

Nawiri Desk Study



Natural Resource Management and Nutrition on Isiolo and Marsabit Counties, Kenya
Izzy Birch, Tufts University





This desk study is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of Catholic Relief Services, recipient of cooperative agreement no. [72DFFPI9CA00002] and do not necessarily reflect the views of USAID or the United States Government.



Table of Contents

Acronyms.....	2
Executive summary	3
1. Introduction	6
2. Research questions.....	10
3. Methodology.....	10
4. Findings.....	12
4.1 Summary of key findings.....	12
4.2 Natural resource management at community level.....	14
4.3 Changes in policies, institutions, and relationships.....	21
4.4 Impact of changes on livelihoods and food security	31
5. Gaps in the evidence and implications for programming	34
References	36
Annex: Literature Reviewed	43

Acronyms

ASALs	Arid and Semi-Arid Lands
CBO	Community-Based Organization
CFA	Community Forest Association
CIDP	County Integrated Development Plan
EMC	Environmental Management Committee
KFS	Kenya Forest Service
KWS	Kenya Wildlife Service
MASL	Meters Above Sea Level
Nawiri	Nutrition in ASALs Within Integrated Resilient Institutions
NRM	Natural Resource Management
NRT	Northern Rangelands Trust
WAPC	Ward Adaptation Planning Committee
WRUA	Water Resources Users Association

Executive summary

This paper explores how the policies, institutions, and relationships that govern access to land and natural resource management (NRM) in Kenya's arid and semi-arid lands (ASALs) are changing, and the potential impact of these changes on livelihoods, food security, and nutritional status. It was commissioned by the Nutrition in ASALs Within Integrated Resilient Institutions (NAWIRI) project and is part of a Nawiri desk study series addressing the various drivers of malnutrition in drylands.

This literature review seeks to answer the following research questions:

1. How does land access and NRM, particularly at the community level and including policies, institutions, and relationships, contribute to mitigate against malnutrition in the Kenyan ASALs?
2. How do these relationships differ by livelihood specialization and type of natural resource (i.e., pastoralists/farmers, grazing land/cultivable land, water for humans/water for livestock, etc.)?
3. How, if at all, are land access and natural resource management policies, institutions, and relationships changing over time? What impact, if any, do these changes have on livelihoods and food security and associated linkages to nutritional status?
4. How do NRM policies, institutions and relationships affect access to land and livelihood resources and for whom, with attention paid to livelihood specialization, gender, and social/economic status?

The literature search was centered on Isiolo and Marsabit counties where the Nawiri project is being implemented but encompassed neighboring counties with similar environmental and livelihood conditions. Documents were evaluated against four criteria drawn from the research questions, specifically the extent to which they contained: (i) discussion of policies, institutions, and relationships; (ii) evidence of change over time; (iii) evidence of socio-economic differentiation; and (iv) evidence of impacts on livelihoods, food security, or nutritional status.

Land and natural resources are the bedrock of livelihoods in Kenya's drylands, even for many who have settled. Sustainable access to these resources is therefore a pre-condition for sustainable livelihoods and consequently for food and nutrition security. Both Isiolo and Marsabit are largely arid landscapes where pastoralism predominates, and the vast majority of land is managed under customary tenure. High rainfall variability means that the distribution of natural resources is unpredictable in both space and time. Producers take advantage of these transient resources and manage uncertainty by using strategies that place a premium on flexibility and reciprocity. These strategies may be either facilitated or constrained by policies, institutions, and relationships, hence the significance of these three factors to livelihoods, food security, and nutritional status in drylands.

The policy environment in Kenya is evolving in different and sometimes contradictory directions, demonstrating both change and continuity with the past. On the one hand, there are now opportunities to pursue a rights-based and locally driven approach to NRM, particularly through

processes of devolution and land reform. There is also more recognition among some policymakers of the ecological realities of drylands and the potential of their production systems. On the other hand, policy continues to enable the alienation of land and natural resources. Large-scale investments in both Isiolo and Marsabit are transforming the value of land and threatening further loss and fragmentation of the natural resource base.

Institutions may be either formal or informal, or a hybrid of the two. Community-based institutions customarily regulate the use of, and access to, common property resources, facilitate knowledge transfer between generations, and manage relationships both within a community and beyond it. Customary knowledge, norms, and practices are being blended with contemporary forms of governance, sometimes to increase the legibility of customary institutions to the state, or to accommodate the priorities of women and youth, but sometimes as an entirely new hybrid form; the community conservancy is an increasingly common example of the latter in northern Kenya.

Access to natural resources is now secured not just by virtue of descent or cultural affiliation but through membership of, or relationship with, a formally constituted body such as a group ranch, conservancy, or forest association. These formal structures accentuate the significance of boundaries in the landscape as markers of belonging and entitlement. Access becomes transactional and market-based, mediated through partnerships that may be inherently unequal, such as with those in the conservation and tourism sectors. However, customary norms of reciprocity and collective action still persist, even where processes of privatization and individualization are further advanced, as dryland producers find new ways to sustain collaborative and reciprocal relationships.

These various changes in policies, institutions, and relationships have a number of implications for livelihoods, food security, and nutrition. First, several studies draw a link between the strength of community based NRM institutions and rangeland health and management. Where these institutions retain both the confidence of those they represent and the capacity to adapt to change and opportunity and are enabled by policies and actions at other levels of jurisdiction, the health of the natural resource base and producers' access to it can be protected and enhanced.

Second, the proliferation of barriers in the landscape, whether the result of privatization, insecurity, or new institutional arrangements, increases the cost of livestock mobility, which is a key strategy for managing variability and reducing exposure to shocks. Poorer households lack both the money to pay fees and fines and the labour that lengthy migration requires. As constraints on household labour rise, including as more children attend school, livestock are kept closer to home, adding to the pressures on women. As a result, migration is becoming the preserve of wealthier households.

Third, access to land and natural resources is key to managing drought and conflict. In situations of high variability, constraints on livestock movement can reduce productivity and increase the risk of livestock mortality. Experience in Isiolo has shown that effective community based NRM can protect against an extended dry season and deliver benefits in terms of asset protection,

milk production, and social relations. However, there is no simple causal link between resource scarcity and conflict: recent studies in both Isiolo and Marsabit suggest that much contemporary conflict, particularly post-devolution, is rooted in competition over political rather than natural resources and over the expected benefits of economic development.

The study concludes with some reflections on the evidence base, noting a research bias towards hybrid institutional forms rather than the customary pastoral and agro-pastoral systems within which most producers still operate. More studies explore economic than social differentiation, with very little exploration of how gender roles are changing. Overall, the evidence assesses the impact of NRM on factors that might be considered proxies for food security, such as milk production, human security, and household income, rather than on food security and nutritional status directly.

1. Introduction

This study was commissioned by the consortium of agencies responsible for implementing the Nutrition in ASALs Within Integrated Resilient Institutions (NAWIRI) project in the counties of Isiolo and Marsabit in Kenya.¹ It is part of a program of collaborative research and learning that will inform project implementation.



The goal of the Nawiri project is to sustainably reduce levels of acute malnutrition among vulnerable populations in its focus counties. Nawiri has adapted an amended framework of the 1990's UNICEF conceptual framework on the causes of malnutrition (UNICEF 1990) specific to dryland environments (Figure 1). The framework lays out the immediate (inadequate dietary intake and disease) and underlying (food security, social and care environment, and health services and health environment) drivers of acute malnutrition, unchanged from the original UNICEF framework. The amended framework expands on the basic drivers: livelihood systems; systems, formal and informal institutions; and seasonality and environment. This desk study is

part of a Nawiri desk study series, that addresses each level of the conceptual framework for drivers of malnutrition in drylands, including:

- Acute Malnutrition Hotspot Analysis in Marsabit and Isiolo (Ochola, 2021a & b).
- Immediate and underlying drivers; The immediate and underlying drivers of child malnutrition in the Kenya ASALs (Marshak, 2021).
- Basic causes;
 - ✓ Livelihoods and Nutrition (Stites, 2021).
 - ✓ Gender Gap Analysis (Stites and Dykstra-McCarthy, 2021)
 - ✓ Natural Resource Management and Nutrition (this study).
 - ✓ Nutrition, Environment, Conflict & Disasters (Marshak and Venkat, 2021)

¹ The consortium is led by Catholic Relief Services, and includes Concern Worldwide, Village Enterprise, Tufts University, The Global Alliance for Improved Nutrition, International Business & Technical Consultants, Inc., Caritas Isiolo, Caritas Marsabit and the Manoff Group.

¹ Source: Omwenga et al., 2019.

¹ Although the map does not include Marsabit in full, the rest of the county is comparable — *i.e.*, predominantly livestock production with pockets of forestry and wildlife conservation.

¹ Sources: (a) RoK, 2019; (b) RoK 2018a; (c) 2018b; (d) MoALF, 2017. The data on population and land area differ slightly between the 2019 census (RoK, 2019) and the two County Integrated Development Plans (CIDPs) (RoK, 2018a & 2018b). Population data in the CIDPs is projected from the 2009 census.

The objective of the desk study is to understand the role of policies, institutions, and relationships that inform access to pastoral lands and natural resource management (NRM), and how these may contribute to, or mitigate against, acute malnutrition in the Kenyan ASALs.

NRM is an essential consideration in dryland food security and nutrition because dryland livelihoods are predominantly derived from the natural resource base, even for many who have settled. Sustainable access to these resources is therefore key to the sustainability of livelihoods and the benefits they provide, including food and nutrition.

Dryland livelihoods are characterized by flexibility and opportunistic management because the distribution of natural resources varies in both space and time, a consequence of high rainfall variability. Pastoralism in particular relies on the integrity of a larger landscape in which different areas take on particular importance at different times. The excision of parts of this landscape, particularly those with permanent water, undermines the viability of the system as a whole. Policies, institutions, and relationships matter because they either facilitate or constrain the flexibility and reciprocity that producers depend on in an uncertain environment

Figure 1 Above: Location of Marsabit and Isiolo in Kenya²

Figure 1 shows the study area within Kenya, and Table 1 summarizes its environmental profile. Both Isiolo and Marsabit are largely arid landscapes where pastoralism predominates and the vast majority of land is community land, managed under customary rules and tenure. Marsabit has a more varied topography than Isiolo, from its Chalbi desert to a ring of volcanic forested mountains which supply both surface and groundwater to the surrounding plains. Isiolo has permanent rivers, is closer to crop-producing areas and markets, and features prominently in national investment plans, all of which result in a slightly more mixed livelihood profile.

Isiolo and the southeastern half of Marsabit lie in the catchment of the Ewaso Ng'iro river. Figure 2 shows the seven principal types of land use identified in a mapping of the catchment's ecosystem services (Ericksen et al., 2013). The dominant land use is livestock production (82 percent of the total area) followed by mixed crop-livestock production (six percent), livestock production with wildlife conservation (four percent), and wildlife conservation alone (three percent).³ Isiolo in particular is vulnerable to changes in land use upstream, particularly increased abstraction for irrigated horticulture and crop production. Irrigation is already estimated to use approximately 80 percent of total available water in the basin (Mutiga et al., 2010).

² Source: Omwenga et al., 2019.

³ Although the map does not include Marsabit in full, the rest of the county is comparable — *i.e.*, predominantly livestock production with pockets of forestry and wildlife conservation.

Table 1: Environmental profile, Isiolo and Marsabit counties⁴

	Isiolo	Marsabit
Total area ^(a)	25,351 km ²	70,944 km ²
Population ^(a)	268,002	459,785
Population density ^(a)	11 per km ²	6 per km ²
Topography ^(b & c)	Extensive plain, 200-1,100 masl	Extensive plain, 300-900 masl 3 highland areas: Mt. Marsabit, Mt. Kulal, Hurri Hills, up to 2,235 masl
Ecological zones ^(d & c)	Semi-arid: 5% total land Arid: 30% total land Very arid: 65% total land	Sub-humid/forest: 1% Semi-arid/woodland Arid/bushland: lower slopes and plains at 700-1,000 masl Very arid/dwarf scrubland: <700 masl, covering most of the county ⁵
Land classification	Community land: 80% ⁶ Public land: 10% Private land: 10%	The CIDP does not state the proportions, except that most is community land
Water sources ^(b & c)	3 main permanent rivers: Ewaso Ng'iro, Isiolo, Bisanada Surface and groundwater	No permanent rivers Surface and groundwater
Forests ^(b & c)	1 gazetted: Koitim 5 ungazetted: Badha-gudho, Badha-sothowesa, Badha-Bulfayo, Badha-galan waso, Lekuruki	1 gazetted: Mt. Marsabit 2 ungazetted: Mt. Kulal, Hurri Hills
Conservation areas ^(b & c)	3 game reserves: Shaba, Buffalo Springs, Bisanadi 8 conservancies (NRT, 2019)	2 national parks: Sibiloi, Marsabit 1 game reserve: Marsabit 6 conservancies

Most land in the two counties is classified as arid or very arid. Figure 3 illustrates the range of annual rainfall in Isiolo. There is evidence of change in the amount and distribution of rainfall in both counties over the past 50 years. Ouma et al. (2018) compare the magnitude and trend of temperature and rainfall extremes in Marsabit, Isiolo, Samburu, and Turkana during the periods 1961-90 and 1991-2013 and find that the maximum and minimum temperatures increased in all locations. Annual rainfall decreased, but on a statistically insignificant trend. Mean total rainfall in both seasons also fell,⁷ but this is attributed to a change in distribution through the

⁴ Sources: (a) RoK, 2019; (b) RoK 2018a; (c) 2018b; (d) MoALF, 2017. The data on population and land area differ slightly between the 2019 census (RoK, 2019) and the two County Integrated Development Plans (CIDPs) (RoK, 2018a & 2018b). Population data in the CIDPs is projected from the 2009 census.

⁵ The source does not give the precise percentages.

⁶ Section 4.2 explains the category of community land.

⁷ The source does not give the precise percentages.

⁸ Section 4.2 explains the category of community land.

⁹ The two seasons are the so-called 'long rains' (March-May) and 'short rains' (October-December).

year (the late onset of seasons). On a more local scale, Dabasso and Okomoli (2015) found a non-linear declining trend in annual rainfall in Central Marsabit between 1961 and 2011; there was a period of recovery during these 50 years though marked by poorer temporal distribution, with more dry days and fewer wet days. The decline was more pronounced in the long rains than in the short. Local perceptions in many dryland areas are that droughts are more frequent and more damaging, but this may be a consequence of factors other than, or in addition to, climate, such as changes in land use or access to key resources that then undermine the capacity of dryland producers to manage variability and risk (Flintan et al., 2013; Lind et al., 2016; Wasonga et al., 2016). These changes are the focus of this study.

