INTERIM REPORT

Towards Inclusive Climate Change Adaptation Interventions on Common Pool Water Resources in Semi-Arid Africa

A case study on emerging social dynamics of conflict and cooperation over a common pool water resource resulting from an adaptation intervention in semi-arid, Southwestern Kenya

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List of abbreviations

COP Conference of the Parties
CPWR Common Pool Water Resource
CPR Common Pool Resource
GCF Green Climate Fund
GEF Global Environment Facility
ILEPA Indigenous Livelihoods Enhancement Partners
MMCWP Maji Moto Community Water Project
NGO Non-governmental organization
SGP Small Grants Program
UNDP United Nations Development Program
UNFCCC United Nations Framework Convention on Climate Change
WB World Bank

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1. Introduction

1.1 The post-Paris world – a renewed focus on climate change adaptation

“Adaptation has come into its own. One could debate whether parity with mitigation has been achieved but adaptation, along with loss and damage, is now a pillar of the international climate change regime [...] Getting 196 governments to agree in Paris was the easy part. Moving from words to action, transforming the global economy, rapidly accelerating action: these are the imperatives of the post-Paris world”

Richard Kinley, UNFCCC Deputy Executive Secretary at Selwyn College, University of Cambridge on January 22nd, 2016 (UNFCCC 2016)

As a reaction on the international agreements made during the climate conference COP21 held in Paris last December, Kinley implicitly suggests that a focus on climate change mitigation, i.e. reducing carbon emissions, has been the dominant discourse of international climate change regime thus far. This has been clearly visible in the climate funding of relatively low-polluting developing countries: the annual billions of US dollars promised at the Copenhagen climate summit (a 100 billion USD by 2020, in 2013-2014 this amounted for 57 billion USD annually) six years ago, which was re-affirmed during the COP21 by relatively high polluting developed countries for their poorer counterparts to help in mitigation and adaptation, have thus far primarily been granted for mitigation measures. Despite the efforts made at COP 17 - exactly 4 years before Paris – to strengthen focus on adaptation measures with the agreements on extensive funding instruments for adaptation, only 16% of the climate aid money accredited thus far was used the help developing countries to adapt to climate change effects, such as flooding and droughts. The rest was spent on preventative mitigation measures such as investments in renewable energy. (The Guardian, 2015). The preference given to mitigation funding makes sense, as it creates more possibilities for Western countries to offshore their carbon emission reductions instead of investing in more costly high-tech mitigation measures in their own countries.

Apart from this preference in mitigation in funding vulnerable and relatively low polluting developing countries, the funding was also inaccessible and its form shaped by multilateral institutions: The Green Climate Fund (GCF), founded as a result of the Copenhagen summit, intended to give developing countries access to the 100 billion in finance. However, the GCFs bureaucratic requirements before granting the fund (despite its ‘readiness program’) to guard against corruption, resulted in leaving not much choice for developing countries but to get indirect access to the funding through quickly accredited multilateral institutions such as development banks. For example, in Kenya, the government founded the institution ‘National Environment Management Agency (Nema)’ purely to access GCF finance. However resources were lacking, and German NGO ‘World Resource Institute’ helps the Nema in complying with all bureaucratic requirements – hence leading to climate funding dependent on Western preferences: which has often been mitigation instead of adaptation. This and other examples in the developing world resulted in climate funding shaped by international multilateral institutions instead of the aimed country-driven climate funding approach, and as a result downplaying adaptation and excluding communities outside of this commercial mainstream.

As a reaction on these undesirable effects of the bureaucratic mitigation discourse in the international climate change regime, the recent Paris agreement urges to simplify application procedures in order to support the aimed country-driven strategies – however simplification is uncertain due to accountability to donors and poor people by the funds (The Guardian 2016). Importantly, considering adaptation, the Paris agreement also states that
“Countries will continue to engage in a process on mitigation opportunities and will put added focus on adaptation opportunities. [...] The Paris Agreement underwrites adequate support to developing nations and establishes a global goal to significantly strengthen adaptation to climate change through support and international cooperation.” - UNFCCC, 12 December 2015

The actual effects of the increased accessibility to funds for country-driven strategy which may strengthen focus on adaptation of the Paris agreement, which will enter force in 2020, are still uncertain. Nonetheless, it is now, after Paris, realistic to assume that funding for adaptation in developing countries will increase in the future, complementary to mitigation funding – if not only because of the strong demands of developing countries for adaptation funds during COP21 due to their high vulnerability for climate change effects, while having relatively low carbon emissions.

1.2 Climate change, adaptation, conflict, and cooperation in semi-arid Africa

Indeed, the poorer countries, such as the African nations, are the most vulnerable continent to climate change and climate variability due to its low capacity to adapt to climate change (Mannke 2010), while remaining one of the relatively lightest global polluters. An important impact of climate change for vulnerable groups lies in the changing availability of natural resources, which are therefore climate-affected – such as changing patterns in rainfall variability and increases in severe weather events such as tropical storms. Especially in the semi-arid regions of Africa, conflicts are increasingly believed to result from vulnerability to climate change, due to its general high economic dependence on climate-affected resource, for example a dependence on rainfall in rain-fed agriculture and pastoralism, in combination with low institutional capacities. Climate-affected resources are fought over, such as scarce water resources, due to an increase of frequency in dry spells in the last decades (Bob et al 2014). In Kenya for example, the frequency of droughts in the semi-arid regions has tripled from one in ten years, to one in three years (NRC Handelsblad, 2016). In many regions tensions between communities grow also due to a high dependence on territorial climate-affected resources such as fertile lands to use for agricultural and/or pastoral activities. Therefore, links between climate change and conflict have become a more widely researched topic in the development field the last decade. As the discussion continues, a consensus within the scientific community is emerging: climate change will at the very least be a threat multiplier, amplifying existing socio-economic, political and other factors that drive conflicts (Bob et al 2014).

More recently, the influence of adaptation strategies in the climate-conflict nexus has been added: studies conducted a few years ago have shown that climate change can be an important catalyst for conflict in Africa due to new scarcities in climate-affected natural resources when adaptation strategies such as migration are adopted (for example Bob et al, 2014, Schilling et al 2014, Tänzler & Ruettinger, 2014). For example, an increased frequency of prolonged droughts in semi-arid Africa leading to migration as an adaptation strategy of the affected people can put new competing claims put on natural resources elsewhere, such as the desire to use the fewer remaining pasturelands needed by the livestock herding of pastoral communities. This may not only lead to conflict resulting from the new competing claims, but also to overuse of the natural resource which is competed for, such as overgrazing in the example of remaining pasturelands. Overuse and conflict may ultimately increase the vulnerability to climate changes even more, a process which is often called maladaptation. Additionally and more recently, it has been shown that not only new resource scarcities, but also new abundances in climate-affected natural resources may lead to adaptive behavior that catalyzes conflict: In northwestern Kenya armed cattle raids, in order to increase herd numbers, are conducted mainly in wetter periods due to favorable raiding conditions (Schilling et al 2014). However, these raids are conducted in preparation for prolonged droughts, so the Kenya case is differently formulated an
example in which periods of abundance are used for adaptation strategies catalyzing conflict in the face of scarcity. More unique for the Kenyan case, cattle is not only increasingly raided by pastoralists, but also killed by lions: due to the dropping rates in wildlife numbers, lions resort to attacking cattle herds as an adaptation strategy to survive (NRC Handelsblad 2016).

These findings on relationships between climate change adaptation and conflict may suggest causal relationship between certain adaptation strategies and conflicts solely because of changes in natural resource availability in the semi-arid regions of Africa. However, the underlying factor for certain maladaptive strategies is not just the climate change itself, but the generally high vulnerability and lack of choice for adaptation strategies of the affected people. Vulnerability is caused by multiple factors, such as the political context of many African countries. The political context of African countries often bears a colonial legacy, characterized by political marginalization of certain (ethnic) groups, ethnic tensions, and a weak and/or corrupt institutional structure. This has an influence on the occurrence of adaptation-related conflicts, as it contributes to vulnerabilities of people through for example poor natural resource management and political exclusion of groups, which may increase dependence of groups on climate-affected resources (Ballet et al 2007) and reduce alternatives to maladaptation. It is rather self-evident that this dependence in its turn increases the vulnerability of people to climate change, hence lowering their adaptive capacity and resorting to desperate adaptive coping strategies which may fuel conflict and unsustainable resource uses.

As there is a relationship between adaptation strategies and conflict, it makes sense to assume that there can also be relationships between adaptation interventions from external sources which affect climate-affected resources, and conflict. This appears definitely to be the case in adaptation interventions which increase water abundance in areas where water is scarce, and the intervention may serve as a catalyst for conflict (Tänzler & Ruettinger 2014). For example, in Kasese, Uganda, tensions are rising as a result of competing demands for available water, and as a result of efforts to provide communities with additional water taps. Initially only one tap was installed in the Rukoki area, causing anger among the Mahango people. (CECORE et al 2008). A challenge of future adaptation interventions which increase abundance of climate-affected resources such as water will therefore lie in preventing maladaptation leading to exclusion of groups or conflicts between groups as a result of new competing claims on the new resource abundance. This is especially the case for water-related adaptation interventions, as it has been demonstrated that water-related tensions may increase and lead to violent conflicts mainly on a inter-communal scale (Houdret 2008). Recently observed water-related conflicts following from adaptation interventions in semi-arid countries of Africa, in the studies of Houdret (2008) and Tänzler & Ruettinger (2014), show that especially here the future adaptation funds of COP21 should be used well for improving adaptive capacity by preventing potential conflictive effects of intervention. To prevent further destabilization of social structures, possibly leading to the outbreak of violent conflict (Carius et al. 2008), it will be necessary to introduce adaptation processes that take into account how social structures may be affected by adaptation interventions. Hence, possible unforeseen negative consequences of the increasing number of adaptation interventions funded by the international climate change regime in the future can be prevented.
1.3 Need of contextual knowledge for more effective adaptation interventions

Bearing the results of COP21 made last December in mind, the expected increase in country-driven adaptation funding for projects or ‘interventions’ in Africa, ask for a focus of development research and practice on how the new level policy making on country and regional level on adaptation interventions can be shaped in such a way that the interventions are effective, hence prevent adaptation-related conflicts. As different effects of climate change combined with different social, economic and political circumstances of the affected people lead to different adaptation strategies, a high level of contextual detail is required to understand the possible dynamics of conflict and cooperation that can be triggered in different localities by adaptation interventions. As sometimes is said by climate change scholars, “climate change can have dissimilar effects on people on different sides of a hill”. Additionally, not just climate change itself, but also cultural factors can shape how people adapt to climate change and how they respond to adaptation interventions (Adger et al 2013). Therefore, climate change can trigger very different adaptation strategies in different places, which is why a wide variety of adaptation interventions is needed in order to fit the highly diverse contexts. Therefore, a much greater integration of local experiences and voices into science is required, to establish whether and how adaptation interventions may affect communities (Bob et al 2014). When certain patterns and relationships are discovered, these can be scaled up for other, similar localities where adaptation interventions are implemented, hence results of combined efforts of studies such as these can be adopted in international policy making for adaptation.

