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Abstract

Water scarcity in Narok county, Kenya may be attributed to demographic pressures, land use changes, environmental degradation, and the apparent influences of climate change. This article combines methodologies from history and political science to explore how local communities cope with water scarcity, and the role of institutions, both indigenous and modern in mitigating violent conflict over access to and control of water sources. Several cases are presented from within the county, which include sites of irrigation and development projects or plans. The research finds that climate change has very little to do with water conflicts in Narok, but that more important factors are privatisation and commoditization of formerly common-pool resources, and challenges and failures in modern water governance in mediating between Maasai and new populations. Indigenous governance still has a place in conflict resolution and environmental protection.

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Introduction

A recent media article provided a graphic description of water scarcity in arid/semi-arid lands. Women from a village in Maasai Mara, Narok county recalled often walking for 13 kilometres in search of water, traveling in groups for protection against wild animals until they reached a seasonal river. At dry times they would dig wells in the river bed and wait into the night for them to fill, again guarding them from thirsty wild animals. In 2013, various stakeholders in partnership with the Narok county government constructed a pipeline from a natural spring to the village. Residents now pay a monthly access fee of Ksh 100 (US$ 0.92), which is reinvested in the maintenance of the infrastructure at the water points, although not all can consistently pay. (Mbugua, 2020).

ASALs constitute 43% of Africa (De Jode, 2009) and 89% of Kenya's land surface (Republic of Kenya, 2012). In Kenya, most of the ASALs have a high population of livestock-keeping nomadic pastoralists, able to subsist in a challenging environment through adaptations such as mobility over the vast rangelands. These ecosystems are able to provide essential goods and services, both tangible and intangible that are crucial for satisfying human needs. Furthermore, systems and institutions have developed over time to govern sustainable use of water and conservation of catchment areas. These have often extended into management of land and other natural resources (Gaur & Squires, 2018). They are not always effective and cycles of pastoralist resource-based conflict are common. However, in recent decades we see ASALs facing even more challenges as a result of climatic pressures, environmental degradation and ambitious development agendas and projects frequently sited within them (Bedelian & Ogutu, 2017). Water is the most basic of human needs and yet it is also a key input to varied and dynamic economic activities such as agriculture, wildlife tourism, construction, industry, and energy production, all components of Kenya's Vision 2030 development agenda, which aims to transform the country into a newly industrialized middle-

income country by the year 2030 (2030 Water Resources Group, 2015). These new contenders for available water resources may put existing resource governance arrangements under severe strain.

In terms of climate and environment, Ogutu et al. (2016) find evidence of temperature rises in the ASALs of Kenya from 1960 to 2013 by perhaps as much as 2 degrees Celsius though rainfall trends are rather inconclusive. Modelling suggests that the East Africa region could potentially experience a rise of 2-5 degrees Celsius by the end of the 21st century, and probably higher rainfall (Niang et al., 2014; Potsdam Institute, 2013). Moreover, the UN Environmental Program's Global Environmental Outlook GEO-6 Regional Assessment for Africa (UNEP 2016) mentions many pressing environmental challenges for Africa other than climate change including pollution, land-use changes and loss of biodiversity from a range of factors including population increase, urbanization, industrialisation and deforestation.

Pastoralist conflicts in northern Kenya have been attributed to these dynamics and labelled 'the world's first climate change conflicts' by some observers and development agencies (Christian Aid, 2006). However, pastoralist conflicts have a long history and climate change is likely, if anything, to be only part of the story. Environmental degradation and increasing competition for water and land as a result of development and immigration are also likely to play a role. It is also vitally important as we look at water scarcity to also understand the role of resource governance both modern and indigenous. This article uses a historical and political science perspective to examine the relationship between water scarcity and violent conflict, and the role of institutions, particularly grassroots institutions in managing conflict. We aim to better understand the socio-ecological aspects of inter-communal resource-based conflict, and the success or otherwise of the various approaches to water stewardship in a water-scarce context.

Environmental Scarcity, Conflict and Institutions

Narratives of conflict in pastoral East Africa frequently emphasise the problem of aridity as an important driver of conflict. The well-known environmental scarcity theory, refined over time, assumes environmental scarcity to be a major causal factor (independent variable) in conflict in many developing countries. Such scarcity is seen as a product of the decrease in quality and quantity of environmental resources (a reduction in the size of the pie), an increasing population (the need to divide the pie into smaller pieces) and an uneven distribution of resources (uneven slices of the pie) (Homer Dixon, 1994). Through a variety of direct and indirect effects on regional agricultural production and the economy, climate change and environmental degradation increase the risk of intra-state conflict (Homer Dixon, 2021).

However, political ecology theorists do not put such emphasis on the link between environmental scarcity and conflict. They identify patterns of power, access, control and struggle from a historical perspective and argue that these are at the heart of so-called resource conflicts. Environmental scarcity is seen as a contextual issue, a result of the political context, and a "threat multiplier" rather than a threat in itself (Floyd, 2008; Le Billon & Duffy, 2018). The environmental scarcity model, they argue, is overly vague, simplistic and deterministic, amongst other problems (Hartmann 1998; Peluso & Watts 2001). Tensions and contestations can even lead to new ideas and adaptations, and ultimately, increased resilience (Simon, 1994 and Lomberg, 2001 quoted in Floyd, 2008).

Linke, O'Loughlin, McCabe, Tir & Witmer (2015) also point out that although large number of mainly quantitative studies have suggested that drought or high temperatures increase the risk of violence, and that migration in response to climate anomalies can bring conflict with host populations, institutional structures and other factors vary this effect. Similarly, Raleigh & Kniveton (2012) in their quantitative study of East Africa provide a variety of potential scenarios in the natural resource abundance/scarcity – conflict relationship. Firstly, competition for scarce resource may lead to conflict, but secondly, resource scarcity

may mean that there is nothing worth fighting over, thus peace prevails. Thirdly, resource abundance may lead to greed-motivated conflicts, but fourthly, it may also lead to self-sufficiency and again, peace. Both extremely high and extremely low rainfall led to increased conflict, lending credence to the first and third scenarios. There remains a need to investigate these issues further.

Buhaug, Gleditsch & Theisen (2008) also argue that the absence of good institutions may be an important trigger in resource-based conflict. However, in Kenya while much attention has been given to the political and instrumental aspects of resource-based conflict, the socioecological aspects require more attention (Greiner, 2013). Particularly interesting in dryland areas of East Africa is the historical perspective on institutions, from traditional to modern, which are often said to be effective in managing water scarcity and mitigating conflict. Vatn (2008) in his book chapter on sustainability and institutional change tells us that institutions are the conventions, norms and rules for society, and a kind of context for various rationalities such as "I" (individualism), "we" (pluralistic) and "they" (altruistic) arguing that there is much evidence for the prior dominance of the "we" rationality seen in the principles of reciprocity and redistribution in many societies. We look to Ostrom (1990), who in her landmark book on governing the commons provides some practical principles, derived from an extensive review of case studies on the commons (in agricultural settings). She argues that management of common pool resources can work if they adhere to certain principles such as: boundaries and contextually relevant rules, monitoring and reasonable sanctions to enforce rules, conflict resolution mechanisms, participation, recognition by higher authorities and links to wider networks of cooperation.

