including species selection, seasonal livestock mobility, herd splitting, and planned daily routines. In the Darfur and Kordofan regions of Sudan, resilience studies have shown how local pastoralist producers have been able to turn specific deficiencies to an advantage (Young et al. 2016, Young et al. 2013). In Sudan, the pastoralist system of livestock production (as opposed to ranching) produces some of the largest livestock exports in the Horn of Africa, competing with oil in its contribution to GDP, not to mention the contribution to local livelihoods (IGAD 2013, Krätli et al. 2013) (see Figure 1).

The majority of the population of Darfur depends on the land and the resources on that land for their livelihoods. The wider economy of Sudan, and the Darfur region, also continues to be largely based on agriculture (both cultivation and livestock). The strength of the oil sector is fading (Patey 2010), and in terms of employment and livelihoods, it is estimated that two-thirds of the Sudan workforce is employed in agriculture (Patey 2010).

Nationally, relative to the crop sector, livestock is expanding in importance and is now by far the major component of Sudan's agricultural output. The contribution of livestock to total agricultural GDP has grown from around 55% to about 65% (Behnke 2014).

Figure 1. Percent contribution to national GDP by petroleum and the agricultural sector (crops, livestock, forestry, and fisheries combined), 1996–2013.



Source: Behnke 2014.

Thus, an environment that was predicted to be enveloped by desertification and the advancing Sahara in the 1970s has become the basis of the national economy and local pastoralist livelihoods—and with very little external investment (Krätli et al. 2013). Pastoralist production has also demonstrated its adaptive capacity, as new, locally adapted livestock breeds have been introduced that are more suited to the export market, are tolerant of the local wetter climate while still offering quality similar to desert sheep (Young et al. 2013).

A continuing challenge is that much of the old thinking and stereotypes about drylands have become entrenched in policy to the detriment of pastoralists and smallholder farmers (Mortimore 2009). For example, dryland contexts have been represented as fragile environments or ecosystems, which if mismanaged can lead to an increasing risk of environmental damage. In relation to Sudan, Ayoub (1998) presents this as a problem of producers, blaming soil degradation on pastoralists and farmers for overgrazing of livestock, or farmers for cropping without appropriate nutrient inputs, or both for overexploitation and clearance of forests and woodlands for firewood and charcoal making (Ayoub 1998). UNEP (2007) similarly emphasizes the fragility and degradation of the environment in Sudan, but importantly highlights

the impact of the displacement into slums, camps and informal settlements that has been accompanied by major environmental damage to the often fragile environments where these settlements have developed. (UNEP 2007, 115)

Critiques of producers' strategies for their failure to adopt and implement basic soil- and water-management practices were widespread in the past (Ibrahim 1982, Sandford 1989), but increasingly this has been challenged. A more widely held current view is that this "resource curse" (whereby countries that have an abundance of natural resources tend to have less economic growth, less democracy, and worse development outcomes than countries with few natural resources), which is evident in Sudan, is the result of multiple layers of governance failure at national, regional, and local levels over the past several decades (Patey 2010).

The concept of resilience has grown into an organizing concept for international humanitarian assistance. Today all the major donors, and both humanitarian and development implementing agencies, have resilience strategies and policies (DFID 2011, Frankenburger et al. 2012). These policies, which build on evidence that investments in prevention and preparedness can result in major savings in humanitarian response budgets, aim to bolster the capacity of at-risk and affected communities to better manage risks posed by hazards, and to mitigate, cope with, and recover from shocks (Cabot-Venton et al. 2012).

There are also critics of the resilience building approach. For example, while Haldrup and Rosén concede the value of socio-ecological resilience in understanding, responding to, and managing change, they caution against the way this *"is allied with contemporary governmental discourses that responsibilize risk away from the state and on to individuals and institutions"* (Haldrup and Rosén 2014, 15).

Key points for Taadoud II

There are important lessons here for Taadoud II:

- Pastoralist and smallholder production is more important to the national GDP than oil and therefore is of interest to politicians and policy makers.
- In the past, producers have been blamed for environmental degradation associated with overgrazing of livestock, or farmers for cropping without appropriate nutrient inputs, or both for overexploitation and clearance of forests and woodlands for firewood and charcoal making. The real problem lies in multiple governance failures across all levels.
- Retain a focus on vulnerability as well as resilience, and the wider responsibilities for humanitarian action and development more broadly.

Part 2. Livelihoods, conflict, power, and institutions

By Helen Young

This section focuses on understanding how conflict has affected livelihoods, and the institutions and natural resources upon which the majority of livelihoods are based. This is intended to help Taadoud II consider how the different conflicts have played out and might have affected their communities and catchment areas.

Conflict has been a prominent feature of the Darfur region since 2003 and has had a profound effect on people's lives and livelihoods, including undermining local institutions, networks, and governance related to systems of natural resource management and use. In the decades before 2003, various conflicts affected the region, including for example the Chad-Sudan proxy war continuing from the 1980s, the war between North and South Sudan, the Fur-Arab war of the 1980s, and the Masalit-Arab conflict from the late 1980s extending into the 1990s. In addition, there have been myriad local tribal conflicts reported throughout the region. This illustrates the wide range of conflicts that have affected the region, involving actors at the transnational, national, regional, and local level, with diverse drivers and underlying causes.

There have been several attempts at incorporating power relations, competition, and conflict more explicitly into livelihood frameworks. Adapting the livelihoods conceptual framework, Collinson adds an additional element that shows how livelihood assets influence power and recognizes that vulnerability is linked to political status and lack of power, rather than simply economic status and material need (Collinson 2003).

In South Sudan, David Keen found that a household's livelihood assets might also render the household susceptible to exploitative or even violent processes linked with the wider conflict and famine (for example, livestock raiding and intimidation that strip assets, disrupt or damage food supplies, and distort markets) (Keen 1991). Livestock were the primary target of raiding parties, and thus owners of larger herds were more vulnerable, reversing the common association between asset wealth and vulnerability.

Livelihoods assets were frequently the target of *janjawid* militia attacks at the height of the Darfur conflict, including looting and destruction of physical and natural resources, and intimidation and gender-based violence against communities. The impact of conflict on local livelihoods and livelihood systems in the Darfur region has been well documented (Buchanan-Smith and Jaspars 2007, Young et al. 2005, Young et al. 2009), and include the direct impacts of conflict and violence, resulting in loss of life, injury, forced displacement, looting and asset stripping, and coercion and intimidation, and the indirect effects of conflict linked with insecurity (restricting travel and movements beyond the internally displaced persons (IDP) camps, thus limiting access to livelihood assets, such as farms, gardens, forests, and rangeland). Many former IDP populations have lived under such restrictive conditions for more than a decade, some only returning to their farms seasonally or not at all. At the same time, the livestock migratory cycles of pastoralists have been disrupted, with much shorter patterns of migration and a consequent shift in herd composition from camels and cattle to sheep (also driven by the market demand).

A key requisite for sustainable livelihoods is security (Chambers and Conway 1992), and the ability of people to move freely in order to access productive resources, employment, and markets. On the other hand, restricted mobility that constrains livelihoods is characteristic of conflict zones (Young and Jacobsen 2013, Young et al. 2005), where people are forced to adopt strategies that are unsustainable or damaging in the medium term. These negative coping strategies can increase societal inequities and marginalization, and overexploit limited natural resources (Young et al. 2009). When practiced on a small scale they may not be damaging, but with the scale of urbanization and displacement now seen in Darfur, the collection and sale of firewood, water selling, and brickmaking are unsustainable. The uncontrolled overexploitation of natural resources is linked to markets distorted by a war economy and presence of a massive international community (Young and Jacobsen 2013, UNEP 2008).

Apart from the negative impacts of coping responses, studies have also revealed more sinister behaviors that are extra-legal and can sometimes seriously affect others, including the use of intimidation, coercion, protection payments, asset stripping, theft, and violence (Buchanan-Smith and Jaspars 2007, Keen 1994, Young et al. 2009). Young et al. define such maladaptive livelihood strategies as

short-term, conflict related strategies that provide quick returns but have no future as they are not based on any legal entitlement or customary rights. Rather, they may depend on either a distorted market, in which IDPs are captive, or alternatively they are linked to conflict, violence, intimidation or coercion (militarization and possibly violence as a means of controlling resources). (Young et al. 2009, 70)

Furthermore, in a context of impunity, such behaviors and maladaptive strategies serve to undermine customary law and local institutions. In the long term, these maladaptive strategies may result in the exclusion of those using these strategies from desired social and economic networks.

Diverging views on drivers of the Darfur conflict

In the past decade, international perspectives on the drivers of conflict in Darfur have tended to polarize around two widely held views. First, the socio-political view focuses on the social, political, and economic marginalization of Darfur and the role of the government—their policies and counter-insurgency campaign—and the way they have manipulated Darfur actors, leading to the International Criminal Court (ICC) warrant for the arrest of the President of Sudan. Second, the environmental security view attributes the Darfur conflict to environmental factors: conflict between tribes over land and natural resources made scarcer by a changing climate.

Socio-political marginalization as a driver of conflict

This line of argument purports that the root of the conflict lies in the social, economic, and political marginalization of peripheral regions of Sudan by the central government in Khartoum. This has led, so the argument goes, to uneven development between regions and groups, which was already a feature of the colonial economy and gained momentum in the 1970s. According to Sørnbø and Ahmed:

Divisive policies at the national level, as well as locally and regionally, have created a confrontational and polarized political environment characterized by inter-communal violence and struggles against continued marginalization. (Sørnbø and Ahmed 2013, x)

Sudan scholars argue that this center-periphery inequity has been present since Sudan achieved independence in 1956, and before. Increased militarization in the Darfur region and recruitment of militia on a tribal basis has led to increasing arms in the region and a deepening polarization between communities at a local level.

The central government of Sudan, so the argument goes, has subjected Darfur (among other regions) to emergency rule and counter-insurgency operation: *“There has been a move away from peaceful co-existence to dichotomization based on claims to cultural authenticity. In such a process, ethnic boundaries and cultures are being defined through a process of violence”* (Manger 2015, 6).

Environmental security: climate change and conflict

This environmental security debate often focuses on the issue of climate change exacerbating inter-tribal conflict or indeed more local-level farmer-herder conflict. The argument that climate change is exacerbating or driving conflicts in Darfur (see for example Lavergne 2010) has received a huge amount of attention and been echoed by international commentators and politicians: Jeffrey Sachs (Sachs 2007), Margaret Beckett (Beckett 2007), and Ban Ki Moon. The environmental argument is based on a belief there has been a pronounced decline in rainfall over the Sahelian zone during the past 40 years (Chavunduka and Bromley 2011), which has contributed to an ecological crisis in the Sahel, threatening the lives of both people and livestock (Unruh and Abdul-Jalil 2012).

However, as we show with our own analysis, 40 years is too short a period upon which to base such an analysis, and in addition this 40-year period commences in the 1960s, an unusually wet period, thus amplifying the impression of change. Our own analysis of the data shows something less than the “pronounced decline” indicated by Chavunduka and Bromley (see Part 3 of this study).

While environmental factors are important, they are by no means the entire story. An examination of the pattern of rainfall just prior to the conflict and violence in Darfur found no correlation between rainfall and conflict (Kevane and Gray 2008). Kevane and Gray (2008) reported that rainfall in Darfur did indeed decline, but the decline happened over 30 years before the conflict erupted (Kevane and Gray 2008).

Some of the arguments linking climate change to conflict are bound up in ideas and paradigms that have been shown to be outdated and even wrong. It is therefore imperative that Taadoud II is familiar with some of these arguments and counter-arguments.

Moving beyond a polarized debate and refocusing on institutions, governance, and power inequities

Some argue these divergent views on the drivers of conflict have been a barrier in the search for peace, as it has *“created a misleading dichotomy between a ‘depoliticized’ local conflict and a ‘political’ conflict at the national level”* (Bromwich 2017, 1), whereas Bromwich insists the two are closely linked (ibid). He attempts to bridge this polarized debate by investigating the contested institutions across Darfur that are relevant to conflicts within Darfur at different levels. We would conclude that both perspectives are important, especially in considering the links and interconnectivity between the drivers of different types of conflict and the levels at which drivers operate.

This question of the interconnectivity between drivers and institutions across scales raises a question about the appropriate scale of analysis in trying to understand livelihood systems, and also in understanding the drivers of conflict. Sørnbø helpfully emphasizes that

both top-down and bottom-up agendas [require]...an approach to peace-building...that can address multiple arenas and sources of conflict in a much more integrated way than has been the case so far. (Sørnbø 2010, 173)

Similarly, Stiansen and Kevane (1998) argue there is a need to shift from a focus on the central state and central institutions to a focus on the interaction between state and non-state institutions at the local level.

Hence the interactions across scales, from central to local institutions, is important to understand.

As a result of their seasonal mobility traversing potentially hundreds of kilometers, the pastoralist landscape and pastoralists themselves are always part of large-scale economies and social structures (Sørnbø 2007). This has ramifications not only for the scale of analysis but also the entry point for engaging with relevant institutions, given that “*pastoral viability clearly depends on the ability of groups and communities to access resources within different institutional contexts of multiple scale*” (Sørnbø 2007, 116). Thus, a local-level dispute involving a pastoralist potentially raises issues across wider contexts. Two examples of this within the Taadoud II area are:

- In the late 90s, Arab *abbala* (camel herders) pastoralists were unable to migrate to their rainy season pastures in the far north of North Darfur because of tribal disputes in that area, which meant they were forced to move southwards earlier than usual and before the harvest, thus risking livestock damaging crops before harvest time.
- The *baggara* (cattle herders) pastoralists who were unable to migrate from East Darfur into South Sudan because of political barriers were forced to stay in South and East Darfur, putting additional pressure on resources in those regions and increasing conflict with cultivators.

Some tribal disputes over land are connected with wider national-level politics in Sudan (Young et al. 2016). These connections might be a result of increasing arms among tribes who were armed by the government to fight proxy wars during the civil wars in southern Sudan and later in Darfur and Kordofan, or they might be a result of disputes arising as a result of new administrative boundaries (Takana 2008).⁴ Some tribal groups, like the *baggara* Arabs, have much stronger links with the dominant political parties in Khartoum than non-Arab groups like the Fur (Haaland 2005).

Tribal conflicts are often confused with farmer-herder conflict, which is problematic. In East Darfur, the Southern Rizaygat and Ma’aliya have a long history of inter-tribal conflict, yet particularly severe episodes of conflict in recent years have been presented by the media and international commentators as a competition between farmers and herders over land, while ignoring the links between land, political capital, and military power (Young et al. 2016).

Farmer-herder disputes and conflict that occur between individuals or small groups of producers are

⁴ Takana (2008) argues that the demarcation of tribal Dars Administrative/Dar system is the main trigger for conflict in South Darfur and that the re-division of Darfur into three states with the creation of new tribal Dars has been very bad for Darfur, and is opposed by a majority of Darfuris.

a serious issue. One of the most frequently reported farmer-herder disputes relates to pastoralist livestock trespassing farmers' fields and damaging crops (Adams 1982; Osman et al. 2013; Fitzpatrick et al. 2016; Young et al. 2013; Young and Ismail 2019a). In West Darfur, farmers report that they are increasingly concerned about the risks of pastoralist livestock herds trespassing their fields and damaging crops before harvest. As many of the herders are armed, farmers report there is little they can do to prevent this happening. Some communities have taken steps to prevent this, including setting up a "Farms Protection Committee," which has helped in protecting farms from animals invading and damaging farms and includes representatives from both farmer and herder communities (Young and Ismail 2019a).

Another less-visible issue, of concern to pastoralists, is the expansion of farms (by both farmers and newly settled pastoralists) at the expense of rangeland and the blocking of livestock corridors used by pastoralist herds to reach their seasonal grazing areas. These are both widespread problems and frequently complained about by households across the Darfur region (Young et al. 2016, Fitzpatrick et al. 2016).

A newer issue related to intensification and expansion of agriculture is the increasing practice of dry season agriculture along wadis, which are the traditional dry season grazing areas of pastoralists. There is a high risk of livestock damaging dry season crops as they struggle to gain access to dry season water resources. This issue has been reported along the Segan River in Borana Zone, Ethiopia, where investors are buying the more productive riverine land, which is then farmed by sharecroppers, raising tensions with Boran pastoralists in the area. The fact that the landowners live elsewhere and that their use of land has been illicitly "approved" by current or former government officials without the knowledge or consent of traditional leaders and communities makes this more challenging to resolve (Stark et al. 2017).

The increasing commercialization of livestock and increase in exports in Sudan is also a factor that is driving farmer-herder disputes (Abdul-Jalil 2008). Abdul-Jalil argues that increasing livestock exports in the past two decades, especially of sheep, has encouraged settled farmers *"to invest in more livestock breeding for commercial purposes, hence the competition with nomads"* (Abdul-Jalil 2008, 19).

The vast majority of farmer-herder disputes take place at the level of the producers (farmers and herders) and are often resolved at that level. If individuals are unable to settle their disputes, the issues are traditionally referred to their local Sheikhs, who are the local-level representatives of the wider Native Administration (see Part 5). Some communities included in the Taadoud I OR, though, reported that with the shift in the balance of power, some groups refuse to accept the role of the local Sheikhs and prefer to raise individual disputes to the higher tribal representation level.

Certainly, there is a need for further analysis on farmer-herder conflict, so that it can be more clearly understood, including its links to wider conflict, if necessary on a case-by-case basis so that it can then be addressed at the appropriate level.

Key points for Taadoud II

- There has been a wide range of conflicts involving actors at the transnational, national, regional, and local level over the past 40 years and more. It is important to consider how the different conflicts have played out and affected communities at the local level.

- A key requisite for sustainable livelihoods and the peaceful co-management of natural resources is security and the ability of people to move freely to access productive resources, employment, and markets.
- A history of maladaptive strategies may result in the exclusion of certain groups from key social and economic networks and institutions.
- While it is important to understand the divergent views on the drivers of the wider Darfur conflict, the focus of Taadoud II should be on the institutions, governance, and power inequities within the local contexts where Taadoud is working.
- Pastoralism is unique in that it bridges multiple local environments, economies, and social structures, which has implications for the scale of analysis and the appropriate entry point for engaging with pastoralist institutions.
- Inter-tribal conflicts are sometimes confused with more localized farmer-herder conflict. The former are more likely to be linked to political capital often associated with land and are sometimes connected with national-level politics. The latter have more to do with grievances on the part of herders (expansion of rainy and dry season farms, blocking of corridors, access to dry season water sources blocked by farms) and farmers (livestock destruction of crops, not respecting the *talaig*).

Part 3. An examination of climate trends in Darfur and the Sahel: a matter of perspective?

By Anastasia Marshak and Aishwarya Venkat

To better understand changes in climate across the Sahel, and the Darfur region more specifically, we reviewed the literature and undertook further analysis of primary data with regard to trends in vegetation, precipitation, and temperature.

Data on vegetation are frequently used as a proxy for land degradation and desertification. Our analysis shows that while there is large decadal variation in the trends themselves, on average vegetation trends have remained stable in the Darfur region over the twentieth century.

Drawing a conclusion from trends in rainfall, on the other hand, proves to be more difficult. Long-term analysis (the past 100 years) shows that precipitation on average has likely remained stable; however, our primary analysis indicates a slight decline (possibly due to the inclusion of data from the past decade), though these findings are not consistent across the different available datasets.

There is far greater consensus in relation to changes in temperature. The literature reviewed and our primary analysis suggest that temperature in the Darfur region has significantly increased. However, the interpretation of the scale and even direction of changing Sahelian weather patterns at the local level depends on many different factors, such as the period under review, the season, the dataset used, and the region explored. Evidence from Darfur indicates the region experiences long-term oscillations in weather patterns based on decades, meaning that trend analysis needs to include the longest periods possible.

Analysis of climate trends is a relatively new field and different models give different results; thus all interpretations and analysis should be taken with caution and replicated as more data become available.

Climate trends in Darfur, and the Sahel more broadly

Darfur is part of a region known as the “Sahelo-Sudanian” agro-climatic zone. This zone is characterized by open grasslands and seasonal rivers (wadis) that support the area’s main livelihood systems, farming and pastoralism (Morton 1985). A better understanding of the trends in climatic variables such as vegetation, rainfall, and temperature is necessary to support livelihoods across the region. However, there is no general agreement on the long-term climatic trends facing the Sahel, including whether there is true desertification or simply land degradation. In this section, we review some of the competing narratives on climate change in the Sahel and present our own (long- and short-term) evaluation based on remote sensing data on precipitation, temperature, and normalized difference vegetation index (NDVI) in the Darfur region, combined with our own experiences and observations in Darfur.

Vegetation

In this section, we review the history of the different approaches used to measure vegetation and the resulting variation in interpretation and narratives around the desertification of the Sahel. Researchers have been writing and arguing about the desertification or degradation issue in Africa since the 1930s. Dodd (1994) tracks the evolution of this discussion. He notes that Stebbing, a

European forester in 1935, on the basis of observations and consultations with local colonial authorities, concluded that the forest was being taken over by the southward encroachment of the desert due to human intervention. Stebbing further claimed that the desert had moved south at a rate of 1 km per year over the past 300 years and suggested the planting of a forest belt 15 miles broad and 1,370 miles long. This thinking was questioned by Rodd in 1938, who claimed that desert boundaries were not fixed but instead were a system that experienced great ebbs and flows through time and that this change was attributed to fluctuations in weather (Dodd 1994).