Figure 2: Land use in the Ewaso Ng'iro catchment⁸

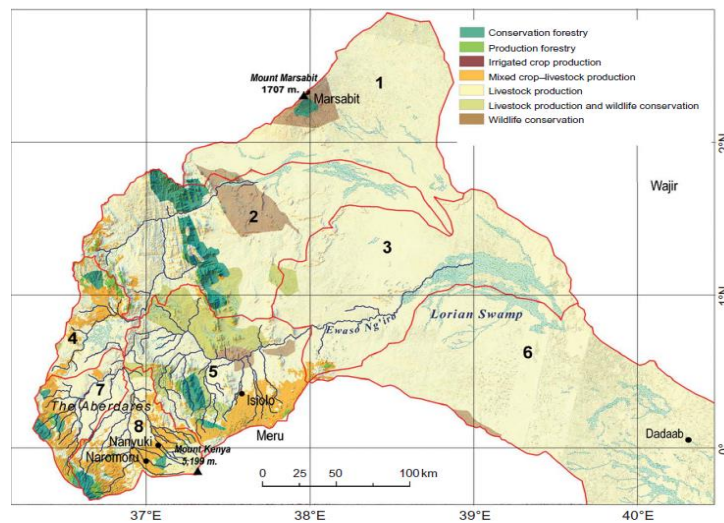
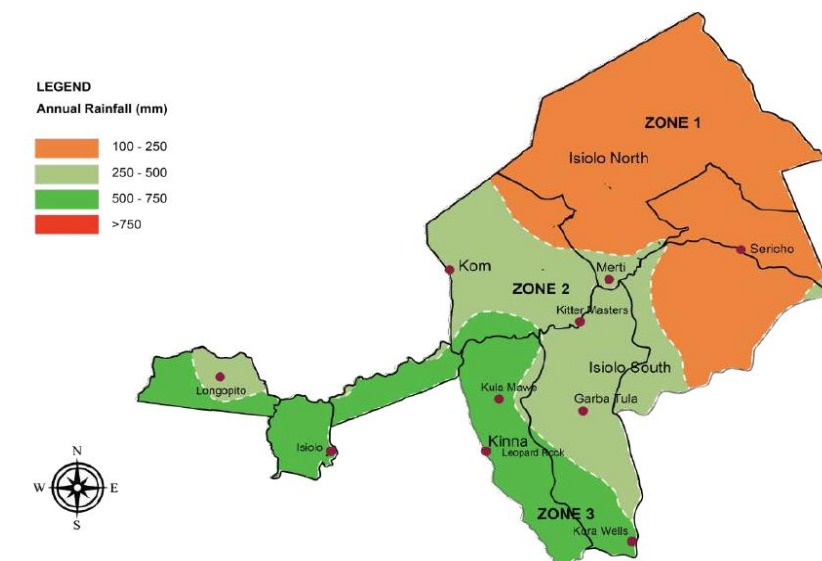


Figure 3: Map of climatic zones in Isiolo⁹



⁸ Source: Ericksen et al., 2013

⁹ Source: KMD, 2018

2. Research questions

This study seeks to understand how land access and NRM policies, institutions, and relationships are changing in the ASALs, with what consequences and for whom, and the potential impact on livelihoods, food security, and nutritional status.

The specific research questions are:

- 1) How does land access and NRM, particularly at the community level and including policies, institutions, and relationships, contribute to mitigate against malnutrition in the Kenyan ASALs?
- 2) How do these relationships differ by livelihood specialization and type of natural resource (*i.e.*, pastoralists/farmers, grazing land/cultivable land, water for humans/water for livestock, etc.)?
- 3) How, if at all, are land access and natural resource management policies, institutions, and relationships changing over time? What impact, if any, do these changes have on livelihoods and food security and associated linkages to nutritional status?
- 4) How do NRM policies, institutions and relationships affect access to land and livelihood resources and for whom, with attention paid to livelihood specialization, gender, and social/economic status?

3. Methodology

The study examined both peer-reviewed and grey literature. The literature search was structured around the objective of the study and the focus of the research questions. The search of literature on NRM was initially limited to Isiolo and Marsabit since Kenya's ASALs cover well over 80 percent of the country and contain a wide diversity of NRM institutions and practices. However, it also absorbed material on neighboring counties¹⁰ with similar environmental and livelihood contexts that is likely to be relevant to the focus counties. The search of literature on land was broadened to the ASALs as a whole, since this material tends to focus on policy, legal, and institutional issues that have wider relevance than single counties. Box 1 illustrates the search terms.

Box 1: Search terms

("natural resource management" OR "water management" OR "range management" OR "rangeland governance" OR "grazing management" OR "forest management" OR "land use") AND (Isiolo OR Marsabit)

("land rights" OR "access to land" OR "land access") AND (ASAL OR drylands) AND Kenya

The policy and institutional framework for land and NRM has changed significantly in Kenya since 2010. For this reason, searches were limited to the past 10 years, although subsequently taken

¹⁰ Particularly Samburu, Laikipia, Wajir, and Tana River.

back a further five years for Marsabit, for which comparatively less had been found than Isiolo. The principal search tools were the search platform of Tufts University (JumboSearch) and Google Scholar, as well as relevant portals¹¹ and websites of organizations with both expertise in drylands and research capacity.¹² A cross-check was made of specialist journals on drylands and NRM. Documents shared by those working on other Nawiri studies were also reviewed.

The first 100 items in each search were assessed for their relevance to the study; after the first 100, relevance declined. Specifically, the items were evaluated against four criteria developed on the basis of the research questions:

1. Discussion of policies, institutions, and relationships (RQ 1, 3, 4)
2. Evidence of change over time (RQ 3)
3. Evidence of socio-economic differentiation (RQ 2, 4)
4. Evidence of impacts on livelihoods, food security, or nutritional status (RQ 1, 3)

Documents were categorized in three groups: 1) those that met all or some of the four criteria; 2) those that were relevant to the research questions and provided useful context; and 3) those that were not relevant to the study or did not meet basic quality standards. The documents that answered one or more of the research questions to some degree and involved primary research are described in more detail in Annex 1; there are 30 in total, of which 23 are peer-reviewed.

The search found no studies that explicitly investigate a direct link between access to land and natural resources and acute malnutrition. However, there is evidence of how NRM affects the sustainability of rural livelihoods and how it intersects with a number of factors that are likely to influence food security and vulnerability to shocks—such as milk production, animal health, access to water, human security, and household income. These factors are therefore treated as proxies in the analysis.

The four research questions are interlinked and to some extent overlap with each other. In order to avoid repetition in the presentation of the findings, the questions are answered collectively rather than individually, although their various dimensions—illustrated by the four criteria listed above—are drawn out.

The main limitation on the study was time, given that there is extensive documentation on the ASALs in Kenya, and that NRM is a broad concept that incorporates multiple elements, each with their own body of literature.

¹¹ <https://landportal.org/>; <https://mokoro.co.uk/resource/land-rights-in-africa/>

¹² These included IIED, ILC, ILRI, IUCN, and ODI.

4. Findings

This section presents the main findings from the study. It opens with a summary, followed by three further sections that discuss different aspects of the terms of reference: 1) natural resource management at the community level; 2) the changes in policies, institutions, and relationships over time; and 3) the impacts of these changes on livelihoods and food security and how they may either contribute to, or mitigate against, acute malnutrition. The final section of the report discusses gaps in the evidence and issues that might be explored in future programming.

4.1 Summary of key findings

Secure and sustainable access to land and natural resources in northern Kenya is increasingly being shaped by the following factors, all of which have implications for the livelihoods and food security of dryland communities.

Changes in the natural resource base. High-quality forage improves animal nutrition and reproductive performance and increases the value of livestock in terms of milk, income, and the capacity to invest in social relations (Turner & Schlecht, 2019; Dabasso et al., 2012). However, studies point to significant changes in rangeland quality in northern Kenya; specifically, a decline in the cover and diversity of grass species, and an increase in woody vegetation and invasive species (Wasonga et al., 2016; Dabasso et al., 2012). These trends are associated with changes in land use and a breakdown in customary rangeland practices.

Institutional capacity. Access to natural resources can be protected and enhanced when community institutions retain both the confidence of those they represent and the capacity to adapt to change and opportunity (Tari & Pattison, 2014; Crick et al., 2019). However, community based NRM is not autonomous. Rather, it is embedded in larger jurisdictions and landscapes, and therefore shaped by changes in policy priorities and institutional effectiveness at other levels of governance (Robinson et al., 2017; Wynants et al., 2019).

The policies of government and investors. Large-scale investments in northern Kenya are transforming the value of and attitudes toward land and threatening further loss and fragmentation of the natural resource base (Cormack & Kurewa, 2018; Lind et al., 2020; Vilela & Bruner, 2017). At the same time, there are new opportunities to strengthen rights over land and land-based livelihoods through constitutional protections, ongoing land reforms, and devolved governance (Ochieng, 2015).

The policies of external partners. The growing dominance of the community conservancy model in northern Kenya, in collaboration with conservation and tourism organizations, means that access to natural resources is increasingly shaped by their policies and preferences (Bersaglio & Cleaver, 2018; German et al., 2017). NRM is being driven by new incentives, such as access to livestock offtake programs being made conditional on meeting the husbandry standards of the external partner (Unks et al., 2019b). The relationship with the partner transforms not just what

happens within the conservancy or group ranch but also its relationships with its neighbors (Unks et al., 2019a; German et al., 2017).

Formality and conditionality. Access to natural resources is increasingly secured through membership of, or relationship with, a formally constituted body, such as a community conservancy (Pas, 2018; Unks, 2019a&b) or a forest association (Lengoiboni et al., 2011). These processes accentuate the significance of boundaries in the landscape, which then become markers of belonging and entitlement (Pas, 2018). Customary institutions are also introducing elements of formality into their governance and practice, in part to make them more legible to government, as well as in response to the diverging priorities of women and youth (Tari & Pattison, 2014).

Gender and generational dynamics. The impacts of social and environmental change are being absorbed by women, men, and youth in different ways. For example, as school attendance rises, the care of livestock in poorer households increasingly falls to women (Kibet et al., 2016). As barriers to livestock mobility multiply, and migration becomes lengthier and more complex, moran are absent for prolonged periods and assume decision making about livestock movements that would once have fallen to older men (Pas, 2018). Fewer livestock able to migrate over long distances, whether due to species composition or body condition, increases the size of the home-based herd, further adding to women's responsibilities (Wasonga et al., 2016).

Individual endowments. The ability of individuals to use their wealth and social connections to personal advantage takes on added significance in landscapes that are increasingly circumscribed, and where reciprocity is in decline. In such an environment, access has additional financial consequences, such as payment of grazing fees or fines to private landowners (Lengoiboni et al., 2011). Wealth allows individuals to circumvent these barriers, making access even more unequal (Unks et al., 2019b). The costs involved in long-distance migration, in terms of both finance and labor, mean that it is increasingly the preserve of wealthier households. This may deepen inequality in vulnerability to shocks, since movement is a key strategy for reducing exposure to drought (Unks et al., 2019b; Tari & Pattison, 2014).

The persistence of reciprocity. Despite the transformations taking place in drylands, and their consequences for social and economic differentiation, customary norms of reciprocity and collective action do still persist, even where processes of privatization and individualization are further advanced (Lesorogol & Boone, 2016).

4.2 Natural resource management at community level

The distribution of rainfall in drylands varies in both time and space. Consequently, the distribution of rainfall-dependent resources, such as water and vegetation, is also unpredictable. Variability is evident on multiple scales. At the landscape level, drylands are a patchwork of different types and states of vegetation which have particular ecological value at particular times of the year (Flintan et al., 2013; Little & McPeak, 2014). Variability exists even at the smallest scale, since a plant's stage of development and consequent nutritional value is determined by the point at which rainfall stops and starts (Krätli & Schareika, 2010).

Dryland producers deploy a range of strategies to take advantage of these transient resources (Krätli, 2015), such as moving livestock to areas where forage has reached peak nutritional content (Tari & Pattison, 2014; Krätli & Schareika, 2010), or combining crop and livestock production in an integrated system (Flintan et al., 2013). Pastoralists differentiate landscapes using criteria such as soil type, vegetation, topography, and temperature (Wasonga et al., 2016; Dabasso et al., 2012; Oba, 2009; Wario et al., 2015). Some areas have special importance, particularly those with permanent water which are grazed only during the dry season or used as drought reserves. These are often located along watercourses, or in hills or alluvial grasslands (King-Okumu, 2015a), and are particularly attractive to other land users such as those engaged in cultivation, tourism, or conservation (Tari & Pattison, 2014).

Pastoralists themselves increasingly practice riverine crop production (Flintan et al., 2013), although harvests are by no means guaranteed (Kibet et al., 2016). Sedentary rain-fed agriculture has been expanding for some time in areas of higher rainfall, such as central Marsabit (Ouko et al., 2018), but the potential for irrigated agriculture in arid areas is constrained by high rates of evapotranspiration, desiccation, salinity, and low soil fertility (Avery, 2013).

If high-value areas of the ASAL landscape are permanently converted to other forms of land use, or if livestock lose seasonal access to them, then the viability of the whole pastoral system on which people depend for their livelihoods and food security is threatened (Tari & Pattison, 2014; King-Okumu, 2015a; Little & McPeak, 2014; Flintan et al., 2013). Further, pastoralists' periodic absence from these areas reduces their visibility to others and complicates their ability to claim or defend seasonal access rights during any adjudication process (Lengoiboni et al., 2011).

A common theme in the literature on NRM in drylands is the fragmentation of landscapes and the accumulation of boundaries, whether physical or not, created by settlements, changes in land use, state restrictions, or insecurity (Pavanello & Levine, 2011; Tari & Pattison, 2014; Pas, 2018). In their study of a group ranch in northeast Laikipia, Unks et al. (2019a) graphically illustrate the "successive waves of exclusion" that have progressively reduced access to forage outside the ranch: first in the 1980s, when private ranches to the west began stopping access; then in the 1990s, when conflict prevented entry into parts of Isiolo; and finally in the 2000s, when neighboring areas began forming conservancies.

While livestock mobility is a response to variability, there is a degree of predictability in the movement, particularly in the wet season (but less so in the dry) (Wasonga et al., 2016; Turner

& Schlecht, 2019). The migration routes are generally established, with variations depending on local conditions (Lengoiboni et al., 2010). Kenya's biannual rainfall pattern means that there are two dry seasons within the year. Lengoiboni et al. (2010) map the movements of pastoralists in the Samburu-Isiolo-Laikipia-Meru axis and note the differences between the two seasons: the early-year migration moves largely into unregistered land, while the later-year migration is more likely to involve movement into public or private land and affect relationships with other land users.

Pastoralists' assessment of their environment is linked to their productivity goals (Wario et al., 2015). Decisions about mobility are strongly shaped by the health and nutritional needs of livestock (Turner & Schlecht, 2019). Higher quality forage means healthier animals and an increase in reproductive capital and milk production (Dabasso et al., 2012; Oba, 2009). Livestock adjust their behavior to rangeland conditions, and herders monitor this as an indication of the suitability of landscapes. This is one reason behind the preference for local breeds which have developed the necessary selective feeding behavior (Tari & Pattison, 2014; Krätli & Schareika, 2010).

In mapping exercises in Isiolo and Marsabit, local resource users identified between 80 and 90 different species of vegetation and their uses. Women in Isiolo identified more species than men, which is attributable to the range of roles women carry out, such as caring for weak animals at home, and harvesting and selling products such as food, fuel, and construction that benefit family life (Wasonga et al., 2016; Dabasso et al., 2012). In a similar exercise in the water sector, local resource users in Isiolo identified twice as many water pans and sand dams than government surveys over the same period (King-Okumu, 2015b). The added value of this knowledge, and communities' stewardship of local resources, tends to be overlooked (Tari & Pattison, 2014; Pavanello & Levine, 2011).

Other natural resources that sustain dryland livelihoods include minerals and forest products. Saline water contains valuable minerals for livestock and is sourced from the waterbeds of seasonal rivers (Pas, 2018) or from hot desert soils such as the Chalbi (Watson et al., 2016). Forest products are an important source of food, fodder, fuel, and income, especially in the dry season (Wekesa et al., 2010). The acacia and commiphora species that are common to drylands are sources of gums and resins harvested for both subsistence and commercial purposes (Gachathi & Eriksen, 2011; Salah, 2014). Aridity is a distinct advantage, in that high moisture levels in the soil reduce production; gum arabic trees in drier and rockier areas desiccate more quickly, producing gum to seal their bark and prevent water loss (Wekesa et al., 2010). There is a close connection between pastoralism and forestry (Flintan et al., 2013): livestock scarify seeds in their digestive systems and facilitate dispersal as they move (Wekesa et al., 2010), while part of the revenue from gum and resin collection is re-invested in livestock (Salah, 2014). Salah found that among households surveyed in four villages in Garbatula, a sub-county of Isiolo, 59 percent engage in the collection and sale of gums and resins. Most of these are poorer households with few livestock; for 37 percent of households it is their primary source of income. Wekesa et al. (2010), studying collection in Isiolo and Samburu, found that women were the main collectors on a full-time basis, and (echoing Wasonga et al., 2016) had a deeper understanding

than men of both the trees and the production process. However, Gachathi & Eriksen (2011) note that the distribution of income is also gendered: The more valuable product (myrrh) is managed by men, while women and children dominate the collection of frankincense, which is a more tedious process and largely sold locally.

Land and natural resources are thus the bedrock of dryland livelihoods, even for those who have settled, since the informal economy in the towns and settlements of northern Kenya is intimately connected with the rural economy (MDNKOAL, 2013). Sustainable access to land and natural resources depends on policies, institutions, and relationships that recognize the ecological realities of dryland livelihoods and allow producers the flexibility required to function effectively in environments of high variability and instability.