Not only for the sake of societal relevance for improving adaptation policymaking in the post-Paris world, but also building up scientific knowledge on links between adaptation interventions which increase the abundance of a climate-affected resource and dynamics of conflict and/or cooperation is a prime reason why this research is conducted, as knowledge is still very limited. As a relatively new field in development studies, the role of adaptation interventions in contributing to or preventing conflicts require further analysis; many scholarly disagreements on the relationships between climate change, adaptation and conflict thus far caused a failure in development policy and practice to ensure that adaptation projects are conflict-sensitive (Bob et al 2014).

In order to create contextual knowledge, this research is a case study in semi-arid Southwestern Kenya where the effects of an adaptation intervention in creating a new abundance of a climate-affected resource on dynamics of conflict and cooperation are studied. The Kenyan context and the studies locality of Maji Moto are introduced in more detail in the next chapter. Importantly, as this contextual knowledge also should be generalizable to other, similar contexts in order to be relevant for policy making outside of the research context, the concept of social capital is used to build up a theoretical framework as a conceptual tool to analyze the dynamics of conflict and cooperation. Hereby not only levels of social capital of the community affected by the adaptation intervention are measured, but also the role that social capital can play in understanding the effects of an adaptation intervention on conflicts and cooperation are evaluated. What social capital is, and its relations with conflict and cooperation in adaptation landscapes are, is discussed more in the fourth chapter.
2. Research context: Maji Moto, Southwestern Kenya

2.1 Climate-change adaptation strategies, interventions and conflict in Kenya

Inland Kenya in particular is affected by climate change, with an increased frequency of droughts and increases in rainfall variability, a context in which both resource scarcity and abundance is related to the occurrence of conflicts caused by adaptation strategies in order to cope with climate change (Orindi et al 2007), such as the mentioned armed cattle raids, while the government is unable to disarm the region (Schilling et al, 2014). Kenyan crop farmers are also affected by climate change, in particular when these depend on rain-fed agriculture. However, pastoralists are seen as the most vulnerable group, as these also face non-climatic challenges such as weak infrastructure and consequences of poor natural resource management policies, and need a relatively long time to recover from losses in cattle (Orindi et al 2007). Droughts are not new in Kenya and communities have developed indigenous adaptation strategies. However, due to the increased frequency and intensity of droughts, most indigenous strategies such as increasing cattle herds are no longer adequate. Additionally, governments, development agencies and NGOs have also developed and implemented adaptation interventions in order to reduce the vulnerability of pastoralists to droughts. However, these adaptation interventions tended to be reactive in nature and showed limited understanding and appreciation of pastoral livelihoods (Orindi et al 2007). In fact, Kenya did not have a comprehensive policy on environment and dry lands in particular. Most policies were influenced by assumptions, myths, and misconceptions, disadvantaging pastoralists as these were seen as lacking in national loyalty, politically unreliable, and difficult to control because of their cross-border movement, hence threatening national unity (Omosa 2005). The most important policy unsupportive for Kenyan pastoralists has been the allocation of pastoral lands to individuals and private entities. The general practice has been to fence and develop these lands, leading to alienation and individualization of pastoral lands with the creation of livestock ranches, grazing blocks, national parks, game reserves and wheat farms. This not only reduced the available land for pastoralists, but also blocked their migration routes. Additionally, the contemporary promotion of land sub-division and titling has promoted the sedenterization of pastoralists. This might be beneficial in some circumstances however most semi-arid and arid lands are too fragile to foster sustainable sedentary farming practices. Altogether, individualization and privatization of former communal pastoral areas has had many negative impacts, and even fuelled conflict by disrupting the indigenous communal allocation structure of land (Barton et al 2001). Not only inter- and intra-ethnic conflicts occur over pastoral resources, but also over water, as these are also not policed adequately, and will not be so in the foreseeable future (Orindi et al 2007).

Southern Kenya in specific has been subject to several projects of development agencies and NGOs focusing on building adaptive capacities of pastoralist groups (such as the WB and UNDP) and resolving conflicts between pastoralists and agriculturalists (such as Oxfam), which are often characterized by a different ethnic descent, respectively Masaaai and Kikuyu. Despite these attempts, and in spite of the lacking of Kenyan governmental entities to formulate adequate policies for pasture and water resources, livelihoods are still vulnerable in general and conflicts (however mostly non-violent) occur in southern Kenya as a result from this (Orindi et al 2007).
2.2 The Maji Moto Group Ranch and the Community Water Project

This study focuses on a case study where an adaptation intervention on a climate-affected resource has taken place in Southwestern Kenya: The Maji Moto Group Ranch in Narok County. Maji Moto is an area well-suited for research on the effects of an adaptation intervention for several reasons. First of all, Maji Moto is a largely pastoral population affected by a drying climate, as these people are dependent on the climate-affected resource of water, which is used for drinking, irrigation, cattle-herding, and has domestic purposes. Second, an adaptation intervention in 2006/7 has taken place which aimed increasing the resource abundance of the climate-affected common-pool water resource (CPWR). Dams, catchment areas, and a windmill pump were built in order to increase water provision, and the establishment of institutional arrangements as an adaptation strategy in the form of a water committee to regulate water distribution. Third, there are ongoing dynamics of conflict and cooperation within and between the different groups that are dependent on the water, which have shown to have been altered by the adaptation intervention while the research is ongoing, caused by for example inequality in access to water. As an adaptation landscape, Maji Moto, with its ongoing (however mostly non-violent quarrels) conflicts and inequality related to access to the communal water made available by the intervention, can serve as an example study to show the complexity of impacts on dynamics of conflict and cooperation an adaptation intervention creating a new abundance of a climate-affected natural resource can have. The context of Maji Moto can be introduced in more detail, now that a large part of the fieldwork in the area has been conducted.

Maji Moto is a group ranch of roughly 500 square kilometers located at the edge of the Rift Valley in semi-arid Southern Kenya. The area is characterized by rocky, sandy and partially degraded hillsides surrounded by lower grazing lands. The Maasai communities living here are traditionally mobile pastoralists relying on cattle rearing as the basis for their livelihoods. More recently agro-pastoralism has emerged, practiced by sedentary farmers who cultivate the land as well as keep livestock. Furthermore, wildlife uses the savannah as a migratory route and grazing grounds, such as wildebeest and zebra. The name Maji Moto, Kiswahili for ‘hot water’, refers to the centrally located hot spring (Enkare Nairowua), providing a perennial water supply on which much of the rural Maasai population depends throughout the year. There is a second ground water source located around 20 kilometers from Enkare Nairowua, called the Entiangasir spring. Additionally, several seasonal streams are important sources of water for a third of the year. Rainfall is bimodal with the long rains usually occurring in March-May and the short rains normally falling from November through December.

Agro-pastoralists are located near the hot spring, as its water is used for irrigation purposes. The farming activities are a result of the arrival of missionaries in the late 1970s. Irrigation schemes were initiated, creating a possibility for a number of Maasai pastoralists to settle and adopt farming activities, growing crops such as maize and tomatoes combined with traditional livestock keeping. As a consequence of the rise of agro-pastoral activities, the population living off the hot spring’s water grew rapidly throughout the 1980s and 1990s, reaching 9000 people in 2000. The resulting rise in water demand in combination with an increased frequency of droughts made Maji Moto chronically food insecure. Livestock was lost, and famines occurred during severe droughts. As a response, at the end of the 1990s missionaries built a water dam and pans, a windmill pump and irrigation channels connected to the hot spring’s stream. By capturing the water, a better water supply for the (agro) pastoralists, domestic users, and newly emerged local businesses was created. Despite the increase in water supply from the water pans, it was still not sufficient to provide for many pastoral and agro-pastoral livelihoods during droughts. Additionally, the dams were not well maintained, resulting in a lower water supply at the early 2000s. As a result many people in the Maji Moto Group Ranch still lacked a stable provision of water and food in an increasingly drying climate.
In 2002, a younger generation of farmers and a local community-based organisation (‘Touch of Love’, which later changed its name to Indigenous Livelihood Enhancement Partners, ILEPA) recognized the water shortages and resulting conflicts during dry spells in the Maji Moto. They instigated the community-based ‘Maji Moto Community Water Project’ (MMCWP) in cooperation with the Maji Moto community and in partnership with the UNDP’s and GEF’s funded Small Grants Programme (SGP). The project was mainly funded by the SGP and the local government of the Maji Moto Group Ranch, respectively providing nearly 20,000 and 4,000 USD. Implementation took place in 2006 and 2007. It mainly focused on increasing water supply of the hot spring, entailing the rehabilitation of the dams, the reparation of a water pump driven by a wind mill, installing drip irrigation systems, and de-silting and protecting the water pan by fencing and the planting of grass and trees. Additional to these technical fixes, the MMCWP organized a conflict resolution workshop with all stakeholders related to the water source, and aimed to train the community on managing their own projects related to water use, such as drip irrigation. According to the SGP, the MMCWP was “satisfactory completed”. As a result of the technical fixes water supply has increased, which can be considered as a positive outcome. The rise in water abundance for the users of Maji Moto’s hot springs heightened opportunities for pastoralists to maintain their livestock, and for recently settled agro-pastoralists to access water for irrigation during dry spells. It also provided water needed by local businesses as well as drinking water for the local communities. Thereby, the adaptive capacity was improved for most sectors of the community. Nonetheless the MMCWP project could not prevent famine as a result of prolonged droughts in 2009. Regardless, settling down near the hot springs remained attractive for agro-pastoralists, and the Maji Moto population grew to around 11,000 by 2015.