But how do these institutions fare amidst abnormal pressures and the changing context? And how well are modern institutions managing? Linke et al (2015) quantitatively investigate a similar question to our own in Kenya about the effectiveness of local traditional institutions for mitigating inter-ethnic conflict in situations of increasing water scarcity. They find that local informal dialogue works as an important institution to mitigate violent conflict risk, while government/formal institutions do not. They speculate that

the latter may be less responsive to local needs, or may exclude certain groups, or that there is a lack of effectiveness due to the recent state of flux brought by devolution in 2013. Where both informal or traditional institutions exist alongside modern ones they also refer to the term 'institutional bricolage' – that is, the place-based combinations of formal and informal systems that influence how adaptive responses occur (Frick-Trzebitzky, Baghel & Bruns, 2017).

Findings in Narok county

Narok County is around two thirds semi-arid rangeland (Narok County Government, 2018). Sources of water in the county include several rivers, streams and springs, and in water-scarce areas, water pans, dams, wells, and structures for rainwater harvesting. Pipelines, canals and boreholes were constructed from the colonial era onwards but have often not provided sustainable benefits.

There is a population of just over one million (Kenya National Bureau of Statistics, 2019) with an annual population growth rate of 4.7 per cent contributed by high immigration. Historically, the Maasai are the natives of Narok, however, the areas currently inhabited by the Maasai were forcibly allocated under the agreements with the British in 1904 and 1911, in which Maasai lost their rangelands in Rift Valley and Laikipia, and were forced into the Southern Reserve (parts of what is now Narok and Kajiado counties). Hughes (2005, p.208) writes, "A combination of factors - driven by the moves and by colonial intervention as a whole - have since led to acute population pressure, land degradation, erosion of subsistence livelihoods and increased vulnerability to drought." These dynamics have resulted in ethnopolitical tensions (Removed for blind review).

Drought is not a new phenomenon and severe droughts have been recorded from 1926-1929, 1934 and 1942 (Kenya National Archives, 1930, 1934, 1942), as well as some severe floods due to escarpments to the east

and northeast, and the Mau Forest and Loita highlands in the north and south of the county respectively. Between 1960 and 2014 in Narok county there has been a rise in minimum and maximum temperatures (though the latter does not reach statistical significance) (Ogutu et al, 2016). In terms of environmental degradation, water towers such as the Maasai Mau Forest complex, Loita Hills, and Enosupukia are under threat from unregulated exploitation and settlement with massive deforestation leading to soil erosion and landslides, increased charcoal burning, sand harvesting and overgrazing (Kenya Water Towers Agency, 2018); areas served by East Mau water tower have seen a decline in water flow or drying up of some springs and rivers (Kenya Water Towers Agency, 2018; Mutugi & Kiiru, 2015). Land-use change is well illustrated by a time series showing reduced forest cover around Mau Forest in the northwest and Loita forest in the south, as well as increased agricultural activity since 2010 (figure 2); There are now 8 irrigation schemes in Narok county, (of which the two largest schemes are Narosoora and Mosiro were visited for this study).

Historically land tenure has been communal in nature, with some adjudication during colonialism with alienation of large chunks of land to settlers including Cobb, Meyers, Nasora and Delamere and also the original removal of Mau Forest complex from the Maasai to Kenya Forestry Service for conservation and plantation in the 1950s, paving the way for the exploitation mentioned. The colonial government having relocated the Maasai did endeavour to prevent non-Maasai from settling or cultivating in the district (Hughes, 2005; Narok District Annual Report, 1923, p.3-4) however Immediately after Kenya gained independence in 1963, the numbers of immigrant cultivators in the county increased with an influx of Kikuyu, Kipsigis and Kisii. Areas previously designated as dry season grazing reserves such as the Loita Hills, Soit Ololol and Nguruman escarpments were also brought under cultivation (Republic of Kenya, 1980; Sindiga, 1984). From the 1960s group ranches were introduced in Kajiado and Narok for Maasai communities to provide the security of a group title and possibilities for loans and commercial production. However, these were impractical and failed to benefit most members (Ng'ethe, n.d.; Ole Pasha, 1985; Galaty, 1992). Most group ranches are now sub-dividing or have subdivided which has led to individualised

models of land use, threats to common pool resource access and land-based conflicts (Mukeka, Ogutu, Kanga & Røskaft, 2019; Gartner, 2015).

INSERT FIGURE 1 AROUND HERE

We examine two semi-arid sub-counties in Narok county with study sites in Naroosura-Loita, Mosiro and Suswa areas (figure 2). Archives since 1897, other historical sources and government and civil society reports were important documentary sources for the work, as was the Armed Conflict Location and Event Data Project (ACLED) database (Raleigh, Linke, Hegre & Karlsen, 2010). This was complemented by stakeholder interviews (80) carried out with administrators, officers of parastatals and other water governance institutions, civil society officers, police, pastoralists and farmers and other community members of various ages. Sites of conflict to be visited within the county were identified through the interviews with key informants.

INSERT FIGURE 2 AROUND HERE

Institutions for water governance

The *Olosho* is a territorial section of Maasai lands, governed by a council of elders, of which there are 12 in total (four within Narok). The *Olosho* is responsible for regulation of grazing patterns and management of other natural resources like water points within their jurisdiction. They carry out dispute settlement, and give punishments, usually in the form of fines. *Moran* (warrior youths) seek and protect community water sources. Under the leadership of the *Olosho*, specific water points were identified and set aside for livestock watering and others for domestic water harvesting. Cows were not kept close to the river, to avoid overgrazing and malaria. The responsibility of ensuring livestock had water belonged to the men while women were allowed to collect domestic water from anywhere. Women also played an important role in monitoring water levels and quality for domestic consumption. An elder explained the ethos of common ownership,

> *Water sources could not be owned, they were sacred places under custody of the elders who regulated access…You could be cursed if you did not act in the interests of community and future generations.*[1]

An exception to the rule of common ownership and access is that water pans, dams and wells were and are subject to private arrangements with those individuals or groups who developed them.

Most respondents believed that since Maasai are used to water scarcity, internal conflict over water was not common or severe, as noted by one,

> *There were no conflicts long time ago, if you dug your dam we would borrow water for cows or domestic use. People loved each other. If you had water, mothers and children would access it freely to use the water. Cows you had to request for permission for the cattle to drink the water.*[2]

The response, while perhaps presenting a rather rose-tinted view of times past, suggests that institutions functioned well, notwithstanding that the system was less strained.

The *Laibon/Nkidongi* (the guard, office of the prophet) are also relevant to water governance; they are members of a sub-clan believed to have divine powers which are passed down from father to son. The chief *Laibon* who currently resides in Loita forest and is seen as a guardian of Loita forest who can curse or ostracize an individual from the community for abuse of the forest and its resources and can also intercede for rain. (Ole Riamit, 2010). His role in water governance is further illustrated in the Loita case to be described.

Indigenous institutions for governance and conflict resolution are still used, and are often preferred due to their relevance and responsiveness,[3] as the Naroosura case illustrates. However, according to Zaal and Ole Silomma (2006), over time they have been weakened by the emergence of complex formal institutions and political structures. Sometimes traditional institutional actors have been open to new ideas and engagement

with formal government institutions and the private sector. Chiefs are also used as neutral arbiters and their decision is respected and the consensus reached is owned by the community.[4]

Key water developments from the colonial era onwards are summarised in Table 1. Some notable developments have taken place in arid and semi-arid areas, particularly by NGOs, and efforts made to decentralise water provision and extend it to all areas, although this has not yet happened as envisaged. The rural poor still remain rather disadvantaged by the current state of water development and water management.