Land tenure. Community tenure underpins a number of land uses in drylands, including pastoralism, hunting, foraging, and beekeeping (Musembi & Kameri-Mbote, 2013). Communal land tenure facilitates access to transient dryland resources because it recognizes that the right to their use needs to be constantly re-negotiated as environmental conditions change (Tari & Pattison, 2014).

At least 80 percent of land in both Isiolo and Marsabit is classified as community land—a new category that was introduced in the National Land Policy in 2009, alongside public and private land, and given supreme force by the Constitution the following year (RoK, 2009; RoK, 2010). The Community Land Act of 2016 establishes the community as a collective legal entity and provides for the registering and titling process of community land (Kibugi & Mwangi, 2019; RoK, 2016a). Wily (2018a) corrects a common misunderstanding by emphasizing that community land already exists in law, even without title; registration does not create the property, it merely recognizes its existence.

The Community Land Act states that customary tenure has equal force and effect in law as other types of tenure (such as freehold or leasehold). Customary¹³ land traditionally belongs to a group linked by descent or cultural affiliation (Tari & Pattison, 2014). Each group has primary rights over certain areas and either shared or periodic rights over others (Wily, 2018a); secondary rights are secured through negotiation with the primary rights holders (Pavanello & Levine, 2011). A system of communal tenure may be constituted of layers of rights of both ownership and access in which the public and private co-exist. For example, deep wells in Borana are owned by the individual who developed them or their descendants but are nevertheless accessed by others under agreed rules (Tari & Pattison, 2014; Pavanello & Levine, 2011). Similarly, Oba (2009) describes how the names of wells among the Orma in Tana River reflect their ancestral owners; the property rights belong to that family, passed from one generation to the next, but the wells are considered a public resource managed for the good of society.

¹³ Wily (2018a) notes that the interchangeable use of “customary” and “community” lands is appropriate in the rural sphere.

Adjudicated private land is still a small proportion of land in both Isiolo and Marsabit, generally located close to the county capitals. However, its political significance is increasing as investment in the region intensifies, a trend discussed in section 4.3.

Customary NRM institutions. Customary institutions in drylands regulate the use of common property, such as water and rangeland, within their areas of jurisdiction and negotiate reciprocal access across a larger geographical space (Pas, 2018; Pavanello & Levine, 2011). These institutions promote sustainable resource management by determining when different resources are used and for how long; for instance, the period within which certain trees can be cut or tree products harvested, or the point at which seasonal wells are opened and closed (Wekesa et al., 2010; Tari & Pattison, 2014; Pas, 2018). They also facilitate the transfer of knowledge between generations (Oba, 2009) and manage relations with both neighboring groups and the state (Tari & Pattison, 2014; Oba, 2009). Reciprocity is key to these relationships and essential to successful production in an uncertain environment.

A characteristic feature of customary institutions in drylands is their approach to collective decision making. Robinson et al. (2010) describe the deliberative processes used by the Gabra in Marsabit, which take place not just in institutionalized bodies (such as the Yaa councils) but through institutionalized processes such as *korra* meetings. *Korra* can be assembled at any level of social organization, and at any time, and their decisions are considered binding. Other pastoralist groups have similar mechanisms: for the Rendille it is *ur'uuri mejel*. Important decisions about NRM are made in *korra* meetings, such as which part of the herd can access which water point and when, and the watering rota, as well as the process of traditional restocking and the distribution of external assistance. Interviews with government and NGO personnel suggest that these informal decision-making mechanisms are essentially invisible to outsiders (unless those personnel are themselves Gabra). However, once constituted, formal structures established by government or external partners to manage natural resources, such as Environmental Management Committees (EMCs), will themselves convene *korra* to take decisions (Robinson et al., 2010).

The ideals that guide decision making by Gabra and other pastoralist groups include respect for alternative viewpoints, the primacy of consensus, and inclusivity—although as Robinson et al. (2010) note, the latter extends only to Gabra men. In their study of gender, water management, and conflict resolution at three sites in Marsabit (Loglogo, Turbi, and Walda), variously used by Samburu, Rendille, Gabra, and Borana, Yerian et al. (2014) find that both customary and statutory systems of water management are dominated by men who place a high value on water for livestock. Livestock are prioritized over domestic use at water points; “domestic use” includes the water that women collect for young stock kept at home. As a result, the time needed for domestic water collection increases, causing women to collect less than they would like or to use other sources that are more costly or further away.

Research in Wajir (Bedelian, 2019) illustrates the differing preferred characteristics attached to domestic and livestock water points by respondents. For example, domestic water must be available on a 24-hour basis, while water for livestock needs to be controlled and regulated

according to the numbers of livestock and the availability of pasture. Early drafts of the Wajir county government's water management bill and water regulations contained almost no mention of water for livestock. Poorly planned water provision has had adverse consequences for livestock mobility and the health of rangelands in Wajir. This has disrupted grazing management by placing water points in, or close to, dry season grazing areas, thereby encouraging settlement and year-round grazing. This is in part due to a lack of consultation between the county departments responsible for water and livestock.

Governments and external agencies tend to organize their work by sector, but customary institutions are more likely to manage natural resources in an integrated way, with the same institution responsible for water, grazing, and forest products. A sector-based approach results in fragmentation, as each generates its resource-specific, community-level organization. In the Kenyan context these include Water Resources Users Associations (WRUAs), Community Forest Associations (CFAs), Community Wildlife Associations, and EMCs. The coverage of these structures may be limited in arid counties. For example, WRUAs are the foundation of the institutional framework for water and the principal entry point for community participation. In the lowest and most arid part of the Upper Ewaso Ng'iro North catchment, 80 sub-catchments were identified by government staff but only two (North Horr and Budha Hurri) had WRUAs in place. In the Middle Ewaso Ng'iro sub-region there were 16 WRUAs across 67 sub-catchments, even though in all these locations there were customary institutions already managing water resources, unrecognized by the mainstream government system (King-Okumu, 2015b).

Yet, the customary and the formal do intersect. King-Okumu et al. (2018) find considerable overlap in the membership of WRUAs and customary institutions in Isiolo, suggesting the potential for mutual learning. Similarly, Robinson & Kagombe (2018) find that members of EMCs around Mt. Marsabit were elected from among Rendille elders, and that decision making is in effect a collaborative process between formal and customary authority. Nevertheless, other studies caution that the plethora of community-based organizations adds bureaucracy and risks confusion and conflict (Tari & Pattison, 2014; Odhiambo, 2015).

Hybrid community-based institutions. Customary institutions adapt in response to external and internal dynamics. Pas (2018) explains how those in Samburu have evolved to accommodate increasingly sedentary lifestyles. The *nkwe ngishu*, for example, was an area set aside for grazing where homesteads were not permitted, but it was not a fixed place in the landscape. Over time it evolved into *mpaka*, which is a designated restricted space for dry season grazing, opened when the elders decide. Oba (2009) describes another evolution in Tana River: the *jaarsa mata d'eedha*, or elder heads of grazing associations. The Orma abandoned the *gada* (an indigenous democratic system of governance) a century ago after conversion to Islam, but after realizing that they still needed a mechanism to manage their affairs, including regulation of grazing lands and negotiation with other pastoralist groups, they resurrected the *jaarsa mata d'eedha*, an institution that had previously functioned under the *gada* laws.

In Isiolo there have been recent attempts to strengthen a similar Boran structure — the *jarsa dedha* (*dedha* council of elders).¹⁴ Its members are opinion and religious leaders selected by the community to ensure that rangelands are used sustainably and provide multiple benefits. They define wet, dry, and drought reserve grazing; control access to both water and pasture; and ensure that households separate their animals into two groupings: a satellite herd (*forra*), and a home-based herd of milking, sick, and young stock (Wasonga et al., 2016). Fourteen *dedha* have been identified in Isiolo (Cormack, 2016).

The process of reviving the *dedha* council was motivated by a number of trends that are discussed in more detail in Section 4.3. The primary trend was to challenge the ongoing fragmentation of communal land and to strengthen customary authority over natural resources within the new institutional opportunities provided by devolution. Cormack (2016) notes the historical transformation of the *dedha*. Researchers 40 years ago characterized *dedha* as a loose association between a group of families and an area of grazing land, while today it is becoming a more formal institution responsible for a bounded community and territory that is more legible to government. Its hybrid nature is reflected in its marriage of customary knowledge, norms, and practice with certain features of formal governance (Tari & Pattison, 2014).¹⁵

Another example of a hybrid institution is the cross-border committees in the border area between Kenya and Ethiopia (Pavanello and Levine, 2011). These committees were facilitated by external partners to strengthen customary arrangements for conflict management. Their membership includes both customary authorities and state officials, women and youth, and they blend formal and informal rules and mechanisms. Some of these committees have begun to take a more active role in natural resource management, including negotiating with those seeking rights of access – a function that customarily belongs to elders alone. Informants to the study reported that this model of joint working was advantageous to both sides, although the authors note that customary authorities risk co-option where the partnership is an unequal one.

A third example, and one that is increasingly dominant, is the community conservancy. Wildlife conservancies are a form of land use recognized by the Wildlife Conservation and Management Act, 2013 (RoK, 2013). Community conservancies are those established by a community-on-community land and make up 57 of the 119 members of the Kenya Wildlife Conservancies Association.¹⁶

Conservancy models differ, depending on the type of tenure, the history of land use, and the balance between wildlife conservation and other objectives. In Kenya's southern rangelands, which have a longer history of land subdivision and privatization, households may lease their

¹⁴ "*Dedha*" refers to both the grazing area and the institution that manages it.

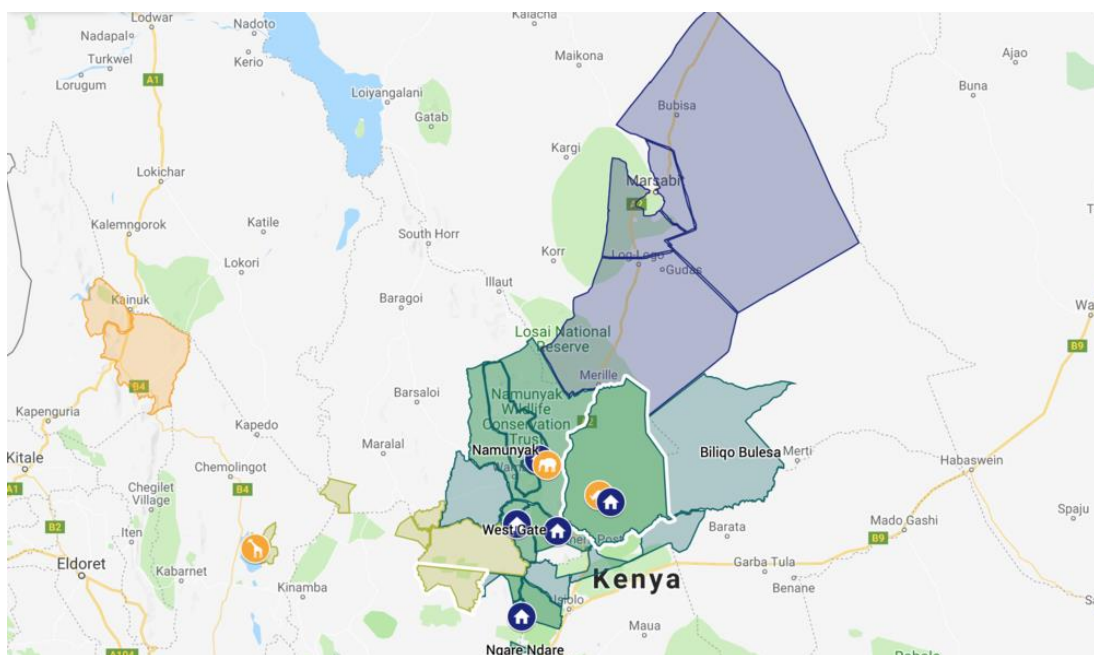
¹⁵ For example, a Rangeland Users Association (RUA) was registered with social services because the *dedha* council could not be formally recognized, even though the two overlap. The RUA developed a constitution that addresses issues such as accountability and representation, and its management committee includes women and youth, although some study respondents regarded this as tokenistic (Tari & Pattison, 2014).

¹⁶ <https://kwckkenya.com/conservancies/> - accessed 23.10.20.

plots to a conservancy for ecotourism. However, in the northern rangelands, the management models tend to build on communal land ownership (Keane et al., 2016; Kibet et al., 2016). Community conservancies blend customary and statutory governance by incorporating and repurposing traditional institutions such as Councils of Elders so that conservancy governance mirrors existing leadership structures (Kaye-Zwiebel & King, 2014; Bersaglio & Cleaver, 2018; ASSAR, 2018). The Northern Rangelands Trust (NRT), an umbrella association of community conservancies in the northern ASALs and at the coast, makes no mention of wildlife in its most recent definition of a community conservancy: “a community-based organization created to support the management of community-owned land for the benefit of improving livelihoods” (NRT, 2019). Community conservancies have some form of registration as a CBO or not-for-profit company and are governed by a Board of Directors or Trustees (NRT, 2017).

NRT has become a prominent actor in ASAL development and supports 39 conservancies in 10 ASAL counties, compared with nine at its start in 2004 (NRT, 2019). Figure 4 shows the distribution of conservancies; eight are located along the western side of Isiolo and four are in the south eastern part of Marsabit.

Figure 4: Map of NRT member conservancies in Isiolo and Marsabit¹⁷



County governments are beginning to endorse the community conservancy model. Samburu became the first to pass a Community Conservancies Fund Act, which provides for county financing. Isiolo has developed a similar bill and proposes the creation of a dedicated community conservancy fund (NRT, 2019).

¹⁷ Source: <https://www.nrt-kenya.org/map>

Community conservancies in northern Kenya sit alongside, and often overlap with, group ranches—a form of land tenure created by the Land (Group Representative) Act, 1968,¹⁸ under which a group of households holds joint title to land that is held in trust for them by a limited group of representatives (Wily, 2018a). The registration of land for group ranches began in the 1970s in counties such as Samburu and Laikipia, although titles were sometimes not provided until much later, if at all. Group ranches are still more common in these two counties than in Isiolo and Marsabit, where the majority of land has not been registered. In her study of Sesia in Samburu, which was registered as a group ranch in the 1970s but with few members and little enthusiasm, Pas (2018) finds that the group ranch and its boundaries only became significant once a community conservancy was created.¹⁹ This brought a new form of social organization, along with the prospect of new benefits such as employment, profit-sharing, and bursaries. Natural resources in Sesia are now managed according to the rules of three institutions: the customary institutions, the Sesia group ranch, and the Meibae conservancy.

This section has shown that there are layers of institutional frameworks for community-based NRM on community land in northern Kenya: 1) customary institutions managing community land under customary tenure; 2) group ranch committees managing registered community land in trust for their members, with or without formal title; 3) community conservancies managing community land that is either unregistered or registered as a group ranch, and whose governance may or may not incorporate customary norms; and 4) sector-based associations responsible for managing a particular natural resource. These institutions are evolving in response to internal and external dynamics and adopting hybrid forms to serve new purposes. They are also embedded in larger jurisdictions and require the support of policies and institutions at higher levels of the governance framework if they are to be effective (King-Okumu et al., 2018). These linkages are the focus of the next section.

4.3 Changes in policies, institutions, and relationships

This section explores how land access and NRM policies, institutions, and relationships are changing over time.

Policies. Odhiambo (2015) characterizes the history of state- and nation-building in Kenya as one of communities' alienation from the management of land and land-based resources. This occurred under a policy and institutional framework that was "centralized, top-down, bureaucratic, even militaristic," particularly with regard to the management of forests and wildlife resources. The loss of pastoral land to conservation is widely documented. For example, the Gabra lost large parts of their dry season grazing on the eastern shore of Lake Turkana when Sibiloi National Park was created in 1973 (Little & McPeak, 2014).

To this is added the equally long history of state blindness to the complexities of dryland systems and consequent poor policy (Wynants et al., 2019). Odhiambo (2013) traces the evolution of

¹⁸ The Community Land Act, 2016, repealed both the Land (Group Representative) Act, 1968, and the Trust Lands Act, which was the colonial legal framework for customary land.