In 1975, Lamprey and a team of researchers mapped the boundary between the desert and sub-desert scrub in Kordofan, reporting that it had shifted 100 km southward since 1958 (Lamprey 1988). Lamprey explained that he and his team understood the ecological degradation that they found to be due to several thousands of years of abuse of the fragile ecosystem and the current land use practices (Dodd 1994). This view was taken up and pronounced by many international agencies and culminated in United Nations Environmental Protection (UNEP) agency's 1977 conference on desertification.

It is worth noting that an important component of the “desertification” argument was that the phenomenon was partially man-made and not just driven by cyclical climatic trends. For example, Ibrahim (1984) writes:

This process of the creeping destruction of the quasi-natural ecosystem of the Sahelian zone has been caused by a synergism of human and natural factors: i.e. the rapid increase of human and animal populations and the simultaneous occurrence of a long drought phase which began in 1968 and has lasted up till now. (Ibrahim 1984, 185)

The author turns his ire towards sedentary forms of production:

The most far-reaching impact on the natural resources of the savanna is affected by rainfed cultivation beyond the climatically adapted agronomic dry limit. The most serious damages in northern Darfur are not caused by the nomadic animal husbandry, but by the combination of rainfed cultivation and sedentary animal breeding. As the latter is practiced in the surroundings of settlements, where soil is also exhausted through cultivation, a concentration of desertification phenomenon is to be noticed there. A further deterioration of the ecological resources in the farther surroundings of settlements is caused by the clearing of the tree-stock, for the inhabitants require great amounts of wood for building and cooking purposes. (Ibrahim 1984, 186)

However, this view and Lamprey's findings specifically were criticized by Hellden (1988), who concluded that Lamprey was wrong in his statement that the desert boundary had moved at all, let alone 100 km since 1958. Hellden suggested that the original 1958 boundary that served as the baseline for Lamprey's analysis was not mapped but merely, and incorrectly, assigned to the 75-millimeter-rainfall isohyet (contour line), thus leading Lamprey to mistakenly conclude that the boundary had moved southward (Dodd 1994).

When looking at more recent analysis of desertification, the opposite narrative emerges—one of “greening” in the Sahel. Using NDVI as a proxy for land degradation, one study found that from 1982 to 1999 NDVI increased in 88% of the Sahel, with the Darfur region specifically showing a strong positive change (Eklundh and Olsson 2003). A similar trend in increasing NDVI, particularly in Darfur,

is further observed when extending the time period to 2010 (Fensholt et al. 2013). This evidence captures the recovery of the region from the droughts in the 1970s and 80s and suggests the resilience of the Sahel, with no dramatic negative change in terms of primary production per unit of rainfall and overall “greenness” or NDVI. However, it is worth noting that when applying a longer-term perspective, the observed increase in NDVI (as with rainfall below) can be interpreted as a return to “average” rainfall conditions that prevailed before the 1960s and after the extremely dry period of the 1970s and early 80s, thus cancelling out any long-term downward trend (Herrmann et al. 2005).

In summary, when the narrative of a general desertification or “drying” of the Sahel, and hence the role of man-made land degradation, is evaluated on a sufficiently long time horizon, it largely is debunked. However, analysis from just the 1980s and 90s showing a “greening” or increase in vegetation across the Sahel also misses the full picture. A more realistic perspective is the analysis carried out by Herrmann et al. (2005) showing that vegetation in the Sahel experiences significant variability not just across years but also across decades, with “average” vegetation conditions prevailing such that there is no significant downward or upward trend over the twentieth century.

Rainfall

The prevailing narrative on rainfall is that precipitation has been declining in the Sahel and in Sudan more specifically. Authors of this narrative cite an increasing frequency of drier years since the 1970s (UNEP 2007; Bromwich 2008). This narrative is questioned with more long-term time series analysis (Hermance 2014; Hulme et al. 2001). Furthermore, as our own analysis of the rainfall data shows with the inclusion of the most recent decade of precipitation, there are competing stories of trends of increasing or declining rainfall, depending on the remote sensing data used.

An analysis of precipitation using a global precipitation dataset known as Precipitation REConstruction (PREC) and the whole layer of moisture flux between 1948 and 2005 in Sudan found a significant decrease in average precipitation in almost all months in the rainy season and specifically a declining trend in the central belt of the Sudan (including the Darfur region), particularly during the month of August (Zhang et al. 2011). This finding is further confirmed by an approach developed by the Climate Hazard Group at the University of California, Santa Barbara (UCSB). Using remote sensing data on precipitation from 1960 to 2009, the study found a significant decline in rainfall (averaging about 100 mm across Sudan and Ethiopia), particularly in Sudan, Ethiopia, and Kenya (Wardlow et al. 2012).

However, a retrospective analysis of the past 100 years of rainfall using rain gauge data in Sudan shows that any evidence of a persistent and coherent regional trend in diminishing rainfall is minimal. Where change is present is in the highly localized inter-seasonal, inter-annual, and multi-annual variability. The data show that in the past 100 years, 96% of the variation in rainfall was between years and decades, rather than a consistent trend over time (Hermance 2014); thus the variability in total rainfall over time is not evident.

The lack of an overall trend in precipitation in the Sahel is further supported by the work of Hulme et al. (2001), who also use data going back to 1900 and therefore account for much longer trends compared to the frequently referenced studies that only use data from 1960 onwards. Hulme et al. (2001) show that despite a more recent drier 30-year period, rainfall in the Sahel has remained stable.

A review of the literature on rainfall trends in the Sahel, and Sudan more specifically, paints a similar picture as that of vegetation, one of competing narratives driven by the time horizon of data used for the analysis. Research focused on rainfall in the second half of the century shows a declining trend; however, when reviewing the past 100 years (as Hermance and Hulme did) the evidence points to overall stability, with decadal variation in trends.

Temperature

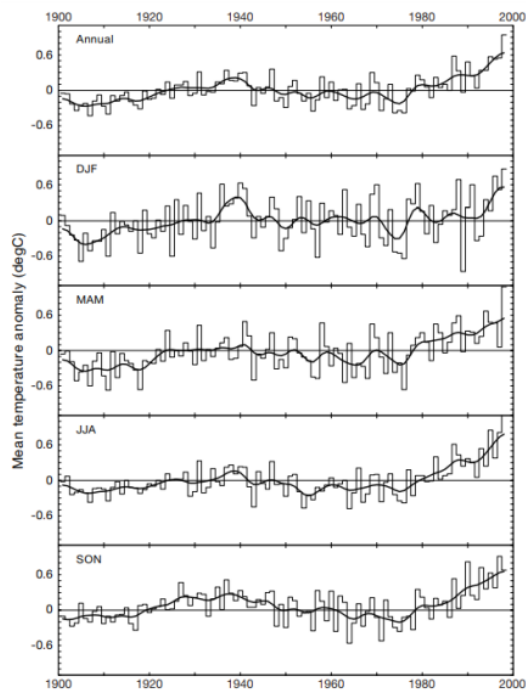
The evidence for increasing temperature has been more robust compared to precipitation. An increase in temperature is important because it increases the amount of water that plants lose through transpiration and therefore increases the amount of water plants need to remain productive.

Mean annual temperature in Sudan between the period of 1941 and 1996 has climbed significantly by 0.076–0.2 degrees Celsius per decade (Elagib and Mansell 2000). The increase in temperature has been highest during the wet and growing season. This impact was highest in the central (including Darfur) and southern regions of Sudan. Elagib and Mansell conclude that the increase in wet season temperature could be traced back to the decline in rainfall amounts during the same period (Elagib and Mansell 2000). Another study by the Climate Hazard Group at UCSB confirms this analysis. Using remote sensing data from 1960 to 2009, the study found a significant increase in temperature, with Sudan warming the most compared to its neighbors in the Sahel (Wardlow et al. 2012).

Hulme et al. (2001), using temperature data from 1900 to 2000, found that average temperature is higher now in the three regions analyzed—the Sahel, East Africa, and Southeast Africa—than it was earlier in the century (except for a period at the end of the 1930s in the Sahel) and is (as of 2000) between 0.2 and 0.3 degrees Celsius warmer than the 1961–1990 average (see Figure 2). At the same time, the difference between the daily maximum and minimum (annual diurnal temperature range or DTR), while increasing in most regions in Africa, actually declined on average between 0.5 and 1 degree Celsius since the 1950s in Sudan and Ethiopia, with some seasonal differences. The DTR increased during the main planting period (July–September), while decreasing during the rest of the year (Hulme et al. 2001). The implication of the increase in the DTR during the critical agricultural period is greater variation in temperature, which could affect crop production.

In summary, unlike with vegetation and precipitation, there is a consensus across the literature that temperature has been increasing, as is the variability of that temperature during the planting month. More so, the increase in temperature appears to be greatest in Sudan compared to its neighbors within the Sahel.

Figure 2. Mean surface air temperature anomalies for the African continent, 1901–98, expressed with respect to the 1961–1990 average; annual and four seasons—December, January, February (DJF), March, April, May (MAM), June, July August (JJA), September, October, November (SON). The smooth curves result from applying a 10-year Gaussian filter (Hulme et al. 2001).



Primary analysis of NDVI, precipitation, and rainfall

In this section we draw on available remote sensing data to look at climate trends in NDVI, precipitation, and temperature. For NDVI, we explore more recent trends only because historical data are not available. However, for precipitation and temperature we explore both long-term trends (1900 onward) and short-term trends (the past four decades). Much of the analysis in the existing literature explored above only goes up to 2000, or at best 2010, and/or covers a much larger geographic area beyond the Darfur region. Thus, the primary analysis in this section allows us to explore trends in climate, including the most recent years, as well as to specifically focus in on the Darfur region.

Normalized Difference Vegetation Index (NDVI)

To analyze NDVI⁵ trends for the Darfur states, we utilize the NASA Vegetation Indices dataset; key properties of this dataset are provided in Table 1.

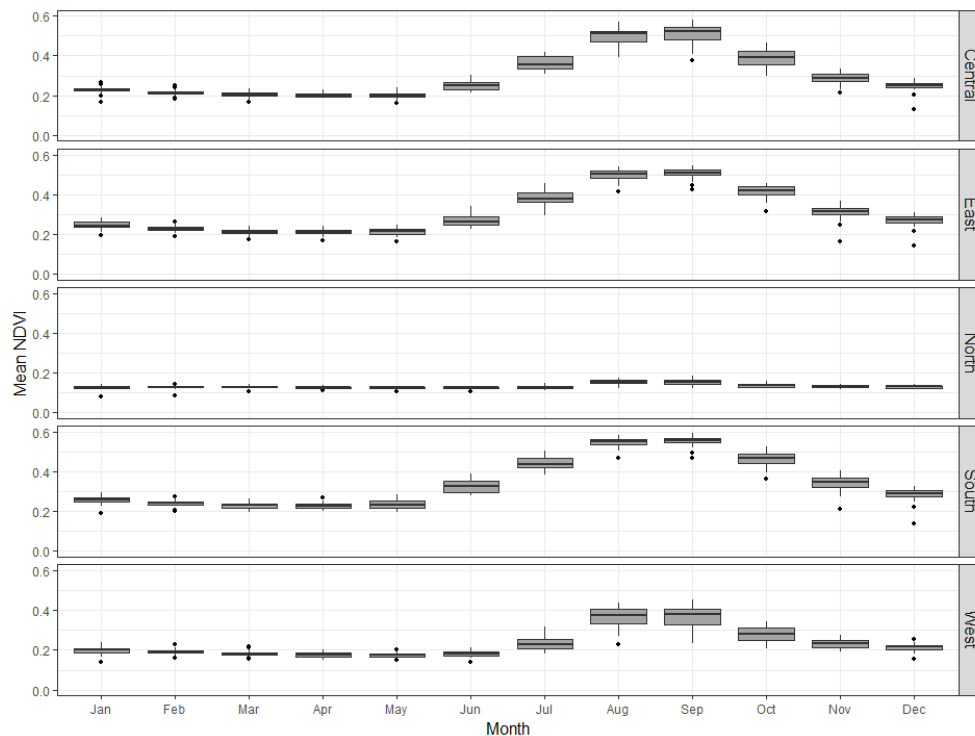
Table 1. Key properties of NDVI datasets

Dataset	Product	Spatial resolution	Temporal resolution	Variable name	Methodological notes
NASA Vegetation Indices Monthly Global dataset, Version 4	Vegetation Index and Phenology (VIP)	0.5° x 0.5°	1981–2014	Mean Monthly NDVI	Advanced Very High Resolution Radiometer (AVHRR) data used for 1981–1999, Moderate Resolution Imaging Spectroradiometer (MODIS)/Terra MOD09 data for 2000–2014

Figure 3 shows the pattern of monthly mean NDVI response over a calendar year for each state in the Darfur region. North Darfur State is the least vegetated region year-round, though it is worth noting that North Darfur covers more than 100,000 square miles, most of which is uninhabited desert, hence accounting for the very low NDVI. The remaining states display a seasonal pattern in which vegetation peaks during August–September, with a lag after peak precipitation (Figure 3). NDVI decreases steadily after these months and into dry months until the next rain.

⁵ NDVI measures the amount of green vegetation, or more technically: the ratio of the difference of the red and infrared radiances over their sum in satellite imagery. A high value of NDVI indicates large density of green leaves, typically representative of agricultural regions or forests. Low values indicate dryland, fallow regions, or non-planted acreage.

Figure 3. Magnitude of monthly mean NDVI by state and month, 1981–2014.



Seasonal adjustment for NDVI allows for distinction between seasonal patterns and overall trend. As seen in Figure 4, after seasonal adjustment, monthly mean NDVI shows a clear upwards trend across all states during the study period, which means vegetative growth as captured by NDVI has increased from 1981 to 2014. The spatial distribution of this upward trend is reflected in Figure 5, which displays the magnitude of change in NDVI. A clear belt of increased vegetation is observed in the southern portion of North Darfur State, and northern portions of West, Central, and South Darfur states.

Figure 4. Seasonally adjusted monthly mean NDVI by state, 1981–2014.

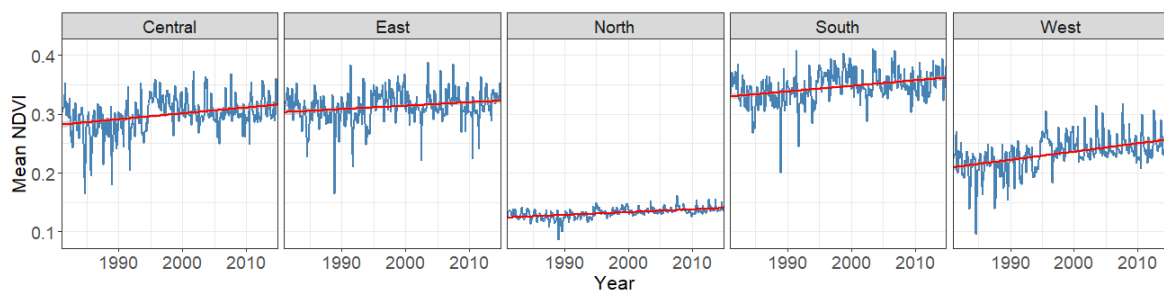
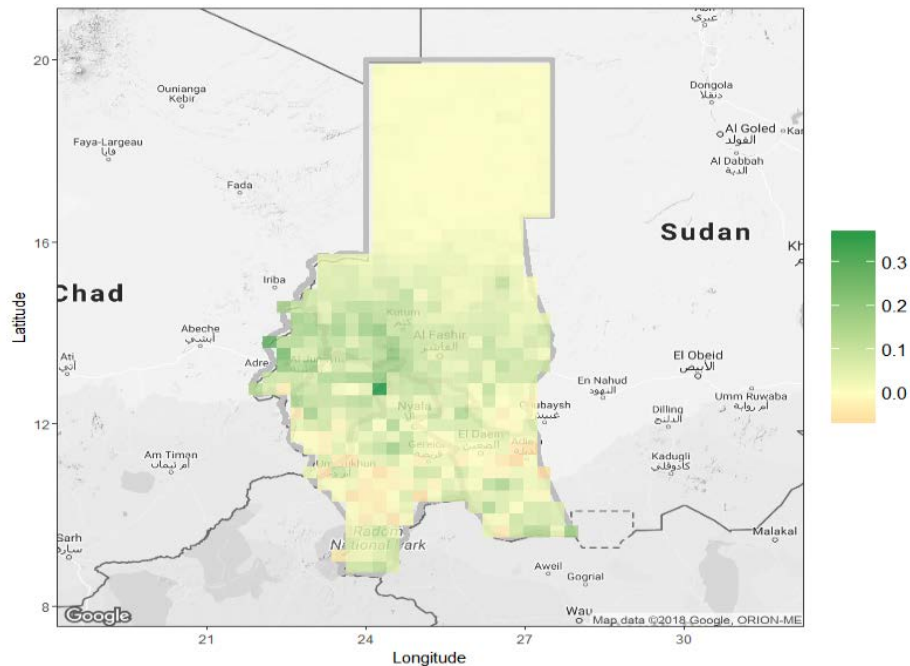


Figure 5. Magnitude of monthly NDVI trends in the Darfur region. Colors correspond to magnitude of change in NDVI (1981–2014). Positive (+) indicates increased NDVI over time as shown in green, and negative (-) indicates decreased NDVI over time as shown in orange.



In conclusion, despite the trend in decreased precipitation in the past 40 years, NDVI displays a small increasing trend, especially in the mid-Darfur belt for the period 1981 to 2014. This corresponds to the analysis in the literature that shows that trends in NDVI over the past three decades point to a picture of “greening.” However, when put in context of the past 100 years, the droughts in the mid-1970s, and other proxies for vegetation (remember, NDVI is only available after 1980), the literature indicates that NDVI has remained stable over the twentieth century.

Precipitation

Mapping historic precipitation trends (1901–2013) in the Darfur region (using the GPCC dataset derived from rain gauge data; see Table 2) shows a shift in the spatial distribution of rainfall (see Figure 6). Most Darfur states have experienced long-term reductions in mean annual precipitation of 5–10 mm. The greatest drying trend is seen in North Darfur State, with less-pronounced drying in southern Darfur states. The spatial and temporal distribution of these trends is further elucidated in Figure 7. A decline in precipitation is observed in all states starting in the 1960s, culminating in a trough in the late 1970s to the mid-1980s. However, compared to the historical precipitation record for July and August (Figure 7), this pattern is not novel.

Figure 6. Magnitude of historic precipitation trends in the Darfur region, 1901–2013. Colors correspond to magnitude in millimeters. Positive (+) indicates increased precipitation over time as shown in blue, and negative (-) indicates decreased precipitation over time as shown in red.

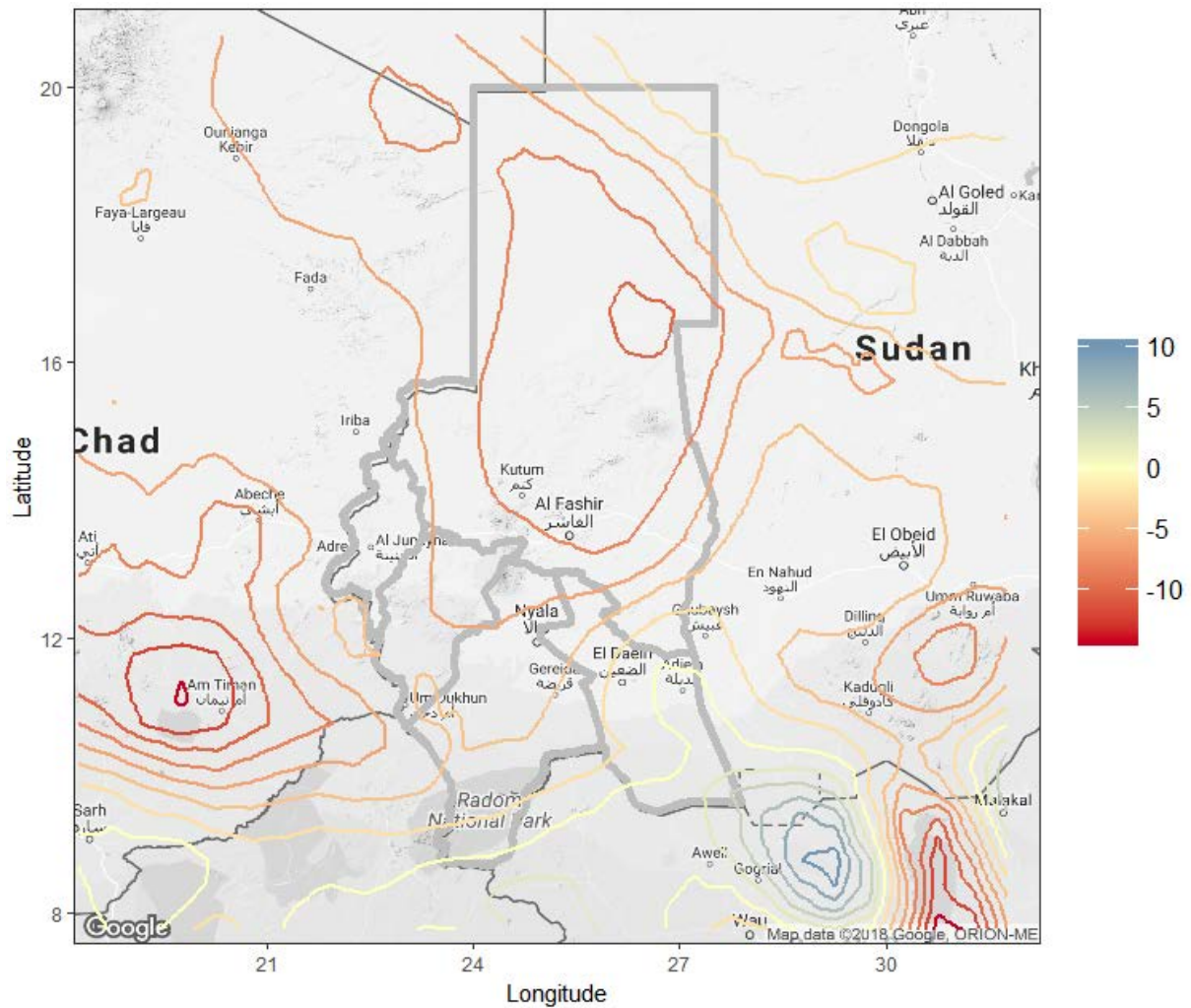
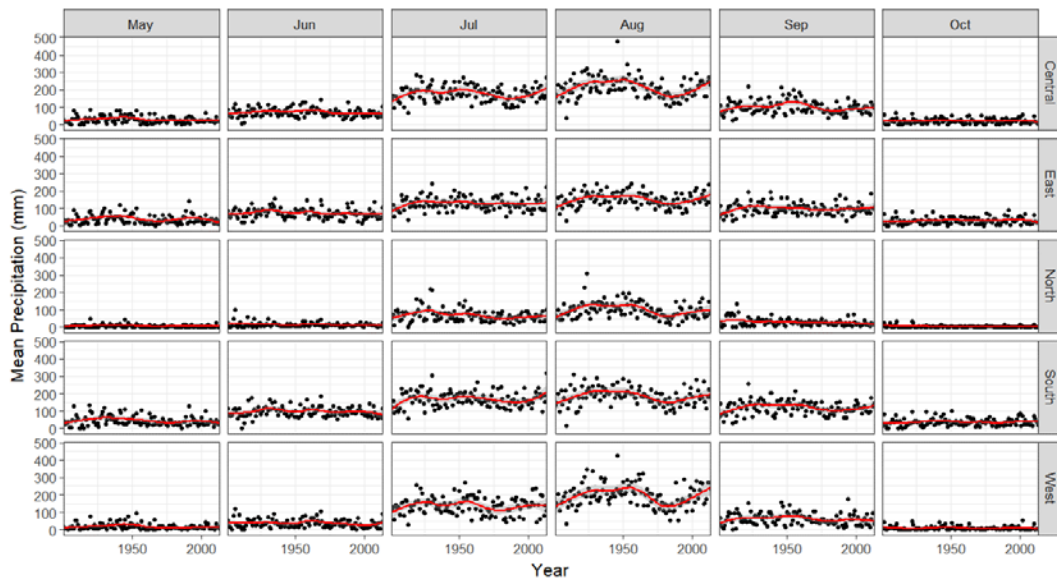


Figure 7. Mean monthly precipitation in millimeters by state during wet months (May–October), 1901–2013.