INSERT TABLE 1 AROUND HERE

WRUAs are the lowest organisational level of water management in the Kenya framework. Their roles are: involvement in the decision-making process to identify and register water users; collaboration in water allocation and catchment management, assisting in water monitoring and information-gathering, and conflict resolution and cooperative management of water resources. They create sub-catchment management plans which include duties such as controlling abstractions, pollution control, protecting springs and riparian zones and improving farming and land-management practices (Richards & Syallow, 2018).

Naroosura: "Cultivating immigration & harvesting conflict?"

Naroosura is a remote location in southern Narok about 60km along an unpaved road after turning off near Narok town. The town and surrounding area relies for water upon the various rivers and springs from the nearby Loita hills,[5] while in the drier plains and lowland areas, dams, boreholes, and water pans are used, and a 44 km pipeline from the river. Several agencies have tried to remedy the water scarcity in the area; Action Aid constructed the pipeline; the World Bank Group (WBG) has invested in boreholes and dams,[6] while parastatals such as the Ewaso Nyiro South Development Authority (ENSDA) and National Drought

Management Authority (NDMA) have invested in water projects in the water-scarce lowlands with mixed outcomes.[7]

The area is home to the 64,000-hectare Naroosura Group Ranch (NGR which is in the process of subdivision. This subdivision has opened the way for irregular land allocations and various conflicts over land given its high potential for irrigated farming. There are legal disputes relating to allegations that officials have allocated themselves large portions of land up to 50 acres near the river at the expense of others.[8] Some of those involved are political elites; one local politicians father managed to acquire a title for 3,500 acres, while his wife who is also a politician was trying to acquire 700 acres. [9] This is not an unusual report in accounts of group-ranch subdivision.

In 1944, Maasai evangelist, Jacob Nakola, of the African Inland Church (AIC) began irrigated crop production in Naroosura. He requested a parcel of land from the locals on which he settled and dug a canal two kilometres long from the Naroosura River. His farming techniques intrigued and motivated the residents.

> *He lived here, and nobody could interfere with him… He was the first to plant oranges here and we grew up eating oranges from his farm. On Sundays after his sermons, he would give us sugarcane alongside oranges to motivate us to come to church…. ///…., that is how irrigated farming began in Naroosura.*[10]

The area under cultivation expanded over the years to nearly 1500 acres (Narok County Government, 2018). Over time, NGOs and faith-based organizations such as World Vision came to Naroosura, providing seeds and pesticides, and introduced dairy farming.[11] In the 1990s in other areas such as Loita-Entesekera, subsistence farming was introduced through the Ilkerin Project by the Dutch government through the Catholic Diocese of Ngong. Most of the canals were developed by the community themselves with no outside assistance and are as yet uncemented.[12]

About 85% of the farmers in Naroosura are immigrants from various parts of Kenya and even other eastern African counties, leasing land from Maasai landowners, who sometimes invest their profits in more livestock. Land is leased for a growing season for between 3,000-10,000 KShs with highest rates near the river. In recent years, some wealthy immigrant farmers have been able to develop large hi-tech farms, such as one Kikuyu farmer with 100 acres under irrigated farming.[13] In another story, an immigrant farmer began as a casual labourer and was able to eventually invest in buying a water pump and 86 watering pipes. His former boss now uses the equipment in a profit-sharing arrangement.[14]

The Naroosura Water Resource Users Association (WRUA) covers Naroosura and three other locations, constituting 75% pastoral rangeland and 25% irrigated farmland. Ten dams, seven boreholes and 25 canals are overseen by this WRUA which addresses flood management, soil erosion, degradation, and water pollution by developing sub-catchment management plans with guidance from by-laws. The board of the Naroosura WRUA is composed of chairpersons and secretaries of more localised irrigation canal management committees in the area which schedule irrigation.[15] The WRUA have carried out some helpful initiatives including fenced off the catchment area, that is, the two springs that are a source of the Naroosura River, and construction of a watering trough for livestock and a water point for domestic use at the river source to help avoid water use conflict. Similarly in Loita-Entesekera, the water management committee have fenced off the source of the spring. Challenges for the WRUAs include maintenance challenges, water quality which is compromised by chemicals and human activities, enforcement of by-laws regulating extraction quantities and non-payment of the annual membership fees.[16]

Table 2 documents police records of water conflicts over a period of a year showing the various conflicts. Several respondents complained about corrupt leadership which allowed influential members able to get more water.[17] A farmer noted that during dry periods, irrigation of plots depends on who 'one knows' and he was among the 'lucky ones,' being in partnership with a Maasai landowner who happens to hold an executive position in the Naroosura-WRUA committee.[18]

Conflict is common, between upstream (irrigation farming) and downstream (pastoralism) users a few kilometers.[19] This is despite irrigation schedules which also allocate times for watering of livestock only. Conflicts often become violent, and police often get involved.[20] As a pastoralist narrated,

> *Farmers here use all the water and if one follows the Naroosura river, from Elangata Enterit it becomes seasonal unlike before where it would flow up to Lake Magadi (….) When it reaches July, August, and September, we are always hustling for water because it is the dry season and that is when we come upstream to destroy dams here and burn generators …. ///…. we never have any problems with the people of Naroosura except during the drought period.*[21]

INSERT TABLE 2 AROUND HERE

Pastoralists, especially wealthy livestock keepers may also cause problems for farmers, as noted,

> *The locals here have many cattle and during the drought, they take them to the forest for grazing …. For example, we have a case today that the chiefs are handling. There is a man who has about 700 bulls without counting cows and calves…he is known as Mali Ngumu (Hard Wealth). He was ordered by the [government administration] to sell some so that others may have places to graze… he takes all the grazing area since it is communal land (…) when he takes his livestock to graze up the hill, all is usually okay. However, when bringing his livestock back to drink water, he traverses through the riparian land that is under cultivation (…) this creates problems at watering points or in the grazing field.*[22]

Resentment of immigrant farmers leads some pastoralist *morans* to make trouble for farmers. One farmer had his phone taken.[23] Another noted,

> *Farming has not been that stable because we have a group called Maasai morans, (…). The outsiders are afraid of them…Hence, outsiders undertaking farming in our area are reducing …Harassment by the morans was the reason why they left. When the COVID-19 pandemic started, people were also affected. However, some are still farming, and you get morans invading farms and they forcefully snatch phones and cash from people, and that is a problem. (…)*[24]

There does seem to be a mechanism for managing this conflict however,

> *Nowadays, if morans attack people on farms and the incident is reported, so long as the culprit is known, those things must be returned to the owner, and maybe a fine might be imposed to compensate the affected persons (…) We have cultural leaders who can punish the morans for going against the customs of the community.*[25]

This suggests that even though WRUAs manage the distribution of water in the irrigation schemes, indigenous governance has not lost its relevance in managing conflict when things go wrong.