¹⁹ Sesia is part of the NRT-supported Meibae Conservancy.

ASAL policy narratives in Kenya from the colonial period to the present day. While more policymakers now recognize the potential of dryland production systems, others hold a deeply engrained belief that pastoralism is unproductive and environmentally damaging. In her exploration of the relationship between indigenous culture and national development planning, centred on the impact of the Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor, Cormack (2016) also notes that policy is contradictory, in that newer paradigms about pastoralism sit alongside the modernist vision that underpins large-scale national development projects and the priorities of sectors such as agriculture and irrigation.

Lind et al. (2020) analyze the recent “land and resource rush” in East Africa’s drylands, which is driven by perceptions that the north—historically neglected by successive regimes—could be the engine of Kenya’s economic growth (Cormack & Kurewa, 2018). Isiolo is one hub for this investment, given its location at the intersection of major infrastructure routes, and is consequently experiencing rapid land speculation. Marsabit hosts the largest public-private investment in Kenya’s history, the Lake Turkana Wind Power project (Cormack & Kurewa, 2018). These projects are facilitated by both external and indigenous capital, in effect co-opting dryland entrepreneurs into the state’s vision (Lind et al., 2020). Often designed as enclaves of investment, they create barriers to accessing natural resources while also transforming attitudes to land. Cormack & Kurewa (2018) find not so much outright hostility to the idea of a wind farm in Marsabit as dissatisfaction with the process of land acquisition. Grievances around the distribution of compensation and benefits are also generating increasingly exclusive claims over land. Moreover, in an inter-connected landscape such as the ASALs, projects have impacts well beyond the specific focus of investment. It is estimated that the Crocodile Jaws dam on the Ewaso Ng’iro river that will service the expansion of population, commerce, and irrigated agriculture in the Isiolo area, will reduce total river flow to 38 percent of its current level and eliminate seasonal variability, with significant consequences for downstream producers (Vilela & Bruner, 2017).

Alongside this growth-oriented agenda, other policy and legislative frameworks over the past decade have set a more rights-based direction for the ASALs. The National Land Policy, approved by Parliament in 2009, recognizes that land is more than a commodity and has multiple values (cultural, ecological, social, economic); and that customary tenure has been insufficiently protected under the law (Musembi & Kameri-Mbote, 2013). Its commitments to secure pastoralists’ livelihoods and land tenure include establishing suitable methods for defining and registering pastoral land rights; providing for flexible and negotiated cross-boundary access to protected areas, water, pastures and salt licks; and ensuring that the rights of women in pastoral areas are recognized and protected (RoK, 2009, Article 183). In systems where women generally gain user rights through men, such as pastoralism, formalizing customary tenure generates a tension with one of the constitutional principles of land policy, which is “the elimination of gender discrimination in law, customs and practices related to land and property in land” (RoK, 2010, Article 60 (1) (f); Andersson Djurfeldt, 2020). All law, including customary law, is required to be consistent with the Constitution (RoK, 2010, Article 2 (4)).

Other recent legislation provides for benefit-sharing measures. A Natural Resources (Benefit Sharing) bill currently in Parliament seeks to provide a framework for sharing revenue among resource exploiters, the national government, affected county governments, and communities. The scope of the bill covers not just water, forests, and biodiversity, but also sunlight and wind, bringing solar and wind farms within its purview (EMSI, 2019). Benefit sharing is also addressed in the Community Land Act, 2016, and in the Mining (Community Development Agreement) Regulations, 2017. However, the implementation of such measures, even if actually beneficial to communities, is far from guaranteed. In the forest sector, for example, benefit sharing is one of the core functions of the Kenya Forest Service (KFS) under the Forest Conservation and Management Act, 2016, partly as an incentive to increase tree cover (RoK, 2016b). The same applied to its predecessor legislation—the Forests Act, 2005—a provision which Museng'ya et al. (2011) find was never implemented because KFS continued to apply a “colonial command and control licensing system” with all revenue returned to the exchequer. The same study concludes that an enabling policy and institutional framework for collaborative NRM does exist, with local communities as partners and beneficiaries, but that policy commitments are not being implemented.

As well as its provisions on land, the Constitution introduces measures to address the regional inequalities which have particularly disadvantaged the ASALs. Chief among these measures is devolution. This has transferred not just significant discretionary authority over planning but also significant financial resources, meaning that counties have both the legal and financial powers to lead development in their areas, drawing on constitutional principles of public participation and accountability (Crick et al., 2019). Although policy governing land and the environment remains a national function, county governments have powers that can be entry points to secure rights over land and land-based resources, such as county planning and development, and land survey and mapping (Odhiambo, 2015). The right of communities to participate in decision making over natural resources is recognized, creating opportunities to reconcile customary and statutory frameworks and to redress the lack of statutory recognition which has historically undermined customary institutions (Odhiambo, 2015).

With regard to the ASALs in particular, the ASAL Policy, 2012, recognizes the ecological realities of drylands and the inappropriateness of past policy paradigms. It acknowledges the strengths of traditional knowledge, institutions, and systems but also the legacy of marginalization that must be overcome if the region is to fulfil its potential (RoK, 2012; Odhiambo, 2013).

However, implementation of this new policy direction faces a number of challenges. Odhiambo (2015) characterizes the Constitution and the land and ASAL policies as “framework documents,” in that they depend on subsidiary legislation or regulations and institutional capacity to take effect. For example, the process of community land registration is in its early stages and until complete, community land remains held in trust by the county governments (RoK, 2016). While the Constitution forbids counties from disposing or converting community land held in trust until the relevant law is developed, the Community Land Act (which is that relevant law) is opaque on the limits of county rights in this area, particularly over land it believes should be classified as public (for example, for investment) (Wily, 2018a). This leaves community land still

vulnerable to conversion without community consent, as the preceding category of trust land always was (IUCN, 2011).

Wily (2018b) notes that other challenges to realizing land security in drylands may not materialize until communities begin the process of defining and registering themselves. However, some are becoming clear. First, definitions of “community” and belonging may be contested (Musembi & Kameri-Mbote, 2013). Boye and Kaarhus (2011) narrate the history of overlapping claims to land by five ethnic groups in Isiolo and conclude that institutional legitimacy will be critical in developing procedures for community land. Robinson et al. (2017) illustrate these tensions with the example of the Isiolo County Customary NRM Bill, which was developed by those working with the *dedha* councils but failed to secure support in the county assembly due to concerns that it would privilege the Borana resource governance system.

A second challenge is whether new land administration procedures will deal with community land appropriately, or even constitutionally; concerns have been raised recently about those procedures for valuation and adjudication (Wily, 2019). Kibugi & Mwangi (2019) suggest that the adjudication and registration of community rights over land in protected areas will be particularly challenging. Third, and more broadly, pastoral land rights are particularly complex to address. While a registered community under the Community Land Act is required to establish “measures to facilitate the access, use and co-management of forests, water and other resources by communities who have customary rights to these resources” (Article 20 (2) (c)), a law based on discrete parcels of land cannot fully address the complexity of overlapping rights of access and use in pastoral areas (Wily, 2018a). This is echoed by Cormack (2016), who notes the paradox that customary institutions such as *dedha* councils in Isiolo, which have been mapping *dedha* rangelands, are challenging the fragmentation of community land by themselves drawing boundaries around it.

In summary, the policy context in Kenya is evolving in different and sometimes contradictory ways, demonstrating both change and continuity with the past. On the one hand, there are now opportunities to pursue a rights-based and locally driven approach to NRM, particularly if devolved governments choose to use their powers to take this path. On the other hand, policy continues to enable the alienation of land and natural resources that has been such a feature of Kenya’s past. In both cases, the actual outcome for dryland communities may differ from the stated intent, whether due to Kenya’s poor record of policy implementation (Ochieng, 2015), or because national visions are inevitably transformed by their interaction with local realities (Lind et al., 2020).

Institutions. The most far-reaching institutional reform in Kenya in recent years, particularly for previously marginalized regions such as the ASALs, is devolution (Kanyinga, 2016; Ochieng, 2015). It has led to the transfer of functions from national ministries to county governments, varying by sector and degree, and the creation of new institutions at the county level. The organization of government differs by county. Marsabit, for example, has a county department of water, environment and natural resources, and a separate department of energy, lands and urban development. Isiolo combines lands, physical planning, roads, works and urban

development, and then a second cluster of water, sanitation, energy, environment, natural resources and climate change. In both counties it is notable that “land” is associated with urban development rather than with natural resources.²⁰

The extent of devolution differs by sector: more advanced in the water sector, for instance, than in forestry and wildlife. The Water Act, 2016, requires county governments to establish water service providers on the basis of commercial viability, but they are also required, under Article 94, to put in place measures which ensure provision in areas not considered commercially viable (RoK 2016c; Bedelian, 2019). There is evidence from Isiolo that devolution is enabling a more strategic and locally relevant approach to water management. King-Okumu et al. (2018) find a move away from a crisis-driven approach to drought and flooding and toward a more strategically planned response that draws on local institutional capacity and technical expertise. There is also evidence of communities increasingly pushing back against inappropriate water development in rangelands, and continuing challenges in trans-boundary resource management between Isiolo and her neighbors. In their four-country study of decentralization in the water sector, including a case study of Isiolo, Ziervogel et al. (2019) also note the importance of coordinated and flexible multi-scale management, and find evidence of constructive collaboration between *dedha* councils and the county government. However, Bedelian (2019) cautions that devolution has also increased the number of actors in the water sector and created some overlapping jurisdictions in its governance.

Crick et al. (2019) reflect on the lessons from an innovative institutional model developed in Isiolo, and subsequently scaled out to other ASAL and non-ASAL counties. This model seeks to facilitate the flow of climate finance to devolved authorities as well as the quality of public participation in the use of those funds. Although facilitated in its early stages by external partners, the model is now embedded in county systems, with county legislation governing its institutions and financing mechanisms. Citizen-led Ward Adaptation Planning Committees (WAPCs) have proven to be an effective bridge (across both distance and understanding) between national and county government and community institutions; their membership includes both customary leaders and women and youth (King-Okumu, 2018). Most of the investments prioritized by WAPCs in Isiolo have concerned water and natural resources. The insistence of county planning officers in both Isiolo and Wajir that WAPC members be present during discussions over the county annual development plan and budget, illustrates just how valuable the ward committees are (Crick et al., 2019).

The intensive investment in the process of WAPC formation in Isiolo mirrors the findings of Robinson & Kagombe (2018), who link the effectiveness of EMCs on Mt. Marsabit with the quality of thought and care taken in their establishment. The authors highlight the spatial misfit between Mt. Marsabit’s socio-ecological system and the institutional framework that governs it, as well as overlapping mandates and weak organizational linkages. Mt. Marsabit is officially listed as both a national park and a forest reserve, the latter being a small area within the former, thus creating a mandate for both the Kenya Wildlife Service (KWS) and the KFS (Ouko et al., 2018).

²⁰ <https://marsabit.go.ke/> <https://isiolo.go.ke/> accessed 28.10.20

Devolution has added another layer of institutional complexity, in that while KFS remains the administrator of all public forests, county governments also have a role in forest management under the Forest Conservation and Management Act, 2016 (RoK, 2016b).²¹ The timing of this research (Robinson & Kagombe, 2018) coincided with the transition to devolution and highlights its potential for more effective governance; for example, if county legislation were to legitimize community-based resource management. Thus, while devolution has added to the intricacy of institutional arrangements for NRM, it also presents an opportunity to rationalize and reform them.

Ironically, at a time when devolution has widened the space for public participation, the community institutions that might take advantage of this are less well-placed to do so after prolonged and systematic policy neglect and exclusion (Wynants et al., 2019; Ochieng, 2015; Pavanello & Levine, 2011). Customary institutions are also being weakened from within as livelihood priorities diverge and social differentiation widens. The literature suggests two ways in which this happens. The first is when an institution no longer reflects the changing and diverging priorities of those it represents. For example, Tari & Pattison (2014) note that a key function of the Isiolo *dedha* is to manage strategic boreholes and dry season grazing, but neither of these may be a priority for those with fewer livestock, insufficient labor, or insufficient income to pay watering fees. The *dedha* then risks being seen as representing only the interests of richer pastoralists who can afford long-distance migration. Cormack (2016) identifies a similar challenge that faced Isiolo's Kinna *dedha*, whose efforts to prevent commercial charcoal burners operating in the drought reserve were resented by poor and stockless families who themselves made money from selling charcoal.

The second is when individuals have the means to bypass institutions and pursue their interests and claims in other ways. Pavanello & Levine (2011) give examples of where access to grazing and water has been granted by government officials on appeal, rather than by the customary authorities responsible for them. Once its rules are no longer seen as applying to all, the authority of an institution is weakened (Tari & Pattison, 2014). However, it is important to note that poverty, as much as wealth and connections, may lie behind the violation of agreed rules. This is illustrated by Kibet et al. (2016), who find that as more children attend school in a group ranch in Laikipia, herding is increasingly carried out by either hired help (wealthier households) or women (poorer households). The extra burden on women leads them to graze livestock close to home, in violation of group ranch rules.

In their study of five group ranches in Laikipia, Kaye-Zwiebel and King (2014) explore three factors which, they argue, shape the effectiveness of resource management institutions: 1) individual perceptions of resource scarcity, 2) the values they attach to different ecosystem services, and 3) indicators of social capital. Four of the five group ranches established a grazing-restricted conservation area in collaboration with an external partner (a tourist facility, conservation NGO, or private ranch). These conservation areas differ in their design and

²¹ The Act classifies forests as public, private, or community, and allows for community participation in public forest management through CFAs (Kibugi & Mwangi, 2019).

management, and consequently in their implications for pastoralism. Two of the four partially open the conservation area for grazing during drought, one allows it in principle but in practice never has, and the fourth does not allow it under any circumstances. Three of the four external partners also built ecotourism facilities within the conservation areas. The study found that all five communities diverged in all three of the factors explored. The divergence in preferences and priorities creates trade-offs which can be an underlying source of tension if not well managed. The authors conclude that there is no single path to sustainable resource use that is likely to be relevant to all communities.

Relationships The relationships that shape access to land and land-based resources are also being transformed. Section 4.2 discussed how reciprocal relationships facilitate access to natural resources in conditions of variability. The literature suggests that reciprocity still persists, but that access is increasingly conditional and transactional, and mediated through new ties, including with partners in the conservation and tourism sectors. The studies discussed here explore changing relationships at different levels: within communities; between different pastoralist communities; between pastoralists and other land users; and between communities and their external partners.

Relationships within communities

Lesorogol and Boone (2016) study social relations in an area of Samburu where land was privatized in the 1980s. Land ownership is mixed: Each registered household has its own parcel, while all male residents are also members of a group ranch on adjacent land. The arrangement represents a compromise between those who favored either private or collective ownership at the time of registration. The authors explore two broad livelihood preferences. The first is held by those who rely on livestock for food and income and for whom mobility remains important; these lie in the top two quintiles for livestock wealth but may have limited income from other sources. The second preference is held by those who graze small numbers of livestock within their private parcel, who are in the lower quintiles for livestock wealth but may be in higher quintiles for income, predominantly from wage labor and agriculture. The study finds that social norms of reciprocity have persisted: Individual landowners continue to feel some moral pressure to allow livestock to access their land when needed. Equally, those more invested in pastoralism also value autonomy over their personal plots. The authors characterize the area as a “privatized commons,” where private and commons rights co-exist, and where local actors have succeeded, for the time being at least, in managing diverging livelihood preferences through institutional innovation. However, the simulations carried out during the study illustrate that pastoral production is seriously threatened once access is restricted above a certain level, and that continued access hinges on whether the moral force of reciprocity persists.

A different perspective is evident in the work of Unks et al. (2019b), which reveals that access to natural resources is increasingly monetized, individualized, and unequal. The study describes four pathways to access forage outside the Koiya group ranch in Laikipia: 1) seasonal access to former government land, or the land of absentee landlords; 2) paid grazing on private ranches; 3) personal connections on private ranches; and 4) illicit use of areas where historically there was access, but which are today closed off. Households’ access to these pathways is determined

by their level of endowment, such as wealth, employment on a private ranch, or personal connections with ranch owners. Herders with greater numbers of livestock are more likely to have the means to access secure grazing through the second and third pathways, while those with fewer livestock rely on more precarious or illicit pathways. In the past, herders would have coordinated their movements to dry season forage outside Kojja. Migration is now individualized, as each household weighs up the costs and benefits in a context of deepening inequality and weakening reciprocity (Unks et al., 2019a).