Next, we compared historical data (1901–2013) with more recent data (1981–present). Annex 2 summarizes the key properties of all datasets compared in this analysis and discusses the differences between the results generated by the different datasets. A large part of this discussion focuses on discrepancies between the datasets, which limit our ability to draw clear conclusions in relation to short-term trends in precipitation in the Darfur region. The comparison between TRMM and MERRA precipitation measurements in Annex 2 provides a valuable discussion regarding the availability of reliable precipitation data for this region. MERRA-2 documentation notes the necessity of supplementing rain gauge data with remote-sensing observations for Africa, given the lack of historic rain gauge data in the continent. However, TRMM data collections formally ended in April 2015, limiting the range of instruments available to derive remotely sensed precipitation in the region. Thus, understanding the limitations of each of these datasets and their comparative value is especially important for consistent assessment of precipitation trends in Africa broadly, and in the Darfur region specifically.

In summary, between 1901 and 2013, most Darfur states experienced a long-term slight decline in mean annual precipitation. The greatest drying trend is seen in North Darfur State, with less-pronounced drying in southern Darfur states. For more recent trends in precipitation (1998 to 2013), monthly mean precipitation derived from GPCC, TRMM, and MERRA datasets was compared for each of the Darfur states. The more recent data also indicate a declining trend in precipitation, with a notable decrease in precipitation during rainy months. The largest magnitude of rainy season precipitation reductions seems to have occurred in North Darfur, where all datasets indicate that the mean has shifted but disagree regarding when this shift occurred.

Temperature

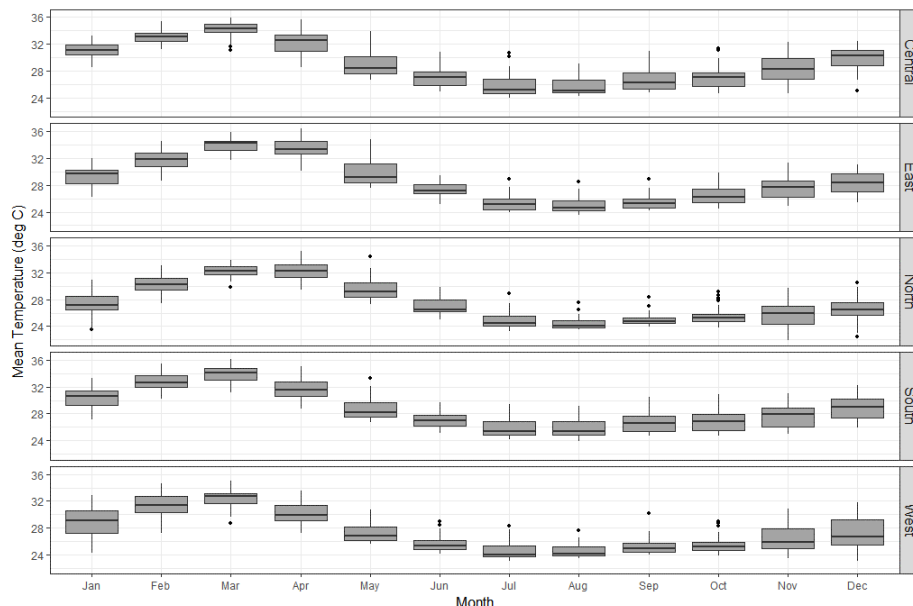
Key properties of both the long-term and short-term temperature datasets utilized in this analysis are provided in Table 2.

Table 2. Key properties of temperature datasets

Dataset	Product	Spatial resolution	Temporal resolution	Variable name	Methodological notes
University of Delaware	Air Temperature	0.50° x 0.50°	1901–2014	Air Temperature	Spatially interpolated from station data
MERRA-2	Land Surface Diagnostics V5.12.4	0.625° x 0.50°	1979–2018	Land Surface Temperature	Derived from MERRA-2 model, which includes several atmospheric variables

Figure 8 shows the monthly pattern in mean temperature according to historical data. The highest temperatures predictably occur in the driest months, with March being the hottest month of the year. A slight spatial difference is observed between the states—Central, East, and South Darfur states seem to experience relatively high temperatures during January–April compared to North and West Darfur. Lowest temperatures coincide with the rains, in July–September.

Figure 8. Historic monthly mean temperature by state, 1901–2014.



The spatial trends in changing temperatures can be observed in Figures 9 and 10. Figure 9 indicates a historic increase in temperature in the Darfur region of 0.5–1.5 degrees Celsius. This seems to reflect a general warming trend in this region. Recent data (Figure 10) corroborate this trend and show significant localized changes in temperatures. The range of changes is corroborated as well—both Figures 9 and 10 point to a temperature increase of 0.5–1.5 degrees Celsius in the Darfur states. Adjusting these temperatures for seasonality, it can be seen from Figure 11 that temperatures across all states have been increasing steadily since 1980, consistent with historical trends.

In summary, temperature in the Darfur region has increased in the past 40 years, consistent with historic trends and the literature. Historically, the highest magnitude of increased temperature is observed in North Darfur State; however, in recent years, all Darfur states are experiencing higher temperatures.

Figure 9. Magnitude of historic temperature trends in the Darfur region. Colors correspond to magnitude in degrees Celsius. Positive (+) indicates heating over time as shown in red, and negative (-) indicates cooling over time as shown in blue.

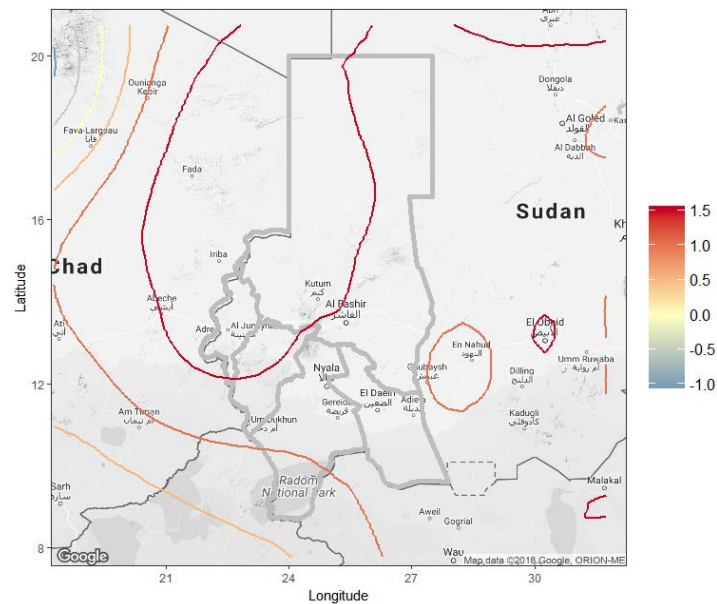


Figure 10. Magnitude of recent temperature trends in the Darfur region. Colors correspond to magnitude in degrees Celsius. Positive (+) indicates heating over time as shown in red, and negative (-) indicates cooling over time as shown in yellow/blue.

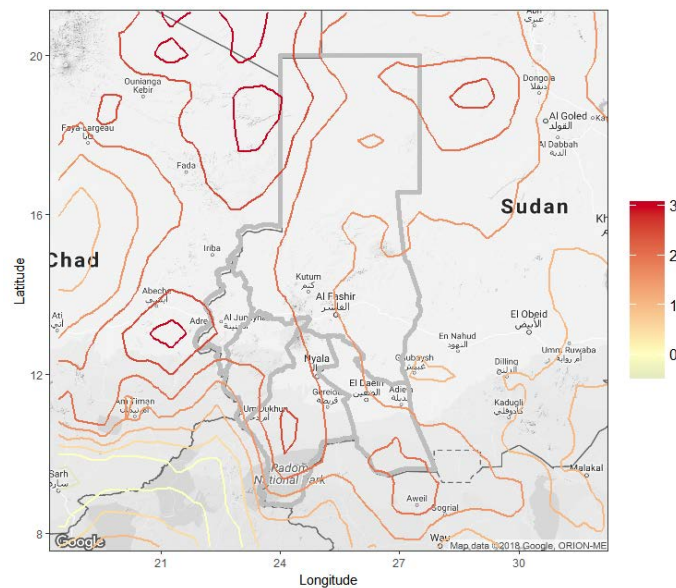
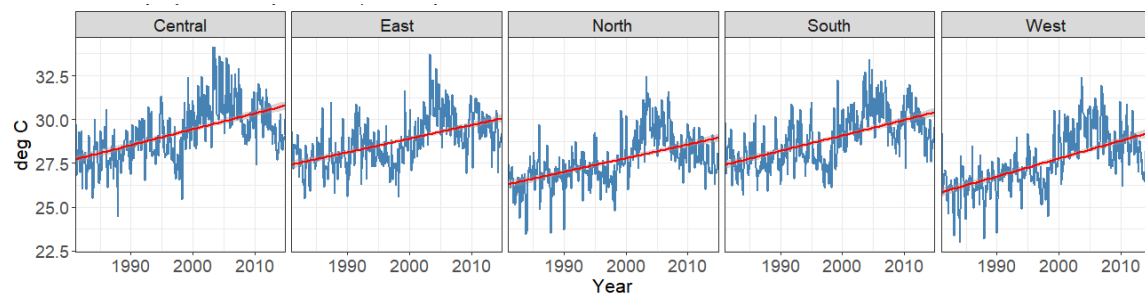


Figure 11. Seasonally adjusted monthly mean temperature by state, 1981–2014.



In summary, interpretations of the scale and even direction of changing Sahelian weather patterns at the local level depend on many different factors, such as the period under review. Evidence from Darfur indicates the region experiences long-term oscillations in decadal weather patterns, meaning that trend analysis needs to include the longest periods possible. Analysis of climate trends is a relatively new field, and different models give different results. If an analysis begins on a peak (such as the 1960s) and ends in a trough (the 1980s), this gives a different picture than an analysis that incorporates multiple peaks and troughs. And finally, different regions experience different changes in weather patterns, and the effect of weather patterns on the vegetation differs by region.

Key points for Taadoud II

- Interpretations of the scale and even direction of changing Sahelian weather patterns at the local level depend on many different factors, such as the period under review. Evidence from Darfur indicates the region experiences long-term oscillations in decadal weather patterns, meaning that trend analysis needs to include the longest periods possible.
- The literature indicates that vegetation cycles have remained stable over the twentieth century in Darfur.
- In the last 100 years, most Darfur states have experienced a long-term slight decline in mean annual precipitation. The greatest drying trend is seen in North Darfur State, with less pronounced drying in southern Darfur states.
- Temperature in the Darfur region has increased in the past 40 years, consistent with historic trends and the literature. Historically, the highest magnitude of increased temperature is observed in North Darfur State; however, in recent years, all Darfur states have been experiencing higher temperatures.

Part 4. Natural resource systems and institutions

By Merry Fitzpatrick and Helen Young

Introduction

In this section we consider how, from a livelihoods perspective, institutions mediate access to livelihood resources, especially natural resources, upon which the majority of livelihood systems are based. Thus, institutions influence, or even determine, the livelihood assets and strategies that are available to different communities, households, and individuals. We start with a brief introduction to the livelihood specializations found in the Darfur region and some of the wider processes or trends that have influenced these. This introduction is followed by five sections, each reviewing specific natural resources (land, rangeland and pasture, water, forests (trees and shrubs), and crop residues), their systems in Darfur, and related institutions.

Managing environmental variability: the role of livelihood specialization

As a drylands region, Darfur is characterized by ecological diversity and extreme rainfall variability, which gives rise to unpredictability. Farming and pastoralist production systems have co-evolved in this context of environmental variability and have well-rehearsed strategies for dealing with this uncertainty. Producers are able to offset periods of drought with periods of plenty, when herds and flocks grow again and stores of grain are established (Scoones 2004, Morton 1993). This was an important finding under Taadoud I.

In Darfur, farming and pastoralism represent two production sub-systems that are part of a wider regional system (Barth 1967). Barth warned of the risks of viewing farming and pastoralist livelihoods as distinct groups, and instead emphasized “*sub-systems which are systems of production, or ‘productive regimes’*” (Barth 1973) (Barth’s emphasis). This integrated view of sub-systems within a wider regional system remains highly relevant and compatible with the thinking on resilience of socio-ecological systems and sustainable livelihood approaches discussed earlier, which formed the basis of the Taadoud II OR design.

Integration of livelihood specializations

This integrated approach is also a particularly helpful framework for promoting greater cooperation between natural resource users and the peaceful co-management of natural resources. The integrated approach contrasts with some of the commentary on Darfur over the past 15 years, which has emphasized differences, contributing to further polarizing groups practicing farming and those practicing herding. Abdul-Jalil has challenged this view: “*the interaction between pastoralists and farmers is so complex that it cannot be adequately understood by using a simple herder/farmer dichotomy. Depending on varying situations such interaction can involve cooperation and complementarities and/or competition and conflict*” (Abdul-Jalil 2014, 102).

Producers, production systems, and tribes

The development literature on Darfur frequently distinguishes between sedentary farming and nomadic pastoralism, with the emphasis on their systems of production and secondarily their particular ethnic group or tribe. This distinction contrasts with the anthropological and conflict literature that frequently distinguishes between different tribes, giving secondary importance to

their association with particular livelihoods or specializations. For example, the Fur and Masalit tribes inhabiting the central transition zone are known as expert farmers, while the Northern Rizaygat are known to be camel nomads. Krätli et al. view pastoralism as a specialization that is able to take advantage of the characteristic instability of rangeland environments: *“Through strategic mobility, pastoralism finds an asset in the existence of dynamic variability in the drylands.”* The authors go on to say that pastoralists *“distinguish between the vulnerability that is the business of pastoral systems to manage and the vulnerability that arises from obstacles to operate the system”* (Krätli et al. 2014, 42).

Our interest as part of Taadoud is with what people do—the production or livelihood sub-system—and how their livelihoods are integrated as part of a wider regional system. For this reason, we focus on the livelihood system rather than the livelihood “group” or tribe associated with that livelihood. That said, identities are important, in part because they represent a cultural heritage and provide clues as to the historical livelihood specialization, interests in natural resources, and possibly experience of conflict (noting these are only clues, not hard evidence), and especially the institutions to which they may be accustomed.

Why the need to understand institutions and get them right?

Institutions are seen as critical to regulating land rights, preventing degradation and depletion of resources, managing common property, and creating sustainable livelihoods (Cleaver 2012).

Institutions are found everywhere and affect almost every aspect of our lives. They include the widespread and persistent patterns of behavior and regular practices that are structured by the rules and norms of society (Scoones 1998). Institutions may be formal or informal, ranging from market networks, to tenure regimes, to labor sharing systems or credit arrangements. Institutions are part of the wider governance environment, including civic, political, and economic institutions, and other social customs and rules (such as gender norms and expectations) that are part of society.

Cleaver (2012) defines institutions as *“arrangements between people which are reproduced and regularized across time and space and which are subject to constant processes of evolution and change”* (p. 8). She explains that definitions of institutions vary according to the emphasis put on formal organizational structures or on the “rules of the game”—the codes of conduct that define practices, assign roles, and guide interactions. In reviewing institutional theory or schools of thought, she distinguishes between mainstream institutionalism (MI) and critical institutionalism (CI). MI is linked with the ideas of new institutional economics purported by Ostrom (1990) and North (1991) and which are generally privileged in development policy. However, supporters of CI question many of the assumptions of MI, including for example:

- Community management is thought to be pro-poor.
- Community management is seen as contributing to a virtuous cycle of good governance and so mitigates state failure.
- People express their needs and call service providers through participation to account and challenge corrupt practices (based on the assumption that choices are rational).
- Local traditions of cooperation provide the building blocks of good resource management.

In contrast, CI scholars emphasize the complexity of institutions in everyday life, their historic formation and interplay between the traditional and the modern, and formal and informal

arrangements (Cleaver 2012). Advocates of CI argue that people's complex social identities and unequal power relationships shape resource management relationships and outcomes. According to Cleaver (2012), the value of CI thinking is in steering policy to more fully address issues of power and inequality (which is very different from the apolitical MI explanations of social environment interactions).

A further important difference is that the starting point for MI is often narrowly concerned with predicting and improving the outcomes of particular institutional processes, whereas CI takes a broader focus on the interactions between the natural and social worlds. These interactions include, for example, the impact of social and economic changes such as the extreme demographic, economic, and social changes associated with the Darfur conflict occurring over the past 15 years or more:

The workings of power and the patterning of inequality means that some people are more able to shape collective rule making and to benefit from the outcomes than others.

Rather than being designed or crafted institutions are patched together, consciously or unconsciously, from the social, cultural and political resources available to people. (Cleaver 2012, 15)

Agencies often see institutions, especially agricultural institutions (government, private sector, and civil society) as the primary entry point to support livelihoods, promote peace, and resolve conflict (Longley et al. 2006). An agency's initial analysis needs to pay attention to the underlying institutional arrangements, some of which may not be immediately obvious or may remain hidden, and to the differing outcomes of public or social action on livelihood activities for different stakeholders, as these are key in determining the effects of interventions into livelihood systems for different stakeholders (Davies 1997). This analysis of potential institutions as entry points needs to consider "their historical evolution and their inclusivity or exclusivity, and hence how effective they are in oiling the wheels of society" (Adger 2000, 351).

By understanding institutional processes we gain insights into the barriers and opportunities (or "gateways") to sustainable livelihoods. Often these barriers to accessing resources remain hidden or unacknowledged. Institutions are a means of exercising power and so define the route to positive or negative (livelihood) adaptation (Davies 1996). This type of power is evident in who is represented in local institutions and the connections to structures of power such as political authorities and armed actors (Collinson 2003). Examining changing power relations is a crucial part of both a livelihood and a humanitarian protection analysis (Jaspars and O'Callaghan 2010).

Embedded in institutions are the structural causes of social inequalities or even exploitative relations, which are important to understand. Scoones notes that

contestations, negotiations and trade-offs are evident at every turn. An insight into social relationships, their institutional forms (both formal and informal) and the power dynamics embedded in these, is therefore vital. (Scoones 1998, 12)

Institutions are continually evolving and adapting, and this is particularly evident during periods of rapid social and economic change, such as during or immediately following conflict, linked to the war economy and conflict dynamics. Changes to institutions may mean they either serve to replicate or even reinforce rather than alleviate structural vulnerability (Longley et al. 2006; Cleaver 2012).

Institutional reform is therefore no simple matter post conflict, and it is very likely that old animosities and sources of tension remain present. While agencies and communities might agree that fundamental reform or new institutions are needed, outsiders must ask themselves questions as to their role and potential biases when engaging with the aim of supporting local institutions.

Land use and land rights systems

Land tenure has been broadly defined as *“the terms and conditions on which land is held, used and transacted, within a particular system of rights and institutions that govern access to and use of land. When there is an actual or perceived likelihood that rights in land will be lost, tenure is insecure”* (Reale and Handmer 2010, 2).