Loita: Threats to the forest and "towering" leadership

The Loita Forest is a water tower and a vital resource. On the eastern side of the forest, water is in abundance and the residents practice subsistence farming, though commercialized farming is somewhat curtailed by a bad road connection to the towns. Subdivision of the Forest complex has not yet occurred here but there are concerns that where it has not for the leadership of the *Laibon*, the area would have gone the way of forest encroachment, land subdivision, and deforestation, which would threaten water availability and Maasai livelihoods.[26] Other threats include development projects such as a road through the forest, proposed in 1997. While proponents welcomed a faster and shorter route through Magadi to connect them with Nairobi and Tanzania thereby facilitating quicker transportation of agricultural produce and livestock, among other benefits, opponents rightly fear that the road would be the thin edge of the wedge for immigration, land-use change and destruction of their ecosystem and culture.[27] They specifically cite the parallels between the threat to Loita forest and the deforestation of the Mau forest following its removal from Maasai management (Ole Riamit 2010). The previous *Laibon* known as Sendeu had tasked his son and successor Mukombo, not to allow the Loita forest to go the same way as the Mau. With assistance from international bodies they successfully resisted the handover of the Loita forest to the Narok County Council in 1993.

The Water Towers Authority which was established in 2012 "to coordinate and oversee the protection, rehabilitation, conservation and sustainable management of all the critical water towers in Kenya" is also responsible for Loita Hills and has opposed the road development.[28] While the Loita-Naimina Enkiyio Conservation Trust, a hybrid arrangement between the council of elders and NGOs has also played an important role in legal protection of the forest.[29]

Mosiro: Wealth "flows" and resource "diversions"

Mosiro is a dry lowland area around 30km from Naroosura, separated by a ridge. Here, historically, pastoralists have relied upon water pans and seasonal rivers during rainy seasons,[30] and the Narok Ewaso Nyiro river.[31] The main town is 7km away from the Ewaso Nyiro which ironically is prone to flooding, exacerbated by deforestation of the surrounding highlands. The area is also a wildlife corridor, leading to human-wildlife competition at water sources, and destruction of water pans when elephants enter them.[32] Various boreholes near the town, and in remote areas, have been drilled and upgraded by state and non-state organizations. These are functional and important water sources for the locals. Borehole use is charged for instance, at 500 KShs per 20 cattle, per month by locally elected borehole committees which govern and maintain the boreholes. [33]

In order to mitigate problems of food insecurity a large irrigation project was started in 1989 with help of government and donors including World Vision, World Bank and African Development Bank. It comprises around 800 acres under cultivation (Narok County, 2018), irrigated by gravity from the Ewaso Nyiro river.[34] Like Naroosura the area is former group ranch land, which has completed or is in the process of adjudication, and the land under the scheme belongs to many of the original members, who own around 1-2 acres within it. Some of the original group-ranch members are not involved in the scheme but have now seen the profitability of the project and this brings tension.

As in Narosoora, the scheme has attracted many immigrant workers and investors.[35] They lease the land from Maasai owners at around 5000-6000 Kshs per growing season, or invest and work with Maasai farmers. This is very little lease income in comparison to the kind of profits which some farmers are able to get. Esther (name changed), a non-Maasai farmer said.

> *Per acre I can use 90,000 shillings then I get a profit of 300,000 depending on the market price, but at times if the price goes up we can get even 500,000 shillings when the season is good.*

A wide range of crops including onions, tomatoes, butternuts, cabbages, bananas, bell peppers, chilli peppers, potatoes, watermelons, beans and maize are grown and can easily be sold in the nearby towns and outskirts of Nairobi. Tomatoes and onions, the most popular cash crops, are quite water intensive.[36]

There are also concerns about environmental degradation through deforestation and the use of chemicals. Said one farmer,

> *Of the 90,000 [invested] nearly 50,000 is used on chemicals, medicines for the cold, flowering medicine, pests and fruit medicine…you have the starter, for dudus (insects), cold, folio buster, fruit and flowering, calcium, harvest- spread cold medicine. All these chemicals must be bought.*[37]

A young man noted that Toyota Proboxes are used to collect tomatoes and take them to market. "I carried 15 times full in a Probox. I am a farmer and a broker. I assist to get the buyers. One bread crate [sells at] 1560 Kshs."[38] Some see brokers as exploitative, taking advantage of farmers who are limited by the poor road infrastructure.[39] Although many non-Maasai are benefiting from the project, more Maasai are becoming interested in farming too, including the broker, who explained,

> *Now it is more of locals because before [we] did not know how to do farming, because we are pastoralists and now [we] have learned… even when foreigners started doing watermelon here, and they see people eating, they would laugh and ask why people eat pumpkin…so once they discovered, they changed, and now they do farming…some have even built their houses through that.*[40]

Members pay 500KShs per month to committee members for maintenance of the scheme, though many do not manage to pay. Maintenance is a challenge and sometimes conflict is exacerbated by siltation which

reduces water flow, leading to people bribing to get more water.[41] As in Naroosura, there are frequent conflicts between non-local farmers and Maasai pastoralists who resent the presence of the former. The absence of a police post in the remote area is an important enabling factor in conflict as noted.

> *We have morans who come to destroy non-locals' crops…The other day they came harassing people to give them money or a phone 'if you have sold tomatoes'…There is no security, so they take advantage…*[42]

Another staff member complained that despite their attempts to provide water troughs for cattle young herding boys still cause trouble.

> *We have a place set for them to drink water, but even now they come into the scheme…some even break pipes to get water for their animals… some don't care about the project.* [43]

It is not clear why herders would break pipes rather than use the troughs, which may again be an issue of maintenance, or the difficulty for children to completely control cattle. In these situations sometimes the scheme members carry out a citizens' arrest and contact the chief who enlists the help of village elders and appointed community police to talk to the perpetrators.[44] It was noted that *moran* respect elders and are more likely to attack when elders are away.[45] Sometimes the police are requested by the chief to attend.[46]

Suswa: "Steaming" exclusion and a "flood" of development projects

Suswa ward is located on the edge of Narok bordering Kajiado and Nakuru counties. It is a place of extremes; Mount Suswa, a volcanic crater rises up from the floor of the Rift Valley, and the area experiences both severe drought and impassable floods. Maasai pastoralists with subsistence livelihoods graze alongside large ranches owned by Kenya's political elites, the standard gauge railway project from Mombasa, which is to connect to Kisumu, and the terminus for main electricity lines including the powerline from the Lake Turkana wind project. As a result, Suswa town experienced an investment boom, until a change of route for the railway relegated the town's importance (Removed for blind review). A planned dry port and business park in Kedong Ranch (in neighbouring Kajiado county, formerly land of the colonial farmer Mayers), have brought tension with the displaced community who have been using the land (Removed for

blind review). Exploitation of geothermal energy, already present in nearby Olkaria is set to start in the Mount Suswa area, threatening Maasai homelands.

An elder gave a rather contrasting description of the past, herding between the lowlands and highlands of Suswa, rudimentary water development and the increase in flooding.