Relationships between pastoralist communities

Pas (2018) explores the migration of Samburu pastoralists on a larger scale, across the Ewaso Ng'iro ecosystem, and finds a number of ways in which relationships are changing, both within the community and with neighboring communities. Within the community, access constraints are having an impact on inter-generational relationships. The shrinking resource base, and the growing number of obstacles in the landscape such as settlements and wildlife conservation areas, mean that moran, the younger men responsible for herding, are now absent for prolonged periods on longer and more complex migrations; women and elders both reported that they had missed two consecutive occasions of calf birthing. While older herd-owners would once have decided on cattle movements, by necessity this has now fallen to moran, who at times cross restricted boundaries without permission. In effect, elders control the conservancies while moran control the livestock movements.

The same study (Pas, 2018) notes that one impact of establishing a conservancy on the existing group ranch is that it changed the meaning of the boundaries; they now identify who is entitled to the benefits from the conservancy and who is not, reinforced by measures such as ranger patrols. Conditionality is replacing reciprocity: Access to resources is increasingly restricted to the members of a particular community, or to members of other communities only if they restrict and manage their own resources similarly. Access involves an increasingly complex set of interactions across a grid of enclosures. This more rigid understanding of space attaches more emphasis to the land itself, as opposed to the customary right of access to fluctuating resources when required.

Relationships between pastoralists and other land users

Lengoiboni et al. (2011) study dry season access agreements in the Samburu-Isiolo-Laikipia-Meru axis between pastoralists and five other land users: farmers, private ranchers, urban residents, wildlife park wardens, and forest officers. They find that most respondents never allow access. Of those who do, the agreement is verbal except for private ranches, which draw up a written agreement and require this to be managed by a grazing committee constituted by the migrating pastoralists. These agreements are personalized and provide no certainty about future access. Only forest officers were unanimously in favor of formalizing access arrangements and 17 percent noted that livestock grazing in the forests reduces the chance of fire during the dry season (Lengoiboni et al., 2010). All private landowners set rules and penalties for access, including fees for grazing and overnight stays. Migration involves other costs, such as fines or compensation when required, as well as the impact on livestock body condition and household labor of longer routes around barriers. The lack of arrangements to support seasonal migration

directly affects the sustainability of pastoralist livelihoods by increasing the cost of participation and the risk of confrontation between different land users.

Letai and Lind (2013) analyze a more mutually beneficial arrangement negotiated during the 2009 drought between Maa-speaking pastoralists from Laikipia's group ranches and Kikuyu and Meru smallholders living adjacent to Mt. Kenya's forest reserve. Farmers benefited from grazing fees, manure, and a market for their farm produce, while pastoralists benefited from access to the forest, new agro-ecological knowledge, and a higher price selling livestock to farmers than would be paid at markets in the group ranches. The authors note that these access agreements resulted from a long-term effort by herders and farmers to renew their relationship, which had previously declined as boundaries hardened. Lengoiboni et al. (2011) also find that some pastoralists are buying land in the highlands around Mt. Kenya which qualifies them to become members of community forest associations and thus graze livestock in the forest for a fee, though they note that this is a strategy only open to the wealthiest herders.

Kibet et al. (2016) describe a reverse process by which grazing rights in the group ranch are traded with Somali camel herders, either for fattening before sale or to access forage in times of scarcity; the shift in vegetation cover from grasses to woody species also facilitated the arrangement. The group ranch invests the income in services such as education. During the 2009-10 drought, when their own livestock were dry or had moved out of the ranch, camel milk from Somali tenants was an important source of support for households.

Relationships between pastoralists and external partners

A number of studies (Bersaglio & Cleaver, 2018; German et al., 2017; Kaye-Zwiebel & King, 2014; Kibet et al., 2016; and Unks et al., 2019a & b) focus on the cluster of group ranches located in Mukogodo, in the northeastern corner of Laikipia on Isiolo's southern border. Due to the historically uneven pattern of land distribution in the county, most pastoralists are concentrated there. While this is a rather different context to that of Isiolo and Marsabit, Letai & Lind (2013) suggest that Laikipia could in some respects be an intimation of pastoralism's future, in circumstances where different forms of capital and outside interests become more economically dominant.

The Mukogodo group ranches have entered into a variety of relationships with neighboring private ranches and with organizations in the conservation and tourism sectors. The impact of these relationships appears to differ depending on the objectives and approach of the external partner (Kaye-Zwiebel & King, 2014). The benefits of the partnerships are mixed and their distribution variable. Some of the positive impacts reported by group ranch residents include employment opportunities (ecotourism, security), new social networks (table banking, beadwork associations), dividends from tourist facilities, small-business support, access to livestock marketing schemes, investments in health and education, and the strengthening of security and governance (ASSAR, 2018; Bersaglio & Cleaver, 2018; German et al., 2017; Kibet et al., 2016). Perceived negative impacts include: increased human-wildlife conflict and lack of compensation for losses; the belief that wildlife are prioritized above livestock; increased livestock pressure in the rest of the ranch due to setting aside land for conservation; poorer nutritional value of grass

in conservation areas due to restricted grazing; and problematic relationships with those outside the conservancy (ASSAR, 2018; Bersaglio & Cleaver, 2018; German et al., 2017). Mkutu (2020), writing about three community conservancies in Isiolo, also explores their various impacts on peace and security, with one multi-ethnic (Turkana and Borana) conservancy reporting that it has provided both a platform and an incentive to build peace, and another suggesting that the conservancy has been a more disruptive force. Likewise, the first also reported a harmonious integration of conservancy management and *dedha*, while the second felt that the management system advocated by NRT failed to respect customary systems.

The cluster of Laikipia studies provide more nuance on the nature of these impacts. For example, wildlife tourism has proven an uncertain income stream and less profitable than other enterprises. In 2014, it represented 60 percent of the income generated by more conventional means (livestock and beadwork sales) in NRT community conservancies (Bersaglio & Cleaver, 2018). Unks et al. (2019a) find that the relatively small group of those with employment use it to overcome the constraints on access (such as paying for grazing) or to expand their herds. Kibet et al. (2016) suggest that the new social networks represented by institutions such as table banking or beadwork associations are substituting for traditional social support mechanisms in decline.

The incentives for private ranches to collaborate with the group ranches include an element of self-interest, in that the partnerships provide a means to control in-migration by other pastoralists and to mitigate growing challenges to colonial-era land appropriation. Thirty percent of respondents in the private ranches reported that the group ranch acts as security for them (German et al., 2017). The formalization of grazing in the private ranch is exchanged for joint efforts to restrict access by pastoralists from drier areas to the north—characterized as a policy of “selective connectivity” by the private ranch (German et al., 2017). However, for members of the group ranch, their partnership with the private ranch comes at the cost of previously reciprocal relationships with other pastoralists, whose areas they no longer expect to have access to (Unks et al., 2019a).

This cluster of studies also highlights the unequal relationship between group ranches and their external partners. Control over access to grazing is structured in a patron-client relationship between conservation actors and herders (Unks et al., 2019b). In governance and decision making, pastoralists may be disadvantaged by their lack of familiarity with the economic principles of conservation management (Bersaglio & Cleaver, 2018). There are also shifts in who sets the rules for resource management. German et al. (2017) find that customary authority is limited to small parts of the conservancy portfolio, such as the rules governing communal property, or enlisted by other actors such as county departments or tourist facilities in their enforcement agenda. In the sphere of biodiversity conservation within the group ranch, the rules are predominantly set by external conservation actors, with a minor role for the group ranch management committee.

While NRT emphasizes that its function is to support community-led conservancies, Bersaglio & Cleaver (2018) suggest that the growing scale and scope of its operations mean that pastoralists’

access to natural resources in northern Kenya is increasingly mediated by the organization's policies and programs. They find that NRT uses the promise of benefits from the conservancy model to leverage support for conservation and the adoption of the particular environmental behaviors they endorse. Similarly, in a non-NRT-supported ranch, access to livestock marketing is conditional on compliance with conservancy standards for livestock husbandry (Unks et al., 2019b). In this case the private ranch and NGO partner initiated the group ranch land-titling process to provide a legal framework for joint commercial projects, thereby coupling the formalization of tenure with conservation. Land title in this context is no longer an unambiguous right but a means to advance a particular (conservation) agenda (German et al., 2017).

Enns (2019) illustrates the comparative power of pastoralists and conservationists in her study of the response of rural actors to the LAPSET corridor. Both groups have been lobbying to influence the route; though given their greater political power, the conservation actors have more success. At the time of the research, the draft Strategic Environmental Assessment had proposed moving the route north, responding to conservationists' concerns about fragmenting wildlife habitat, but in the process likely worsening the impact on rangelands. The author notes that this is consistent with a long-standing bias in favor of land uses deemed to be more lucrative and "modern" than pastoralism.

In conclusion, relationships—like policies—demonstrate both continuity and change. On the one hand, dryland producers are finding new ways to sustain collaborative and reciprocal relationships within new institutional forms. On the other hand, relationships are becoming more transactional and conditional, and more unequal, within a landscape that is increasingly fragmented and commodified.

4.4 Impact of changes on livelihoods and food security

This final section summarizes how the changes previously discussed may affect livelihoods and food security in drylands, and consequently the implications for nutrition. Four issues are highlighted: 1) land cover and rangeland quality, 2) socio-economic differentiation, 3) resilience to drought, and 4) peace and security. All four have the capacity to influence the sustainability and resilience of dryland livelihoods and the distribution of their benefits.

Land cover and rangeland quality. The natural resource base is the bedrock of dryland livelihoods, and therefore its condition has a direct impact on productivity. For example, high-quality forage results in improved livestock nutrition, which in turn improves reproductive performance and consequently the nutritional, social, and economic value of the herd to households (Turner & Schlecht, 2019; Dabasso et al., 2012).

A number of studies in different parts of the region find similar changes in rangeland quality, specifically a decline in both the cover and diversity of grass species and an increase in woody vegetation and invasive species (Wasonga et al., 2016 in Isiolo; Pavanello & Levine, 2011 and Dabasso et al., 2012 in Marsabit; Kimiti et al., 2017 in Samburu and Laikipia; and Strum et al., 2015 in Laikipia). These changes broadly favor browsers over grazers. Several studies reveal a growing preference for camel and small stock over cattle (Watson, 2016; Kibet et al., 2016; Unks

et al., 2019a). Between 1980 and 2016, the number of cattle on a group ranch in Laikipia fell by approximately 35 percent, the number of shoats increased tenfold, and the number of camels rose from zero to 299. Milk yields fell across all species (Unks et al., 2019a).

The factors responsible for these ecological changes are varied and interlinked. Kimiti et al. (2017), Strum et al. (2015) and Dabasso et al. (2012) emphasize changes in land use associated with increased grazing pressure and sedentarization. The expansion of farming and settlements in areas of dry season grazing in Marsabit means that the wet season areas are now continuously grazed, leading to a decline in important forage plants and the spread of invasive species. This is exacerbated by an increase in charcoal burning and logging (Dabasso et al., 2012).

Wasonga et al. (2016) and Pavanello & Levine (2011) link the decline in rangeland quality with the breakdown of customary rangeland practices. Wasonga et al. (2016) note that all the factors identified by informants as driving change in natural resources in Isiolo are exacerbated by weak customary institutions such as upstream cultivation, restricted access to the national reserves and national park, pressure on water resources, and failure to adhere to customary regulations. This weakness results from these institutions' lack of government recognition and disregard by communities. Conversely, where the *dedha* is stronger, informants in Isiolo report positive results, such as the recovery of grazing after temporarily closing boreholes to prevent the overuse of pasture. Roba & Oba (2013), in their study of changes in woody vegetation around settlements in Marsabit between 1986 and 2000, also find that degradation is reversible when considered over a longer timeframe (since this allows for the impact of climate variability to become evident); and when strong community-based institutions for managing natural resources have the confidence of communities.

Socio-economic differentiation. Wealth provides the cushioning for livelihoods in conditions of instability and uncertainty, whether purchasing pumping equipment to mitigate unreliable river flow to farms (MDNKOAL, 2013), or paying grazing fees, hired herders, and fines to private landowners (Lengoiboni et al., 2011; Unks et al., 2019b). Access to natural resources in circumstances where landscapes are more and more circumscribed, and reciprocity is in decline brings additional financial implications. Wealth allows individuals to circumvent these barriers, making access even more unequal.

Long-distance migration is becoming the preserve of wealthier households. Poorer households lack both the money to pay watering and grazing fees and the labor that lengthy migration involves (Unks et al., 2019b; Lengoiboni et al., 2011; Tari & Pattison, 2014), particularly now that more children are attending school (Kibet et al., 2016; Unks et al., 2019b). Constraints on household labor translate into increased responsibilities for women, as more livestock are kept closer to home (Wasonga et al., 2016). Given that migration is an important drought mitigation strategy, the fact that it is increasingly unviable for poorer households may further deepen inequality in households' vulnerability to shocks (Unks et al., 2019b; Tari & Pattison, 2014).

Resilience to drought. In his study of drought-resilient livelihood systems in the Horn of Africa, Oba (2009) notes that with the changes to land use and access, even normal dry spells are

adversely affecting livestock productivity. As space constricts, livestock production becomes more intensified. Restricted mobility in environments of high variability reduces productivity and increases the risk of livestock mortality during drought (Tari & Pattison, 2014).

However, there is evidence that more effective community based NRM can protect against an extended dry season and deliver benefits in terms of asset protection, milk production, and social relations. In 2014, Isiolo experienced an uncharacteristic decoupling of rainfall conditions from their expected impacts: Despite an extended dry season, socio-economic indicators did not significantly worsen. County officials attributed this in part to the efforts made to strengthen local NRM institutions, for example in their capacity to manage seasonal boreholes, access to drought reserves, and relations with other pastoral groups. These impacts benefited livestock from inside and outside the county given Isiolo's traditional function as a source of dry season grazing for herds from neighboring counties (Tari et al., 2015).

There is also evidence that the devolution of both political authority and financial resources can facilitate a more strategic and locally appropriate response to both climate variability and climate change, particularly in sectors such as water, where devolution is further advanced (King-Okumu et al., 2018; Crick et al., 2019).

Peace and security. Conflict can deepen vulnerability if insecurity impedes migration and access to natural resources or essential services (Pavanello & Levine, 2011). However, evidence on the relationship among seasonality, resource availability, and conflict is unclear. Dietz et al. (2015) analyze long-term data on violent conflict in Marsabit and find almost twice as many deaths in wetter years than dry. Interviews around well sites in the vicinity of Mt. Marsabit suggest a number of reasons for this. First, is the fluid association between ethnicity and territory. Second, are common property regimes strong enough to enforce access rules even in times of scarcity, but also flexible enough to accommodate use rights by multiple ethnic groups. Lastly, is a perception among poorer herders for whom mobility is not affordable that cooperation rather than conflict is a more rational choice. The authors find no evidence in this case that increasing competition over scarce resources leads to more conflict; rather, they conclude that water resources can play a vital role in social interaction and reconciliation.

Similar conclusions are reached by Linke et al. (2015) in their analysis of rainfall variability and attitudes to violence in three counties of Kenya. They find little evidence that reported worsening of drought is associated with increased support for the use of violence and conclude that physical insecurity does not arise as a reaction to drought in a social and political vacuum.

The conclusions of both these studies echo those of Seter et al. (2016), who analyze 11 case studies of violence in dryland areas of the Sahel and East Africa. They find that, while drought is a contributing factor in some of the cases, resource scarcity is never the most important cause of the violence. Rather, the main explanatory factor for differences in conflict intensity is the coupling of local exclusionary claims over resources with political processes such as elections or boundary reviews which favor one group over another. Recent conflict analysis in both Isiolo and Marsabit confirms that much contemporary conflict in ASALs has its roots in competition

over political rather than natural resources, particularly post-devolution, and over the expected benefits of economic development (Scott-Villiers et al., 2014; Mkutu, 2019).