In the Darfur context, land has both an economic and a political value (Morton 2008). It also contributes to cultural identity and the resilience of livelihood systems and communities. The economy of Sudan, and the Darfur region in particular, continues to be largely based on agriculture (both cultivation and livestock). Although during the height of its oil boom from 2005 to 2010 Sudan was the third-largest oil producer in sub-Saharan Africa behind Nigeria and Angola, the strength of the oil sector is fading (Patey 2010). In terms of employment and livelihoods, it is estimated that two-thirds of the Sudan workforce is employed in agriculture (Patey 2010), and this is probably higher for the Darfur region. Land has a political as well as an economic value, which means that where there is conflict over the political value of land, technical reforms do not necessarily help and may make the situation worse (Morton 2008).

For these reasons, the systems of rights and institutions that govern access to and use of land and other resources are crucially important. Loss of land can represent a lost livelihood, homelessness, loss of identity, or the displacement of community, all of which can increase vulnerability (Reale and Handmer 2010) and undermine resilience.

Where land tenure is perceived to be insecure, land-improving investments are less likely to be made. However, the logic can also work the other way—where improvements are made, particularly those that are highly visible, tenure is sometimes perceived to be more secure, since it lets others know that the land in question is occupied (Sjaastad and Bromley 1997, from Reale and Handmer 2010).

Plurality of land tenure systems in Darfur

The land laws in Sudan are an overlapping combination of legislation by the central or federal government, rules introduced by the judiciary, customary laws, and *Sharia* law.

Government legislation

According to government law, the major division in land ownership is between land owned by the state and that which is privately owned. This has been well reviewed elsewhere (Gordon 1986), and here we note some key points.

The Unregistered Land Act (1970) placed all land in Sudan under a property regime, with all non-registered land being automatically registered as “property of the Government” and around the same time abolished customary land use rights in 1971 (Gordon 1986). The Act has been described as a *“government tool to facilitate the acquisition of large tracts of land for agricultural schemes, at the expense of rural dwellers and especially pastoralists”* (de Wit 2001, 7).

The main source of current Sudanese land legislation is the 1984 Civil Transactions Act (CTA). The CTA provides that “land belongs to God.” The state is declared responsible for its control and owns all land that was not registered in the name of a private party prior to April 6, 1970. This principle has been maintained in different legislation that has been enacted under colonial administration and national rule (Osman 2012).

Government only recently (in 2017/18) has started implementing a policy of land registration. Osman (2012) notes that “*registration in Darfur has, however, taken place only in the major towns of the region and in the mechanized agriculture in South Darfur*” (p. 119) (quoting El Sammani 1987 and the Land Tenure Task Force 1986). The current land registration is a new departure, as in Osman’s study area he noted that there are elites who have managed to register their farms, though no governmental registration or cadastral plan has taken place in that area.

The CTA reaffirmed state ownership of non-registered land but acknowledged the value of customary usufruct rights and re-opened the possibility of registering those rights (El Hassan and Birch 2008). Thus the right to use non-registered land may belong to a private party through “usufruct” rights, which according to the CTA could be acquired through deed, inheritance, will, or exercise of possession (Osman 2012).

However as Osman explains, this seems to differ from the customary usufruct right, which implies that the usufruct right is temporary and is allocated administratively on the basis of need and group membership (Osman 2012), which is further discussed in the next section.

Customary land tenure in Darfur

The customary land tenure system has developed over centuries and has formed the basis of land management and administration in Darfur dating back to the Fur Sultanate (1631 to 1916), persisting up to the present. Under the Sultanate, all land belonged to the Sultan who granted estates or concessions (*hawakir*, *hakura* pl.) to nobles to maintain control over the land and to encourage newcomers to the kingdom. However, this was only a grant of use, and at that time *hakura* were not inherited or disposed in any manner without the Sultan’s consent (O’Fahey 1980). The colonial administration endorsed this system under the supervision of the Native Administration—the indirect rule system—and it has continued under national rule. The traditional customary system does not give permanent private rights to land, and as such land is kept under a redistribution system as part of a collective, not a system of individual ownership (Osman 2012). As Osman explains, “*this system worked well when there was a relative abundance of land and the population density was low. These two elements, however, have changed in recent decades*” (127).

With increasing pressure on land in part due to population growth, land use has now changed considerably. In the BRICS studies (Young and Ismail 2019b), some shifting cultivation continued to be practiced in Kulbus locality in West Darfur, but further south where soil fertility was better, farmers cultivated their land continuously. This means that the redistributive mechanisms of the *hakura* customary system had become strained.

Under the CTA, customary land tenure systems have no legal force. However, at community level they continue to control access to and use of land. This has led to unclear property rights and tenure security, and in land dispute cases there is overlap and friction between the customary and statutory law.

Osman (2012) concludes his review by stating

Land laws in the Sudan create an insecure and a confused tenure situation in Darfur. This insecure situation affects the different livelihood groups, those who cultivate the land and those who use the land for grazing on a cyclical manner. For the former it creates an ambiguous and uncertain tenure situation, and for the latter the legislation remains mute on their right. (124)

Furthermore, there is often little relationship between formal legislation and what occurs on the ground, where land holdings are largely governed by customary law and practices, even though land formally comes under the possession and ownership of the state.

In practice, new systems accessing land and transfer have evolved, while others no longer exist. Osman highlights two major changes. First, in contrast to earlier years (1986), at the time of his study in 2009 there was no longer land allocation by the Sheikh, or acquisition by bush/land clearance. Loans had also declined. Second, the non-traditional means of acquiring land were increasing, including inheritance, land sale, and land renting.

These changes were also evident in BRICs communities. In South Darfur, in communities with fertile soils and good access to wadis, small farmers had sold their farms to small investors from Nyala, who then hired these same households (mostly women and some men) as agricultural day labor to work the farms. During the ISI Baseline for the Taadoud II OR, some participants described direct negotiations between users to gain access to land rather than seeking land from the Sheikh.

The shift from temporary usufruct rights to a private property market was first reported in relation to fertile wadi land in the early 1990s:

High-value alluvial wadi land is part of a private property market with an established system of individual tenure. Fencing, land sales and hiring systems reinforce this. Ownership of alluvial land appears to be related to the length of residence in an area; more recent immigrants are excluded unless through hire or purchase of wadi land.”
(Scoones 1991, 371)

This marked the beginning of an increasingly inequitable system whereby wealthy and politically influential people were able to appropriate large areas of more fertile land, thus reducing opportunities for resource-poor farmers in the dry season (Scoones 1991), who at that time were mostly women (Umbadda and Abdul-Jalil 1985).

Osman et al (2013) note that conflicts over land were less about local issues such as “crops damaged by livestock or access to land and landed resources.” For a time they “shifted to highly generalized violence of all sorts, including tribal conflicts fought along ethnic lines, armed criminal activities and lootings, and land-related disputes.” But he goes on to say that “in practice, the principles of compromise and reconciliation that are embedded in the local norms and institutional arrangements, which form an important part of the indigenous social order, have become difficult to apply” (Osman et al, 2013, 8).

Box 1 provides an example of institutional bricolage—the institutional mixing of the traditional with the modern, which is defined as the constant renegotiation of norms, the reinvention of tradition,

the importance of legitimate authority, and the role of people in shaping such arrangements (Clever 2012).

Box 1. Example from Taadoud II of institutional mixing

During the excellent 2018 rainy season, as part of the Taadoud OR, researchers noted a return to some of the traditional norms in West, Central, and North Darfur. A hybrid is emerging in some regions, of local customary systems making decisions on land use and penalties for crop damage but depending on government systems for their enforcement. For example, when someone finds an animal in their fields damaging the crops, they may seek the police to impound the animals rather than the *ajaweed* (mediator). The *ajaweed* would negotiate the fines and terms of payment.

Rangeland and pasture

El Sammani identified three systems of livestock production in Sudan that depend on rangeland: the nomadic system, the agropastoralist system, and the sedentary system of mixed farming (El Sammani 1987). These categories still prevail in the everyday discourse in Sudan. According to El Sammani, these systems differ in relation to the relative importance of livestock and the settlement patterns of the three groups (sedentary, transhumant, or nomadic). For nomads and agropastoralists, livestock mobility is implied, and for sedentary groups, it is assumed to be limited.

The nomadic pastoralist system in the Darfur region is traditionally associated with north-south livestock migration along eleven official livestock corridors, which are also used by some agropastoralists. Annex 3 contains three maps showing an example of a livestock corridor, the timing of movements, and the movement in real time of an actual herd during the rainy season. A fourth map is also included that was drawn by the Taadoud “*baggara*” breakout group illustrating the natural resources accessed by this livelihood system, which bears a remarkable resemblance the map of actual herd movements.

The distinction between sedentary cultivators and nomads in Sudan continues to permeate the local, national, and international discourse, and is now part of the conflict discourse, as noted by Assal (2009):

Yet this dichotomy [between nomads/sedentary people] tends to be enforced, particularly in the context of protracted conflicts that result from the competition over natural resources. The existence of competition in Western Sudan contributes to sharpening the dividing lines between the nomadic and farming communities and leads to violent conflicts of the sort we see today in Darfur...The persistence of this dichotomy is without a doubt the result of conflict conditions in which identity boundaries of different sorts are stressed and manipulated by various actors. In other words, conflict conditions that sharpen identification lead scholars to construct analytical tools based on false premises. (p. 155)

Taadoud should note that this framing of “nomads versus rural settled farming communities” puts people in opposition to one another, so that people either belong to one category or the other—sedentary farmers or mobile nomads. This potentially serves as an “intergroup divider” between people on different sides of a conflict (Anderson 2001). Further, it is important to understand that pastoralism is both a form of cultural identity and lifestyle, as well as an economic and environmentally sustainable livestock production system.

Pastoralism is made up of multiple sub-specializations (for example, *abbala*—camel herders, *baggara*—cattle herders), and there are a wide range of Darfuri tribes who practice them. For example, there are four Darfuri *abbala* tribes: the Zaghawa, the Meidob, the Zayadia, and the Northern Rizaygat.

Increasingly pastoralists own mixed herds (including cattle, camels, sheep, and goats, with donkeys, sometimes horses, and chickens), although they are likely to have a traditionally preferred livestock species.

Pastoralist policy

The African Union Policy Framework for Pastoralism in Africa defines African pastoralism as

a high reliance on livestock as a source of economic and social wellbeing, and various types of strategic mobility to access water and grazing resources in areas of high rainfall variability. (African Union 2010, i)

Importantly, strategic mobility enables livestock to take advantage of the extreme variability in key resources (nutrients and water for livestock). Although mobility is a common feature of pastoralists in different parts of Darfur and is seasonal by nature, there are many different types of movement practiced, according to the herd management practices. For example, a common seasonal pattern of movement in Sudan is for herds to move in the direction of the resource gradient (moving north with the advancing rains and south in the dry season) in order to increase the time spent under the best conditions for the time of year. At the same time, other pastoralists may keep their livestock closer to their settlement but still benefit from strategic mobility (Sulieman and Young, 2019).

Pastoralist systems maximize productivity in a context where uniform and stable distribution of pasture cannot be relied upon. Pastoralist herds are not chasing the rains; rather, they are physically tracking resource concentrations, which means that pastoral production will fail if animals stop moving (Behnke et al. in press).

Successive development policies in Sudan have ignored pastoralism and pastoralists and generally favored cultivation (and mechanized farms over rainfed farms) since even before national independence. The continued growth and commercialization of the sector is testament to the resource availability and pastoralism specializations of Sudan.

More recently, the increasing recognition of the value of pastoralist production for the national economy and exports relative to the declining contribution of oil (Figure 1) (Behnke and Osman 2010) has led to significant policy changes, including a new federal law on pasture regulation (Republic of Sudan 2015) and federal livestock policy (Republic of Sudan 2018). This latest livestock policy explicitly recognizes the contribution of migratory livestock production to the national economy and characterizes rangelands as “*the mainstay of the development of the livestock sector*” and recognizes the importance of the migratory routes to that sector (Republic of Sudan 2018, xiii). It goes on to state:

The importance of the tracks [migratory corridors] lies in the fact that they follow the pastoral system in Sudan, which forms the backbone of the livestock, fish and pasture sector because it contributes mainly to meeting the needs of domestic and regional markets for red meat and live animal products. (Republic of Sudan 2018, 37)

This is a major shift in government policies and is partly driven by the wide-ranging research highlighting these issues and engagement of national groups (the Pastoralism Forum, the work of national NGOs like SOS Sahel, and the National Pastoralism Support Team) on these issues.

As with many policies, there remains a gap between policy and project implementation, with a wide array of stakeholders often unaware of changes in national policies or lacking the resources to apply them (Behnke et al. in press). This gap is exacerbated by the inherent bias of earlier laws and policies (see examples in Box 2) and also the gap in the scientific evidence to reinforce and inform the Sudanese government's and other stakeholder's emerging awareness of the importance of migratory livestock production.

Box 2. Examples of policy biases that undermined pastoralism

- At the federal level, access to pasture land is weakly defined in law: the CTA (Section 565) identifies pasture land “by subtraction” from other uses (namely agriculture and forests) (de Wit 2001, 10). The CTA also empowered state authorities to impose restrictions on grazing as to time and place, and allocate land for grazing for the benefit of the whole community and the protection of animal resources (de Wit 2001).
- In the 1960s and 1970s, schemes for resettlement and sedentarization of pastoralists, associated with the mechanized agricultural schemes of central and eastern Sudan (Egemi 2013), severely restricted animal grazing and led to their failure. Lessons from this experience include the importance of involving pastoralists themselves as part of the planning process, distinguishing between the settlement of people versus animals, and also the impossibility of completely separating animals from crop production.

Customary arrangements for accessing rangeland

The arrangements (or property relationships) for accessing rangeland are different from the customary practices related to land. Behnke (2018) compares and contrasts common property institutions from pastoralist open access systems, as shown in Table 3.

Table 3. Common property versus pastoral property

Common property institutions	Pastoral property—“open access”
<ul style="list-style-type: none"> • Small size, well-defined boundaries • Clearly defined membership • Rule-based internal regulations 	<ul style="list-style-type: none"> • Extensive area, contested boundaries, erratically productive • Secondary users, networks of relationships, contested membership • Access by negotiation, coercion, competition, and strategic preemption • Tenure systems that regulate and promote a degree of open access

In the Darfur context, both these systems of access co-exist. The common property institutions are akin to the customary systems of accessing land through the Sheikh described earlier that take place within specific areas of relatively small size and with well-defined boundaries. In contrast, the pastoralist domain or landscape is potentially huge, covering up to 600 km from north to south and including multiple seasonal grazing areas, each of which is potentially huge and in between livestock

routes and resting places that cross numerous ecological and administrative zones. Whereas the common property regime governing access to land has clear rules and internally defined regulations, pastoralist access to pastures and water is usually through carefully negotiated access, or alternatively coercion, competition, and at times conflict.

These two widely different systems coincide in the Darfur context; with the open access system governing pastoralist resources, and the customary system relating to farming systems and resources. However, both are open and readily accessed by both systems of production, as pastoralists seek to access resources under the common property rules of the farming systems, while farmers take advantage of the open access system of pastoralist resources when moving their livestock farther from their community.

What this does suggest, however, is that the common property system is not entirely closed and that there are fluid interactions between the two. It also highlights the complexity of interactions between what is a relatively closed, well-defined system on the one hand and the differing expectations of open access users on the other. Clearly both systems need to regulate and promote a degree of responsible open access.

In this respect there are several examples of new institutions and rules or regulations that are working well:

- Control of southwards migration of cattle herds to the Bahr area of East Darfur at the beginning of the dry season;
- Cross-border migration of large cattle herds into South Sudan from East Darfur in the hot dry season, which is negotiated some months before at an annual pre-migration conference between Dinke and Northern Rizaygat;
- New agreements made in advance of the harvest regarding access to crop residues by pastoralist herds in exchange for payments made in advance and fertilizing fields.

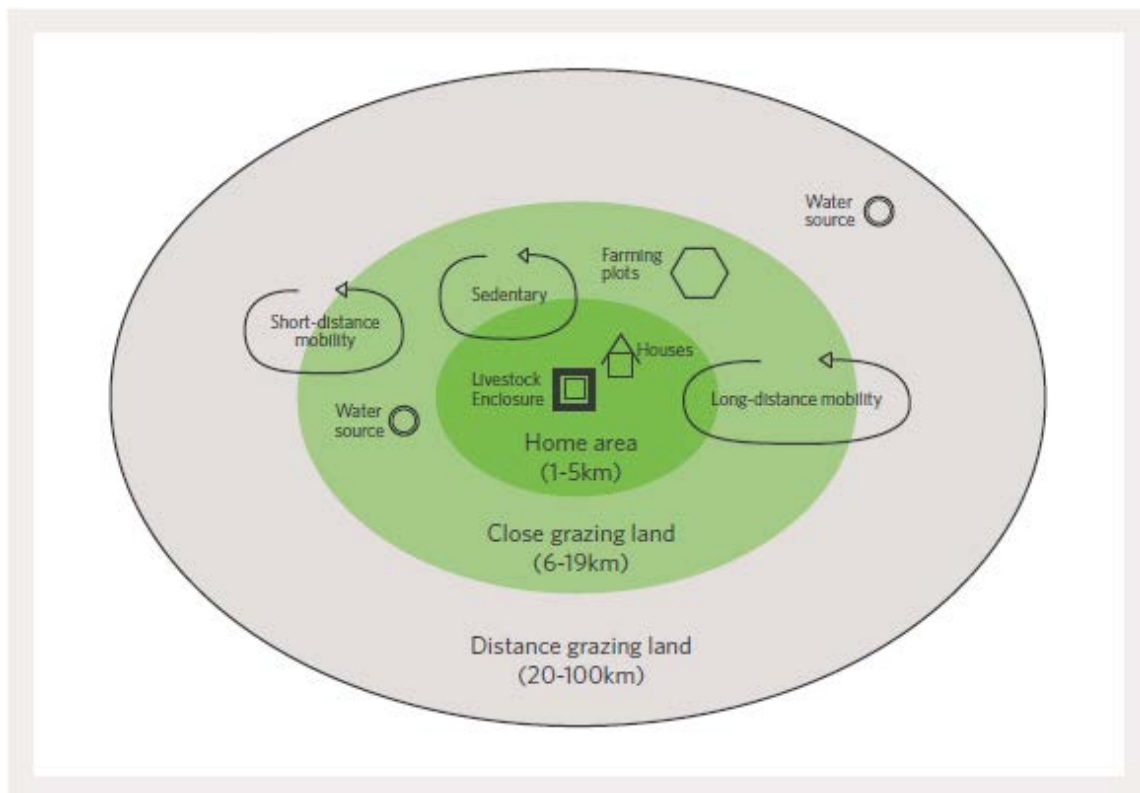
Changing patterns of livestock mobility and composition of herds

Patterns of livestock mobility, livestock holdings and species, as well as patterns of settlement, have changed significantly in the past 20 or 30 years.

In a study of livestock mobility patterns in West Darfur, Sulieman and Young (2019) identified three territories of current movements or grazing zones in West Darfur (see Figure 12):

- Home area (1–5 km); practiced by settled communities, primarily farmers; pastoralists also do this when facing periods of conflict or threat of looting;
- Close grazing land (6–19 km); most popular and most at risk of overgrazing;
- Distant grazing land (20–100 km); pastoralists divide their time between the three territories or grazing zones—distant areas during the hot dry season, *rushash* (early rains), and *kharif* (established rains); harvest is spent in the home area.

Figure 12. Schematic of the grazing zones visited by the recruited livestock keepers in their annual movement.



Source: Suleiman and Young, 2019

Compared to the past, these territories or grazing zones are shrinking or retracting closer to the home area. This is principally because of the risk from bandits and armed groups in the more remote rangelands. Other factors include shortage of water further north and sometimes blocked corridors (Sulieman and Young 2019). Consequently, distances travelled by camel herds from south to north are shrinking (see Annex 3 for map showing actual routes). With changes in livestock mobility come increasing problems, including: overcrowding at water points, causing tensions; deteriorating rangeland near villages; increasing farmer/herder tensions.

As described in the previous section, government policies in Sudan have a history of favoring agricultural cultivation over pastoralism and large mechanized farming over smallholder rainfed farms. Box 3 provides a recap of policies as they relate to rangeland and pasture, a key natural resource for pastoralists, as well as for mixed farmers.

Box 3. Extracts from a policy review on pastoralism (Krätli et al. 2013)

Several policy reviews have argued that successive development policies have ignored pastoralism and pastoralists, resulting in no clear policy to date (Mohamed and Egemi 2012; Egemi 2013; El Hassan and Birch 2008). Even before national independence, this marginalization of pastoralism in favor of cultivation was an explicit policy bias and has continued to this day. The CTA empowered

state authorities to impose restrictions on grazing as to time and place, and allocate land for grazing for the benefit of the whole community and the protection of animal resources (de Wit 2001).

In the 1960s and 1970s, other government initiatives directly affecting pastoralist mobility were schemes for resettlement and sedentarization of pastoralists, often associated with the mechanized agricultural schemes of central and eastern Sudan; for example, the Gash Delta, Rahad, Suki, Western Savanna, and Fashaga agricultural schemes (Egemi 2013). Lessons from this experience include the importance of involving pastoralists themselves as part of the planning process, distinguishing between the settlement of people versus animals, and the impossibility of completely separating animals from crop production. A severe restriction on animals grazing within the schemes together with a poor understanding of pastoralism has been blamed for their failure (El Sammani and Salih 2006).