> *I was born in 1941. This place was full of wildlife. We had natural ponds on the mountain…we could take [animals] and graze. We continued and we said, Maasai we have developed, we started water pans. Until now it is what we depend on for 2-3 months, then the population was very low. There were no floods because there was forest and trees and population was low. Floods started in 1985 with water travelling from gullies, when the forest was destroyed and roads started being built.*[47]

As noted, lowland areas are dry and lack natural water sources, such that most residents are engaged in pure pastoralism. Subdivision has taken place and each pastoralist household was given owning around 30 acres, but this area is unable to sustain pastoralism and pastoralists still migrate seasonally. A few boreholes exist, created by NGOs and faith-based organizations but the area is said to have poor groundwater potential, and moreover, the volcanic soil is unsuitable for water pans (Narok County 2018).

There have been many attempts at water development, "We have a lot of pipes but no water!" a local pastor remarked, ironically. The first pipeline was created in 1950s by colonial farmers at at Kedong Ranch who wished to avoid Maasai cattle mixing with their own and to avert water conflict. Maasai herders contributed the proceeds of 120 cattle, sold at a market in Kilimanjaro, to help pay for the construction of the pipeline from Kijabe on the highlands to Ewaso Kedong near Mount Suswa; it was owned by the Maasai and still functions and has been extended since. Unfortunately however, it has not been able to supply all the needs of the growing population of people and animals in the area. Other pipeline projects have been carried out since that time, with varying long-term success and maintenance challenges.[48] The county government was blamed for not taking charge of maintenance. [49] The cost of piped water (around a shilling per litre paid to

Narok county is a strain for some community members. [50] And the needs of the increasing population as well as their livestock and wild animals have meant water scarcity remains the reality in the Suswa area.

In 2004 a fierce water conflict broke out between Maasai downstream and Kikuyu upstream communities due to poor regulation and political influence. For years, water flows from the escarpment had been reducing due to upstream settlements. A group led by the then Limuru councillor of Kikuyu ethnicity obtained permission from the government to pump water uphill to farms in Kiambu, one of which was his own, using the same source as the gravity-fed pipeline mentioned above. The councillor for Ewaso, of Maasai ethnicity, together with his people protested the act, saying that they had only one source and that downstream communities should be protected like the countries which rely upon the Nile River. The government failed to act, allowing an ethno-political conflict to emerge. Maasai community members took matters into their own hands, destroying the intake, cutting power lines, and burning buildings. Violent conflict ensued, and the police responded in a heavy-handed manner, firing at people from above, using an army helicopter and killing two Maasai. Media sources reported a total of 15 lives lost and two thousand people displaced (*BBC* 2005). Following peace meetings, the government halted the upstream project. It is important to note that Maasai resentment against the Kikuyu had a long history because of the failure to restore Maasai lands at independence, and their subsequent transfer into mainly Kikuyu hands (Hughes, 2005).

Mount Suswa is a double volcanic crater covering an area of 270km^2 with an outer crater around 11km across and an inner collapsed crater about 3 km across. The inner crater is covered by forest and is home to wildlife only, while around 100 Maasai households own land on the outer crater which is registered as a community conservancy and receives a small but steady stream of visitors. One non-Maasai investor has an eco-lodge on the outer crater.

Water collects in water pans and natural ponds when it rains, but most of the year is dry and people travel to Ewaso Kedong river 20km away with their donkeys and jerricans.[51] A pipeline was constructed in 1992

from Olugumi, 10 km away but it was not functioning at the time of the research. Water pans are owned by individuals or families and there are several. The story was told of one family of 30 brothers who own a particularly reliable water pan. They sell water at 10,000 KShs/month for access for a herd of 50 cows, to be paid in advance. Small scale conflicts may arise over management; the fee may increase if water demands increase, but doesn't reduce if the rains start, and with so many brothers involved as manager, some conflicts arise from private arrangements made with one brother are disagreed by the others. [52] Another difficult challenge in August of each year is that migrating elephants try to use the pans. [53]

In 2013-14 the government through the Ministry of Environment and Natural Resources built a dam[54] for communal use proposed by a local NGO, at a settlement on the outer crater called Kisharu. The dam served many of the homesteads, but the hooves of drinking animals and the powdery volcanic soil led to soil erosion. Maintenance challenges and local ownership disputes has meant that it has been abandoned and vandalised since April 2020.[55]

A recent reliable source of domestic water for community members has been the harvesting of steam from natural vents, of which there are around 100 in the entire crater area.[56] What began with tin cans suspended over the vents, has in recent years become quite sophisticated; a cement base structure is covered by large metal sheets or collections of plastic pipes draining into large tanks. The water is clean and pleasant tasting, but may contain an excess of minerals. A local elder and his brother, a plumber, have been very enthusiastic in developing the technology after seeing something similar in the nearby Olkaria geothermal project, "I saw how it was being done. I took the plan and brought it here" he explained.[57] "There were some missionaries who provided the materials and pipes and I did the technical work." However, since land has been subdivided, not everyone has a vent. As with the traditional administration of private wells and pans, domestic water is free but water for livestock is charged by owners.[58] This may lead to conflict, "A lot of people depend on our vent and sometimes they come and steal so it forces me to sleep and guard my water.[59] He explained that sometimes fights ensue between community members, while children are posted as

sentries to fight of thirsty baboons. Water is still not enough to meet all the community needs but the limiting factor is the size of the tanks, not the amount of steam, so there is scope to develop the technology further. [60] However, geothermal development is also on the horizon, to begin with the exploratory drilling of four wells in the outer crater area, and many more if the first wells are successful. The Environmental and Social Impact Assessment for the project done in 2013 does not confirm one way or the other the impact to the vents. It suggests instead that a reliable supply of water ought to be established through other means. It is uncertain whether this would be sustained and at what cost to the communities (Geothermal Development Company, n.d.).

Discussion

The cases examined come from semi-arid locations in Narok county, historically Maasai rangelands which have witnessed profound changes over the past century including land-use changes and population influx. Although climate change is often a key concern for policy-makers and the public, the available evidence from Narok does not allow us to blame climate change for water conflict. Rather the current problems are a combination of population increase, environmental degradation, poor and corrupt functioning of institutions for water governance and the overall ongoing socioeconomic and political marginalization of the Maasai.

A historical perspective is important in understanding current water conflict because the colonial moves destabilized the Maasai traditional spatial and ecological order. Even in the late 1930s Maasailand was considered to be seriously degraded (James, 1939, p.59-60). The creation of group-ranches in 1970s and their later subdivision have been other massive steps in land-use change. Together with water development, particularly in the form of irrigation schemes these steps paved the way for commoditization of land near water sources, and inequitable access to water. Those who envisaged the schemes may not have imagined the outcome, since they were initiated mainly through missions and development NGOs for subsistence

agriculture, mostly prior to subdivision. This recalls the situation in other counties where borehole developments have in fact brought more conflict rather than less, by becoming a magnet for people and their livelihoods, disrupting previously carefully balanced established systems of water governance.[61] However, it might have been anticipated; since throughout the 20th century, members of communities from neighbouring counties, themselves displaced from farmland by colonial settlers had been trying to enter Narok to utilise well-watered parts. Areas such as Loita Hills, and Soit Ololol and Nguruman escarpment have been considered as under threat of immigration for decades (Sindiga, 1984).