5. Gaps in the evidence and implications for programming

The literature studied for this report suggests an uneven distribution in research focus. First, there is a geographical imbalance, in that more relevant material was available from Isiolo than from Marsabit, and more still from neighboring counties such as Laikipia and Samburu. Coverage is also uneven within counties. For example, literature on the environment and natural resources in Marsabit tends to focus on the technicalities of conditions in its biodiversity hotspots, such as Mts. Marsabit and Kulal; there was less of relevance to a study such as this which is focused on the impacts of policies, institutions, and relationships.

The second bias is institutional, in that the literature focuses on particular models, such as community conservancies and group ranches, rather than the customary pastoral or agro-pastoral systems which operate outside these frameworks but are nevertheless affected by them. The relationship between conservation and pastoralism is a particularly topical subject of research, as is the impact of externally driven investment in northern Kenya and the likely distribution of its benefits.

The third bias concerns social differentiation. There appear to be more studies exploring differences in economic status than in social status, with very little examination of how gender roles are changing and the consequences for women and men, girls and boys. Other relevant social and economic trends were touched on but not in great depth, such as the impact of increasing school attendance on household labor and gender roles.

Finally, there appear to be important gaps in the literature, such as the relationship between devolution and NRM. There is some limited evidence on this from the water sector, but no comprehensive assessment of the consequences of this major policy and institutional reform. County governments are nearing the end of their second administrative term, and therefore sufficient time has passed for some conclusions to be drawn about the different paths they are pursuing.

In light of the study findings, the following questions may be relevant to explore through future research or programming:

- To what extent can the more transactional and market-based forms of interaction in NRM—which in some parts of the ASALs are replacing previously reciprocal relationships—protect against shocks, and consequently against food insecurity and acute malnutrition?
- Under what conditions are customary institutions and mechanisms able to achieve secure access to land and natural resources, with what benefits and for whom? What are the internal and external factors likely to ensure their success?

- What drought mitigation strategies are proving effective for resource-poor households in a context of growing constraints on migration, changing patterns of household labor, and increasing individualization?
- How are the changes in herd composition and livestock husbandry affecting vulnerability to acute malnutrition, and for whom?
- What strategies and measures are county governments adopting, either independently or in collaboration with other counties, to protect access to land and land-based resources? What are the likely impacts of these strategies and measures on food security and nutrition, and for whom?

References

- Andersson Djurfeldt, A. 2020. Gendered Land Rights, Legal Reform and Social Norms in the Context of Land Fragmentation - A Review of the Literature for Kenya, Rwanda and Uganda. *Land Use Policy*, 90, 104305. <https://doi.org/10.1016/j.landusepol.2019.104305>
- ASSAR, 2018. Adapting to Change in the Semi-Arid Regions of Northern Kenya: ASSAR's Key Findings. www.assar.uct.ac.za
- Avery, S. 2013. Discussion Brief: Irrigating Kenya's Drylands—Food for Thought. Regional Learning and Advocacy Programme for Vulnerable Dryland Communities.
- Bedelian, C. 2019. Water Governance and Development in the Drylands: The Case of Wajir County, Kenya. BRACED Working Paper.
- Bersaglio, B. & Cleaver, F. 2018. Green Grab by Bricolage: The Institutional Workings of Community Conservancies in Kenya. *Conservation and Society*, 16:4, 467-480. [DOI:10.4103/cs.cs.16.144](https://doi.org/10.4103/cs.cs.16.144)
- Boye, S.R. & Kaarhus, R. 2011. Competing Claims and Contested Boundaries: Legitimizing Land Rights in Isiolo District, Northern Kenya. *Africa Spectrum*, 2/2011: 99-124. <http://www.jstor.com/stable/41336256>
- Cormack, Z. 2016. The Promotion of Pastoralist Heritage and Alternative 'Visions' for the Future of Northern Kenya. *Journal of Eastern African Studies*, 10:3, 548-567. [DOI:10.1080/17531055.2016.1266195](https://doi.org/10.1080/17531055.2016.1266195)
- Cormack, Z. & Kurewa, A. 2018. The Changing Value of Land in Northern Kenya: The Case of Lake Turkana Wind Power. *Critical African Studies*, 10:1, 89—107, <https://doi.org/10.1080/21681392.2018.1470017>
- Crick, F., Hesse, C., Orindi, V., Bonaya, M. & Kiiru, J. 2019. Delivering Climate Finance at Local Level to Support Adaptation: Experiences of County Climate Change Funds in Kenya. Ada Consortium, Nairobi.
- Dabasso, B.H., Oba, G. & Roba, H.G. 2012. Livestock-based Knowledge of Rangeland Quality Assessment and Monitoring at Landscape Level among Borana Herders of Northern Kenya. *Pastoralism: Research, Policy and Practice*, 2:2. <http://www.pastoralismjournal.com/content/2/1/2>
- Dabasso, B.H. & Okomoli, M.O. 2015. Changing Pattern of Local Rainfall: Analysis of a 50-year Record in Central Marsabit, Northern Kenya. *Weather*, 70:10. [doi:10.1002/wea.2539](https://doi.org/10.1002/wea.2539)
- Dietz, T., Adano, W.R. & Witsenburg, K. 2015. Natural Resources and Conflicts: Theoretical Flaws and Empirical Evidence from Northern Kenya. *Africa Environmental Review*, 2:1. <https://www.aer-journal.info/index.php/journals/article/view/7>

- EMSI. 2019. Empowering Local Communities through Natural Resources. EMSI & Associates Alert. Energy Practice Issue 4.
- Ericksen, P., de Leeuw, J., Said, M., Silvestri, S. & Zaibet, L. 2012. Mapping ecosystem services in the Ewaso Ng'iro catchment. *International Journal of Biodiversity Science, Ecosystem Services & Management*, 8:1-2, 122-134. [DOI:10.1080/21513732.2011.651487](https://doi.org/10.1080/21513732.2011.651487)
- Flintan, F., Behnke, R. & Neely, C. 2013. Natural Resource Management in the Drylands in the Horn of Africa. Brief prepared by a Technical Consortium hosted by CGIAR in partnership with the FAO Investment Centre. Technical Consortium Brief 1. Nairobi: International Livestock Research Institute.
- Gachathi, F.N. & Eriksen, S. 2011. Gums and Resins: The Potential for Supporting Sustainable Adaptation in Kenya's Drylands, *Climate and Development*, 3:1, 59-70. [DOI: 10.3763/cdev.2010.0066](https://doi.org/10.3763/cdev.2010.0066)
- German, L.A., Unks, R. & King, E. 2017. Green Appropriations Through Shifting Contours of Authority and Property on a Pastoralist Commons. *The Journal of Peasant Studies*, 44:3, 631-657. <https://doi.org/10.1080/03066150.2016.1176562>
- IUCN. 2011. An Assessment of Natural Resource Governance in Garba Tula, Northern Kenya. Governance for Conservation and Poverty Reduction Project. IUCN.
- Kanyinga, K. 2016. Devolution and the New Politics of Development in Kenya. *African Studies Review*, 59:3, 155-167. [doi:10.1017/asr.2016.85](https://doi.org/10.1017/asr.2016.85)
- Kaye-Zwiebel, E. & King, E. 2014. Kenyan Pastoralist Societies in Transition: Varying Perceptions of the Value of Ecosystem Services. *Ecology and Society*, 19:3. <http://dx.doi.org/10.5751/ES-06753-190317>
- Keane A., Gurd, H., Kaelo, D., Said, M. Y., de Leeuw, J., Rowcliffe, J.M., et al. 2016 Gender Differentiated Preferences for a Community-Based Conservation Initiative. *PLoS ONE* 11(3): e0152432. [doi:10.1371/journal.pone.0152432](https://doi.org/10.1371/journal.pone.0152432)
- Kibet, S., Nyangito, M., MacOpiyo, L. & Kenfack, D. 2016. Tracing Innovation Pathways in the Management of Natural and Social Capital on Laikipia Maasai Group Ranches, Kenya. *Pastoralism: Research, Policy and Practice*, 2016, 6:16. [DOI 10.1186/s13570-016-0063-z](https://doi.org/10.1186/s13570-016-0063-z)
- Kibugi, R. & Mwangi, E. 2019. Are Forest Tenure Rights Secure for Local Communities and Indigenous Peoples in Kenya? Assessment of Land Tenure Rights under Kenya's New Legal Framework. Centre for International Forestry Research.
- Kimiti, D.W., Hodge, A-M.C., Herrick, J.E., Beh, A.W. & Abbott, L.E. Rehabilitation of Community-Owned, Mixed-Use Rangelands: Lessons from the Ewaso Ecosystem in Kenya. *Plant Ecology*, 218:23-37. [DOI 10.1007/s11258-016-0691-9](https://doi.org/10.1007/s11258-016-0691-9)
- King-Okumu, C. 2015a. A Framework to Assess Returns on Investments in the Dryland Systems of Northern Kenya. IIED Working Paper. IIED, London.

- King-Okumu, C. 2015b. Inclusive Green Growth in Kenya: Opportunities in the Dryland Water and Rangeland Sectors. Study in support of the Danish Green Growth and Employment Programme in Kenya 2015-2020. IIED Issue Paper. IIED, London.
- King-Okumu, C., Jillo, B., Kinyanjui, J. & Jarso, I. 2018. Devolving Water Governance in the Kenyan Arid Lands: From Top-down Drought and Flood Emergency Response to Locally Driven Water Resource Development Planning, *International Journal of Water Resources Development*, 34:4, 675-697. [DOI: 10.1080/07900627.2017.1357539](https://doi.org/10.1080/07900627.2017.1357539)
- KMD. 2018. Isiolo County: Climate Information Services Plan. Nairobi: Kenya Meteorological Department.
- Krätli, S. 2015. *Valuing Variability: New Perspectives on Climate Resilient Drylands Development*. IIED, London.
- Krätli, S. & Schareika, N. 2010. Living Off Uncertainty: The Intelligent Animal Production of Dryland Pastoralists. *European Journal of Development Research*, 22: 605-622. [doi:10.1057/ejdr.2010.41](https://doi.org/10.1057/ejdr.2010.41)
- Lengoiboni, M., Bregt, A.K. & van der Molen, P. 2010. Pastoralism within Land Administration in Kenya - The Missing Link. *Land Use Policy*, 27, 579-588. [doi:10.1016/j.landusepol.2009.07.013](https://doi.org/10.1016/j.landusepol.2009.07.013)
- Lengoiboni, M., van der Molen, P. & Bregt, A.K. 2011. Pastoralism Within the Cadastral System: Seasonal Interactions and Access Agreements between Pastoralists and Non-Pastoralists in Northern Kenya. *Journal of Arid Environments*, 75, 477-486. [doi:10.1016/j.jaridenv.2010.12.011](https://doi.org/10.1016/j.jaridenv.2010.12.011)
- Lesorogol, C.K. & Boone, R.B. 2016. Which Way Forward? Using Simulation Models and Ethnography to Understand Changing Livelihoods among Kenyan Pastoralists in a "New Commons". *International Journal of the Commons*, 10:2, 747-770. [DOI: 10.18352/ijc.656](https://doi.org/10.18352/ijc.656)
- Letai, J. & Lind, J. 2013. Squeezed From All Sides: Changing Resource Tenure and Pastoralist Innovation on the Laikipia Plateau, Kenya. In: Catley et al. (Eds.) *Pastoralism and Development in Africa: Dynamic Change at the Margins*. London and New York: Routledge.
- Lind, J., Sabates-Wheeler, R. & Kohnstamm, S. 2016. Changes in the Drylands of Eastern Africa: A Review of Evidence and Data and their Implications for Efforts to Strengthening Resilience. Brighton, Institute of Development Studies.
- Lind, J., Okenwa, D. & Scoones, I. (Eds.) 2020. *Land, Investment and Politics: Reconfiguring Eastern Africa's Pastoral Drylands*. James Currey.
- Linke, A.M., O'Loughlin, J., McCabe, T., Tir, J. Witmer, F.D.W. 2015. Rainfall Variability and Violence in Rural Kenya: Investigating the Effects of Drought and the Role of Local Institutions with Survey Data. *Global Environmental Change*, 34, 35-47. <http://dx.doi.org/10.1016/j.gloenvcha.2015.04.007>

Little, P.D. & McPeak, J.G. 2014. Resilience and Pastoralism in Africa South of the Sahara, With a Particular Focus on the Horn of Africa and the Sahel, West Africa. 2020 Conference Paper 9. Washington DC: International Food Policy Research Institute.

MDNKOAL, 2013. Garbatula Resilience Assessment Report. Ministry of State for Development of Northern Kenya and other Arid Lands, Kenya Meteorological Department, Resource Advocacy Programme, International Institute of Environment and Development.

Mkutu, K. 2019. Pastoralists, Politics and Development Projects: Understanding the Layers of Armed Conflict in Isiolo County, Kenya. Bonn International Center for Conversion (BICC) Working Paper 7/2019.

Mkutu, K. 2020. Security Dynamics in Conservancies in Kenya: The Case of Isiolo County. BICC Working Paper, 3/2020. Bonn International Center for Conversion (BICC).

MoALF. 2017. Climate Risk Profile for Isiolo County. Kenya County Climate Risk Profile Series. The Ministry of Agriculture, Livestock and Fisheries (MoALF), Nairobi, Kenya.

Musembi, C.N. & Kameri-Mbote, P. 2013. Mobility, Marginality and Tenure Transformation in Kenya: Explorations of Community Property Rights in Law and Practice. *Nomadic Peoples*, 17:1, 5-32. [doi:10.3167/np.2013.170102](https://doi.org/10.3167/np.2013.170102)

Museng'ya, M.P., Caleb, M. & Calestus, O. 2011. Participatory Natural Resource Management: Policy and Institutional Framework. Part II. *Environmental Policy and Law*, 41:6.

Mutiga, J.K., Mavengano, S.T., Zhongbo, S., Woldai, T. & Becht, R. 2010. Water Allocation as a Planning Tool to Minimise Water Use Conflicts in the Upper Ewaso Ng'iro North Basin, Kenya. *Water Resources Management*, 24:3939-3959. [DOI 10.1007/s11269-010-9641-9](https://doi.org/10.1007/s11269-010-9641-9)

NRT. 2017. Press Statement on Misrepresentation and Misinformation about NRT. Northern Rangelands Trust.

NRT. 2019. 2019 State of Conservancies Report. Northern Rangelands Trust.

Oba, G. 2009. Harnessing Pastoralists' Indigenous Range Management Knowledge for Drought-Resilient Livelihood Systems in the Horn of Africa. World Initiative for Sustainable Pastoralism, IUCN.

Odhiambo, 2013. The Unrelenting Persistence of Certain Narratives: An Analysis of Changing Policy Narratives about the ASALs in Kenya. A Position Paper Prepared for the New Perspectives on Climate Resilient Drylands Development Project. Reconcile and IIED.

Odhiambo, M.O. 2015. Securing Community Land Rights in the Kenyan ASALs: Available Legal Options. Ada Consortium Issue Paper.

Omwenga, I., Aboge, G.O., Mitema, E.S., Obiero, G., Ngaywa, C., Ngwili, N., Wamwere, G., Wainaina, M. & Bett, B. 2019. *Staphylococcus Aureus* Enterotoxin Genes Detected in Milk from Various Livestock Species in Northern Pastoral Region of Kenya. *Food Control*, 103: 126-132. <https://doi.org/10.1016/j.foodcont.2019.04.005>

Ouko, C.A., Mulwa, R., Kibugi, R., Owuor, M.A., Zaehring, J.G. & Oguge, N.O. 2018. Community Perceptions of Ecosystem Services and the Management of Mt. Marsabit Forest in Northern Kenya. *Environments*, 2018, 5, 121. [doi:10.3390/environments5110121](https://doi.org/10.3390/environments5110121)

Ouma, J.O., Olang, L.O., Ouma, G.O., Oludhe, C., Ogallo, L. & Artan, G. 2018. Magnitudes of Climate Variability and Changes over the Arid and Semi-Arid Lands of Kenya between 1961 and 2013 Period. *American Journal of Climate Change*, 7, 27-39. <https://doi.org/10.4236/ajcc.2018.71004>

Pas, A. 2018. Governing, Grazing and Mobility in the Samburu Lowlands, Kenya. *Land*, 7:41. [doi:10.3390/land7020041](https://doi.org/10.3390/land7020041)

Pavanello, S. & Levine, S. 2011. Rules of the Range: Natural Resources Management in Kenya-Ethiopia Border Areas. HPG Working Paper. London: ODI.