Water resources

Water in rural Darfur has multiple uses: in the household (for drinking, cooking, cleaning, etc.) and for livelihood purposes (for livestock, crop irrigation, and other livelihood endeavors like brickmaking). Its availability influences the combination of livestock types within a herd, the timing of their migration, and the routes used (Reid et al. 2014). In cultivation, access to water and the sources of water (rain or other) is a major factor in decisions about the types of crops grown, the timing of the agricultural seasons, and even in which fields to cultivate. To meet these multiple needs, throughout the year and across multiple years with variable rainfall, households depend on a variety of water sources that serve different purposes during different seasons. Different livelihood specializations or subsystems will also use water sources differently throughout the year. Young et al. provide a quick explanation of 13 different types of water sources found in a survey of pastoralists in East Darfur and North Kordofan with their local names. The dams found more commonly in other parts of Darfur were not included in that list (Young et al. 2013). Annex 4 provides a more detailed description of these water sources and how they are most commonly used.

“The value of water depends...on whether it is physically located where we want it to be, and in the right quantity” (Seabright 2010, 174).

Technical aspects of constructing and maintaining various water sources, and the ways in which they are used to support livelihoods in Darfur, are thoroughly described in numerous widely available reports, guides, and manuals. Their management and the institutions through which individuals or groups gain access are much less well documented and understood, yet they are a critical

component of their sustainability and usefulness. This section will focus mainly on the institutions regulating the access and use of water sources, and their seasonality.

The dynamics surrounding institutions governing how water is used in rural Darfur vary depending on the type of water source and the land on which it is located, or the land surrounding it. For example, a hand-dug well in a field beside a wadi would be managed very differently from a similar well dug in the center of a wadi bed. This section of the report will first discuss the general governance and institutions related to water, then will move on to discuss dynamics related to particular types of water sources.

Water governance and institutions

As a critical resource with many valuable productive uses, complex institutions and policies to manage access to water have evolved and continue to evolve at all levels, from the individual community up to the state and national government level. In arid and semi-arid lands, many aspects of water need to be actively managed. The Global Water Partnership (GWP) sponsored by the Swedish International Development Agency (SIDA) defines integrated water resource management (IWRM) as *“a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems”* (Agarwal et al. 2000, 22). The management of water resources is therefore not simply a technical solution to control the flow of water, rather it is a *process* involving social welfare and equity. The GWP proposes four principles of IWRM emphasizing water as a finite, vulnerable, and yet essential resource with economic value. Both its planning and management need to be inclusive of all types of users, including women (Agarwal et al. 2000).

State and national institutions governing the management of water resources are changing, reflecting changes in the global and national economy, as well as changes in national and state power structures. Local institutions are changing as the livelihood strategies transform to adapt to changing market systems, social systems, climate, and population density, as well as long-term shocks such as inflation. With the decline in national oil revenues, cultivation and livestock constitute an increasing proportion of the national economy and food security, and there is a corresponding increase in political priorities. Not only are institutions changing to reflect these realities, but their enforcement is also changing. This section will review some of the key policies and institutions managing water, some of which have been recently enacted.

National policies and institutions

The primary ministry at the federal level is the Ministry of Water Resources and Electricity, with the National Water Resources Council as its advisory body (FAO 2016). This ministry *“sets the national water resources policies, develops and monitors water resources and promotes water management including irrigation and drainage.”* Their web page also lists a number of water-related research institutes. In light of the proposed water harvesting structures, the Water Harvesting Research Institute may be of particular interest to Taadoud. Quoting Omer Ali (2009), Mohamed and Egemi describe the Draft National Water Policy (written in 1999 and amended in 2006), which aims to promote *“sustainable and integrated management of available water resources,”* specifically recognizing *“water as an instrument for conflict resolution”* (Mohamed and Egemi 2012, 20).

Water and land have separate yet overlapping government frameworks and permit processes, with policies relating to land often determining which institutions relating to water apply, while some water sources are regulated directly. The CTA of 1984 links the rights to develop and access water to the land on which the water resource is found *“as long as permission is granted by the respective water authority”* (Mohamed and Egemi 2012, 15). They explain that the Water Resources Act of 1995 relating to the National Council for Water Resources requires a license for *“any water use.”* Mohamed and Egemi further explain the Groundwater Regulation Act of 1998 names the Groundwater and Wadis Directorate *“as the sole government technical organ to develop and monitor wadis and groundwater, and to issue permits for constructing water points,”* though it is unclear how this Act relates to the previous acts ((Mohamed and Egemi 2012, 16).

At federal level, the Ministry of Water Resources and Electricity is responsible for developing and monitoring water resources, developing drinking water for urban populations, developing and updating standards for water quality, and conducting research on irrigation and water resources.

Their stated strategy includes reference to *“assist in resettlement and stability of citizens”* (ministry website). Among the Directorates within this ministry is the General Directorate of Water and Municipalities, responsible for the *“general management of groundwater and wadis”* who determine *“the best ways to develop, exploit, manage and maintain these resources from overexploitation”* and *“working with international, regional and local organizations in the field of water resources development and general rural development in integrated water resource management.”* They state they have a database with information, including maps, on more than 12,000 wells nationwide.

According to Symonds et al. (2013), the 2006 Darfur Peace Agreement (DPA) Article 20, line 158, confirms that traditional or customary *“access to water shall be recognized and protected”* (DPA). The DPA also lists *“safe drinking water”* as a right of all Sudanese citizens (DPA, 2006). Access to potable water for domestic use featured in the 2011 peace negotiations. DPA Article 38 established the Darfur Land Commission to arbitrate disputes related to not just land ownership and grazing but also disputes over access to water points (Symonds et al. 2013).

State-level management

Each state has a State Water Corporation that is responsible for water management and policies within each state (Abdo and Salih 2011). But Abdo and Salih, and FAO (2016) caution that statistics, understanding, and authority in the water sector in Darfur are fragmented. Responsibilities are spread among multiple institutions, and it is unclear how responsibilities and authority are allocated among them. As water resources and their use vary considerably from one Darfur state to the next, the state-level policies and institutions will also vary. Exactly how they are established in each state is a gap in the accessible literature but is a component that would affect how local IWRM institutions link to higher-level institutions for the long-term support they need for sustainability.

Local management

Local control of water rights varies by community and even among sources within a community, but is often correlated with the capacity of a water point and the scarcity of water in a particular season or location, and the difficulty of controlling access to that water point (Behnke 1994). Behnke suggests that because demand for water is constantly changing as demographics, livelihood strategies, economic interests, and political alignments are constantly shifting, rigid legal or rule-based management systems may not be appropriate. Instead, he encourages flexible procedural-based systems for negotiating use and management of local water sources.

The importance of integrating catchment and community-based water resources management into government policy and institutions

To be both effective and sustainable, an integrated catchment-based management system that connects with national policy and institutions needs to accompany any large-scale water-related infrastructure. As populations grow and the amount of water drawn from the water table increases, this disconnect between administration of water and its natural catchment system becomes important. Technical plans need to include larger, unintended impacts on the environment, while simultaneously the social aspects need to support equitable access and voice in management of the systems through the institutions regulating the water sources.

Though water systems follow hydro-geological zones, the government manages water along administrative lines, complicating large-scale management of water resources (FAO 2016). At the other end of the spectrum, many INGOs and communities focus on management of water resources at the community level without full consideration of the larger environmental or down-stream impacts.

Omer Ali notes that *“failure to take into account the rights of all the water users”* is an institutional failure associated with surface water collection that *“frequently results in conflict between upstream and downstream users, and between different stakeholders in a given area”* (Omer Ali 2015, 84). He suggests *“a coordinated approach to resource management across the entire watershed, giving due consideration to social, cultural, and environmental aspects as well as to the rights of downstream users”* (Omer Ali 2015, 85). Additionally, he suggests establishing *“linkages and partnerships between the water-harvesting projects, the communities, and the relevant institutions and departments at the regional, national, and state levels in order to ensure networking and effective coordination”* (Omer Ali 2015, 84).

Seasonal changes in use of different water sources

The quantity and quality of water in most water sources varies with the seasons, as does their use. The onset of the rains creates surface pools and refills ponds, which are especially useful for watering animals. As the rains progress, the wadis flood briefly, allowing replenishment of the aquifers and a range of water catchment structures (such as *hafir*⁶ and dams) and techniques (such as barricading *khors*⁷ and ridges in cultivated fields). With the onset of the dry season, small surface water sources dry up, and water within the *hafirs* and ponds begins to slowly evaporate while more and more herds depend on them. Water quality drops drastically as the use of the *hafirs* increases and the amount of water drops. As the dry season progresses, dams and shallow wells farther from the wadi will similarly dry up, and only permanent water sources like deep wells, boreholes, and *donkis*⁸ continue to provide water. Wells in the smaller *khors* may also dry towards the end of the dry season. Deep wells, especially boreholes and *donkis*, retain on average the highest-quality water throughout the year, but with the increasing use of these sources and associated overcrowding, unless measures are taken, water quality from contamination around the wells will suffer. Shallow hand-dug wells dug in the beds of wadis remain accessible throughout all but the driest years, though their quality may also suffer because contaminants easily fall into them or are carried into them on the buckets used to draw water.

Sources such as ponds, *hafirs*, and dams are easier to use for livestock, and if there is a fee, it is usually less than that for water from a *donki*. Therefore, they are generally preferred by herders when they contain water (i.e., during the rainy season or in the early dry season). The quality of water in shallow wells, *hafirs*, and ponds is potentially poor and the water quality of permanent open water sources (such as shallow wells or uncovered deep wells) used in the dry season tends to deteriorate as the early dry season progresses.

A recent study shows that the use of different types of water sources in a range of Darfur communities shows a definite seasonal pattern; the use of surface water is highest in the rainy

⁶ A *hafir* is a man-made depression in the ground that collects rainwater from ground surface run-off.

⁷ A *khors* is a small tributary to a *wadi* (a seasonal river or riverbed).

⁸ A *donki* is a deep borehole with a powered mechanical pump that fills an elevated water tank.

season and declines by the time of the harvest, while borehole use increases in the dry season. This pattern of use appears to be more heavily influenced by preference than by availability, and this preference is influenced by proximity, convenience, and taste. The use of traditional wells remains relatively steady between seasons (Young and Marshak 2019). Women sometimes express a preference for the taste of fresh surface water in the rainy season rather than that from the hand pump. Additionally, if the higher-quality sources like boreholes become crowded and other surface sources are not available, animal owners may elect to get their household water from *hafirs* or the wadi while watering the animals rather than to wait in line at the crowded deep wells (Fitzpatrick et al. 2016).

Water for livelihoods

Water is a necessary component for both cultivation and herding, having a direct impact on the resilience of these livelihood activities. Some of the newer livelihood activities are linked with increased water usage, especially brickmaking, and the expansion of dry season cultivation requires water for irrigation.

Water for cultivation (irrigation)

Although most cultivation in Darfur is rain fed, the Taadoud I OR documented that the cultivation of fruits and vegetables during the dry season on irrigated land near wadis is common and is a growing source of cash income. Most irrigated fields in Darfur are relatively small and supported with water from shallow wells dug in or near a wadi. Because shallow wells are usually only feasible near larger wadis, this limits the land that can be used for this activity and the number of people that can engage in it; competition for this land, therefore, can be quite high. Newcomers, such as settling pastoralists, find it difficult to gain use of land with this type of water access, once again demonstrating the link between land and water access, and the need to integrate the policies and institutions (Scoones 1991).



Woman in a hand-irrigated vegetable plot bordering a wadi in Central Darfur.

The Taadoud I OR showed that in recent years cultivating households have been increasing their engagement in this small-scale dry season irrigated cultivation to fill gaps in food and income. Where possible, they dig deeper wells and purchase or rent mechanical pumps to increase the amount of water they can draw from the wadi and thereby increase the area they can plant during the dry season.

Reinforcing the links among land, water, and conflict, Osman et al. explain in some detail the friction the increase in vegetable cultivation has created with animal herders (Osman et al. 2013). Most vegetable cultivation still occurs on the banks of wadis in the dry season, a time when herds are most dependent on water from pools or wells in the wadi. The vegetable fields may block the animals' access to water from the wadi, and

the close proximity of water for herds and vegetation during times when vegetation is scarce increases the risk of animals entering into the fields and destroying the crops. Expansion of fields also sometimes means cutting down trees along the wadis that the herds may previously have used for shade or fodder in conjunction with the daily watering of the herds.

Irrigated cultivation appears to have different gendered and cultural norms than rainfed cultivation. The Taadoud I OR found that cultivation of vegetables has been relegated primarily to women, in large part because until recently there was little earning or sustenance potential for the large amount of work required. Men are responsible only for digging the well that supplies water to the field, while women perform all other tasks, unless access to a mechanical pump increases the economic viability of the activity. As water pumps become more common, the potential scale of irrigated cultivation increases, and the labor of drawing water decreases. These factors increase the potential for larger economic returns on vegetable cultivation, and men become more interested in vegetable cultivation as an enterprise. Activities that promote vegetable cultivation through the distribution of water pumps should take these dynamics into account to prevent the potential exclusion of women.

Water for animals

Pastoralists time their migrations to maximize the quality of their grazing, but sometimes when and where they can graze is limited by access to water. Availability of water is often a key factor in determining whether or not pasture in a particular area can be utilized by herders. Even if there is still grazing available in the north, if northern seasonal water sources dry up earlier than usual, herds may be forced to migrate south earlier than usual, coming into contact with unharvested fields and creating conflict with the cultivators. The Rural Water Provision and Development Authority, as well as some NGOs, have tried to support migrations in Kordofan by improving stations along migration routes to provide water and other services (Krätli et al. 2013). When there is excellent grazing but no water available in the dry season, herds are unable to access the grazing and must remain within a radius of the permanent watering point that is appropriate for their species, regardless of the state of the grazing land. Of all the livestock, camels can go the longest between waterings and so can graze much farther from water sources than smaller bovines.

A market has emerged to sell water for livestock, whether through private boreholes, water yards, or even the delivery of water by truck (Krätli et al. 2013). In North Kordofan, Krätli et al. found that *“during the hot dry season cattle are watered every second day, sheep every five days and camels once a week”* (Krätli et al. 2013, 35). Purchase of water therefore can be a major expense for those who own large numbers of animals, especially during drier years when there may be fewer free sources of water, such as from surface water sources or wells in wadis.

A final word on the management of water

Water is a critical resource to lives and livelihoods in Darfur. Its uses and availability vary by source through the year and from one year to the next. Access to this natural resource is mediated by institutions at all levels, from national to local. Increasing availability of water without consideration of these mediating institutions can lead to the destruction of the water sources or conflict over them. Increasing availability of water while strengthening inclusive local institutions linked to supporting state and national institutions can increase the productivity, health, and stability of the region.

Forestry (trees and shrubs)

Populations in Darfur use trees for firewood, making charcoal, construction, fodder, and more recently for firing bricks (Fitzpatrick et al. 2016). They provide shade for humans and animals. During droughts and floods, trees often continue to provide fruit or pods for income, food for humans, or fodder for animals. The pods of the acacia trees are a very high protein fodder (Osman et al. 2013). Trees and woody shrubs are associated with increased soil fertility (van Haren et al. 2010). Some types of trees fix nitrogen, dropping leaves that are rich in nitrogen, replenishing the soil. Their roots resist erosion from water, while their leaves and branches resist erosion from wind. With their deep roots, they are less dependent on current rainfall and so can provide livestock feed when recent rainfall is not sufficient for pasture (Olsson and Rapp 1991). Herders know which species their animals prefer and where to find them, sometimes planning their herd's movements accordingly (Krätli et al. 2013; Young et al. 2013).

National and state policies relating to forestry

National forestry policy in Sudan dates back to the establishment of the Forests and Woodlands Service in 1902, but the first national policy on forestry was not issued until 1932, dividing administration of forests between the central and provincial governments (FAO website <http://www.fao.org/forestry/country/57479/en/sdn/>, accessed November 5, 2018). The Forest Legislation of 1989 added “the need to involve local communities in forestry activities,” demonstrating a growing awareness of the influence of local institutions (FAO 2016, 3). The key national body is the Forests National Corporation (FNC). In 2002, the FNC gained responsibility for range management in addition to the management of “forests and natural resources” (FAO website). The first policy objectives of the FNC relate to desertification and deforestation, then to biodiversity. The fourth policy objective, as with water, links challenges to forestry back to land tenure issues. It states the issue as:

Poorly defined property rights, non-protected public forests, and lack of appropriate regulations governing the stakeholders' rights and responsibilities create a situation of free access to forests and range land. This invariably leads to severe tensions among users and in turn results in faulty land use practices negatively affecting the vegetation cover, accelerating forest resources degradation, food insecurity and poverty. (FAO 2006, 24)

The policy further notes that land tenure reforms are necessary for the implementation of forestry reforms.

Trees as property: customary institutions

Usufruct rights for trees are sometimes more pertinent than official “ownership,” and the fluidity of these rights is similar to the fluidity of rights for land in the traditional system. Even when someone has usufruct rights for a particular tree, there may be limitations to those rights—for example, in Kenya the rights are to harvest the fruit or pods, to cut some branches, but not to cut it to the point of killing it, while other types of claims on trees allow the user to cut the tree down (Barrow 1990). The rights associated with a tree can depend who planted the tree, the type of land on which the tree is found (e.g., communal land, agricultural fields, or around the homestead), the type of tree, or the uses made of the tree (Barrow 1990; Stave et al. 2002; Osman et al. 2013).

Current trends and issues relating to trees

Trees and changing land-use patterns

Changing land-use patterns in Darfur have affected pastoralist access to trees located near wadis (Osman et al. 2013). Wadis, together with the trees along their banks, are particularly important to pastoralists because they simultaneously provide water, shade, and fodder for their animals (Stave et al. 2002). Cattle that rest under and feed on the pods of these trees then deposit manure, further increasing the fertility of these areas for cultivation. Farming of “alluvial land” associated with wadis in Darfur increased immediately following the droughts of the 1970s, and has continually increased, accompanied by the cutting of wadi acacia stands (Osman et al 2013).

Trends in tree coverage

The FAO Global Forest Resources Assessment 2015 shows a steady loss of almost 1% of forest per year in Sudan from 1990 to 2015, comparable to other countries across the Sahel and Horn of Africa (FAO 2015). FAO reports that the composition of that area is also changing, with an increasing proportion of remaining forest composed of planted trees rather than naturally regenerating woodlands, which are normally much more diverse. While some farmers are extending the area cultivated into woodlands, they are also planting trees near their homesteads or around the edges of their fields, citing the benefits of improving fertility of their fields, while at the same time producing fodder, fruit, or wood that can be relied upon during droughts and floods.

The management of trees in different contexts also affects the benefits that accrue to the individual. Woodlands are generally managed by a group (Arts and de Koning 2017). Access must be negotiated through the group, and benefits are often limited to those that can be taken from the tree without risking the life of the tree—like the collection of pods or the limited cutting of branches. Arts and de Koning found that the success and benefits provided by community forest management (CFM) depend on strong engagement of community-based organizations, but even more on links between the users and external forest professionals who can support the users.

In contrast to managed forests, trees planted around homes and fields where the cultivator has sole usufruct land rights are generally managed by the planter alone. Not only does he/she have the freedom to make any use of the tree, but the proximity of the tree to his/her field or homestead confers other benefits, such as shade, erosion control, or nitrogen fixing uniquely to himself (Quandt et al. 2017). A reforestation program needs to understand the customs dictating who will receive what benefits from trees under what circumstances and determine if these are sufficient to encourage the population to sustainably manage the trees.

Trees and conflict

Although trees are a potential shared resource, in the past they have been both a driver and a victim of conflict. At the height of the large-scale conflict in Darfur, multiple sources documented the large-scale cutting of trees (UNEP 2007). UNEP reports that deforestation rates in the conflict-affected areas was more than twice the national average reported by FAO for the same period (FAO 2015). Some of this activity was localized around concentrations of IDPs as they cut wood for their own firewood and as an alternative source of income to replace the loss of income from cultivation (Fitzpatrick et al. 2016; Fitzpatrick 2008). Some deforestation was due to individuals in the military and armed groups profiting by the sale of wood and charcoal in areas they had gained control over

(Buchanan-Smith and Fadul 2008). Other cutting was associated with attacks on villages and alongside wadis (UNEP 2007; Young et al. 2005).

The large-scale clearance of fodder-bearing trees for agriculture and the re-allocation of wadi land for dry-season cultivation or fruit orchards increased the strain on pastoralists, blocking herds' access to water, impeding their movement through traditional migration corridors, and reducing the availability of key dry season browsing (UNEP 2007). Improvement of land, such as construction or the planting of trees, is one way to establish ownership of land. UNEP suggests that *"destroying trees severs the former community's links to the land and reduces the likelihood of resettlement"* (UNEP 2007, 93).

Crop residues: an example of changing strategies and relationships

The Taadoud I OR noted changes in the management of both crop residues and hay.⁹ Previously farmers made these freely available once the harvest was completed as fodder for livestock. More recently, these are harvested and stored by farmers, either for feeding the harvester's animals or for sale to other livestock owners (Young et al. 2009; Fitzpatrick et al. 2016).

A major difference between these hay and residues is the access rights to the land on which it is grown. Crop residues are part of a crop on land to which an individual household has at least temporary usufruct rights. Hay, on the other hand, is almost invariably cut from rangeland to which a group or groups have communal access and falls under rangeland policy. This section will focus on crop residues rather than hay, though hay also provides an excellent example of changing strategies and relationships. Unlike land, water, and trees, there are no government bodies or policies relating to crop residues; residues are governed by customary rights, many of which are rapidly changing in response to a new balance of power and the resulting changes in livelihood strategies.

Crop residues are a resource in which pastoralism, farming, land management, and socio-economic dynamics come together. Under traditional land tenure systems, farmers had the right to control access to agricultural land and the produce on it only during the agricultural season. Following the harvest, farmers in Darfur would traditionally collect a portion of the crop residues for their own use, leaving the remaining portion in the field. When migrating southward through cultivated areas after the harvest *talaig*, the herds would then graze freely over the fields. The farmers' fields benefited from the manure dropped by the grazing animals, and the animals benefited from the availability of the fodder.