3. Research questions

The aimed understanding of dynamics of conflict and cooperation resulting from the MMCWP in Maji Moto, Kenya, and the resulting assessment of the intervention to suggest how interventions such as these can prevent conflict and stimulate cooperation, brings us to the following main research question:

*What have been the implications of the MMCWP on dynamics of conflict and cooperation over the use of the CPWR in Maji Moto, Kenya, and how could adaptation interventions such as these prevent conflict and stimulate cooperation?*

The first step in working towards answering the question above, is to investigate the change in water abundance the MMCWP has created and the visible consequences this had on the people dependent on this water:

*How and to what extent has the MMCWP increased CPWR abundance for the Maji Moto community in terms of accessibility and availability?*

After investigating the new abundance, the changes in social capital of the different water users is analyzed:

*How has the MMCWP altered (bonding and linking) social capital of and between the different water users?*
Additionally, some sub-questions considering dynamics of conflict and cooperation are aimed to be answered in order to test the viability of the conceptual model, as well as to observe the actual impacts of the MMCWP on conflict and cooperation:

- **What changes in cooperation have taken place between the different water users after the MMCWP?**

- **What changes in conflict have taken place between the different water users after the MMCWP?**

A logical next step is to use the results of the sub-questions above to use the conceptual model to analyze the conflict-sensitivity and potential for stimulation of cooperation of the MMCWP.

- **How conflict-sensitive has the MMCWP been and what can be done to stimulate cooperation between the different water users?**

Once the Maji Moto case has brought clarity as to how adaptation interventions such as the MMCWP can become more conflict-sensitive and stimulate cooperation, it is possible to formulate policy suggestions:

- **How can adaptation interventions on CPWRs such as the MMCWP prevent conflict and stimulate cooperation between the different resource users?**

The final part of the research focuses on the reflection of the theoretical approach used. What will this study have added to our understanding of the dynamics of conflict and cooperation? Is social capital a viable approach to understand and assess conflict and cooperation over CPRs? What aspects of these dynamics are understood well, and which aspects remain unclear? Based on this, what could have been better in the approach as formulated for this research? Is the challenge of using social capital unambiguously fulfilled? These questions are summarized in terms of strengths and weaknesses of using a social capital approach, culminating in the following final research question:

- **What are the strengths and weaknesses of using a social capital approach on research that aims to understand and assess the dynamics of conflict and cooperation created by an adaptation intervention on a CPWR?**
4. Literature review on social capital and CPR use

4.1 Social capital, useful for adaptation. But why is it used in research?

Social capital is a broad concept, often defined as relationships of trust, norms of reciprocity, and networks among individuals that can be drawn upon for individual or collective benefit (Coleman 1990, Putnam 1993 in Wagner and Fernandez-Geminez 2008). More fundamentally, social capital is seen as a resource that people own which can be used to acquire other resources (such as other forms of capital) (Bourdieu 1986). This resource constitutes an important asset, which can be called upon in a crisis, enjoyed for its own sake, and leveraged for material gain (Woolcock and Narayan 2000). Additionally, social capital may improve a group/community’s ability to come up with innovative solutions to problems, manage risks, and adapt to change. In the context of climate change adaptation, high levels of social capital can therefore form a relevant part of people’s adaptive capacity, in the form of abilities to cooperate over the use of a climate-affected natural resource.

Therefore, social capital can be important to collectively manage natural resources through the creation of trust and social cohesion within and between communities (hence create cooperation). When trust and social cohesion increases, it is argued, social norms and social control is created which can form a solution against opportunistic, often called ‘free-rider’ behavior in using the shared resource – making collective action possible (Ostrom 1990, Ballet et al 2007), which is a form of cooperation. But apart from these benefits of having social capital in communities, why does social capital lend itself useful for this research, therefore why is it a viable concept in order to reach a deeper understanding of dynamics of conflict and cooperation as a result of an adaptation intervention on a climate-affected natural resource?

First of all, social capital has communicative benefits. It can help to bridge orthodox divides among scholars, practitioners and policy makers. This division is bridged by cooperation and dialogues between the different groups involved, as social capital has generated consensus in all social science disciplines regarding the role and importance of institutions and communities in development. Social capital represents a first approximate answer to the challenge of “appraising the vices, virtues and vicissitudes of the social dimension as it pertains to the wealth and poverty of nations” (Woolcock and Narayan 2000), relevant for development studies. As an aim of this study is to inform policy makers on how the conflict-sensitivity of an adaptation landscape can be improved, the use of a concept which recognizes the importance of (and is recognized by) institutions and communities is also communicative choice, as an aim of this study is to communicate the findings and suggestions to actors involved in the shaping of adaptation interventions, such as NGOs and policy makers.

Second, social capital can help with understanding how outside agencies can work to alleviate poverty in diverse and poorly understood communities, which is a great challenge in development studies and practice. It does so by stressing the importance of social interactions between communities and institutions for economic performance, and that “technical and financial soundness of a project is a necessary, but insufficient condition” for the proper mobilization of ‘outside’ projects (Woolcock and Narayan 2000). As the research focuses on an ‘outside’ project in the form of a CBA intervention, the assumption can be made here that levels of social capital created or diminished by the MMCWP are an important indication for the soundness of the intervention in creating economic performance, thereby also for other adaptation interventions.

Third, social capital has accuracy to address complex issues considering CPR management and governance. Relationship between CPR management and social capital form an important part of this research, as the CBA intervention created a new abundance of a climate-affected CPR, which is water. As the management of a CPR has important implications for the dynamics of conflict and cooperation between people using this resource, it is important that this is incorporated in the social...
capital framework. Relations between CPR use and management and social capital are discussed more in the next section, before the final theoretical framework is formulated.

4.2 Bonding and linking social capitals as catalysts for conflict over CPRs

By the looks of it, there is a tendency to see social capital uncritically as a social good (Pelling et al 2005). This celebration of social capital holds that social capital is inherently good, the more is better, and its presence would always have a positive effect on a community’s welfare (Woolcock and Narayan 2000). This view however, became increasingly challenged in academics at the end of the 1990s, with the start of the recognition of the downside of social capital, also called perverse social capital. Perverse social capital, it is argued, may lead to negative outcomes in societies. This was demonstrated by Rubio (1997) and Portes (2000, 2014), who exemplified perverse social capital with urban gang communities or drug cartels. It may therefore also hinder development, in which communities bear costs of being in a highly integrated community or groups within this community.

In order to conceptualize differences in social capital within and between communities, a distinction between ‘bonding’ and ‘bridging’ social capital has been made by Woolcock and Narayan (2000). Bonding social capital refers to associations between people and of relations within and among organizational entities such as community groups and firms (Woolcock and Narayan 2000). In a cognitive sense, bonding refers to intra-communal ties which give families and communities and sense of identity and common purpose (Astone et al 1999). Bridging social capital on the other hand, refers to inter-communal ties, meaning ties crossing various social divides such as religion, class, ethnicity, gender and socioeconomic status. As it is positively stated, bridging social capital helps in creating cooperation and avoids conflict between communities, and helps to avoid the pursuit of narrow sectarian interests by (isolated) communities as a consequence of a lack of bridging social capital. Hence, when communities are seen as part of an institutional context, bridging social capital helps creating well-being when it exists in combination with well-functioning states or serves as a coping strategy in more dysfunctional states (Woolcock and Narayan 2000).

Using these concepts, perverse social capital can also be formulated as a form of high levels of bonding social capital in a community to which costs can be attached. High levels of bonding social capital within communities, it is argued, especially in combination with low levels of bridging social capital between communities, can lead to the undermining of collective action due to the breaking down of trust between communities (Woolcock and Narayan 2000). Considering cooperation, bonding social capital can therefore have an exclusionary function serving as a barrier to collective collaboration (Wagner & Fernandez-Geminez 2008). Importantly, in the context of conflict and cooperation over a CPR, these situations (of high bonding and low bridging social capital) can create a ‘scapegoat’ attitude towards other communities (Ballet et al 2007), which may create tensions between resource users and eventually lead to conflict. This may lead to situations in where there is no longer sufficient trust between people or communities to manage a resource collectively, which may ultimately lead to social exclusion and inequality in access to the common pool resource (CPR) (Pelling and High 2005), which is water in the case of this research (In short CPWR: Common Pool Water Resource.

For CPWRs specifically, research on local water conflicts suggests that social exclusion and inequality in water availability and/or access can exacerbate already existing tensions and make communities more prone to conflict (Gehrig & Rogers 2009, Houdret 2008, Houdret et al 2010, Lecoutere et al 2010, Richards 2002). This is a warning for research on adaptation: especially bonding social capital can be used to further social control and exclusion, and has been seen to distort adaptation through the building of coalitions of power, with which even development policy can be influenced (Putzel 1997, Pelling 1998).
Therefore, Ballet et al (2007) argue that social capital is no guarantee for creating cooperation over the use of a CPR and preventing exclusion. Cultural norms and values also play an important role in the outcomes of high levels of bonding social capital when bridging social capital is relatively low in how a CPR such as water is managed. This is a warning for this research to pay attention to Maasai cultural values that may influence in how the water is used and distributed among the users, and whether this leads to inclusion or exclusion of certain user groups: another sign that contextual knowledge for inclusive adaptation is necessary, and therefore cultural norms and values should not be ignored in adaptation research and policy making.

Finally, what has been mentioned less in literature on perverse social capital, it is reasonable to assume that not only bonding social capital can have a negative impact on cooperation - thereby distorting adaptation – but also the sub-concept of “linking” social capital. Linking social capital, a form of bridging social capital, refers to the ability of groups to engage with external agencies, to influence policies or draw on useful resources (Pretty 2003). By acquiring this ability, individuals may use their social capital to exclude others or to form alliances that benefit elite factions rather than the common good – also in the case of using of a CPR (Singleton 2002; Walker and Hurley 2004). This process is recognized in Kenya in the form of ‘elite capture’ and exclusion of women during decentralization of government, as well as processes of land privatization (Riamit, 2013). Likewise, vertical ties may be important for agencies implementing adaptation interventions on CPRs, because they are a link between the organization and the community. Such links provide agencies access to community viewpoints, concerns, and knowledge and furthermore, provide means for agencies to distribute their information (Wagner & Fernandez-Gemenez 2008).

5. Theoretical framework: understanding and assessing effects of an adaptation intervention on a CPWR in terms of conflict and cooperation

5.1 Conceptual assessment model: Levels and equality of social capital and water abundance

How can all these different relationships between social capital and possible dynamics of conflict and/or cooperation over the use of a shared water resource be integrated into an assessment model? How can this knowledge be used as a means to understand and explain, and therefore predict, outcomes of adaptation interventions that influence the water use on dynamics of conflict and cooperation?

To clarify and structure the theoretical relationships described above, it is important to step back and recognize patterns. What can be seen?

First, for both bonding and linking social capital, it has been shown that a certain level of social capital is important to have in order to cooperate and prevent conflict related to the use of a CPR, as social control and norms are thereby created, as was stated in the beginning of this chapter. Therefore, average change in level of (bonding and linking) social capital of the different CPWR users is a central part of the analysis.