Republic of Kenya, 2009. Sessional Paper No. 3 of 2009 on National Land Policy. Nairobi: Government Printer.

Republic of Kenya, 2010. The Constitution of Kenya, 2010. Nairobi: Government Printer.

Republic of Kenya, 2012. Sessional Paper No. 8 of 2012 on The National Policy for the Sustainable Development of Northern Kenya and Other Arid Lands.

Republic of Kenya, 2013. The Wildlife Conservation and Management Act, 2013. Nairobi: Government Printer.

Republic of Kenya, 2016a. The Community Land Act, 2016. Nairobi: Government Printer.

Republic of Kenya, 2016b. The Forest Conservation and Management Act, 2016. Nairobi: Government Printer.

Republic of Kenya, 2016c. The Water Act, 2016. Nairobi: Government Printer.

Republic of Kenya, 2018a. Isiolo County Integrated Development Plan, 2018-2022. Isiolo County Government.

Republic of Kenya, 2018b. Second County Integrated Development Plan, 2018-2022. County Government of Marsabit.

Republic of Kenya, 2019. 2019 Kenya Population and Housing Census: Volume 1: Population by County and Sub-County. Nairobi: Kenya National Bureau of Statistics.

Roba, H.G. & Oba, G. 2013. Understanding the Role of Local Management in Vegetation Recovery Around Pastoral Settlements in Northern Kenya. *Environmental Management*, 51: 838-849. [DOI 10.1007/s00267-013-0020-1](https://doi.org/10.1007/s00267-013-0020-1)

Robinson, L.W., Sinclair, J.A. & Spaling, H. 2010. Traditional Pastoralist Decision-making Processes: Lessons for Reforms to Water Resources Management in Kenya. *Journal of Environmental Planning and Management*, 53:7, 847-862. [DOI:10.1080/09640568.2010.490051](https://doi.org/10.1080/09640568.2010.490051)

- Robinson, L.W., Ontiri, E., Alemu, T. & Moiko, S. S. 2017. Transcending Landscapes: Working Across Scales and Levels in Pastoralist Rangeland Governance. *Environmental Management*, 60:185-199. [DOI 10.1007/s00267-017-0870-z](https://doi.org/10.1007/s00267-017-0870-z)
- Robinson, L.W. & Kagombe, J.K. 2018. Institutional Linkages and Landscape Governance Systems: The Case of Mt. Marsabit, Kenya. *Ecology and Society*, 23:1. <https://doi.org/10.5751/ES-09933-230127>
- Salah, Y.M.S. 2014. The Role of Indigenous Gums and Resins in Pastoralists' Livelihood Security and Climate Change Adaptation in Garba Tula Area of Northern Kenya. *Future Agricultures*.
- Scott-Villiers, P., Ondicho, T., Lubaale, G., Ndung'u, D., Kabala, N. & Oosterom, M. 2014. Roots and Routes of Political Violence in Kenya's Civil and Political Society: A Case Study of Marsabit County. Evidence Report No. 71. Brighton, Institute of Development Studies.
- Seter, H., Theisen, O.M. & Schilling, J. 2018. All about Water and Land? Resource-related Conflicts in East and West Africa Revisited. *GeoJournal*, 83:169-187. <https://doi.org/10.1007/s10708-016-9762-7>
- Strum, S.C., Stirling, G. & Mutunga, S.K. 2015. The Perfect Storm: Land Use Change Promotes *Opuntia Stricta's* Invasion of Pastoral Rangelands in Kenya. *Journal of Arid Environments*, 118: 37-47. <http://dx.doi.org/10.1016/j.jaridenv.2015.02.015>
- Tari, D. & Pattison, J. 2014. Evolving Customary Institutions in the Drylands: An Opportunity for Devolved Natural Resource Governance in Kenya? IIED Issue Paper. IIED, London.
- Tari, D., King-Okumu, C. & Jarso, I. 2015. Strengthening Local Customary Institutions: A Case Study in Isiolo County, Northern Kenya. IIED Research Paper, IIED, London.
- Turner, M.D. & Schlecht, E. 2019. Livestock Mobility in Sub-Saharan Africa: A Critical Review. *Pastoralism: Research, Policy and Practice* (2019) 9:13. <https://doi.org/10.1186/s13570-019-0150-z>
- Unks, R.R., King, E.G., German, L.A., Wachira, N.P. & Nelson, D.R. 2019a. Unevenness in Scale Mismatches: Institutional Change, Pastoralist Livelihoods, and Herding Ecology in Laikipia, Kenya. *Geoforum*, 99, 74-87. <https://doi.org/10.1016/j.geoforum.2018.12.010>
- Unks, R.R., King, E.G., Nelson, D.R., Wachira, N.P. & German, L.A. 2019b. Constraints, Multiple Stressors, and Stratified Adaptation: Pastoralist Livelihood Vulnerability in a Semi-arid Wildlife Conservation Context in Central Kenya. *Global Environmental Change*, 54: 124-134. <https://doi.org/10.1016/j.gloenvcha.2018.11.013>
- Vilela, T. & Bruner, A. 2017. Local Economic Costs of the Proposed Isiolo Dam: A Scoping Study. Discussion Paper. Conservation Strategy Fund.
- Wario, H.T., Roba, H.G. & Kaufmann, B. 2015. Shaping the Herders' "Mental Maps": Participatory Mapping with Pastoralists to Understand Their Grazing Area Differentiation and Characterization. *Environmental Management*, 56:721-737. [DOI 10.1007/s00267-015-0532-y](https://doi.org/10.1007/s00267-015-0532-y)

- Wasonga, O.V., Musembi, J., Rotich, K. Jarso, I. King-Okumu, C. 2016. Vegetation Resources and their Economic Importance in Isiolo County, Kenya. IIED, London.
- Watson, E., Kochore, H.H. & Dabasso, B.H. 2016. Camels and Climate Resilience: Adaptation in Northern Kenya. *Human Ecology*, 44: 701-713. [DOI 10.1007/s10745-016-9858-1](https://doi.org/10.1007/s10745-016-9858-1)
- Wekesa, C., Makenzi, P.M., Chikamai, B.N., Luvanda, A.M. & Muga, M.O. 2010. Traditional Ecological Knowledge Associated with *Acacia senegal* (Gum Arabic Tree) Management and Gum Arabic Production in Northern Kenya. *International Forestry Review*, 12:3.
- Wily, L.A. 2018a. Community Property in Kenya. Brief #3. Forest Peoples Programme. Briefs on the Legal Status of Community Property at the Global, African, and Kenyan Levels.
- Wily, L.A. 2018b. The Community Land Act in Kenya: Opportunities and Challenges for Communities. *Land*, 7:12. [doi:10.3390/land7010012](https://doi.org/10.3390/land7010012)
- Wily, L.A. 2019. Analysis of the Land Value (Amendment) Act, 2019. Natural Justice and Drylands Learning and Capacity Building Initiative.
- Wynants, M., Kelly, C., Mtei, K., Munishi, L., Patrick, A. Rabinovich, A., Nasser, M., Gilvear, D., Roberts, N., Boeckx, P., Wilson, G., Blake, W.H. & Ndakidemi, P. (2019). Drivers of Increased Soil Erosion in East Africa's Agro-Pastoral Systems: Changing Interactions Between the Social, Economic and Natural Domains. *Regional Environmental Change*, 19:1909-1921. <https://doi.org/10.1007/s10113-019-01520-9>
- Yerian, S., Hennink, M., Greene, L.E., Kiptugen, D., Buri, J. & Freeman, M.C. 2014. The Role of Women in Water Management and Conflict Resolution in Marsabit, Kenya. *Environmental Management*, 54:1320-1330. [DOI 10.1007/s00267-014-0356-1](https://doi.org/10.1007/s00267-014-0356-1)
- Ziervogel, G., Satyal, P., Basu, R., Mensah, A., Singh, C., Hegga, S. & Abu, T.Z. Vertical Integration for Climate Change Adaptation in the Water Sector: Lessons from Decentralisation in Africa and India. *Regional Environmental Change*, 19:2729-2743. <https://doi.org/10.1007/s10113-019-01571-y>

Annex: Literature Reviewed

Reference	URL	Peer or grey	Location	Timing of data coll.	Research questions / objectives	Methodology	Livelihood focus	Gender / socio-economic status considered	Resource type	NRM linked to FS / nutritional outcomes	Limitations identified	Quality
Bedelian, C. 2019. Water Governance and Development in the Drylands: The Case of Wajir County, Kenya. BRACED Working Paper.	http://www.braced.org/content/Asset/data/8df28590-bef8-4935-a393-8105a99d7138/attachmentFile	G	Wajir county	Oct-18	1. Understand the roles & responsibilities of the different institutions in the governance of water in Wajir. 2. Identify the needs of the different water institutions in terms of improved rural water functionality & governance, including technology, management & capacity needs. 3. Understand the extent to which pastoralists' needs & preferences are integrated into water development & management. 4. Make recommendations for the improved governance & management of rural waterpoints & water service provision.	Task force with county institutions / partners. KIIs & FGDs at 16 water point sites across Wajir's six sub-counties.	Pastoralism	Gender-based preferences for water provision	Water - domestic & livestock	Impact of water development on range management	None stated	2
Bersaglio, B. & Cleaver, F. 2018. Green Grab by <i>Bricolage</i> - The Institutional Workings of Community Conservancies in Kenya. <i>Conservation and Society</i> , 16:4.	doi:10.4103/cs.cs.16.144	P	Laikipia: Il Ng'wesi conservancy (plus	Oct 2014 - June 2015, May 2016, April &	Analyze key institutional arrangements for managing communal lands and NR in NRT conservancies, focusing on institutions governing revenue distribution & use, rangeland	Ethnographic: participation, observation, KIIs	Pastoralism Tourism Enterprises	Gender roles in conservancy management & enterprises	Land (plus conserv. revenue)	No	None stated	2

Reference	URL	Peer or grey	Location	Timing of data coll.	Research questions / objectives	Methodology	Livelihood focus	Gender / socio-economic status considered	Resource type	NRM linked to FS / nutritional outcomes	Limitations identified	Quality
			Samburu, Isiolo, Marsabit)	July 2017	access & use, and conservation enterprises.							
Cormack, Z. 2016. The Promotion of Pastoralist Heritage and Alternative 'Visions' for the Future of Northern Kenya. <i>Journal of Eastern African Studies</i> , 10:3, 548-567.	https://doi.org/10.1080/17531055.2016.1266195	P	Isiolo: Kinna ward	Nov 2014 - May 2015	Examine increasing prominent claims of "heritage" and "culture" along the LAPSET corridor, and how heritage is being used to promote pastoralism, communal land ownership & the survival of indigenous cultures in northern Kenya.	Qualitative: FGDs, SS interviews	Pastoralism	Relevance of customary NRM institutions to poorer HH	Rangeland	No	None stated	2
Cormack, Z. & Kurewa, A. 2018. The Changing Value of Land in Northern Kenya: The Case of Lake Turkana Wind Power. <i>Critical African Studies</i> , 10:1, 89-107.	https://doi.org/10.1080/21681392.2018.1470017	P	Marsabit: Loiyangalani, South Horr, Sarima	April-May 2016	Examine the local effects of the Lake Turkana Wind Power Project's construction, explore how the value of land has been transformed by the wind farm and the effects this has had on local social relationships, territoriality & connections to place.	Qualitative: KII	Pastoralism / multiple	No	Rangeland	No	None stated	1
Dabasso, B.H., Oba, G. & Roba, H.G. 2012. Livestock-based Knowledge of Rangeland Quality Assessment and Monitoring at Landscape Level among Borana Herders of Northern Kenya. <i>Pastoralism: Research, Policy and Practice</i> , 2012:2	doi: 10.1186/2041-7136-2-2	P	Marsabit Central	n/s	How do Borana herders classify grazing landscapes? How do Borana reconstruct environmental history of grazing landscapes? What indicators are used by Borana herders to assess & monitor landscape-level vegetation changes?	Mixed Participatory (FGD, KII, direct observation) Nested plots / transects	Pastoralism (with discussion of other land uses)	No	Rangeland	Relationship between rangeland quality & livestock productivity	None stated	2

Reference	URL	Peer or grey	Location	Timing of data coll.	Research questions / objectives	Methodology	Livelihood focus	Gender / socio-economic status considered	Resource type	NRM linked to FS / nutritional outcomes	Limitations identified	Quality
Dietz, T., Adano, W.R. & Witsenburg, K. 2015. Natural Resources and Conflicts: Theoretical Flaws and Empirical Evidence from Northern Kenya. <i>Africa Environmental Review Journal</i> , 2:1.	http://www.aer-journal.info/index.php/journals/article/view/7	G	Marsabit: Mt. Marsabit, particularly its shallow wells	1997-2000	Investigate the empirical basis of conflict as it relates to the natural resource scarcity-causes-interethnic violent conflicts paradigm.	Quantitative: data on incidence of violent conflict & on governance of water resources. Qualitative: KIIs with well-owners & well-users.	Pastoralism	Impact of water scarcity on strategies of poorer / mobility-constrained households	Water	Impact of water scarcity on conflict	Lack of data on violent conflict 1960-89. Challenges in quantifying resource scarcity, given fluctuating nature.	2
German, L.A., Unks, R. & King, E. 2017. Green Appropriations Through Shifting Contours of Authority and Property on a Pastoralist Commons. <i>The Journal of Peasant Studies</i> , 44:3, 631-657.	10.1080/03066150.2016.1176562	P	Laikipia: Kojia group ranch	n/s	Case study analysis of the institutional consequences of partnerships between conservation actors & a group ranch. How have twin histories of tenure formalization & conservation helped to constitute new contours of authority in the rangelands of eastern Africa, and with what consequences for property?	KIIs; FGDs; household interviews (purposive sampling)	Pastoralism Crop production Tourism Enterprises	Uneven distribution of benefits	Land	Impact of conservation measures on pastoralist mobility & inter-communal relationships, and on HH income & basic services	None stated	3
IUCN. 2011. An Assessment of Natural Resource Governance in Garba Tula, Northern Kenya. Governance for Conservation and Poverty Reduction Project. IUCN.	https://www.iucn.org/sites/dev/files/import/downloads/final_garba_tula_governance_assessment_report_1.pdf	G	Isiolo: Garbatula sub-county	n/s	Establish baseline information on existing NR governance arrangements in Garbatula, and identify how these governance mechanisms can best be improved.	Conservation Action Planning, simplified for use with non-scientific stakeholders. S/h workshop & KIIs.	Pastoralism Crop farming Timber harvesting Sand collection	No - except background information on gender representation	Multiple	No	None stated	1

Reference	URL	Peer or grey	Location	Timing of data coll.	Research questions / objectives	Methodology	Livelihood focus	Gender / socio-economic status considered	Resource type	NRM linked to FS / nutritional outcomes	Limitations identified	Quality
Kaye-Zwiebel, E. & King, E. 2014. Kenyan Pastoralist Societies in Transition: Varying Perceptions of the Value of Ecosystem Services. <i>Ecology and Society</i> , 19:3.	http://dx.doi.org/10.5751/ES-06753-190317	P	Laikipia: five group ranches	2008-2009	Investigate whether communities show variation in their perceptions of ecosystem services & levels of social capital, either or both of which may influence their decision making & success in adopting new conservation measures.	Full HH census. Opinion survey (stratified random sampling within 3 livestock wealth categories)	Pastoralism	Inter-community variations in perception of ecosystem benefits and social capital	Forage (plus social capital & conservation benefits)	No	None stated	2
Kibet, S., Nyangito, M., MacOpiyo, L. & Kenfack, D. 2016. Tracing Innovation Pathways in the Management of Natural and Social Capital on Laikipia Maasai Group Ranches, Kenya. <i>Pastoralism: Research, Policy and Practice</i> , 2016, 6:16.	doi: 0.1186/s13570-016-0063-z	P	Laikipia: Il Kotiok group ranch	April 2012 - March 2014	Understand innovative pathways in the management of pastoral livelihood assets among the group ranches in Laikipia county.	S-S questionnaire KIs, FGDs, direct observation	Pastoralism Crop farming Enterprises	Increased income inequality; increased labor demands on women in poorer households	Multiple	Access to milk; income from new forms of livelihood	None stated	2
King-Okumu, C., Jillo, B., Kinyanjui, J. & Jarso, I. 2018. Devolving Water Governance in the Kenyan Arid Lands: From Top-down Drought and Flood Emergency Response to Locally Driven Water Resource Development Planning. <i>International Journal of Water Resources Development</i> , 34:4, 675-697.	doi: 10.1080/07900627.2017.1357539	P	Isiolo county	2016	Case study of devolved water governance.	Authors' reflections based on community consultations and KIs	Multiple (whole county)	No - except quality of representation in ward structures	Water	Impact on resilience to drought & flooding	None stated	2