Multiple sources, including the Taadoud I OR, report that crop residues are now rarely offered to pastoralists free of charge (Krätli et al. 2013; Fitzpatrick et al. 2016; Osman 2013; Young et al. 2005). After using some of the residues for themselves in construction or as a source of fodder, farmers are selling the excess, either to passing pastoralists, or by transporting it to markets for sale. The scale of crop residue sales is no small matter. Krätli estimates that even with 16 factories in Sudan producing livestock feed, it represents only 0.21% of the demand. Instead, *"most of the livestock feed traded in Sudan is believed to come from crop residues"* (Krätli et al. 2013, 35).

Near Habila during the first stage of the Taadoud II OR, pastoralists had come ahead of the *talaig* (without their animals) to purchase crop residues while they were still standing in the fields, then

⁹ Farmers generally cultivate crops primarily for its grain, fruit, or root. The rest of the plant is considered the "crop residue." Hay is long grass that grows wild, most often on rangelands, and is cut for fodder.

harvested the residues themselves to feed to their animals later in the dry season when communal grazing would be less available. Osman relates the changes in access to crop residues to local conflict: *“The limited access and availability to pastoral herds of the crop residues has turned the talaig into a period of fierce competition for the crop residues. In fact, the talaig has become a period of tensions and conflicts between farmers and pastoralists”* (Osman et al. 2013, 25).



Crop residues collected and stored in a sorghum field in West Darfur.

In drier years when grazing is more limited, demand for residues is much higher. The residues may be the only part of a farmer’s crop with value, so he will be especially anxious to sell them. At the same time, pastoralists, lacking natural grazing, will be more dependent on residues, leading to higher market prices and increased potential for conflict over the residues. Krätli explains that in North Kordofan about one in three harvests typically fail, very similar to much of Darfur, and therefore, *“the sale of residues from both harvests and failed crops is likely to represent a significant proportion of the farmers’ income in these areas. There is no*

information on the exact proportion, but it is common understanding in the region that many famers rely on these sales more than on the actual crops” (Krätli et al. 2013, 36). Interestingly, Krätli goes on to explain that crop residues usually have lower nutritional content for livestock than normal grazing, so farmers extend their fields to cultivate more sorghum, just to turn around and sell it for the residues it will produce. The system as a whole thus becomes less productive.

Multiple forces changing the crop residue system

There are many forces that have been pushing this shift in the institutions surrounding the use of crop residues. Not all of them are immediately obvious, including changes in access to natural resources, a changing national economy, and increased pressure on the land by all users.

During the initial field visit for the Taadoud II OR, we noticed large stores of sorghum stalks up in the trees among pastoralists’ tents and some cattle within the fencing of a large harvested sorghum field. A pastoralist explained that previously the farmers took what they needed of the crop residues and simply left the rest for the pastoralists to graze on freely. But now, the farmers do not have access to as many fields as they used to, so they need the money from the residues and value them more. So they collect the stalks and sell them to the pastoralists. While the pastoralist did not like to pay for the residues, he also did not suggest that the farmer was acting beyond his rights. A farmer from a nearby village added that the previous year they had had a very good harvest, so they had not harvested the residue at all because it was very hard work for relatively little return, and they hadn’t needed to resort to that strategy. In other words, collecting and selling residues is an alternative strategy, replacing lost income, rather than a decision on the part of the farmer to arbitrarily change

the traditional institutions to earn additional income. This short anecdote is echoed in other studies (Young and Ismail, 2019b) and highlights some of the forces shaping these changes in long-held traditions. These changes then become forces for further change.

Another factor changing crop residue management cited by Osman et al. is the increase in the number of livestock belonging to both farmers and pastoralists that are not migrating but are instead remaining nearer permanent settlements (Osman et al. 2013). Because of this, the local livestock have less access to pasture during parts of the year. Osman cites a second element related to expansion of vegetable cultivation mentioned above. The grain stalks are used as windbreaks for the vegetable plots and to increase yield. Both of these changes increase local use of crop residues, leaving less available for the passing mobile herds.

Key points for Taadoud II

- All natural resources co-exist within a single ecological system.
- Formal and informal institutions, layered from the national level to the local catchment and community, are the primary entry point for regulating and managing access to natural resources and promoting sustainable livelihoods.
- Pastoralist resources tend to be “open access,” while farm land is managed under long-standing customary rules and institutions, but both are affected by more recent state policies and institutions.
- The inclusivity or exclusivity of institutions influences how effective they are in practice. Hence an understanding of changes in institutions provides insights into barriers and opportunities for equitable and sustainable livelihoods.
- The unhelpful labelling of communities or groups as either “sedentary farmers” or “nomads” has enforced dividing lines associated with wider conflicts. This language continues to put people in opposition to one another. Taadoud should focus on what people do for a living and the integration between livelihood sub-systems.
- There remains a gap between policy and project implementation, with a wide array of stakeholders often unaware of changes in national policies or lacking the resources to apply them.
- Development of infrastructure needs to be linked to local institutions that manage them, and external governance and technical structures for sustainability.
- Livelihood strategies are transforming to adapt to a new context and new relationships among users. Institutions are also changing. Programming agencies should not assume old institutions function as they did in the recent past.
- Local institutions may need to be supported to ensure they are able to change in a way that ensures equitable access, regardless of livelihood specialization and gender.
- To be both effective and sustainable, an integrated catchment-based management system that connects with national policy and institutions needs to accompany any large-scale water-related infrastructure.
- Technical plans need to include larger, unintended impacts on the environment, while simultaneously the social aspects need to support equitable access and voice in management of the systems through the institutions regulating the water sources. For example, the increase in vegetable cultivation has led to friction between the vegetable cultivators and farmers as it has blocked paths to the wadis for pastoralists to water and feed their animals due to the clearance of trees for cultivatable land.

- A market has emerged to sell water for livestock through private boreholes, water yards, and truck delivery. This will have an impact on herd management strategies which may then affect areas under cultivation.
- Trees are a resource with different uses and values to different specializations. Institutions to manage trees may overlap with institutions with control over other resources, such as the type of land on which they are located and their proximity to water sources.
- Crop residues are a resource in which pastoralism, farming, and land management come together. The management of residues has changed significantly since the 1990s, negatively affecting land fertility and the cost of managing herds. Krätli (2013) estimates that most of the traded livestock feed comes from crop residues.

Part 5. Darfur's juridical systems: a context of legal pluralism

By Francesco Staro

Darfur's juridical system is made up of three institutions: formal courts, customary courts (under the Native Administration or *idara ahalia*), and traditional (*judiya*) justice. Formal courts at the state level are headed by qualified judges, who are versed in the Sudanese criminal and civil code. At the regional level, local courts are connected to the *idara ahalia* and are based in the capitals of regional entities. There are also rural and town courts that are part of the formal court system.

The customary courts are part of the Native Administration.¹⁰ Generally there are more customary courts than formal courts in rural areas, so they are more frequently used. *"All customary court members are appointed by the chief justice on recommendation of the district judge and after consultation with the local Native Administration (which will generally propose names) and the state governor"* (Tubiana et al. 2012, 39). Native administrators can be members of these courts. These courts use statutory and *Sharia* law.

The traditional justice system uses *judiya*, which is a tribal reconciliation mechanism. It is comprised of *ajaweed* (mediators) who hear the case and recommend a settlement. *Judiya* play a key role in settling disputes relating to access to natural resources and therefore will be the focus of this section.

Judiya: general description

Judiya is not a court or judicial proceeding; rather, it is a grassroots system of arbitration that focuses on reconciliation and revival of social relationships in the community. It is the lowest level of jurisprudence and only addresses low-level crimes that do not require intervention by the courts (El Tom 2012).

¹⁰ At the end of 2011, 32 Native Courts were functioning in North Darfur, 69 in South Darfur, and 20 in West Darfur (Tubiana et al. 2012, 38). Of the 41 courts in West Darfur, two—one in Geneina and one in Kulbus—are town courts. Only 20 were functioning at that time. The popularity of the customary courts in Darfur was largely due to their presence: they were more numerous generally and more present in rural areas.

Mediators within the *judiya* are known as *ajaweed* (singular *ajwad* or *ajwadi*). They are respected members of the community, usually elders known for their knowledge of communal and customary law and for their understanding of the environment and history of tribal areas. They only mediate cases that do not involve their own family, clan, or tribe. Research points out that *ajaweed* are not “neutral” as “*their practice is to exert pressure on the party resisting a settlement until they accept the recommendations*” (Elsanousi 2017, 18). The importance of the profile and social background of the *judiya* is well documented. For example, the Rizaygat and the BeRa came into conflict on at least two documented occasions before the current war, in 1986 and 1996. The cause of both conflicts was similar, but the *judiya* was used effectively to avert violence only in the first case. The success was due to the mediator’s profile (tribal membership, precedent employment as a government officer and field experience, support of central government) (Sansculotte-Greenidge 2009).

The ideal profile of an *ajaweed* is changing, and new competences and skills are becoming more valued. Today *ajaweed* are not necessarily traditional leaders; rather, they are increasingly “*professionals who have prestige and money, and individuals with knowledge of statutory law and even sharia. A legal background is important as judiya settlements are increasingly registered with the formal court*” (Tubiana et al. 2012, 57).

The common principles underlying *judiya* institution are:

- Mediators are volunteers and are expected to be knowledgeable about customary law related to the dispute.
- Parties to the conflict must voluntarily agree to participate in the *judiya*.
- Mediators must be voluntarily accepted by all parties to the conflict. Either party has the right to dismiss an *ajaweed* for suspicion of non-neutrality or any other reason, but only prior to commencement of the *judiya*.
- The parties to the conflict decide on the agenda, without outside intervention.
- Customary law serves as the reference for adjudication.
- The parties to the conflict are obligated to accept the outcome and commit consensually to *ajaweed* recommendations. Rulings made by *judiya* are binding to all parties once a *judiya* offer has been accepted.
- The parties to the conflict and the mediators are jointly responsible to implement the agreement.
- Higher-level tribal leaders serve as guarantors for the implementation of the agreement and serve as witnesses when there is a dispute over interpretation of the outcome.

Judiya meetings are relatively easy to set up and can take place in an *ajaweed*’s house or in a space which is accessible to all (Tubiana et al. 2012; El Tom 2012; Elsanousi 2017; Ibrahim 2013). A *judiya* session normally has five *ajaweed* who join and depart at will to carry out other activities. A well-done session will finish in one sitting. To start the proceeding, relevant verses of the Quran are read. The case is then presented verbally and in the presence of the other party. Each side appoints a spokesman who must follow specific rules (e.g., may not point with his hand nor provoke the other side in any way). The *ajaweed* normally question the aggrieved party first, then the accused. During a session, the *ajaweed* remind the disputants of past relations and focus them on the benefits of future cooperation.

Reconciliation is the central component. The *ajaweed* demonstrate how to communicate by employing good speaking and listening skills, paying attention to non-verbal messages, and possibly

contributing expertise and experience. To lead a *judiya* “is an art—and a show, as the meeting is open to all, even passing guests” (Tubiana et al. 2012, 55). The *ajaweed* rely heavily on symbolism, quotes from the Quran or Hadith, and popular sayings and wisdom to extract apologies and forgiveness.

Judiya ruling has a consensual nature and has been described as a community attempt to combine individual interests with community ideals. This legal mechanism is free, and no penalties or fines can legally be enforced; they are only morally enforced.

Evolution of the *judiya*

Judiya protocol and administration has evolved due to the conflict and wider socio-economic changes in Darfur. *Judiya* processes increasingly appear to be adopting court procedures such as calling witnesses or visiting incident scenes. This is likely the result of a number of trends, “including the increasing impact of formal education—especially law—among elites, the increasing influence of sharia since 1983, and the general urbanization and modernization of traditional rural Darfur society” (Tubiana et al. 2012, 55).

El Tom notes that it is important to “improve the justice delivery of *judiya* while maintaining at least some of its traditional ethos” (2012, 113). Some recommendations for how to do that are:

- Address the issue of poor training of mediators and lack of space for lawyers by boosting the role of counter witnesses.
- Limit *judiya* jurisdiction to minor offenses (property damage, theft, looting, and non-fatal injuries) and transfer all crimes leading to fatalities to the national justice system;
- Create rules that enable the *judiya* to remain independent from government interference;
- Increase the role of women in the *judiya*. Currently women feature as victims, defendants, and witnesses but rarely as judges.

Compensation and reconciliation

Customary justice is founded on compensation practices and the recognition of responsibility, which can lead to reconciliation. It can be ordered by the court, recommended by *ajaweed* or other mediators, or agreed by consensus by the parties (Tubiana et al. 2012).¹¹

Diya (compensation) varies from region to region and from ethnic group to ethnic group. In Darfur, *diya* is used in cases of unintentional homicide, injuries, and damage to property. It is based on *Sharia* and local customs.

Payment of *diya* is worked out by dividing the amount of imposed compensation by the number of contributing households. It is reported that 66.5% of the *diya* is paid to the paternal family of the victim, and 33.5% of the *diya* is paid to the victim's maternal relatives. The collection of money may be an arduous task as households' contribution may be as low as 100 SDG (Sudanese pounds). However, payment of *diya* is seen “as an honorable deed, symbolic of belonging to the group. Few are prepared to endure the shame of not meeting the obligation” (El Tom 2012, 107–108).

Diya payment illustrates the importance of considering local institutions in terms of resource rights relationships between different groups of producers. This form of collective payment reaffirms values of responsibility and respectability among and between groups, and reinforces social

¹¹ For other case studies on *diya* and compensation in Sudan beyond Darfur, see also J. H. Wilson, 2014, Blood money in Sudan and beyond: Restorative justice or face-saving measure? PhD dissertation, Georgetown University.

belonging to the community. *Diya* is thus an important governance mechanism that relates to resource usage and the maintenance of socio-economic relationships.

Complementarity between juridical systems

The main differences between *judiya* mediation and customary courts are shown in Table 4.

Table 4. Differences between *judiya* and customary court

<i>Judiya</i> mediation	Customary court within Native Administration
Tree	Mud room
Moral/traditional base	Literate
Spontaneous	Formally arranged
Open jury	Restricted jury
Restitutive	Punitive
Moral enforcement	External enforcement
Ruling consensual	Ruling imposed by judges
<i>Source: Adapted from El Tom 2012, 110.</i>	

Box 4. Complementarity between formal and customary courts and *judiya*

In the spring of 2010, a case of two women quarrelling over a goat was brought to the Kutum police, who referred it to the local court under Native Administration system. One woman said she bought the goat in the market; the other said it was born in her house. They were asked both to bring witnesses. When they brought the witnesses, neighbors who knew both of them suggested a *judiya*, which the court's president accepted. The *ajaweed* asked the woman who claimed to have bought the goat to bring the seller. She was unable to do so, and the goat was returned to the second woman. In this case, community members favored a *judiya* process because they feared the woman who had no proof could have been sent to prison for stealing and lying to the customary court (Tubiana et al. 2012, 61).

Formal and customary courts and *judiya* complement each other and compete to some degree. See Box 4 for an example.

A court, whether customary or statutory, may refer a case already before it to a *judiya* if the judge believes that mediation is more likely to restore good relations between the parties. *Ajaweed* may also come to the (formal or customary) judge or the prosecutor and request permission to take on a particular case that is already before the court. The *ajaweed* may also ask the government to apply pressure on the party in cases where the council fails to reach a settlement (El Tom 2012).

Selecting a judicial system

The nature of the case normally determines the choice of justice mechanism. Prior to the conflict, only big cases—armed robbery, livestock rustling, murders, tribal conflicts—went to the formal courts, and smaller cases went to customary courts and *judiya*.

Darfurians usually say that the first step in any dispute resolution should be a *judiya*. *Ajaweed* may proceed without informing the government or the formal justice system. The government is the last resort (Tubiana et al. 2012). It is reported that Darfurians favor *judiya* over the courts in part because it is faster and in part because it has less governmental interference (Elsanousi 2017). There is tremendous social pressure to go to *judiya* first.

However, since the war began, customary courts and *judiya* have lost influence: “*people tend to respect their rulings less, and, when unsatisfied by a customary court’s ruling they sometimes try their luck with the formal court*” (Tubiana et al. 2012, 53). In fact, in this ethnically based system, we have seen that the traditional courts and *judiya* have lost their ethnic mix. “*It used to be that the [Fur] malik’s¹² court worked for everyone, and Arabs would bring their criminals there. Now, that is out of the question*” (Tubiana et al., 2012, 51). In West Darfur, Arab *amirs*⁹ and their people have stopped addressing their problems to the courts of the Fur but have not all created their own courts. Arab leaders, however, “*have not only begun to create courts for their tribes, but have also sought to create territorial courts that claim jurisdiction over other tribes living in the area. Non-Arab observers see this as an effort to gain legitimacy as leaders of the territories they have occupied by force*” (Tubiana et al. 2012, 51).

As a consequence, cases of crop damage in the past had the nomad and farmer in question going to a native court to negotiate damage payment. With the increasing use of statutory laws, the nomads no longer feel obliged to go to these courts, further undermining the customary tenure system, aggravating relations between the two groups, and reducing the overall adaptive capacity (Unruh and Abdul-Jalil 2012). This means that if a farmer wants to get damage payment for his crops, he would need to go to a formal court, which is expensive, and where a different burden of proof is needed. Today, most cases never go to court of any type because many victims are afraid to complain (Unruh and Abdul-Jalil 2012).

Key points for Taadoud II

- Darfur’s juridical system is made up of three institutions: formal courts, customary courts (under the Native Administration or *idara ahalia*), and traditional (*judiya*) justice. These institutions operate very differently, sometimes complementing each other and other times competing with each other.
- *Judiya* is the lowest level of jurisprudence. It focuses on reconciliations. It is evolving due to the conflict and wider socio-economic changes in Darfur. *Judiya* processes increasingly appear to be adopting court procedures such as calling witnesses or visiting incident scenes.
- Darfurians usually say that the first step in any dispute resolution should be a *judiya*. However, since the war began, customary courts and *judiya* have lost influence, and issues are ending up in formal courts more and more frequently.

¹² Malik and amir are titles for traditional leaders.

Part 6. The transition from humanitarian action to early recovery and resilience programs

By Anne Radday

Humanitarian agencies face a variety of challenges when shifting from strictly humanitarian to resilience approaches and/or incorporating resilience concepts into their humanitarian programs. These challenges are steeped in the different origins of humanitarian and resilience programming; each emerged for different reasons and continue to be distinguished by different goals, target beneficiaries, principles, and partners, which affect cooperation, coordination, and transition (Steets 2011).

It is well recognized that we are still learning how to effectively apply resilience approaches in protracted crisis settings (Kent 2016). Therefore, challenges also present an opportunity for actors to test new ways of working and capture lessons learned to continuously improve resilience programming. Table 5 provides an overview of the differences between humanitarian and resilience philosophies from the literature that are most relevant to Taadoud II. In the following sections we discuss challenges and potential opportunities related to differences, specifically in the “ways of working” section of the table.

Table 5. Humanitarian vs. resilience philosophies and ways of working

		Humanitarian	Resilience
Over-arching philosophy	Goals	Save lives, alleviate suffering, and maintain human dignity in the face of man-made crises and natural disasters, as well as prevent and strengthen preparedness for the occurrence of such situations (DFID 2007).	To improve the ability of countries, communities, and households to manage change by maintaining or transforming living standards in the face of shocks or stresses without compromising their long-term prospects (DFID 2011).
	Core principles	Principles of humanity, neutrality, independence, and impartiality are universally recognized and central to all organizations’ operations.	None universally recognized. Humanitarian principles of independence, impartiality, and neutrality no longer apply.
	Approaches	Clear and well-tested humanitarian approaches (Frankenburger et al. 2012).	Ambiguous and untested resilience approaches incorporate development and humanitarian tenets (Frankenburger et al. 2012).
Ways of working	Operational principles	International law and the Code of Conduct for NGOs and Red Cross/Red Crescent are well established and central to organizations’ operations.	By and large, remain at the level of individual organizations, and the ways to incorporate humanitarian principles are largely untested.

	Role of INGOs	Providers of life-saving resources (Frankenburger et al. 2012).	Facilitators of change (Frankenburger et al. 2012) and institutional capacity building.
	Delivery strategies	Deliver inputs (aid) in a way that protects the impartiality and neutrality of assistance (Macrae et al. 1997).	Understand the local context and priorities of local people and work with and through institutions for long-term benefits.
	Targeting	Individuals and households who are most in need.	Communities and institutions: determined by the agency, often in association with government partners and donors.
	Staff capacities	Ability to deliver aid in the midst of a disaster to save lives in the short term on the front lines.	Ability to work with and within systems to support long-term institution building and transitions.

Detailed review: ways of working

Core and operational principles

The core humanitarian principles (humanity, impartiality, neutrality, and independence) are deeply ingrained in humanitarian action. However, sometimes it can be challenging to abide by them outside of the humanitarian context. For example, Duffield notes that we need new ethics for working in protracted crises, where neutrality is not always possible or the best route to long-term engagement and is therefore applied selectively (Duffield 1994).

We should not toss out the idea of principles simply because the difference between humanitarian and resilience efforts make it impossible to simply transfer the humanitarian core and operational principles to resilience. Rather, we need to create and uphold an ethical framework for resilience programming that prioritizes relief where lives are at stake and addresses those people's other basic priorities (White and Cliffe 2000).