Second, it is not necessarily just the average level of social capital of resource users that may lead to conflict and block cooperation, but also whether there is a strong (in)equality or (dis)parity in levels of these forms of social capital between the different users of the CPR. As discussed, exclusionary activities by certain groups within a group that all use the common resource are much more likely to take place when their mutual bonding social capital is higher than their bonds with other people in the community. Because if bonds were to be more equal in the whole community, these groups would have a smaller chance or incentive to conduct exclusionary activities in the first place:
their feeling of mutual responsibility towards the rest of the resource users would be too strong to exclude others. Moreover, the rest of the resource users would not allow for it to happen, as it is at the cost of their own resource use. The same can be said for ‘elite capture’ as a consequence of certain people having higher levels of linking social capital than the rest of the group using the shared resource: if people have no more access to external agencies than others, they will have no ability to exclude others or to form alliances benefiting themselves. There must be stressed here that this considers bonding and linking social capital within the group that all are (potential) users of the CPR. Therefore, the model is particularly useful for CPR users that consist out of one community. However, if an adaptation intervention that adjusted CPR and social capital levels for multiple communities is studied, the indicators for social capital can easily be changed: for example using bonding and bridging social capital instead of the bonding and linking variation used here.

Third, as adaptation interventions primarily aim to increase the abundance of a climate-affected CPR due to new scarcity, especially in the case of water, the levels of accessibility and availability that have been, or will be, changed by the intervention need to be taken into account. In other words, the average change level of CPR abundance for all (potential) users needs to be integrated in assessing such adaptation interventions. Abundance is thus not the actual extra amount of CPR that is created, but the actual increase in access and availability of the resource for the users. Accessibility is defined as how accessible the CPR is valued by its users, while availability refers to the sufficiency of water that can actually be used, in both quality and quantity (Tänzler & Ruettinger 2014).

Fourth, as not necessarily just new abundance of a CPR can trigger conflict and cooperation, the level of equality of the availability and accessibility created by the adaptation intervention needs to be incorporated as well. As stated before, unequal water access and/or availability can exacerbate already existing tensions and make communities more prone to conflict (Gehrig & Rogers 2009; Houdret 2008, Houdret et al. 2010; Lecoutere et al. 2010; Richards 2002), which is why creating equal availability and accessibility to the CPR should be an important aim of adaptation interventions that aim to increase CPR abundance. The four factors used to understand the dynamics of conflict and cooperation triggered by an adaptation intervention on a CPR, hence to assess the conflict-sensitivity of an adaptation intervention of this type, are visualized below.

![Conceptual model for understanding & assessing effects of adaptation interventions on CPWRs on conflict and cooperation](image-url)
Using the four indicators in the model, the higher increases in all four factors an intervention has made or aims to make, the higher its conflict-sensitivity and potential for creating cooperation over the CPWR use is. The changes made by an intervention on social capital and CPWR abundance can be clearly visualized using the model, for example:

Example of visualization of an analysis of an adaptation intervention using the CPWR-SC Model

In the example above, results of an imaginary adaptation intervention are visualized. In this case, the adaptation intervention has increased the average level of CPWR abundance and social capital, however has also decreased equalities in available CPWR abundance and levels of social capital between the different resource users. Therefore, this adaptation intervention lacks conflict-sensitivity in the sense that it increased inequalities, which possible triggers for new conflict or may be at the cost of cooperation between the resource users. The distinction made between general increase in social capital and CPWR abundance and possible adjusted levels of equality make this model critical: creating higher average levels of CPWR abundance or even social capital for beneficiaries is not enough to reach complete conflict-sensitivity and effective cooperation between the different CPWR users – (in)equity also plays an important role, in line with the discussed literature. The interpretation is simple: the bigger and more rectangular the green square us made by an adaptation intervention in the model, the more it stimulated cooperation and prevents conflict between the different CPWR users.

5.2 Operationalization of social capital and water abundance

The different concepts that are used in analyzing the effects of the MMCWP using the proposed CPWR-SC model, are broken down into several sub-concepts that define the concepts of average level of social capital, social capital parity, average level of water abundance, and equality of water abundance

5.2.1 Determining average level and parity of social capital
As stated before, in determining levels of social capital, this research focuses on the bonding and linking aspects of social capital, as the research site consists out of a rather homogenous Maasai-community, in which bridging social capital crossing ethnic or strong socio-economic divides are expected to have small significance. Instead, bonding social capital existing between the different water users of the water body affected by the MMCWP are thoroughly researched, and how these
levels have changed after the finalization of the MMCWP nine years ago. Bonding social capital for this research is measured using two indicators, and how these have changed after the MMCWP had been finalized:

- The level of trust between the water users
- The feeling of togetherness of the water users

Additionally, in order to examine conflict and cooperation in more detail between the water users, the following indicators are added:

- The level of cooperation between the water users
- Reciprocal relations between the water users
- Likelihood of collective action taken by the water users
- Likelihood of sanctioning misuse of water
- Involvement in conflict related to water use

These indicators of conflict and cooperation are used, partly based on CPR literature mentioned before. Collective action, sanctioning and reciprocal relations are well-suited indicators of the degree of efficiency in collaboration over CPRs such as water (Ostrom 1990, Pretty 2003). Therefore, changes in conflict and cooperation triggered by the MMCWP can be determined focusing on forms of cooperation related to the water use and governance. Added to that it is a logical assumption that certain dynamics of cooperation and conflict can be seen as both a consequence of, or cause for, certain (difference in) levels of social capital.

Finally, linking social capital of the water users is measured using the following indicators:

- The level of trust of in the governing body of the water source
- The level of trust in the local government
- The access to information by the water users
- The feeling of having an impact on society
- Membership of groups/organizations

In order to determine the differences in social capital that the different water users have, social capital parity is analyzed by measuring the differences in average levels of social capital between the water users before and after the MMCWP. Therefore, the difference in the indicators used for average level of social capital can be used. For each indicator, a Likkert-scale is used to determine the strength of each indicator (for example from very weak (1) to very strong (5), for more detail: see the questionnaire in appendix I). Combining the observed changes in each indicator, the general change in before and after the MMCWP can be determined.

### 5.2.2 Determining average level and equality of water abundance

As stated before, based on the work of Tänzler & Ruettinger (2014), abundance of a CPWR can be measured properly using indicators of subjective accessibility and availability. It is not about the actual, quantitative increase in water that is created, but on how the water users value their accessibility and availability to the water. The following indicators are used, and how these have changed after the MMCWP:

- The level of having accessibility to the water
- The feeling of being excluded from using the water
- The feeling of having sufficient water
- Distance to the water source
Abundance is thus not the actual change in amount of water for use that is created, but the increase in access and availability of the resource as is valued by the users. As stated before, accessibility is defined as how accessible the CPWR is valued by its users, while availability refers to the sufficiency of water that can actually be used. In order to measure equality of water abundance not only the difference in changes in accessibility and sufficiency between the different water users are determined, but also to what extent people feel excluded from using the water – and how this has changed after the MMCWP. Similarly, Likkert-scales are used to measure these indicators. Adding a more quantitative component, the distance to the water source is determined in order to see whether changes in level, inequality - and thereby exclusion - of water abundance relate to geographical distance of the water user to the source.

6. Methodology

A field trip of roughly three months is being conducted by the researcher, from March to May 2016. At the time of writing this interim report, three field visits in Maji Moto have been conducted.

6.1 Selection of respondents

This research is focused on (changes in) levels of social capital and CPWR abundance of the water users, ultimately understanding their conflict and cooperation triggered by the MMCWP. As for the data, it is therefore important that it is directly provided by the CPWR users. In order to structure the data, a distinction is made between people that use the water for different purposes. The main user groups that have been identified are agro-pastoralists, pastoralists, and women (for domestic use, which are often related to the former two groups). Therefore, both levels of social capital and CPWR abundance are generalized for each different user group, in order to be able to identify possible patterns within and between each user group. Agro-pastoralist respondents are mainly found by spontaneously roaming the Maji Moto area by foot, and entering their manyattas (small houses) after asking permission for an interview. The different areas of cultivation that use the water from the dams is (aimed to be) covered equally. By approaching respondents spontaneously, these are therefore selected in a random manner. Pastoralist respondents are a bit more challenging to find. As most live further away (up to 20 kilometers) from the water dam, these are found by driving a motorbike in search for their manyattas. Women that use the water from the hot spring domestically, are often found in or near manyattas while roaming to find (agro)pastoralist respondents, and are therefore also selected in a random manner in the area. For practical reasons and for more efficient use of the available interpreter in Maji Moto, the interviews are conducted simultaneously with a fellow student, who often takes over after 15-20 minutes of interviewing to ask her questions considering related research on issues of land demarcation and public utility land sites in Maji Moto, for another 15-20 minutes. As translation also takes time, every interview is around 45 minutes in length. Information relevant for both studies, such as family size, occupation, and most importantly social capital, are asked alternately by both students. As some information might be relevant for the student that is not asking the questions at that time of the interview, the transcriptions are combined in order to possibly complement acquired data with the data acquired by the fellow student.

6.2 Conducting social capital and CPWR survey and interviews

To acquire the relevant data to determine the indicators for social capital and CPWR abundance discussed above, a survey is formulated (appendix I). It was planned to conduct the survey directly with proportional groups of water users, however this has changed as try-outs were conducted for
collecting survey data. Instead, the survey data is mostly collected indirectly by conducting and recording in-depth, semi-structured interviews. This is being done for two reasons; One, to provide the researcher with additional, qualitative data on social capital, CPWR abundance, and also with contextual information on water governance, cultural (Maasai) norms and values, and the socio-economic context of Maji Moto. The second reason is more practical for acquiring the data: information given by the respondents of the Maasai community in Maji Moto appears to be often given in an unstructured, story-line manner. Therefore, more information is provided when the respondents are given space to talk with the researcher in a more unstructured manner, which is better achievable with semi-structured interviews rather than following the strongly structured and often closed-questions of the survey. By doing so, the surveys are filled in afterwards by using the recorded interviews. If answers are not clear to be fit into one of the possible answers in the survey, the question is left blank. The question list of the interviews align therefore strongly with the core questions of the survey (the interview topic/question list can be found in appendix II).

6.3 Acquiring geographical location of respondents

Data on the respondent’s location is retrieved by using software on a smartphone, and visualized in importing the data on the Geographical Information System (GIS) of Google Earth. The spatial data is used to calculate their distance to the CPWR as well as to the other respondents. By doing so, it can be determined if and how geographical location of the manyattas of respondents share a pattern in their levels of social capital and CPWR abundance. For example, there can be seen whether exclusion in using the water of respondents correlates with distance to the CPWR or to other water users – hence whether distance to the CPWR matters for being excluded.