Conflicts between pastoralists and immigrant farmers are the most prominent in the cases mentioned, particularly where pastoralists find themselves downstream and vulnerable to a combination of seasonal drought; pump-technologies which allow for easy overextraction and unsustainable expansion of the schemes; and poor regulation by WRUAs and corruption which allows elites to extract more than their share. As a result, there is a natural tendency among Maasai pastoralists to blame immigrants for water shortages, leading to inter-ethnic conflict. A similar problem happened on a larger scale in the Suswa pipeline case when upstream Kiambu farmers threatened to divert a pipeline supply which the Maasai saw as their own, paid for by the sale of their own cows many years previously. Political interests allowed regulations to be breached in this case leading to violent and fatal conflict.

However it is not only water shortages which gall the pastoral Maasai. Although many Maasais are leasing their land and therefore benefitting economically from the presence of the immigrant farmers, some pastoralist Maasai have been economically marginalised because of non-participation in irrigation schemes and inequitable subdivision processes. Therefore conflict is not only about "water flows" but also about "wealth flows" as evidenced when the moran ask the farmers for money "now that you have sold tomatoes." In the Mt. Suswa case we see very little conflict. Although subdivision has taken place the area is not suitable for large-scale farming and hence the community has remained relatively untouched by immigration. It is worth mentioning however, that there is some tension between the investor and a few

Maasai pastoralists, who believe that land ought not to have been sold to an outsider, who is now reaping some economic benefits from it. Internal conflicts do exist but these are not severe or violent, perhaps being managed internally, or supressed because of social constraints.

There are also other tensions with immigrants in Suswa; workers who had built the Mombasa-Nairobi stretch of the SGR were employed again in the Nairobi-Suswa stretch. Such was the outcry that in 2017 Maasai youths rioted violently and attacked immigrant workers demanding that the company employ the requisite 70% from the local area. As immigration continues and more and more "benefits" of development go to non-Maasai similar violence episodes are to be expected.

Indigenous water governance has assisted the Maasai to survive in a water scarce environment and continues to function particularly where water development is minimal. Even indigenous systems endorse payment for any form of improved/developed supply. With increasing technicality of water development, population growth and population movements, the need for formal institutions is clear, but interestingly, these have evolved over time based on a growing understanding that local participation in water governance is very necessary; thus the WRUA was conceived.

However, Mumma (2005) argues that despite providing for community participation, the Water Act 2002 (which has been only slightly modified in the later Act) did not properly recognise the pluralistic legal framework for water management (Mumma 2005). Similarly, Richards and Syallow (2018) in their detailed study of WRUAs in Maasai Mara note that WRUAs are hardly grassroots institutions, rather they follow templates from above in their operations, but they have nevertheless been useful in resolving conflicts and enforcing regulations to protect environmental services resources. Indeed this study concurs that WRUAs seem to be doing many positive and locally relevant activities such as protecting water sources and scheduling extraction. Moreover, Richards and Syallow (2018) also find that the plans made by WRUAs are not at odds with ancestral practices, but in fact often revive them.

However, WRUAs face a number of significant challenges. WRUAs are viewed to be the main institution for addressing resource-sharing challenge but they are troubled with poor and corrupt management. Maintenance is difficult, particularly because many members do not pay. This may be because they do not consider it worthwhile or returns seem to be slow (Richards and Syallow 2018), or because they do not trust or approve of management. Wang'ombe (2013, p.20) comments that there is little incentive for upstream communities to join WRUAs because they themselves are rarely troubled with water shortages and so have less to gain from cooperation. Further, the fact that WRUAs rely on local streams of funding makes them vulnerable to corruption and elite capture; it is easy to see how local economic and political power will be mutually reinforcing in this situation. Richards and Syallow (2018) note that elite capture is an inevitable feature of such systems, and may be necessary to improve local buy-in, but can exacerbate inequalities.

This work illustrates how, even within the modern system, indigenous elements remain relevant and valuable in managing conflict with non-Maasai farmers as we see in the Naroosura and Mosiro cases. In Loita we see a strong institutional bricolage between the Laibon who is part of the indigenous system, civil society and the state agency Kenya Water Towers Authority in the protection of the forest water tower which perhaps offers some hope for protection of water resources and prevention of conflict.

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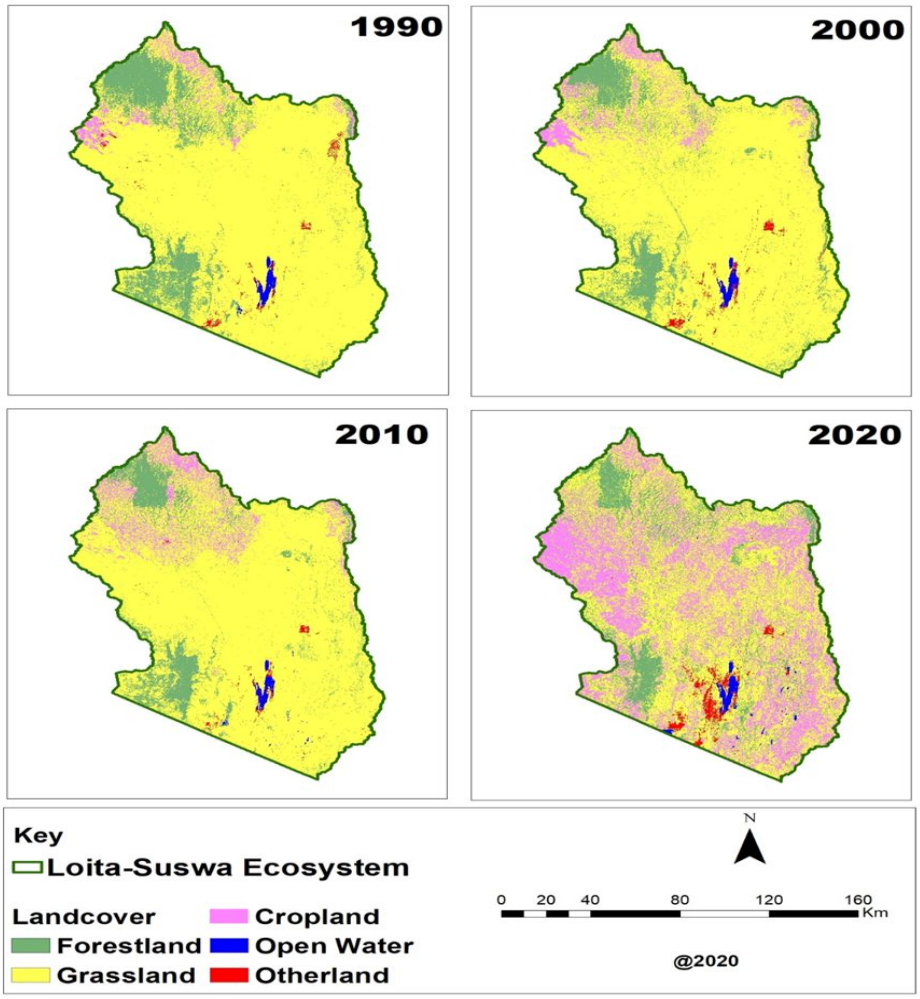

Figure 1: Maps showing changes in land cover from 1990 to 2020 in Narok County. (Source: Kenya Water Towers Agency (KWTA))