Role of INGOs

Frankenburger et al. describe,

achievement of resilience among chronically vulnerable groups will largely depend on the proper sequencing and combination of interventions and enabling conditions that include support for healthy ecosystems, effective formal and informal governance, engagement of the private sector, and provision of social safety nets. Given the range of actors involved—households, communities, informal institutions, civil society governments, donors, private sector—it is important for humanitarian organizations to retain proper perspective on their role as facilitators, rather than directors of change. (2012, 5).

Resilience programs do not require “first responders” to save lives in the short term. Rather, the type of facilitation Frankenburger et al. describe requires that INGOs pay close attention to longer-term issues, such as the health of the environment within which they operate, which is particularly important in Sudan. *“It is increasingly clear that it is often poverty and the downward spiral of*

environmental degradation that enhances vulnerability to acute crises and complicates response to crises as they evolve” (Feinstein 2004, 16).

Bromwich notes that, since the conflict in Darfur, livelihoods have been undermined by environmental degradation and the failure of environmental governance. Therefore, he advocated that in Darfur, even short-term relief programs must be done in an “environmentally sensitive” way (Bromwich 2008, 27).

Delivery strategies

Resilience programming is not “humanitarian plus,” and therefore, in taking on the facilitation role, INGOs need to change their delivery strategies. However, even the literature sometimes presents examples of resilience programming that is simply “humanitarian plus.” For example, White and Cliffe describe FAO’s Special Relief Operations Service as a humanitarian program because it provides “agricultural relief” (e.g., seeds, tools, fertilizers, livestock and veterinary supplies, and fishing gear) on an emergency, short-term basis. They note that if it was a resilience program, it would aim to increase food production in the long term and therefore be a multi-faceted program that would be providing seeds and fertilizers linked with training on agricultural methods that conserve water to also improve resilience to low rainfall in the long term (White and Cliffe 2000). However, simply changing the aim to increase food production through increased inputs would still not be a resilience program. To truly become a resilience program, this would need to move beyond the multi-faceted program of “inputs” to one that facilitates long-term change by engaging with communities and institutions to help them manage the inevitable variability. Therefore, a resilience delivery strategy moves away from inputs. It requires an understanding of local cultures and their resilience strategies, and uses strong and effective partnerships with local actors—governments, municipalities, traditional leaders, civil society organizations, and NGOs—to build resilience. If these are absent, or weak, or if they become lopsided through a power imbalance, at best understanding and therefore programming will suffer (Smilie 1998); and at worst local inequalities and vulnerabilities will be exacerbated.

Targeting

White and Cliffe point out that perhaps the debate about humanitarian/development divide is not useful when one considers the perspective of people living in protracted crises:

Whether there is peace and “adequate security” or not, households will always be seeking to provide for the future beyond food for today and shelter for the night: ensuring there is seed for next season; vital tools and equipment are to hand; breeding stock survive and are built up; some household goods and some form of savings are put away; education, skills and other means for additional livelihoods open up. And in pursuing both immediate needs and their own social reproduction, people will be routinely engaged in economic activities—production and exchange. (2000, 326)

Therefore, they argue that resilience building efforts must consider what economic activities households undertake during conflict that allow them to survive and what those activities require of them to see how it fits with the longer term. Such an analysis will be shaped by the nature of the conflict: “*how it is conducted, how the ‘sides’ are organized, the nature of the current spatial, temporal and social pattern of violence and the short- and long-term trajectories along which this pattern seems to be evolving, more than what was originally at issue*” (White and Cliffe 2000, 326).

Further, resilience programming moves beyond households as “beneficiaries” to include communities and institutions. Such institutions can serve as a resource for resilience programming and can benefit from capacity-building efforts. Young notes that the importance of partnerships is widely recognized, and program committees are central to implementation of programs in Darfur. However, these partnerships are often formed quickly and receive little support. They also miss other important institutions, such as local NGOs and local universities. They point out that Darfur universities have a strong cadre of professionals who are a significant resource that can be mobilized (Young 2007).

Staff capacity

Internally to organizations, the shift to resilience programming begs the question: how will NGOs reshape their leadership, staffing, program planning, partnerships, and agency cultures to successfully run this new type of program? There is much to consider in this area, from the regional offices up to the headquarters. While the literature is helpful in uncovering areas that need to be considered, it does not provide clear guidance on how to restructure to meet the resilience mandate.

As Smilie points out, the shift to resilience programming requires individuals used to working in the humanitarian space to develop new knowledge and skills, such as negotiation, political management, conflict management, human rights, and working constructively with local partners, and the military and combatants. Further, resilience practitioners also need to understand local cultures in deep ways that require effective partnerships with local actors—governments, municipalities, traditional leaders, civil society organizations, combatants, and NGOs (Smilie 1998). Such deep understanding is not required of humanitarians solely delivering aid.

Despite these vast differences, the transition from humanitarian to resilience agendas usually begins with staff who may have limited experience with these different conceptual approaches. NGOs must recognize this constraint as they begin to transition. Taadoud II has already undertaken significant training for field staff making this transition. Further, the consortium has engaged a consultant to work with the teams to create guidance documents to guide their work in each state. It will be important to recognize that organizational change is not linear and that moving towards a new way of working will take time.

Increased role of institutions

Given the areas above, we must carefully consider the role of institutions in building and achieving resilience specific to the context of Sudan. For example, a recent study by Young and Ismail (2019a) describes the role and importance of institutions in Darfur. They note that traditional institutions, such as the Native (tribal) Administration, are still intact. The authority of local traditional leaders (the Sheikh), however, has been undermined as a result of long-term policy change and the impact of more than a decade of conflict on governance. For example, in some communities the Sheikh is less able to coordinate with local government departments and other locality institutions. Despite this, the Native Administration is still at the heart of community life in Darfur. It is now complemented by a range of other formal and informal community institutions such as the Popular Committee, the Women’s Association, and the Youth Association.

However, Young and Ismail note that traditional systems for managing and accessing natural resources have fundamentally changed for both farming and pastoralist groups, and the integration that was common between livelihood systems earlier has been undermined. Therefore, building and supporting these institutions in Darfur, where natural resources management and access are critical for sustainable livelihoods, is the key entry point for resilience programming.

As we engage with institutions, we must beware of introducing western constructions of institutions that may not be suited for the Darfur context. Kaplan argues that

overly westernized legal, governance, and education systems preclude local communities from taking advantage of their own resources, capacities, and social networks, and create unnecessary conflict between formal and informal institutions. Highly centralized governing structures in countries, in which formal state bodies remain ineffective and alternative sources of income remain few, force groups to compete for scarce state resources, accentuating the fragmentation of political identity in the process. Society in such environments becomes obsessed by this conflict, not with generating wealth or increasing national prestige...Such problems are particularly acute in sprawling countries, including Sudan, where political geography makes state management highly problematic. (Kaplan 2009, 7)

Key points for Taadoud II

As Taadoud II continues to engage with teams to develop effective ways of working within the resilience framework, the literature above points to a few key points to keep in mind:

- Taadoud II could develop its own set of guiding principles and ethics through a participatory process. This would provide a platform for the consortium to discuss ethical challenges that may arise on the ground and then have clear guidance for decision-making as issues arise.
- The literature supports Taadoud II's focus on natural resource management as an important building block for resilience in Darfur and the facilitation role that it is taking.
- As noted above, resilience programming remains untested in protracted crisis contexts. It is important for programming to be delivered in a way that builds local capacity and addresses issues of elite capture, conflict, and weakened institutions. Developing effective partnerships with governments, municipalities, traditional leaders, civil society organizations, and NGOs is imperative. As Taadoud II tests this way of engaging and building capacity, it has an opportunity to learn and document how to effectively conduct resilience programming in a protracted crisis environment.
- In the shift from humanitarian response to resilience programming, "beneficiaries" become partners and extend beyond households to communities and institutions. Analysis of how to engage with each target group should be shaped by the nature of the past conflict and consider how to facilitate increased capacity while tapping into the resources that partners bring to the efforts. Resilience building provides an opportunity for a two-way street in which INGOs benefit from partner individuals, communities, and institutions, and partners benefit from the INGOs.

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1. Young, H, R. Behnke, H M Sulieman, and S Robinson. 2016. Risk, Resilience and Pastoralist Mobility. Medford, MA, USA: Feinstein International Center, Tufts University.

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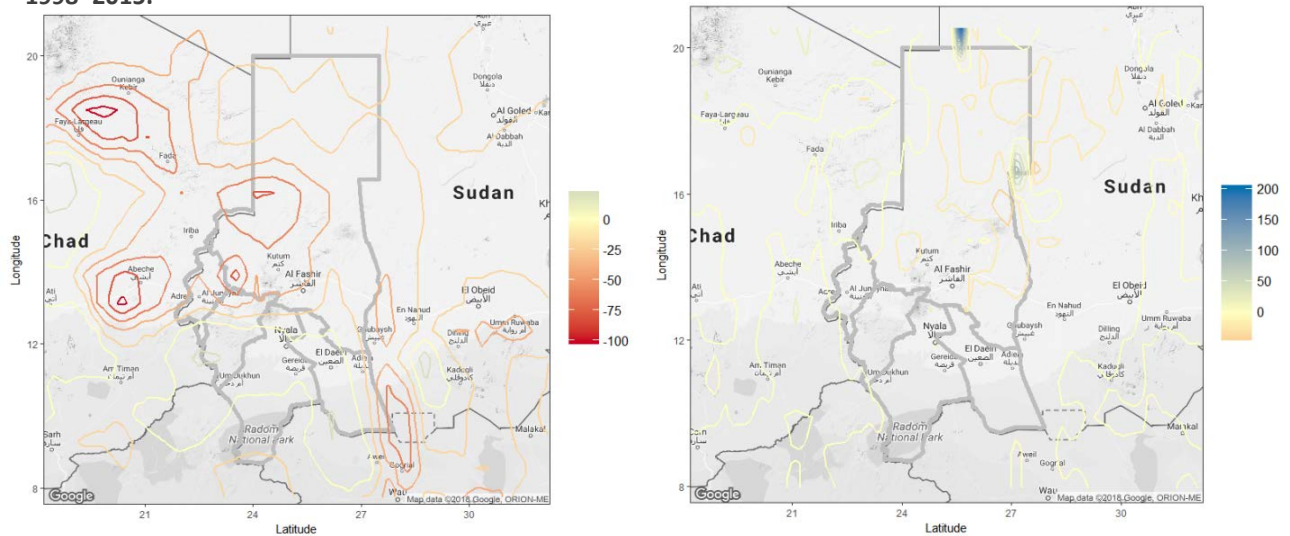
Annex 2. Review of precipitation datasets

Key properties of precipitation datasets

Dataset	Product	Spatial resolution	Temporal resolution	Variable name	Methodological notes
GPCC	Full Data Reanalysis	0.5°	1901–2013	Total Precipitation	Derived from 67,200 rain gauges worldwide with record durations of 10 years or longer
TRMM	3B43	0.25°	1998–2015	Multisatellite Precipitation	Derived from microwave data collected by multiple earth observation satellites and rain gauge analysis
MERRA-2	Land Surface Diagnostics V5.12.4	0.625° x 0.50°	1979–2018	Bias-Corrected Total Land Precipitation	Data for continental Africa derives from the CPC Merged Analysis of Precipitation dataset, which merges rain gauge observations with precipitation estimates from satellite observation.

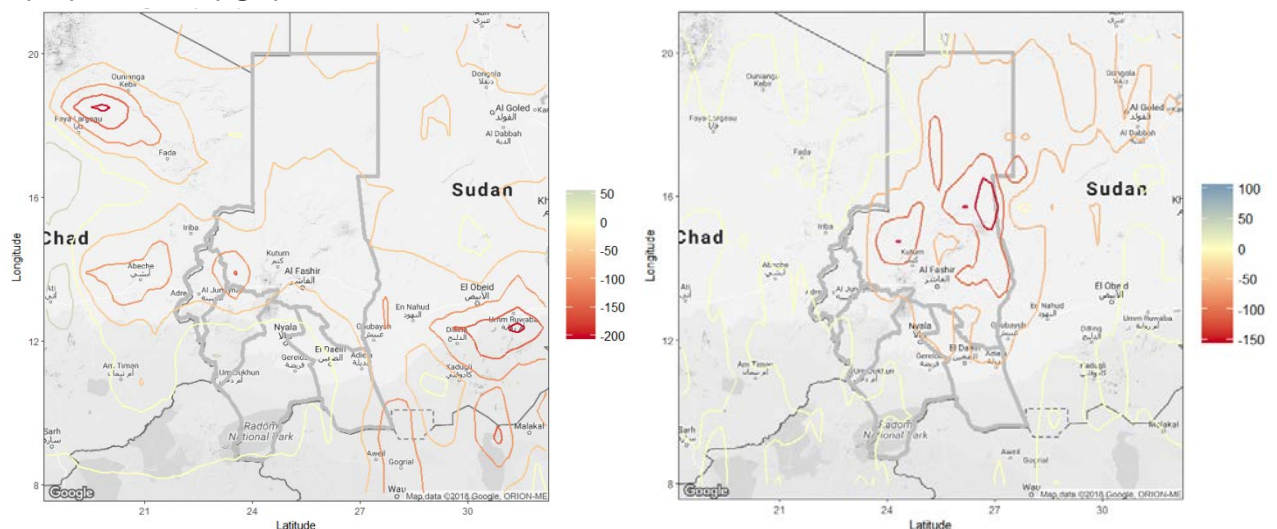
Figure 13 summarizes the spatial distribution of recent trends in mean monthly precipitation over Darfur and neighboring regions. MERRA-2 data point to a decrease of over 100 mm in mean annual precipitation in some portions of the Darfur region. TRMM data, however, indicate that less drastic trends have occurred in the area, with a slight increase in precipitation in some parts of North Darfur.

Figure 13. Magnitude of recent precipitation trends per (left) MERRA-2 and (right) TRMM datasets, 1998–2015.



Since most rainfall occurs during July and August, isolating these months in both the TRMM and MERRA-2 datasets provides a closer look at rainy season precipitation trends during the past four decades. As seen in Figure 14, both TRMM and MERRA-2 datasets indicate that rainy season precipitation is decreasing by approximately 50–100 mm from 1998 to 2015. The spatial distribution of this decrease seems varied—MERRA-2 indicates that the decrease is relatively consistent across the Darfur states, whereas TRMM indicates that the largest magnitude of rainy season precipitation decrease occurs in portions of North Darfur.

Figure 14. MERRA-2 recent trends of precipitation during peak rainy months (July–August), per MERRA-2 (left) and TRMM (right), 1998–2015.



Comparing the recent precipitation data from TRMM and MERRA-2 datasets against the historic GPCC data reveals further trends. Since each product has a different spatial resolution and modelling methodology, discrepancies are to be expected. The GPCC historical data predict higher precipitation during the rainy season in all states except North Darfur, as compared to the MERRA-2 and TRMM

[Lessons for Taadoud II](https://www.fic.tufts.edu/Lessons%20for%20Taadoud%20II)
[fic.tufts.edu](https://www.fic.tufts.edu)

data (Figure 15). Across North Darfur, TRMM indicates high precipitation in July and August that are not reflected in GPCC or MERRA (Figure 16).

Figure 15. Comparison of mean monthly precipitation (mm) by state and source, 1998–2017.

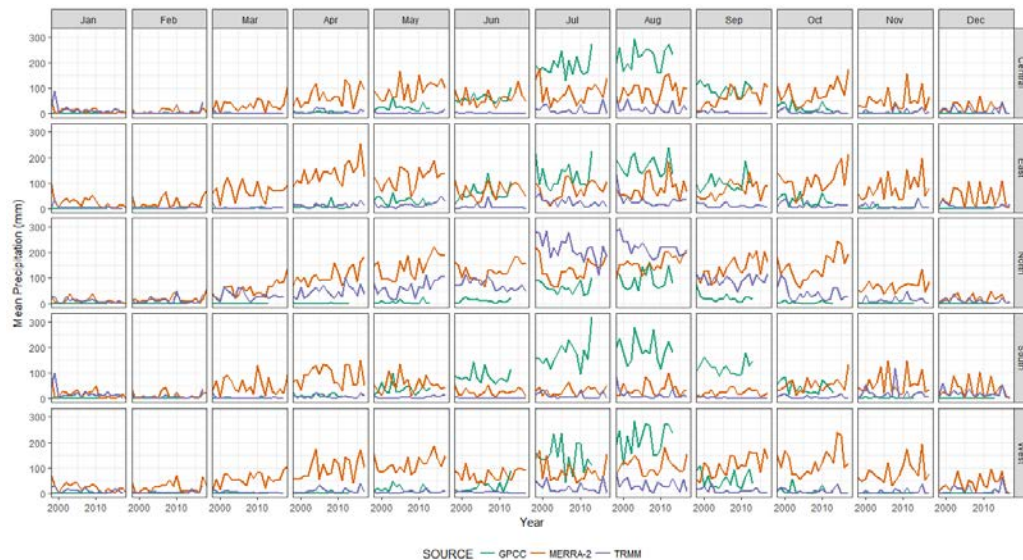
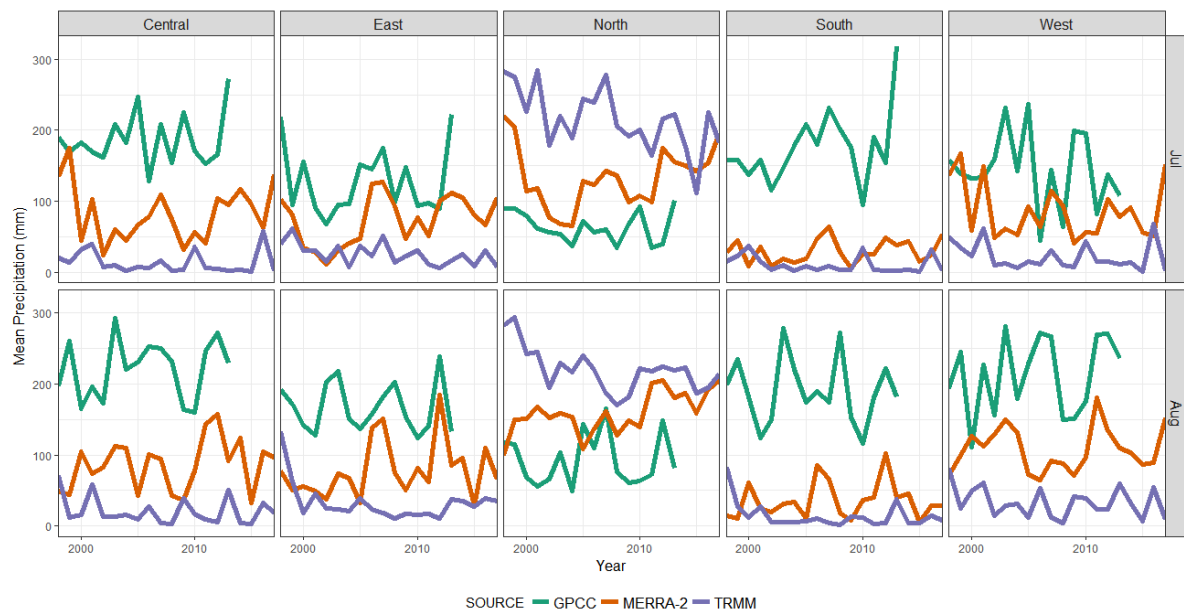


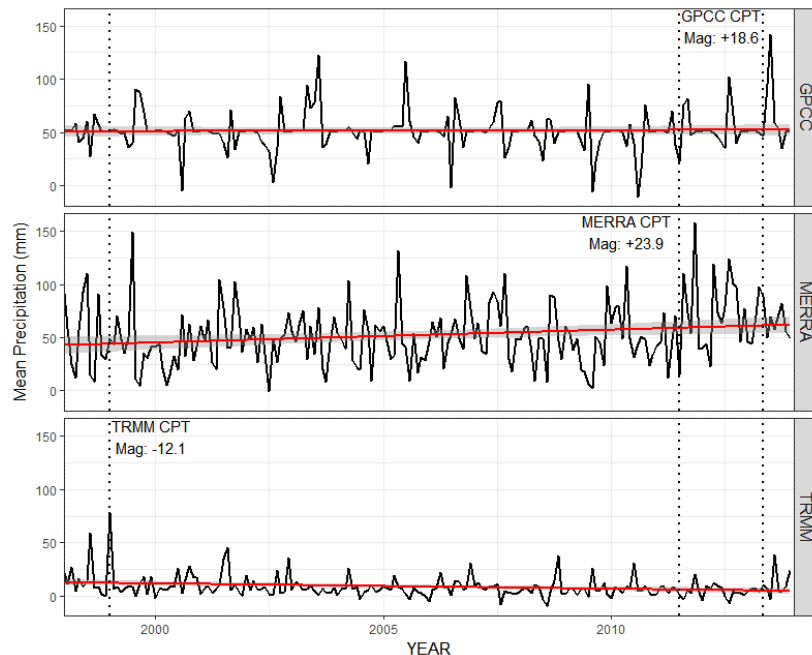
Figure 16. Comparison of mean precipitation for July and August by state and source, 1998–2015.



Each dataset presents a different conclusion regarding the overall trend of rainfall in the area. Since data indicate significant changes in North Darfur, we examine this state in greater detail in Figure 17 below. All three data sources indicate that the mean of each time series has changed between 1998 and 2014, but there is disagreement about when this change occurred. GPCC data indicate that a significant increase in the mean was observed starting in May 2013. However, MERRA data for North Darfur indicate that this shift occurred earlier, starting in July 2011. TRMM data disagree with both

of the above conclusions, indicating instead that the mean *decreased* in January 1999 and has stayed at this level since. The magnitude and trend line for these change points is shown in Figure 17.