6.4 Analyzing the survey and interview data

The acquired survey data on the relevant indicators can be used in statistical analysis, in which mainly Likkert-scale calculations can be made in order to determine the (changes in) levels of social capital and CPWR abundance to the researcher. Where a Likkert-scale is not used (in the indicators reciprocity, feeling of having an impact, access to information), a dichotomous scale is used of either less or more.

The interview transcriptions are being coded in order to be able to fill in the survey using the interview data efficiently, as well as to analyze all the interview data more thoroughly (the code tree can be found in appendix III). The code tree incorporates both codes which reflect data directly referring to the social capital and CPWR abundance indicators, and that reflect important complementary data to this – these are water governance, dynamics of conflicts and cooperation between the water users.

6.5 Ethical considerations

As this research focuses on levels of social capital and CPWR abundance, thereby related conflict and cooperation, it is important that these dynamics can be retrieved by the researcher in the way these exist in reality. Therefore, it is important that different water user groups are represented as equal as possible when collecting and analyzing data. Hereby, it is important for the researcher not to choose sides in certain conflicts between water users when retrieving data. Choosing a side (for example expressing an opinion on the local water committee) may lead to unwillingness of other water users to participate in the research resulting in incomplete data. Also, biased results of the research may be formulated when the researcher chooses to represent one water user group or person in a conflicting situation more than the other group or person in the results. Additionally, choosing side in a conflict may lead to altering existing dynamics of conflict. For example, giving voice to the more powerful or
powerless in an adaptation landscape might have consequences for the social dynamics within the studied community – maybe even exacerbating existing conflicts. Therefore, it is important that the researcher remains neutral in his or her attitude towards respondents. Also, the researcher is to remain neutral when asked to express his/her opinion by people related to the adaptation landscape as this may have an influence on data retrieved and existing dynamics of conflict. When the researcher is asked of whom information is retrieved, the researcher has to protect the anonymity of other informants. Therefore, respondents are kept anonymous and represented in the research data and results under pseudonyms. For privacy reasons and previous ethical considerations, respondents will only made photographs of, or retrieved GPS data from if they have given approval for this. The principle of informed consent is to be used: data will only be used of a respondent if approval is given by him or her. Additionally, all respondents are informed with the aim of the research and how and to whom results will be presented.

7. Preliminary results

Data collection and analysis is still in progress. Thus far, 14 agro-pastoralists (of which 6 women) and 6 pastoralists (of which 1 woman) have been interviewed and the transcriptions have been written. However, the interviews have not been fully coded yet, and therefore the preliminary findings here are based on the impressions of the student. The method used is by searching on related terms in the transcriptions; for example, when looking for results on trust in the Water Committee, results are found in each transcription by searching where related terms such as “Water Committee”, “Trust”, and “Water distribution” are mentioned by the student or respondent. For each respondent, their answers are presented in various tables.

7.1 Preliminary results on level and parity of social capital

7.1.1 Bonding social capital: the level of trust and togetherness (T&T), cooperation, and conflict between the water users

Considering bonding social capital between the water users, distinctions are made in trust between agro-pastoralists or farmers, between pastoralists, and between agro-pastoralists and pastoralists. As most respondents gave similar reactions to questions about trust and togetherness (T&T), which are overlapping concepts, these are put together as a first impression on bonding social capital between the water users. Level of cooperation is also included. The reactions given on trust and togetherness by the different respondents are counted:

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Got higher</th>
<th>Got lower</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&amp;T between agro-pastoralists (total 14)</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>T&amp;T between pastoralists (total 6)</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>T&amp;T between agro-pastoralists and pastoralists (total 20)</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

*Table 1 – Number of respondents indicating the level and change in T&T with other water users*

A clear impression is that most agro-pastoralists indicated that trust between them is low, and has gotten lower over time. The main reasons given for this is the inequality in water distribution, as was said by most respondents that some farmers receive more water than others. Some agro-pastoralists did no longer trust each other as they are able to open and close their furrows to get water access for irrigation, which they sometimes do ignoring the scheduled distribution as they had not received sufficient water. Most mistrust between agro-pastoralists appeared to be between committee members...
and non-committee members, whom are all agro-pastoralists, which is discussed in the next section. Changes in T&T between agro-pastoralists appeared hard to determine, as before the MMCWP most agro-pastoralists were still pastoralists. It was indicated often however, that before land was being demarcated for the pastoralists diversifying their livelihood into agro-pastoralism, people felt generally closer together, as families lived together in larger compounds instead of being divided next to their own farming plots, and therefore had more social contact.

T&T between agro-pastoralists and pastoralists is considered generally good, as most agro-pastoralists’ main source of income is also their livestock (and were pastoralists before the MMCWP). This means that both parties still need the water for their livestock as first priority, which is why there appears to be no mistrust between the two user groups considering water use. However, similar to the lower social interaction between agro-pastoralists, interaction, and therefore togetherness, is also indicated to have become lower has people have been divided onto their own demarcated lands.

T&T between pastoralists was quite divided and less expressed by the interviewed pastoralists. However, one female pastoralist sketched a lowering of T&T with her colleagues, stating that

“The level of trust has gone down. Because everybody is living on their parcel... Before, they trust[ed] each other because of no any competing lands, there was free movement.” (Interview 20)

This means that according to her, similar to the T&T between the agro-pastoralists, T&T has gone down between pastoralists because is recently land is demarcated and privatized. This is a process which is still ongoing, and therefore might reduce T&T between the different water users even more so in the future.

### 7.1.2 Conflict and cooperation between the water users

Second, in order to not only get an indication of changed levels of social capital, also conflict and cooperation between the water users is determined in more detail using the following indicators.

<table>
<thead>
<tr>
<th>Cooperation</th>
<th>Good</th>
<th>Got better</th>
<th>Got worse</th>
<th>Bad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperation between agro-pastoralists</td>
<td>3</td>
<td>2</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Cooperation between pastoralists</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Cooperation agro-pastoralists and pastoralists</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

*Table 2: Number of respondents indicating how they value their cooperation with other water users*

Considering levels of cooperation and change therein, similar trends to T&T changes are observed. A majority of agro-pastoralist have suggested that cooperation with each other has gotten less or has been bad in general. Main reasons given for this were inequality in water access, the use of generators to pump water by privileged farmers, and inequality in distance of their plot to the water source.

Cooperation with pastoralists is not considered as bad, but has gotten less according to most pastoralists. Main reasons for that were the demarcation and privatization of land, leading to fencing and less free movement for livestock, detrimental for cooperation in managing pastureland. A case of non-collaborative, free-rider practices was given by a respondent who told that some pastoralist fenced his land and often grazed his cattle on other remaining unfenced lands. His fenced land he kept as back-up pasture for during droughts – therefore was grazing the other land in wetter times. This put higher pressure on the remaining unfenced land, which is mainly at the cost of pastoralists not able to fence their land and therefore having fewer pasture remaining during droughts (Interview 1).
Most respondents indicated that reciprocal relations are quite strong after the MMCWP. An often mentioned example, is the exchange of crops and livestock between agro-pastoralists and pastoralists, which they value very important. Considering collective action, most agro-pastoralists indicated that when there exists a problem in the water supply, it is very likely that agro-pastoralists work together and fix the problem – for example cleaning the furrows of vegetation or repair leaks.Sanctioning hardly happens when the water is misused. Most people indicated that, when water is misused, for example by the over-use of pumping with generators during droughts, it is easily settled with the WC or chief. So in these aspects, dynamics of cooperation seems to be active between the water users.

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reciprocal relations between water-users</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Likeliness of collective action</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Likeliness of sanctioning of misuse of water</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 3: Number of respondents indicating their collaboration with others in managing the CPWR

<table>
<thead>
<tr>
<th></th>
<th>Before MMCWP (of which violent)</th>
<th>After MMCWP (of which violent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conflicts between agro-pastoralists</td>
<td>0</td>
<td>10 (4)</td>
</tr>
<tr>
<td>Conflicts between pastoralists</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Conflicts between agro-pastoralists and pastoralists</td>
<td>0</td>
<td>5 (1)</td>
</tr>
<tr>
<td>Conflicts between agro-pastoralists and the WC</td>
<td>0</td>
<td>6(3)</td>
</tr>
<tr>
<td>Conflicts between pastoralists and the WC</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4: Number of respondents indicating to have experienced conflicts

All respondents indicated that conflicts have been occurring between the different water users after the MMCWP, while before the project this was hardly the case. So far, it appears that the conflicts primarily take place between agro-pastoralists, of which some form the WC. The respondents indicated that most conflicts are non-violent quarrels, however sometimes may develop into physical fights. Violence mainly occurs between agro-pastoralists, on both members of the WC and non-members. Most respondents indicated that these quarrels mainly develop during droughts, out of discontent about the amount of water that is provided to their parcel. Often, other agro-pastoralists, both members and non-members of the WC are then blamed for distributing the water unfairly. Some respondents think that the quarreling developed because of the increased water abundance, creating higher demand and thereby competing claims. For example, someone stated that

“Therefore the water didn’t have any quarrel because our water was there, and the users were very less. So probably if you get the water there, and the source is only one, and you only use this amount. So the quarreling is very new.” (respondent 1)

Others blame the WC for distributing the water unfairly as an important cause:

“Some of them [the WC], they always betray the people. […] If I have any money that I can now […] give you, and maybe you are the head of the committee. Then you give me the chance of taking that water. Someone who don’t have money, he may not get any water, and the crops may end up dead” (respondent 6)

“The good thing about this project and this dam, is at least we now have enough water. The only challenge now is management” (respondent 2)

To a lesser extent pastoralists are sometimes involved in conflicts with agro-pastoralists. Pastoralists indicated that the main cause for these quarrels is their discontent about the increasing amount of
(fenced) irrigation parcels near the water pan, which blocks their access routes for their cattle to reach the pan. To a lesser extent, there is discontent about the water use for irrigation by the agro-pastoralists which decreases water levels, particularly when water is pumped to parcels with generators. However, it is said, this happens less frequent, as the livestock of agro-pastoralists is also dependent on the same water body.