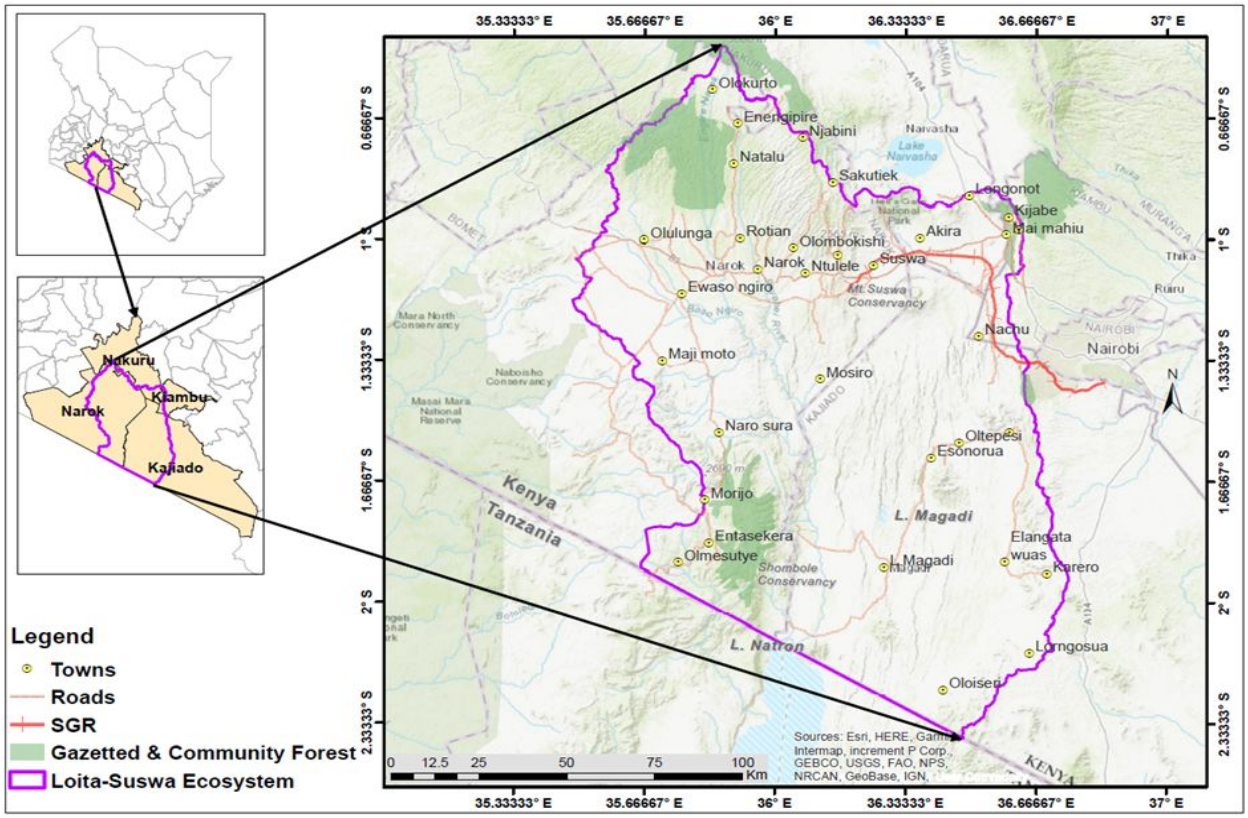

Figure 2: Map showing the study area including the selected sites

Table 1: Key events in water development from colonial era to present

Dates	**Event**	**Notes**
From 1901	Water development related to railway	
1905	Ministry of Public Works took over water development	Mainly served settlers and the railway
1929	Water ownership vested in colonial government	
1943	Dixey Scheme water developments in Northern Frontier Districts	
From 1946	Water development by Development and Reconstruction Authority (urban)	

	and African Land Development Board (rural)	
1954	Swynnerton plan – intensification of agricultural development and creation of pipelines	Mainly serving settler farms
1957	Water management moved to local authorities in large towns and to Ministry of Agriculture in small towns	
1960-1980	Donors, in particular UNICEF and WHO involved in rural water development for sanitation	Served rural poor
1974	Creation of Ministry of Water Development which took over water schemes and instituted some major developments in both urban and rural areas. Abolished metered connections in rural areas.	Aimed to provide free water and sanitation for all.
1983	Shift to decentralisation to local authorities and some commercial management of water schemes.	
1980s-1990s	Structural adjustment policies introduced cost-sharing in water	Led to severe hardships for the poor. By 2000 only 59% of the population were being supplied water.
2002	Water Act • Separated provision from management and policy from regulation. • Further decentralised services	

	• Recognised the role of non-state actors in water provision and management • Created a Water Resources Management Authority (WRMA) • Provides for integrated water resource management by creating WRUAs. These are community groups focused on the management and conservation of water resources of a particular area, river or aquifer.	
2016	Water Act • Enacted certain constitutional provisions • Devolved the water sector largely to new county governments • Replaced the WRMA with the Water Resources Authority (WRA) at the national level along with other bodies. • Basin Water Resources Committees are also established to manage and regulate water resources within a specific basin area. • Retained WRUAs	

Source: Nyanchaga (2016)

Table 2: Water conflicts documented in police occurrence book September 2019-September 2020

Date	**Area**	**Reason for Dispute**

22/09/2019	Elangata Enterit to Naroosura	Demonstration by residents of Elangata Enterit for lack of water downstream due to irrigation activities upstream
01/10/2019	Naroosura	Destruction of local administration offices by farmers for confiscating water pumps along the river
11/10/2019	Naroosura along the river	Water pumps damaged by residents for lack of domestic water and animals
21/10/2019	Koseka	A person slashed/cut another person for trespassing onto to his watering point (Silanga)
04/11/2019	Entiapiri	Two families fought over water sources
08/12/2019	Assistant County Commissioner's office Naroosura	Residents of Elangata Enterit addressed by Assistant County Commissioner after demonstration for lack of water/dry river at their area
03/01/2020	Olepolos	Small farmers up against big farmers for exhausting river water with heavy water pumps for water to their farms
17/01/2020	Kanuka	Water pipes to farms broken by residents for what they termed irrational water supply
26/01/2020	Nakron	Residents demand and demonstrate for removal of water canal official for nepotism/favouritism in water distribution
07/02/2020	Elerai	Residents vandalize water canal in order to get water in their farms
15/02/2020	Salama	Conflict amongst resident over unfair water distribution (canal water)
06/03/2020	Oloshaiki	Farmers using canal water and those pumping water directly from the river by use of machines engaged each other over use of water (river)
20/03/2020	Enkutoto	Demonstration for demand of withdrawal of powerful pumps along the river due to low levels

04/09/2020	Entiapriti	Damage to main pipe. The aggrieved party were demonstrating their anger for water traversing their area yet they had no enough water.