Figure 17. Seasonally adjusted monthly mean with change points (time point for change of mean) for North Darfur State, 1998–2013.



There is considerable difference between the MERRA-2 and TRMM rainfall products. While dry season precipitation is relatively similar, rainy season precipitation is drastically different between the two datasets, as seen in Figure 18 and Figure 19. One explanation for this is that the MERRA product combines numerical models of atmospheric processes with conventional and satellite observations, resulting in over-prediction and large discrepancies in coarse-resolution products (Yi et al. 2011). TRMM on the other hand provides higher spatial resolution and often more conservative estimates of precipitation. The discrepancy between TRMM and MERRA-2 is especially visible in North Darfur State during the peak rainy months of July and August. During these months, TRMM data point to higher-than-modelled precipitation in the state, with a subsequent drop-off in September and October. Although TRMM data are only available since 1998, they are considered more appropriate for this region than MERRA.

Figure 18. Comparative mean monthly precipitation (mm) in dry months (November–March) by state, as measured by TRMM and MERRA-2.

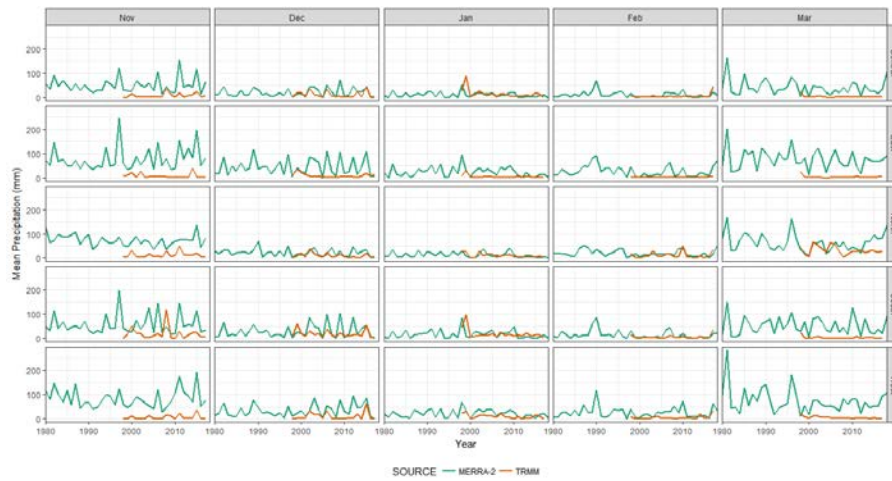
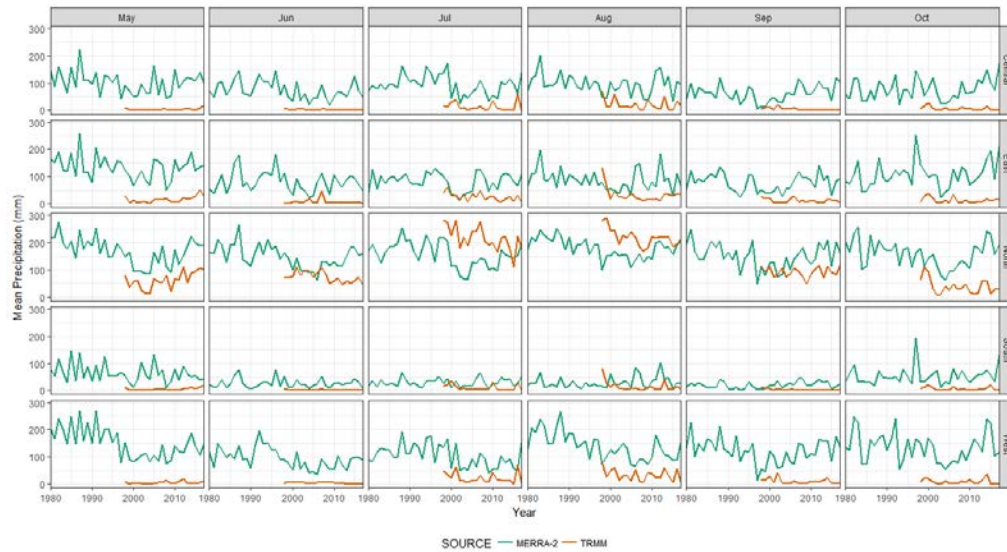
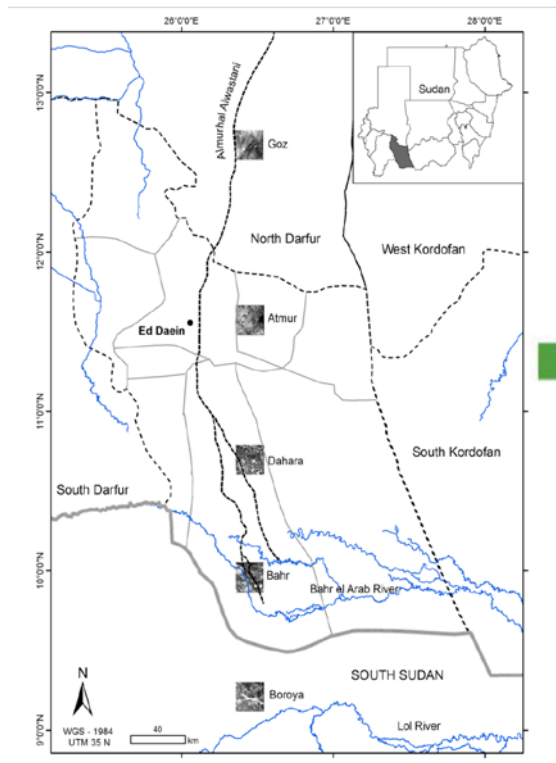


Figure 19. Comparative mean monthly precipitation (mm) in rainy months (May–October) by state, as measured by TRMM and MERRA-2.

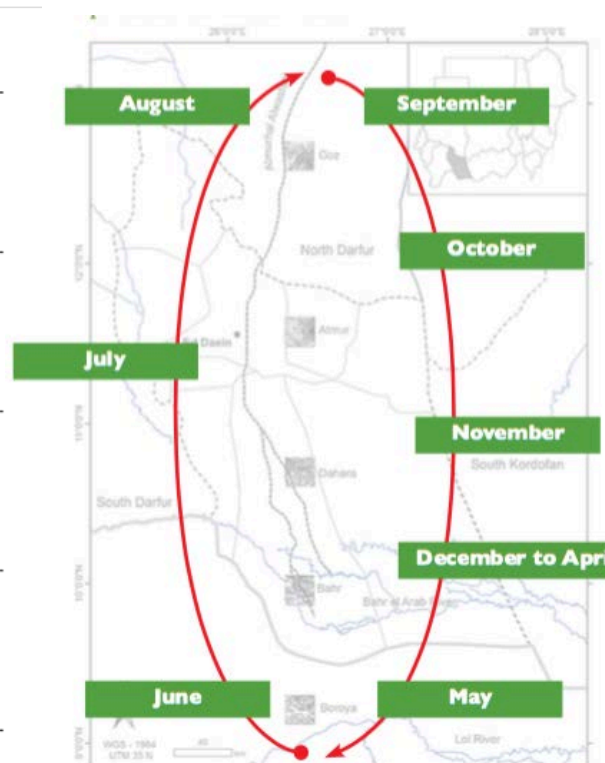


Annex 3. Maps of livestock movements

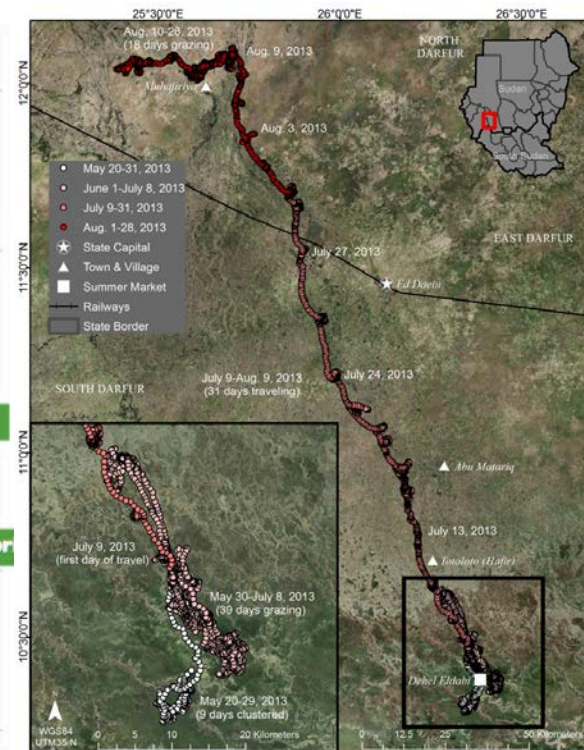
Map A shows the central livestock corridor (alWastani), which runs from the Bahr el Arab in the south northwards past Ed Daein, then runs further north to the *goz* (sandy soil) rangelands of North Darfur. **Map B** shows the approximate timing of the seasonal migrations; northwards in the rainy season and southwards in the dry season. **Map C** shows the movements of a single herd in real time (with a GPS tagging device attached to one of the animals) (Young et al. 2013 and 2016).



A



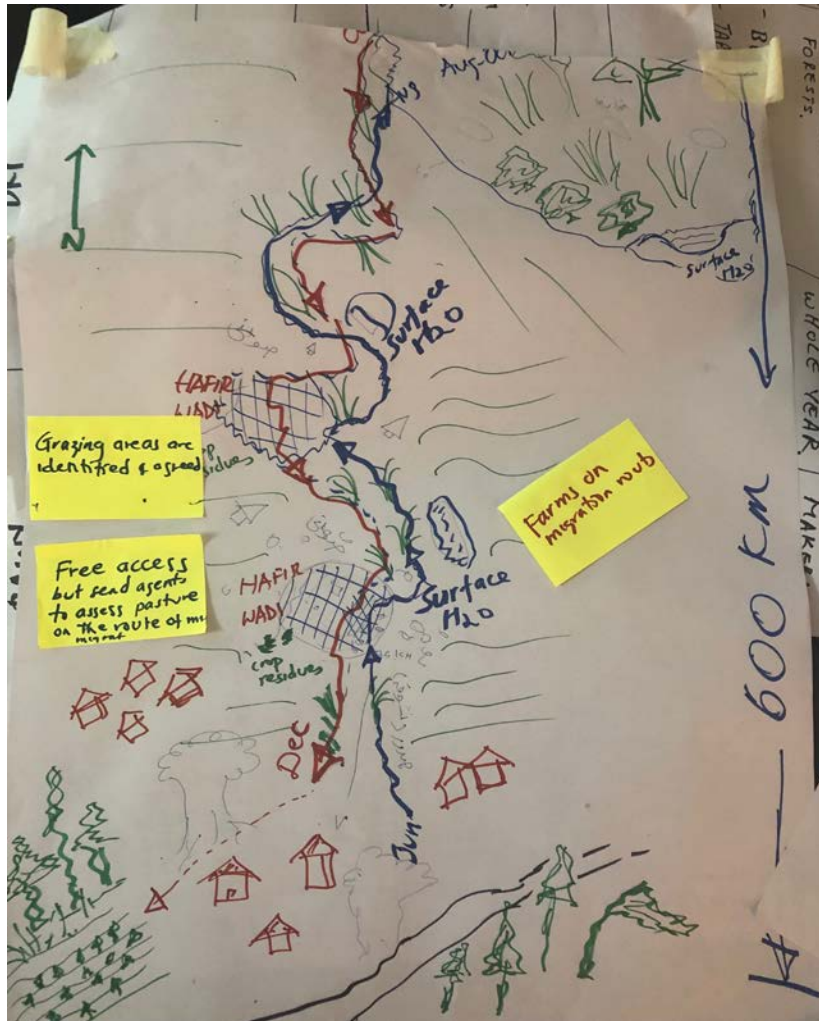
B



C

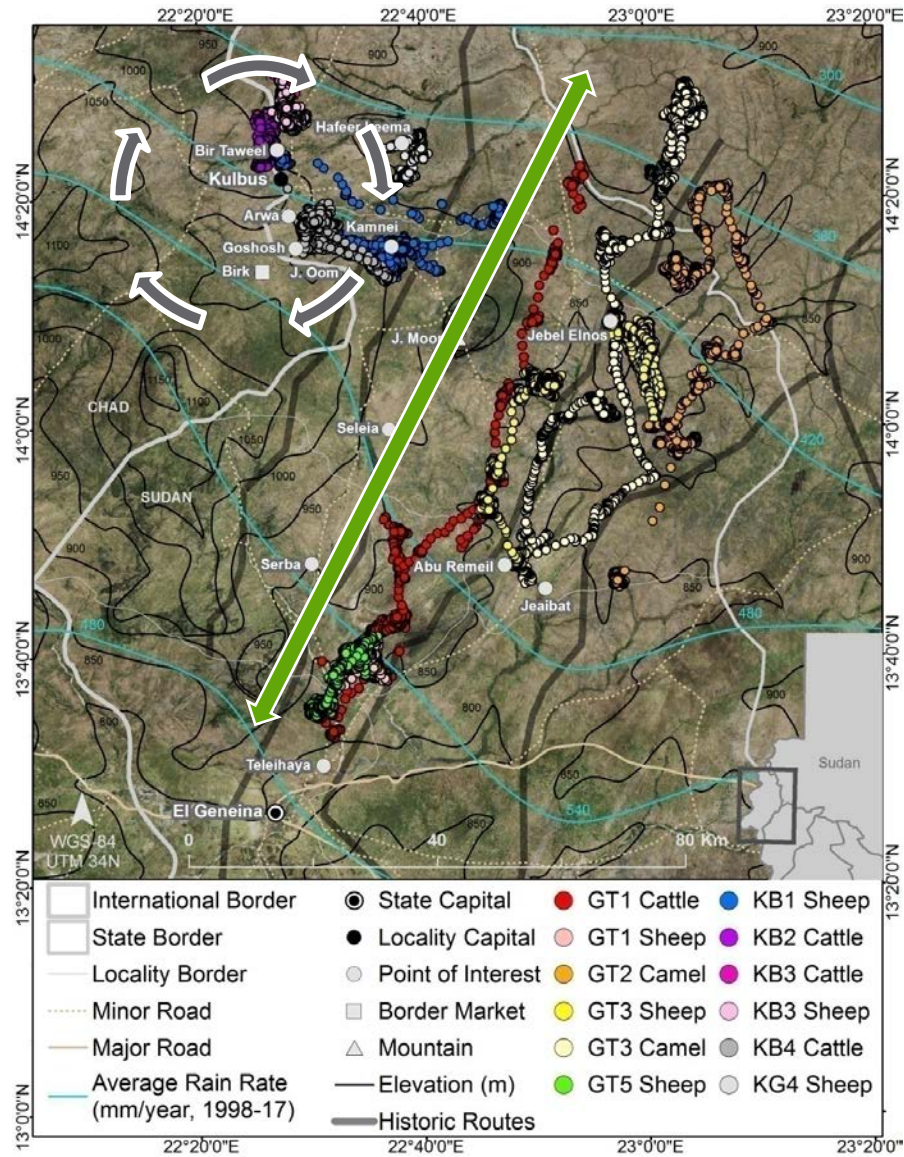
Map D shows the resources accessed by the *baggara* pastoralist system (Project Managers meeting, January 17, 2019)

(note the resting points along the corridor that are clearly shown on Map C and Map D).



D

Annex 4. Changing patterns of livestock mobility in Western Darfur



Annex 5. Additional perspectives on wadis, *hafirs*, and hand pumps

The various types of water sources in Darfur have different advantages and disadvantages, fitting differently into the various livelihood specializations and varying by season. We will discuss three types of water sources commonly used in Darfur and which were referred to in the Taadoud NRM Assessments.

Wadis and their associated sources

During the rainy season, large amounts of rainwater soak into the deep, sandy bed of the wadi to create “alluvial aquifers” (Abdo and Salih 2011). Hand-dug wells or *edad* (the singular is *edd* or *idd*) are dug in the bed of the wadi, yielding water through most of the dry season (Young et al. 2013). These can be an important source of water for herds and for households, especially during the dry season and in areas where more developed water sources are not available (Omer Ali 2015; Marshak et al. 2016; Young et al. 2013). Shallow wells are also dug on the banks of wadis to irrigate vegetable gardens, and control of these depends on rights to use the land on which they are located (Abdo and Salih 2011; Fitzpatrick et al. 2016). There are intricate systems of ownership and use associated with wells either in the bed of the wadi or on its banks, and these vary from region to region (Robinson 2009).

Some wadis spread out to cover large areas during the rainy season, forming rich alluvial soil that is replenished with each rainy season’s flow and which also retains moisture into the dry season. Scoones provides a detailed description of these “wetlands in drylands” in their many forms and uses (Scoones 1991). Examples in Darfur include Badi Golo in North Darfur and the Khazan Gadeed in South Darfur (Omer Ali 2015). These wetlands are a shared natural resource (see the section on land use and land rights systems for information on access to land within wetlands) (Scoones 1991). As the waters recede during the dry season, farmers often plant off-season crops in the residual moisture. Because these crops do not rely on further rainfall, they are a low-risk strategy. Herds have also historically watered and grazed on the relatively dense vegetation and fodder trees (for example *Acacia albida*) around these wadis during the dry season, but now find that more difficult as more of this land is increasingly used for dry season farming and so is inaccessible to herders. Competition among users of this highly desirable land has been known to cause local conflict (Omer Ali 2015).

Hafirs

Hafirs are man-made ponds that also collect rainwater run-off but are generally much deeper and used much further into the dry season. The amount of water captured by a *hafir* and its rate of use largely determine how long the water will last into the dry season. They are prone to filling up with silt carried by the runoff, which may reduce their capacity if they are not regularly cleaned. Though *hafirs* are conceptually simple, they require active institutions to provide timely maintenance and equitable access (Wheater and Al-Weshah 2002; UNEP 2007) to avoid creating conflict and to ensure sustainable access to water. The most commonly cited purpose of this source is to water animals, but sometimes it is also used to irrigate crops and for household use, especially when other cleaner sources of water are not as available or as convenient (Omer Ali 2015). Because they are often built in areas with high demand for water but with few large alternate sources, competition for the water and the grazing around *hafirs* can lead to conflict (UNEP 2007). El Hassan and Birch cite one example where conflict over the use of a *hafir* between local sedentary populations and

seasonal pastoralists led the sedentary population to deliberately neglect the maintenance of the *hafir*, preferring reduced access to water over potential conflict (El Hassan and Birch 2008).

Because they are man-made, the location of *hafirs* is often strategic, taking advantage of the natural slope of the land to maximize its efficiency in catching surface run-off. When their primary purpose is to serve livestock (most often the case), they will be located away from residential areas, cultivation, and water sources for humans. Some are located far from population centers, in areas with few alternate sources of water to increase access to water during parts of the year. Alternately, in some pastures *hafirs* are intentionally not built to conserve those pastures for times of extreme need.

Hand pumps

Boreholes with hand pumps have become ubiquitous in Darfur, promoted by both the government and humanitarian communities as a low-technology, low-cost means of providing potable domestic water through all seasons to small, remote populations. Taadoud I OR respondents in areas where other sources are not available, especially during the dry season, reported that hand pumps were sometimes used for watering animals. In these cases, after a period of conflict over access to water at the pump, water committees had often needed to regulate the use of the pumps for animals to ensure households had adequate access for domestic use.

Ensuring the availability of water has consistently been linked to returns of IDPs (Symonds et al. 2013). At the start of 2005, UNICEF announced plans to drill 250 new wells in the first half of the year (Kodsi 2005). In September 2006, UNICEF reportedly conducted maintenance on 600 hand pumps and 13 “motorized pumps” in North Darfur (UNICEF 2006). In October 2006 alone, UNICEF (through the Water and Environmental Sanitation Department (WES) and INGOs) reportedly installed or rehabilitated 42 hand pumps (UNICEF 2006). Symonds et al. estimate that by 2010, just five years after the earliest wave of installations, about a third of all hand pumps and water yards were not functional (Symonds et al. 2013).



Similarly, the Taadoud I OR found that international NGOs installed large numbers of hand pumps between 2005 and 2008 to encourage the return of IDPs, but few were still working ten years later (Fitzpatrick et al. 2016). Studies have shown that hand pumps with normal preventive maintenance and management should remain economically viable in rural developing communities for 10 to 15 years, and for up to 25 years if major repairs are possible (World Bank 1995).

Hand pumps installed by NGOs are generally managed by NGO-organized volunteer committees in the communities in which they are

located, and the water is usually free to users, with a collection taken up when repairs are needed (Young et al. 2013). Villagers gave numerous reasons why the pumps had failed, all but a few of which involved management failures rather than technical failures. In at least one case, a pump was intentionally not repaired after it broke down because it was creating conflict with non-residents of the village. Unfortunately, many of the boreholes were placed without coordinating with relevant government bodies or other traditional institutions (Symonds et al. 2013).

Some respondents in the Taadoud I OR explained that when there are no other sources of water than a village hand pump, they may water their livestock at the village hand pump, resulting in friction between the livestock owners and the people living near the pump, especially when it is located among the houses rather than on the edge of the village (Fitzpatrick et al. 2016). Men usually water visiting herds, but women collect water for the household or water the local animals. Multiple cultural institutions prevent women from defending their own access to the pump, with women sometimes having to wait hours for a herd to finish watering. In some cases, respondents explained that they preferred to let the pump fall into disrepair rather than risk conflict over the pump. In other villages with stronger institutions that considered the needs of all users, designated hours were negotiated when only water for household use can be drawn at the hand pump and others when the herds could freely access it—emphasizing the importance of strong, inclusive institutions, even for such apparently simple infrastructure as a hand pump.