7.1.3 Linking social capital: trust in local (water) governance, information and societal impact

Linking social capital is determined by considering trust in the local water governing body (Water Committee, WC), the local government, their access to (political and market) information and their feeling of having an impact on the community. The first results are shown here:

<table>
<thead>
<tr>
<th></th>
<th>Agro-pastoralists (total 14)</th>
<th>Pastoralists (total 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust in WC</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Trust in local government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owning a phone</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Owning a radio</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Having an impact on the community</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Member of a group/organization</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 5: Number of respondents indicating their linking social capital (trust in local governance, access to information, group membership and the feeling of having an impact on the community)

Trust in the WC appears to be much divided. Some agro-pastoralists do not trust them because they think the WC is biased in distributing the water, while others think it is not the WC, but rather the low level of water in the dam that causes a lack of water during droughts. Pastoralists are also divided in their trust in the WC, however were not as negative, as most agro-pastoralists also need the water for their livestock as first priority. Trust in local government appears to be very low by both water users, as they feel that land is being allocated, privatized, and even grabbed without their voice being heard. Additionally, many agro-pastoralists are disappointed that the local government has not lived up to their “promise” of cementing the irrigation furrows.

Most agro-pastoralists appear to own a phone and radio, and are part of groups and organizations, while this seems to be the opposite for pastoralists. It therefore seems that pastoralists have a lower access to information than their farming colleagues. Considering membership of groups/organizations, the most mentioned group was the women self-help group, to which a majority of female agro-pastoralists were part of (5 out of 6), and helped them in sharing finance and information. The feeling of being able to have an impact on the community appears to be rather low for most respondents, as they feel that the local government imposes most decisions without their consent.
7.2 Preliminary results of average level and equality of water abundance

7.2.1 Average level and equality of water abundance

<table>
<thead>
<tr>
<th></th>
<th>Agro-pastoralists (total 14)</th>
<th>Pastoralists (total 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Water sufficiency</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Water accessibility</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Feel excluded</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 6: Number of respondents indicating their (lack of) water abundance

“Some people cry for help and they are not helped… and crops may dry up.” (Interview 18)

Most agro-pastoralists indicate that the amount of water available for them is not enough, that it is not accessible enough, and that some of them feel excluded in using the water. The most important reason given for the lack of water sufficiency are the low water levels during dry spells which causes the outlets to close as water has to be left in the pan for their and others livestock. This frequently causes harvests to fail. Their accessibility is also valued low, as many complain that it takes a long time before the water arrives at their parcel, because the furrows slow down the gravitational flow of water due to absorption of the water and the recurrent growth of vegetation in the furrows. Added to that, much of the water evaporates in the furrows as it is on its way to the parcels, given the high evaporation rates in the semi-arid, moderately high altitude (+/- 1900m) climate. Sometimes, leakages of the furrows exacerbate this problem in accessibility. Some feel excluded from using the water as they think that the WC favors themselves and relatives, at the cost of the water supply of others. Others do not blame the WC for a lack of access, but the relatively long distance their parcels are located from the water pan, for which the water needs a long time to flow to their parcels, and more is lost on the way.

The indicated lack of access is related to inequality in water abundance between the agro-pastoralists. As some of them are located further from the water pan than others, their accessibility to irrigation water becomes clearly lower compared to agro-pastoralists with parcels closer to the dam. As the location of each respondent has been recorded with GPS coordinates, an analysis to proof whether a pattern exists between sectional location of the plot and distance to the water dam, and their water availability and/or accessibility, is still to be made. Inequality in water abundance also persists between agro-pastoralists using a generator to pump water onto their irrigation parcels, and their colleagues that cannot financially afford to do so. As the generators can use up a relatively large amount of the dammed water, less may be left behind for those dependent on distribution through the furrows. However, most agro-pastoralists have made clear that generators are no longer allowed to be used when the water level drops to a certain level – an informal regulation that is said to be working.

“Even during dry seasons, there has never been a situation where it is not sufficient for the livestock. It has never been to a level where livestock are not getting enough water. [...] Though currently, since the land became privatized, we are experiencing a lot of problems because the routes to the river blocked. The chairman even assigned someone a parcel that’s on the river. So there is no ways to the river from these far regions. So that is a major problem for the livestock keepers now” (Interview 18)

For pastoralists, the preliminary outcomes are very different. The quote above, made by a veteran pastoralist located around six kilometers from the water dam, summarized their main issue considering water abundance. All pastoralists interviewed thus far, indicated that the water is sufficient for their cattle. However, they also indicated that there is a problem in accessibility to the water. As land is being demarcated and privatized, and the area of irrigated parcels is expanding near the water pans,
routes to reach the water are blocked for pastoralists. In some cases, pastoralists have to divert their routes throughout the Group Ranch dramatically because of the recent and ongoing development of privatizing and fencing of lands. In some cases, pastoralists are forced to drive their livestock over the rocky hills in their attempt to reach the water pans without trespassing the newly privatized territories.

Considering inequality between pastoralists, the main development that creates differences in water abundance between them is that some pastoralists built their own, privatized dams on their allocated land. This is done in a reaction to the reduced access to the water pan near the hot springs. These dams are rain-fed and therefore seasonal, and are not filled by a permanent source of groundwater as the common water dam near the hot springs. But despite not being a permanent source, pastoralists have indicated that these new, privatized dams greatly increase their individual water access. However, many pastoralists cannot afford to build their own dam, which is why there is an increase in inequality of water accessibility between the pastoralists.

### 7.2.2 Geographies of water abundance

As the location of each (agro)pastoral respondent has been recorded, these can be presented in a map. Whether distance to the water source shares any pattern of being excluded, accessibility and sufficiency of water for the different agro-pastoralists can be seen when combining the data given in each interview with the location of that respondent. Also, recordings have been made on the speed of the water flow through the furrows using the location of the water flow at a given time. By doing so, it can be seen how high the differences are in water provision per parcel, and therefore can serve as an indicator for inequality in water abundance. Additionally, the locations of the interviewed pastoralists, who are spread out over the group ranch, can be used to discover possible links with their water abundance and inequality between them in the same manner. This is work to be done.

### 7.3 Summary of preliminary results – the CPWR-SC Model

In order to summarize the impacts of the MMCWP on the different indicators, the first impressions are represented in the the CPWR-SC model.

![Diagram](image)

*Presentation of preliminary results on the impact of the MMCWP on social capital and water abundance*
As can be seen, the preliminary results show a lowering of average level of social capital. This is supported by decreases in T&T and cooperation between the water users, and an emergence of conflicts especially between agro-pastoralists. However, as the likeliness of collective action is still high and reciprocal relations appear to be strong, social capital has certainly not reduced to levels that cooperation is completely absent. But it has weakened. Linking social capital seems not to be lowered as much, however the very low trust in - and therefore low contact with - the local government by all water users proves that linking social capital has not made significant increases either.

Considering social capital parity, this has also decreased – meaning that inequality in bonding and linking social capital appears to have increased. This is supported by the observation that certain groups of agro-pastoralists appear to know each other well and praise their cooperation (these are mainly the farmers more related to the WC), whereas a larger amount of their colleagues is not satisfied with how the water is distributed and indicated that cooperation has gotten less. Also, a linking social capital disparity is visible between agro-pastoralists and pastoralists, where the former seem to have a better access to information as they own phones and radios, while the latter do so less. As most phones of agro-pastoralists are acquired after the MMCWP, this can be an indicator of increasing linking social capital disparity with the more ‘disconnected’ pastoralists.

Average level of water abundance has risen strongly after the MMCWP. Despite that most agro-pastoralists indicate that there is not sufficient water during droughts for their parcels, it is also indicated that before the MMCWP there was hardly any water available at all for irrigation. Also, despite the increasing problems in accessibility, the pastoralists indicated that since the dam has been built, water has always been sufficient for their livestock, while this was not the case before.

However, equality in water abundance appears to have decreased. This is supported by the fact that as farming practices emerged after the MMCWP, inequality between the agro-pastoralists in their water access comes from the emerging use of generators, as well as the strong differences in distance of the plots to the water dam. Before the MMCWP, farming practices hardly existed, and therefore these inequalities hardly existed. However, other inequalities before the project might have existed in terms of access to water for livestock, but the emerging conflicts culminating partly from abundance inequality have shown that this has increased with the emergence of farming practices. For the pastoralists, inequality in water access/availability also seems to have increased. As they are facing increasing problems with accessing the water due to land privatization, fencing and farming, the wealthier pastoralists choose to build their own, seasonal dams on their allocated lands. This increases their access to water strongly, while pastoralists who cannot afford this can find no solution so far.
8. Preliminary conclusions: towards conflict-prevention and cooperation in CPWR-related adaptation interventions

While the MMCWP increased water abundance in terms of availability for all water users, it also appears to have had effect on dynamics of conflict and cooperation between the different people dependent on the CPWR. New forms of cooperation emerged as a consequence of the emerging farming practices in proximity of the dam, between the former livestock keepers who started to diversify their livelihoods by cultivating parcels. The group appears to have high levels of cooperation, whereby collective action for maintaining the water provision is often undertaken. Also, relationships of reciprocity flourish between agro-pastoralists and pastoralists as crops can now be exchanged for livestock.

However, the increased abundance of water created by the MMCWP attracted a high amount of users aiming to diversify their livelihood by adopting farming practices. This created new competing claims on the CPWR, as water demand has increased strongly as a consequence of the use of the water for irrigation. Accessibility to the water appears to be unequal between agro-pastoralists, as some are located closer to the water pan than others, or can use generators to pump the water to their parcels where others cannot. Some of them, especially those located further away from the CPWR, feel therefore excluded from using the water. Some of them blame their colleagues, thereby primarily the local water governing body, for being corrupt and biased in their decisions on water distribution. This is an important trigger for the newly developed conflicts, which in some cases turn violent.

Additionally, while general levels of social capital in the Maji Moto community are high, they seem to have lowered the years following the MMCWP. This is not only an effect following from the emerging farming practices in proximity of the new water body, but also the processes of land demarcation and thereby privatization of the former communal pasturelands. The water users indicate to interact less with each other as of now, each lives on their own parcel, where before the community lived closer together on the traditional compounds – and therefore had stronger social bonds. Apart from lower social bonds, the privatization of land is a major challenge for the pastoralist groups, as these see their accessibility to the water pan becoming lower every year, as well as cooperation that existed when the communal lands were used is fading away.

Adaptation interventions such as the MMCWP, which aim to increase water abundance but also cooperation between the water users of a community, should be aware of the possible conflict-effects that it can have within a community due to the emergence of new competing claims on the created increase in availability of a CPWR. Inequality in access leads to quarrels, and therefore local governance structures such as the WC should be stimulating equal access by representing users that have differences in their access. Technology such as generators in order to cope with a lack of access do solve problems for water sufficiency for its users, however can be at the cost of other users – and therefore technology can increase inequality in access. If technology is used instead to increase accessibility to water for all the CPWR users, it will not exacerbate inequalities. This can be done for example, by incentivizing the sharing of increased water accessibility for a particular technology user with others that previously were also lacking access. That way, conflicting situations can be prevented and cooperation stimulated.