Source: Naroosura Police Station 1 October 2020

Notes

[1] Interview, Maasai elder aged 79, Suswa town, 8 September, 2020
[2] Interview, former councillor for Ewaso Kedong, near Suswa town, 11 September, 2020.
[3] Interview, local administrator Mau Division, Narok East subcounty, 26 August 2020.
[4] Interview, local administrator, Mau Division, Narok East subcounty, 26 August 2020.
[5] Interview, program manager, Narok District Network Forum, Narok Town, 2 October 2020; Interview, staff of National Drought Management Authority, Narok, Narok town, 2 October 2020; Interview, local administrator, Naroosura location, Naroosura police station, 1 October 2020; Interview, Former World Vision officer, Naroosura police station, 1 October 2020; Interview, chairman Naroosura WRUA, Naroosura, 29 September 2020; Interview, two water officers for Narok West and South subcounties, Naroosura police station, 29 September 2020; Interview, former councillor, Loita, 30 September 2020.
[6] Interview, senior national administrator, Olololunga, Suswa town, 28 September 2020; Group interview, local administrators for Naroosura location and local administrator from Elangata Enterit, Naroosura police station, 1 October 2020.
[7] Interview two staff members of National Drought Management Authority-Narok, Narok Town, 2 October 2020.
[8] Interview, a local community member/police officer and program manager for Narok District Network Forum, Narok town, 2 October 2020.
[9] Group interview, a community member/police officer and program manager for Narok District Network Forum, Narok Town, 2 October 2020.
[10] Interview, a former World Vision officer, Naroosura police station, 1 October 2020.
[11] Interview, a former World Vision officer, Naroosura police station, 1 October 2020.
[12] Letter OSUP/IRR/Vol.I/25 from Divisional Agricultural and Livestock Extension Officer, Osupuko Division to District Agricultural and Livestock Extension Officer. "Irrigation Canal Assessment", dated 8 July, 2000; Interview, chairman Naroosura WRUA, Naroosura, 29 September 2020.
[13] Group interview with clan chief/chairman and secretary/engineer, Entesekera Water Supply Project and local pastor, Loita-Entesekera Centre, 30 September 2020; Group interview, local administrators for Naroosura location and local administrator from Elangata Enterit, Naroosura police station, 1 October 2020. Group interview, two water officers for Narok West and South sub-counties, Naroosura police station, 29 September 2020; Interview, former councillor, Loita, 30 September 2020.
[14]Interview farmer, Naroosura downstream, 29 September 2020
[15] Interview, chairman Naroosura WRUA, Naroosura, 29 September 2020
[16] Observation and interviews. These problems were also mentioned in the 1990s and 2000s. See proceedings of workshop at Naroosura Irrigation Project, 9 May 1995. Letter NRK/IRR/1/Vol.IV/93 from District Agriculture and Livestock Extension Officer to District Irrigation Engineer, Narok District. "Field and Workshop Report held between 19-20 April 2002 Naroosura Location", dated 22 May 2002; Letter OSUP/IRR/Vol.I/25 from Divisional Agricultural and Livestock Extension Officer, Osupuko Division to District Agricultural and Livestock Extension Officer. "Irrigation Canal Assessment", dated 8 July, 2000.
[17] Interview chairman Naroosura WRUA, Naroosura, 29 September 2020.
[18] Interview farmer, Naroosura downstream, 29 September, 2020.
[19] Interview, former World Vision officer, Naroosura Police Station, 1 October, 1 2020.
[20] Interview, Agricultural Extension Officer, Ministry of Agriculture in Narok, Naroosura, 1 October 2020; Interview, Former World Vision officer, Naroosura police station, 1 October 2020; Focus group discussion with women from Naroosura, Naroosura police station, 1 October 2020; Group interview, a community member/police officer and program manager for Narok District Network Forum, Narok Town, 2 October 2020.
[21] Group interview, local administrators for Naroosura Location and local administrator from Elangata Enterit, Naroosura Police Station, 1 October 2020.
[22] Group interview, administrator and officer in charge, Naroosura police station, 29 September 2020.
[23] Interview, farmer, Naroosura downstream, 29 September 2020.
[24] Interview, local administrator, Enkutoto sub-location, Naroosura police station, 1 October 2020.

[25] Interview, local administrator, Enkutoto sub-location, Naroosura police station, 1 October 2020.
[25] Group interview, senior police officer and senior Sergeant, Naroosura police station, 1 October, 2020
[26] Interview a local community member/senior police officer and senior sergeant, Naroosura police station, 29 September 2020; Interview, former World Vision officer, Naroosura police station, 1 October 2020.
[27] Interview, local administrator, Entesekera, 30 September 2020.
[28] Interview, Water Towers Authority official, Narok, 3 August 2020
[29] Interview, local administrator, Entesekera, 30 September 2020.
[30] Comment made by local administrator in a group interview, Mosiro, 27 August, 2020.
[31] This is entirely separate from the Ewaso Nyiro which passes through Laikipia, Samburu and Isiolo counties.
[32] Group interview with local administrator Mosiro location/chairman of Mosiro irrigation scheme, 27 August, 2020.
[33] Comment by local administrator in group interview, Mosiro, 27 August, 2020.
[34] Interview with former chairman of Mosiro irrigation scheme, 27 August, 2020; There are 1200 acres owned by the scheme members but only 850 are irrigated.
[35] Comment by new chairman of Mosiro irrigation scheme in a group interview, Mosiro, 27 August, 2020.
[36] Interview, local chairman for Naroosura irrigation scheme 19 September 2020.
[37] Interview, farmer/entrepreneur, Mosiro irrigation scheme, 27 November, 2020.
[38] Interview, local youth farmer/tomato broker, Mosiro, 27 August, 2020
[39] See a Facebook post from March 2021 https://www.facebook.com/389281291186755/posts/the-mosiro-ward-irrigation-schemein-a-bid-to-boost-food-production-in-the-countr/3721245294656988/ Accessed 21 May 2021
[40] Interview with a local farmer/tomato broker, 27 August, 2020.
[41] Interview with Chairman Mosiro irrigation scheme, 27 August, 2020.
[42] Ibid.
[43] Interview, staff member for Mosiro irrigation scheme, Mosiro town 27 August, 2020.
[44] Interview, local administrator for Mosiro location. Mosiro town, 27 August, 2020.
[45] Interview with Chairman Mosiro Irrigation Scheme, 27 August, 2020.
[46] Interview, local administrator for Mosiro location. Mosiro town, 27 August, 2020.
[47] Interview, a 79 old elder, Suswa town, 9 September, 2020.
[48] Letter KNA NKU/WD/RWS/2/42/Vol.1/24, Rehabilitation of Suswa Water Supply 8 August 1992; also see Ross 1993; See also Ross 1993.
[49] Interview Maasai civil society officers in Kedong Valley-Suswa 28 August 2020
[50] Letter from Hon. Ole Ntimama to Permanent Secretary Mr Mwongera, 4 December 1995.
[51] Group interview a local elder and community elder, Eco-Lodge on Mount Suswa, 9 September, 2020.
[52] Group interview a local elder and community elder, Eco-Lodge on Mount Suswa, 9 September, 2020.
[53] Group interview a local elder and community elder, Eco-Lodge on Mount Suswa, 9 September, 2020.
[54] It is likely that this was fed by a seasonal stream.
[55] Group interview a local elder and community elder, Eco-Lodge on Mount Suswa, 9 September, 2020.
[56] Interview, pastor/technician for steam vents, Mount Suswa, 9 September 2021.
[57] Interview, pastor and technical engineer for vents, Mount Suswa, 9 September 2021.
[58] Interview, pastor/technician for steam vents, Mount Suswa, 9 September 2021.
[59] Comment by an elder in FGD with six elders, Suswa, 9 September, 2021.
[60] Comment by an elder in FGD with six elders, Suswa, 9 September, 2021.
[61] Unpublished archival research on Marsabit county, carried out as part of the same project.