Reference	URL	Peer or grey	Location	Timing of data coll.	Research questions / objectives	Methodology	Livelihood focus	Gender / socio-economic status considered	Resource type	NRM linked to FS / nutritional outcomes	Limitations identified	Quality
Lengoiboni, M., Bregt, A.K. & van der Molen, P. 2010. Pastoralism within Land Administration in Kenya - The Missing Link. <i>Land Use Policy</i> , 27, 579-588.	doi:10.1016/j.landusepol.2009.07.013	P	Isiolo, Laikipia, Meru, Samburu counties	Nov 2007-Feb 2008	How well existing land laws and property rights in land administration are able to serve the requirements of pastoralists' land use, identify mismatches, and put forward possible solutions.	S-S q'nnaire, FGD, mapping. Sampling: cluster (pastoralists) ; quota (non-pastoralists).	Pastoralism & its relationship with other livelihoods	No	Land	No	Sample sizes constrained by time (coincided with post-election period)	2
Lengoiboni, M., van der Molen, P. & Bregt, A.K. 2011. Pastoralism Within the Cadastral System: Seasonal Interactions and Access Agreements between Pastoralists and Non-pastoralists in Northern Kenya. <i>Journal of Arid Environments</i> , 75, 477-486.	doi:10.1016/j.jaridenv.2010.12.011	P	Isiolo, Laikipia, Meru, Samburu counties	Nov 2007-Feb 2008	Do landowners make seasonal access agreements to allow pastoralists to graze livestock on private land? What is the nature of those agreements? What are their opinions on formalizing pastoralists' access rights in the form of real property rights?	As above	As above	Economic costs of accessing NR; wealth as an enabler of access	Land	Impacts of access denied on income & livestock condition	As above	3
Lesorogol, C.K. & Boone, R.B. 2016. Which Way Forward? Using Simulation Models and Ethnography to Understand Changing Livelihoods among Kenyan Pastoralists in a "New Commons". <i>International Journal of the Commons</i> , 10:2, 747-770.	doi: 10.18352/ijc.656	P	Samburu: Siambu	2000, 2005, 2009, 2010, 2011	What forms of land use & social relations emerge in the wake of land adjudication, and with what consequences? Can a "new commons" arise following transformation of the traditional commons?	Household survey (100 HH randomly sampled). Sub-sample survey on land use (30 HH, four rounds 2009-2011). 12 in-depth interviews.	Pastoralism Crop production	Livelihood preferences & practices disaggregated by income	Grazing Farm land	Persistence of reciprocity during drought; co-existence of multiple livelihood pathways	None stated	3

Reference	URL	Peer or grey	Location	Timing of data coll.	Research questions / objectives	Methodology	Livelihood focus	Gender / socio-economic status considered	Resource type	NRM linked to FS / nutritional outcomes	Limitations identified	Quality
Mutiga, J.K., Mavengano, S. T., Zhongbo, S., Woldai, T. & Becht, R. 2010. Water Allocation as a Planning Tool to Minimise Water Use Conflicts in the Upper Ewaso Ng'iro North Basin, Kenya. <i>Water Resources Management</i> , 24.	doi: 10.1007/s11269-010-9641-9	P	Laikipia, Isiolo counties (sub-region)		Match the water requirements of various competing sectors in the basin with the available water resources in order to attain both economic and ecological sustainability.	Water Evaluation & Planning Model (computer simulation) plus field work (no details)	Multiple (whole basin)	No	Water	No	None stated	1
Ouko, C. et al. 2018. Community Perceptions of Ecosystem Services and the Management of Mt. Marsabit Forest in Northern Kenya. <i>Environments</i> 2018, 5: 121.	https://doi.org/10.3390/environments5110121	P	Marsabit Central	March-May 2017	Establish the perception of different community members regarding the ecosystem services provided by Mt Marsabit forest and the threats to the forest. To assess community members' involvement in the management of the forest. To determine the main factors which affect community members' participation in the forest's management.	S-S questionnaire to 265 respondents, stratified by: (i) sub-location; (ii) proximity to forest; (iii) socio-economic characteristics, then purposive in each stratum (chiefs consulted on specific HH).	Crop farming Agro-pastoralism	No	Forest	No	None stated	1
Pas, A. 2018. Governing, Grazing and Mobility in the Samburu Lowlands, Kenya. <i>Land</i> , 2018, 7, 41.	doi:10.3390/land7020041	P	Samburu, Isiolo, Laikipia: six sites along mobility	2015-17	Understand how Samburu pastoralists use & govern NR, how livestock grazing & mobility is planned for, and how boundaries and territory are constructed and performed both within and beyond the	70 S-S interviews & four FGDs with pastoralists, plus 20 KIIs &	Pastoralism	Inter-generational relationships; new processes of inclusion / exclusion	Grazing Browse Water	Impact of boundaries on migration, HH labor, reciprocity	None stated	3

Reference	URL	Peer or grey	Location	Timing of data coll.	Research questions / objectives	Methodology	Livelihood focus	Gender / socio-economic status considered	Resource type	NRM linked to FS / nutritional outcomes	Limitations identified	Quality
			y route of pastoralists from Sesia, Samburu		context of (non)governmental projects.	participatory observation.						
Pavanello, S. & Levine, S. 2011. Rules of the Range: Natural Resources Management in Kenya-Ethiopia Border Areas. HPG Working Paper. London: ODI.	https://www.odi.org/publications/5976-rules-range-natural-resources-management-kenya-ethiopia-border-areas	G	Marsabit (Forole, Dukkana), Mandera, Southern Ethiopia	Mar-11	Understand the institutional framework & key actors regulating / involved in cross-border NR activities. Highlight entry points for those supporting cross-border NRM.	Qualitative: FGDs, KIIs. Choice of research sites determined by NGO partner presence.	Pastoralism	No - except quality of representation in committees	Grazing Browse Water	Impact on peace & security	Limited time in field; no separate discussions with women / youth; little secondary data on x-b NRM	3
Roba, H.G. & Oba, G. 2013. Understanding the Role of Local Management in Vegetation Recovery Around Pastoral Settlements in Northern Kenya. <i>Environmental Management</i> , 51: 838-849	doi: 10.1007/s00267-013-0020-1	P	Marsabit: Kargi & Korrs settlements	1986-2000 (satellite); 2005 (field)	Understand the extent to which vegetation has recovered 25 years after UNESCO-IPAL; the extent to which participation by local community management (the EMC) has contributed to the recovery; and why the over-exploitation of woody plants around pastoral camps continues.	Analysis of satellite imagery. Qualitative: 46 KIIs with elders, transect walks (no date given)	Pastoralism	No	Woody vegetation	No	None stated	2

Reference	URL	Peer or grey	Location	Timing of data coll.	Research questions / objectives	Methodology	Livelihood focus	Gender / socio-economic status considered	Resource type	NRM linked to FS / nutritional outcomes	Limitations identified	Quality
Robinson, L.W. & Kagombe, J.K. 2018. Institutional Linkages and Landscape Governance Systems: The Case of Mt. Marsabit, Kenya. <i>Ecology and Society</i> , 23:1.	https://doi.org/10.5751/ES-09933-230127	P	Marsabit: Mt Marsabit	Jan-Aug 2013	Explore the role that organizational & institutional linkages play in the strengths & weaknesses of landscape governance systems, and consider the implications for governance design at landscape level.	Qualitative: 18 S-S interviews; 1 FGD with pastoralist elders; 1 stakeholder workshop	Multiple	Outcomes of governance system for poorest HH	Multiple, particularly forest	No	Institutions in transition (2013 elections); focuses on pre-county context	2
Robinson, L.W., Ontiri, E., Alemu, T. & Moiko, S.S. 2017. Transcending Landscapes: Working Across Scales and Levels in Pastoralist Rangeland Governance. <i>Environmental Management</i> , 60:185-199.	doi: 10.1007/s00267-017-0870-z	P	Isiolo (Garbatula) Laikipia Oromia	n/s	Consider how the materiality of commons influences the nature of cross-scale & cross-level interactions, and how these interactions affect governance.	Qualitative: 24 KIIs & 18 FGDs in Garbatula; direct observation	Pastoralism	Quality of women's involvement in governance structures	Rangeland	No	None stated	2
Robinson, L.W., Sinclair, J.A. & Spaling, H. 2010. Traditional Pastoralist Decision-making Processes: Lessons for Reforms to Water Resources Management in Kenya. <i>Journal of Environmental Planning and Management</i> , 53:7, 847-862.	doi: 10.1080/09640568.2010.490051	P	Marsabit	n/s	Consider the vision for public participation in water resources management embedded in Kenya's 2002 Water Act, as it relates to pastoralists.	Qualitative: 40 S-S interviews w. institutional informants; 33 S-S interviews w. Gabra informants; direct observation.	Pastoralism	No - except women's absence within customary decision-making mechanisms	Water	No	None stated	2

Reference	URL	Peer or grey	Location	Timing of data coll.	Research questions / objectives	Methodology	Livelihood focus	Gender / socio-economic status considered	Resource type	NRM linked to FS / nutritional outcomes	Limitations identified	Quality
Tari, D. & Pattison, J. 2014. Evolving Customary Institutions in the Drylands: An Opportunity for Devolved Natural Resource Governance in Kenya? IIED Issue Paper. IIED, London.	https://pubs.iied.org/pdfs/10076IIED.pdf	G	Isiolo: Garbatula, Oldonyiro, Sericho, Merti & Kinna wards	2011-12	Why the authority & capacity of customary NRM institutions has been weakened, and how this impacts on resource governance & climate resilience.	Qualitative: > 600 informants (community workshops, interviews)	Pastoralism	Growing stratification of pastoral society; relevance of customary NRM institutions to poorer HH	Rangeland Water	Impact on resilience to drought, milk production	None stated	3
Tari, D., King-Okumu, C. & Jarso, I. 2015. Strengthening Local Customary Institutions: A Case Study in Isiolo County, Northern Kenya. IIED Research Paper, IIED, London.	https://www.adaconsortium.org/images/publications/Rapid_Assessment_-_Web_Update.pdf	G	Isiolo: Kinna, Garbatula, Sericho & Merti wards	2014	Weigh the benefits & costs of the investments in adaptation to short-term & long-term climate variability & change (specifically the support to strengthen <i>dedha</i>).	Quantitative	Pastoralism	No	Rangeland Water	Impact on resilience to drought, milk production, household income, inter-communal relationships	Timeframe Market value not always available for selected benefits	3
Unks, R.R., King, E.G., German, L.A., Wachira, N.P. & Nelson, D.R. 2019. Unevenness in Scale Mismatches: Institutional Change, Pastoralist Livelihoods, and Herding Ecology in Laikipia, Kenya. <i>Geoforum</i> , 99, 74-87.	https://doi.org/10.1016/j.geoforum.2018.12.010	P	Laikipia: Kojia group ranch	2013-2015	How have institutional changes interacted with the alignment of livestock husbandry livelihoods & ecological dynamics?	Mixed: Eight FGDs with elders to establish timeline (1980-2015). Survey of 225 households. 20 KIs. Direct observation.	Pastoralism	Growing individualization: decline in labor sharing, increase in hired herding	Grazing Water	Impact on reciprocity, milk production, vegetation quality, inter-communal relationships	None stated	3

Reference	URL	Peer or grey	Location	Timing of data coll.	Research questions / objectives	Methodology	Livelihood focus	Gender / socio-economic status considered	Resource type	NRM linked to FS / nutritional outcomes	Limitations identified	Quality
Unks, R.R., King, E.G., Nelson, D.R., Wachira, N.P. & German, L.A. 2019. Constraints, Multiple Stressors, and Stratified Adaptation: Pastoralist Livelihood Vulnerability in a Semi-arid Wildlife Conservation Context in Central Kenya. <i>Global Environmental Change</i> , 54: 124-134.	https://doi.org/10.1016/j.gloenvcha.2018.11.013	P	Laikipia: Koiya group ranch	2013-2015	How, in a context of changing herding institutions, the ability to adapt to drought & other stressors is differentiated among actors.	As above	Pastoralism	Economic costs of accessing NR; wealth as an enabler of access	Grazing Water	Widening inequality in vulnerability to drought & shocks	None stated	3
Wasonga, O.V., Musembi, J., Rotich, K. Jarso, I. King-Okumu, C. 2016. Vegetation Resources and their Economic Importance in Isiolo County, Kenya. IIED, London	https://pubs.iied.org/pdfs/10141IIED.pdf	G	Isiolo: Kinna, Chera b & Garbatula wards	June-August 2015	Identify grazing areas, characterize vegetation resources in these units, and assess their economic importance to communities.	Mixed: Participatory (KII, FGD, direct observation) Quadrat & line transect sampling	Pastoralism	Gender roles & HH labor	Rangeland Water	Impact on rangeland quality & the distribution of livestock	Short duration Quadrat & line transect sampling may not be representative given high variability	3
Wekesa, C., Makenzi, P.M., Chikamai, B.N., Luvanda, A.M. & Muga, M.O. 2010. Traditional Ecological Knowledge Associated with Acacia senegal (Gum Arabic Tree) Management and Gum Arabic Production in Northern Kenya. <i>International Forestry Review</i> , 12:3.	https://doi.org/10.1505/for.12.3.240	P	Isiolo: four locations; Samburu: two locations	April-May 2008	Investigate & document traditional ecological knowledge associated with gum arabic trees management and gum arabic production, and investigate the multi-purpose uses of gum arabic trees.	Qualitative: FGDs, 149 HH interviews, direct obs	Pastoralism	Gender roles in collection	Forest	Use of forest products for HH consumption & income	None stated	2

Reference	URL	Peer or grey	Location	Timing of data coll.	Research questions / objectives	Methodology	Livelihood focus	Gender / socio-economic status considered	Resource type	NRM linked to FS / nutritional outcomes	Limitations identified	Quality
Yerian, S., Hennink, M., Greene, L.E., Kiptugen, D. Buri, J. & Freeman, M.C. 2014. The Role of Women in Water Management and Conflict Resolution in Marsabit, Kenya. <i>Environmental Management</i> , 54:1320-1330.	doi: 10.1007/s00267-014-0356-1	P	Marsabit: Loglogo, Wakda, Turbi	May-August 2011	Understand the types & nature of conflicts over scarce water resources, how these conflicts impact women, and the role that women can play in water management & water conflict resolution.	Qualitative: 10 KIIs, 16 FGDs, semi-structured observation	Pastoralism	Cultural context for water management; differing gender priorities	Water	Access to water; impact on women's labor & time	None stated	2
Ziervogel, G., Satyal, P., Basu, R., Mensah, A., Singh, C., Hegga, S. & Abu, T.Z. 2019. Vertical Integration for Climate Change Adaptation in the Water Sector: Lessons from Decentralisation in Africa and India. <i>Regional Environmental Change</i> , 19:2729-2743.	https://doi.org/10.1007/s10113-019-01571-y	P	Isiolo county	2015-2017	Review four local cases of decentralization in the water sector in semi-arid regions (Africa and India) through the lens of participation and flexibility.	Qualitative: 26 KIIs; 8 FGDs	Multiple (Isiolo county)	Quality of women / youth engagement in governance structures	Water	No	None stated	1