As inequality in access can not only be a problem and conflict catalyst for users in proximity of a CPWR, adaptation interventions such as the MMCWP may also trigger effects of new water uses that lower accessibility to the CPWR for groups that use the water in a more traditional manner. In the case of the MMCWP, the emergence of farming practices in combination with wider processes of land privatization, is lowering water access for pastoralist users as their access routes are increasingly blocked by formerly common pasturelands into farmland or newly privatized and fenced pastureland.
Contexts in which land is increasingly privatized and put to new use may also lower social bonds between the CPWR users, and therefore lower cooperation. Therefore, adaptation interventions on CPWR such as the MMCWP have to take into account possible new water uses it triggers and thereby changes in social bonds between its users. It is important to include what consequences this can have for the water accessibility for groups that do not adopt those uses. Possibilities to avoid such situations lie in engaging the traditional water users to include them in what for and to what extent the water is used for new (farming) purposes, so this would not go at the cost of their accessibility. Another possibility is to stimulate the processes of creation of new water resource abundances for the more traditional users, in other places where accessibility remains high.

Inequalities in access to a CPWR and thereby a lowering of social ties between its users may not only emerge as a result of existing differences in wealth between the CPWR users, but also because of the new resource uses - such as land and water use for farming, in the case of the MMCWP - an adaptation intervention may trigger. Therefore, as more funds for adaptation interventions are expected as a result of the Paris agreement last December, it is important that possible emerging inequalities in access to a CPWR adaptation interventions as well as existing changes in social ties as a result of wider contextual processes are included in adaptation policy making. Only then, adaptation interventions may avoid conflict and stimulate cooperation between the different CPWR users.

9. Reflection on the progress: Analytical challenges

So far, the research has been going generally well. ILEPA has provided me and the other student with office space, helped well in settling down in Narok Town, and provided an interpreter for the fieldwork in Maji Moto. Some practical issues exist, but these are not detrimental for the research. For example, the main translator (Simon) is sometimes not available; however alternatives are easily arranged by him. Unfortunately, due to the absence of electricity in Maji Moto, data cannot be analyzed at the site, and has to be done in Narok Town. Unfortunately, also in Narok work is sometimes delayed due to a lack of electricity, especially now in the midst of a rainy season. However, these are small problems that are not detrimental for the research in any way.

Two field trips to Maji Moto have been conducted, of which I stayed two times five days. Food and shelter is provided by family of our interpreter. The main work in Maji Moto is data collection, following one or two weeks of writing transcriptions. I interviewed 20 different water users so far, of which 14 agro-pastoralists (of which 6 women) and 6 pastoralists (of which 1 woman). Therefore, it is clear that more (female) pastoralists are needed for data collection, so that the different water users are more equally represented. Despite that the amount of respondents is relatively low, most of them have been highly informative, as some respondents have the habit to answer in elaborate stories. Therefore transcribing and the first analysis has been time- and energy- intensive. But thanks to the richness of the data so far, preliminary results have been written in already a rather accurate manner. However, it will unfortunately not be possible to raise the amount of respondents to an amount that is statistical representative for all water users, within the given time for fieldwork. Nonetheless, strong qualitative implications for certain results are already here, and will be complemented by one or two more field trips.

Remaining challenges of this research are not practical, but more analytical in nature. By rewriting and improving the theoretical framework and conceptual model in the last week, much has been improved in the clarity of the scope of this research. As can be read, the research is now fully focused on the (agro) pastoralist groups, and their changes in water abundance (accessibility/availability) and in (bonding and linking) social capital. Domestic users of the hot springs have been out of the scope of the MMCWP, as these have not been strongly affected by it, and therefore are also left out of this
research. Bridging social capital has been left out of the analysis, as the different water users are nearly all members of the same Maasai community and therefore is less relevant for this analysis: observed competing claims on the water appear to be intra-communal, and not inter-communal. However, the sub-concept of linking social capital is kept in the analysis, as this is especially assumed to be relevant in understanding links of people with local (water) governing bodies which appear to have a relevant impact on water accessibility for the users.

Focusing on the (agro) pastoralist groups also simplifies data analysis, as the two groups can be compared in their changes in water availability, accessibility, and social capital. While analyzing water accessibility/availability is rather clear and respondents are very informative on this, analyzing social capital is more of a challenge. Most respondents are clear that social relations have changed in the sense that the community is less ‘close’ together, therefore a conclusion of decreased bonding social capital can be drawn. It is also clear that this has been a reason for or result of declining cooperation between many of the respondents. The nature of these changes in social capital however, seems to lie primarily in the wider socio-economic-political context of Maji Moto: ongoing developments as land privatization led to decreases in bonding social capital. Changes in linking social capital are more challenging to analyze. An analytical challenge lies in how these different aspects of bonding and linking social capital are valued. If someone acquired a phone, but is less close with his neighbors, but closer with another group of people because of that phone – did his social capital increase or decrease? Perhaps, instead of discussing the change in levels, which seems to be rather constructive, a more proper approach would be fitting such changes in different social capital aspects into the SC-CPWR model. For example, instead of trying to attempt to determine a general increase or decrease in social capital, distinguishing between bonds and links seems more realistic. On the other hand, for the sake of writing proper communicative policy suggestions, the model should also not become overly complex.

An even greater analytical challenge that I am facing is determining the change in equality of levels of social capital. Because as it is challenging to determine levels of social capital, it is even more challenging to determine how changes in differences in social capital levels between people can be captured. For example, when comparing a person with high linking social capital and lower bonding social capital, to a person that has the opposite (high bonds and low links), can this be considered as inequality in social capital? Comparing different kinds of social capital in this manner seems quite artificial as the capitals are different in nature. The indicators used to measure social capital should therefore be re-evaluated and perhaps adjusted – perhaps not measuring levels and inequality, but the changes in social capital itself. For example, a description of growth of linking social capital while bonding social capital deteriorates would be more realistic and clear than describing an increase or decrease in social capital parity. Anyway, this is an analytical challenge that has to be worked out.

Another challenge that I will face, is the policy aspect that the final assignment of writing a ‘policy report’ entails. In order to formulate useful policy suggestions based on the results of the Maji Moto study, an analysis of the existing policy-making related to climate change adaptation is needed. Therefore, it will be needed to conduct a policy analysis on different levels of policy making, capturing the different relevant scales where adaptation policy is, or will be, shaped. This may be international, national - Kenyan -, or regional). However, as adaptation policy making is a relatively new field, there will probably be plenty of opportunity to formulate suggestions based on the Maji Moto study.
10. Outstanding tasks

- Interview people knowledgeable or influential on the local (water) governance. As water users have primarily been used, more knowledge is still needed on the governance aspects of the water. By doing so, tensions between water users and other water users being member of the water committee can be better understood.

- Interview more (female) pastoralists as these have hardly been found thus far, and agro-pastoralists in the irrigation sections which have not been visited so far.

- Conduct statistical analyses on the used indicators, primarily using Likert-scale analyses among other methods that may pop up to be useful. This can be started once all data has been transcribed and coded.

- Make a spatial analysis on relationships between social capital, water abundance (accessibility & availability), and geographical locations of respondents. This can be done by using indicators such as distance to the water pan, the recorded water flow speed through the furrows, and map the different irrigation sections. These can be combined with the results of levels of social capital, conflict and cooperation of the respective respondents. By doing so, can be mapped an seen whether the role of location of irrigation parcels or pastoral manyatta share a pattern with the collected data on water abundance and social capitals. Perhaps, certain geographies of exclusion come to the surface (places of where people are concentrated that feel excluded from water use), which may be an important catalyst of conflict of the area with irrigation parcels.

- Create a map of the Maji Moto area and location of respondents reflecting their accessibility to water and social capitals for the sake of interpreting and communicating results.

- Conduct a policy analysis of adaptation-related policy making. The existing adaptation policies of different governmental levels are to be analyzed, such as international, Kenyan, and Kenyan regional (county) level. By doing so, gaps in policy making can be identified and suggestions can be made based on the results of the Maji Moto study.

References


Appendix I – Survey on Social Capital and CPWR Abundance

Date …………………….. Name …………………….. Respondent no…………………..

This survey is undertaken by Utrecht University in cooperation with ILEPA to investigate the impacts of the Maji Moto Community Water Project, which took place in 2006/2007. The focus lies on social relationships between people that use the water, and what change cooperation and disagreements the project has initiated.

1. **Respondent’s characteristics**

1.1 Are you a man or a woman? M/W

1.2 What is your age? ……………………..

1.3 Are you married? Yes/no

1.4 What is your primary occupation? ……………………..

1.5 What is your household size? ……………………..

1.6 Did you study? If yes, at what level? No/yes, at …………………………………………

2. **Maji Moto Community Water Project and water use**

2.1 Have you heard of the MM Community Water project? Yes/no

2.2 It was a project initiated by local people and was funded by international organizations and the local government. Below are the aims listed the project had, and have been achieved to a varying extent. Did you participate in any of the activities that took place in 2006/2007 of the project below? (tick)

- Rehabilitate the windmill and train community members on its maintenance
- De-silt the water pan, fence the pan area and plant grass and trees
- Train the community members on project management
- Operationalize a management system for sustainability of the project
- Rehabilitate the cattle dip, trough and storage tank
- Install a demonstration drip irrigation kit in the secondary school plot
- Train the community on drip irrigation
- Operationalize the government policy to encourage communities to initiate, implement and manage their own water projects.
- Host a conflict resolution workshop with all stakeholders

2.3 Did you participate in any way with the activities above after the implementation of the project (from 2008 up til now), for example maintenance of the windmill or irrigation channels?

Yes/no
If yes, what activities?
…-----------------------------------------------------------------------------------------------------------------------
2.4 What is your main purpose of water use from the hot spring/dams/windmill?

Pick one or two answers and rank in importance (1=primary use, 2=secondary use)
I use the water mainly for
- Domestic uses
- Pastoral (livestock)
- Farming (irrigation)
- a local business
- a public/private institution (such as a church, community dispensary, local primary and a girls high school, a private academy)

2.5 For each purpose, do you use more or less water from the hot springs after the MM Community Water Project? (tick)

<table>
<thead>
<tr>
<th>Purpose</th>
<th>More</th>
<th>Less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purpose 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If amount of use is similar, leave blank

3. Water availability

3.1 Is there sufficient water for you available in the wet and dry seasons?

<table>
<thead>
<tr>
<th>Before the project</th>
<th>After the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>wet season</td>
<td>dry season</td>
</tr>
<tr>
<td>Yes/no</td>
<td>Yes/no</td>
</tr>
</tbody>
</table>

3.2 How far are you located from the hot springs / dams?

..................

3.3 How do you value your accessibility in using the water from the hot spring?

<table>
<thead>
<tr>
<th>Very accessible</th>
<th>Before the project</th>
<th>After the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somewhat accessible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat inaccessible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very inaccessible</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.4 Did/do you ever feel excluded in using water from the hot spring?

<table>
<thead>
<tr>
<th>Before the project</th>
<th>After the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>wet season</td>
<td>dry season</td>
</tr>
<tr>
<td>Never</td>
<td></td>
</tr>
<tr>
<td>Almost never</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td></td>
</tr>
<tr>
<td>Often</td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td></td>
</tr>
</tbody>
</table>
3.5 Who or what causes this exclusion? On what grounds does this happen, and how do you cope with it? Explain.

3.6 Are women disadvantaged in using water from the hot spring? Has this changed?

<table>
<thead>
<tr>
<th>Disadvantaged</th>
<th>Before the project</th>
<th>After the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somewhat disadvantaged</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not disadvantaged</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Water user groups

4.1 Your water user group includes you and other people that use the water from the hot spring/pans/windmill for the same purposes. You can for example, belong to farmers, pastoralists or domestic users. The questions below focus on relationships within and between people in your ‘user group’ and other ‘user groups’.

How strong is the feeling of togetherness or closeness for you in your water user group? Use a five point scale where 1 means feeling very distant and 5 means feeling very close. Has this changed after the project?

<table>
<thead>
<tr>
<th>Feeling of togetherness/ closeness</th>
<th>Before the project</th>
<th>After the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very close</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat close</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither distant nor close</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat distant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very distant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.2 Have differences within your water user group ever caused problems? If so, what kind of problems?

4.3 How strong is the feeling of togetherness or closeness of your water user group, and groups of people that use the water for different purposes? Use a five point scale where 1 means feeling very distant and 5 means feeling very close.

<table>
<thead>
<tr>
<th>Feeling of togetherness/ closeness</th>
<th>Before the project</th>
<th>After the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very distant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat distant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither distant nor close</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat close</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very close</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.4 Have differences in your water user group ever caused problems? If so, what kind of problems?

5. Trust

5.1 Generally speaking, would you say that most people that use the water from the hot springs can be trusted, or that you can’t be too careful in your dealings with other people?

<table>
<thead>
<tr>
<th>People can be Trusted</th>
<th>You Can never be too Careful</th>
</tr>
</thead>
</table>

5.2 In general, do you agree or disagree with the following statements? (1. Strongly Agree; 2. Agree; 3. Neither Agree or Disagree; 4. Disagree; 5 Strongly Disagree)

- Most people who use the hot spring’s water can be trusted.
- With similar water users as me, one has to be alert or someone is likely to take advantage of you.
- Most people that use the water like me are willing to help if you need it.
- People that use the water for the same purposes, generally do not trust each other in matters of lending and borrowing money

5.3 Do you think that since the MM Community Water Project, the level of trust in your water user group has gotten better, worse, or stayed about the same?

<table>
<thead>
<tr>
<th>Gotten better</th>
<th>Stayed about the same</th>
<th>Gotten worse</th>
</tr>
</thead>
</table>

5.4 Do you think that since the MM Community Water Project, the level of trust between your water user group and other water user group has gotten better, worse, or stayed about the same?

<table>
<thead>
<tr>
<th>Gotten better</th>
<th>Stayed about the same</th>
<th>Gotten worse</th>
</tr>
</thead>
</table>
6. Conflict and disagreement

6.1 Has the implementation of this project created disagreements within your water user?

Yes/No

If yes what kind of disagreements and with who? explain:

--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

6.2 Has the implementation of this project created disagreements between your water user group and others? Yes/No

If yes what kind of disagreements and with who? explain:

--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

6.3 Have disagreements related to the use of water ever lead to conflict, violence or destruction of property? Yes/no

If yes, explain

--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

6.4 Have you been involved in the conflict resolution workshop of the project? Yes/No

If yes, has this workshop contributed to reducing conflicts/disagreements about the water use? Why and how?

--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

6.5 Compared to before the project, has the level of disagreements/conflict in your water user group in general changed?

<table>
<thead>
<tr>
<th>Increased a lot</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased a little</td>
<td></td>
</tr>
<tr>
<td>Stayed about the Same</td>
<td></td>
</tr>
<tr>
<td>Decreased a Little</td>
<td></td>
</tr>
<tr>
<td>Decreased a lot</td>
<td></td>
</tr>
</tbody>
</table>

6.6 Compared to before the project, has the level of disagreements/conflict in between your water user groups and other groups changed?

<table>
<thead>
<tr>
<th>Increased a lot</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased a little</td>
<td></td>
</tr>
<tr>
<td>Stayed about the Same</td>
<td></td>
</tr>
<tr>
<td>Decreased a Little</td>
<td></td>
</tr>
<tr>
<td>Decreased a lot</td>
<td></td>
</tr>
</tbody>
</table>

6.7 In the past 10 years, have any of your assets been contested by anyone/groups? Yes/No

If yes, has this improved since the project? Yes/No

6.8 What assets were contested and by whom?
6.9 Do you think that the increase in water use for irrigation has led to disagreement/conflict between the people that use the water? Why?

6.10 Do you expect tensions between different water users will increase in the future?
Yes  No

7. **Cooperation**

7.1 Has the implementation of the project created cooperation with people that use the water source for the same purposes? Yes/No

Yes: what kind of cooperation and with who? If no, why not? explain:

7.2 Has the implementation of the project created cooperation with people that use the water source for different purposes? Yes/No

If yes, what kind of cooperation and with who? If no, why not? explain:

7.3 Compared to before the project, has the level of cooperation in your water user group in general changed?

<table>
<thead>
<tr>
<th>Increased a lot</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Increased a little</td>
<td></td>
</tr>
<tr>
<td>Stayed about the Same</td>
<td></td>
</tr>
<tr>
<td>Decreased a Little</td>
<td></td>
</tr>
<tr>
<td>Decrease a lot</td>
<td></td>
</tr>
</tbody>
</table>

7.4 Compared to before the project, has the level of cooperation between your water user groups and other groups changed?

<table>
<thead>
<tr>
<th>Increased a lot</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Increased a little</td>
<td></td>
</tr>
<tr>
<td>Stayed about the Same</td>
<td></td>
</tr>
<tr>
<td>Decreased a Little</td>
<td></td>
</tr>
<tr>
<td>Decrease a lot</td>
<td></td>
</tr>
</tbody>
</table>

7.3 Do you think that the increase in water available after the project has led to more cooperation between the different water users? Why? Or why not?
7.4 How do you think that cooperation can be stimulated between the different water users, to prevent overuse and contamination?

8. **Reciprocity**

8.1 Are certain resources exchanged within your water user group, such as money, water, crops, livestock and information?  Yes/No

If yes, what is exchanged?

8.2 If you suddenly needed help in resources from someone (for example money, water, crops, livestock and information), how many people beyond your immediate household would you be willing to help, or would help you?

<table>
<thead>
<tr>
<th></th>
<th>Before project</th>
<th>After project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero to Two</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two to Four</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than Four</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8.3 If someone suddenly needs help from you in resources, how many people beyond your immediate household would you be willing to help?

<table>
<thead>
<tr>
<th></th>
<th>Before project</th>
<th>After project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td></td>
<td></td>
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<tr>
<td>Zero to Two</td>
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<td></td>
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<tr>
<td>Two to Four</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than Four</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8.4 What do you share with the people that would help you, or you would help?

- Ethnic Ties
- Livelihoods/Occupation (the same)
- Formal Associational Membership (Youth Group, Savings Group, Women's Group etc.)
- Gender
- Other, namely: ..............

8.5 Did these helping relations change after the intervention?

<table>
<thead>
<tr>
<th></th>
<th>before</th>
<th>after</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gotten better</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stayed about the same</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gotten worse</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9. Collective action

9.1 When there is a water supply shortage problem in this community, how likely is it that people will cooperate to try to solve the problem? Has this changed since the intervention?

<table>
<thead>
<tr>
<th></th>
<th>Before the project</th>
<th>After the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither likely nor unlikely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat unlikely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very unlikely</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9.2 Do you think that your water user group is concerned of maintaining the water quality/quantity for all users? Explain why or why not

..........................................................................................................................................................................

9.3 Do you think that other water user groups are concerned of maintaining the water quality/quantity for all users? Explain who and why or why not

..........................................................................................................................................................................

9.4 Do you think that livestock should be given priority in using the water, even if you wouldn't have (or don't have) livestock yourself?

..........................................................................................................................................................................

9.5 During and after the project up til now, have you worked with others to do something for the benefit of different water users? What did you do?

..........................................................................................................................................................................

9.6 Was this voluntarily? Yes/No

10. Sanctioning

10.1 How likely was it for what water user group and leaders that abused common rules of water use were criticized or sanctioned prior and after to the project? Abuses can be water theft, or contaminating the water, and sanctions can be withdrawal of water from parcels. Fill in the tables:

Before the project:

<table>
<thead>
<tr>
<th></th>
<th>pastoralists</th>
<th>farmers/agro-pastoralists</th>
<th>local businesses</th>
<th>public/private institutions</th>
<th>Formal and informal leaders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither likely nor unlikely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Somewhat unlikely</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Very unlikely</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
After the project:

<table>
<thead>
<tr>
<th></th>
<th>pastoralists</th>
<th>farmers/agro-pastoralists</th>
<th>local businesses</th>
<th>public/private institutions</th>
<th>Formal and informal leaders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very likely</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat likely</td>
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<tr>
<td>Neither likely nor unlikely</td>
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<tr>
<td>Somewhat unlikely</td>
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<td></td>
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<tr>
<td>Very unlikely</td>
<td></td>
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</tr>
</tbody>
</table>

10.2  Do sanctions help to prevent water users to stick to common accepted rules of how and how much water is used by whom, after the project? Yes/No

10.3  Do you think that sanctioning of abuses is executed equally and gradually on different kinds of water users? Yes/No

10.4  If not, who is sanctioned and who is not?

11. Empowerment/political action

11.1  Overall, how much impact do you think you have in making this community a better place to live?

<table>
<thead>
<tr>
<th></th>
<th>A big impact</th>
<th>A small impact</th>
<th>No impact</th>
</tr>
</thead>
</table>

11.2  Who do you regard as the most important authority locally in terms of improving your community? Has this changed since the intervention?

<table>
<thead>
<tr>
<th></th>
<th>Before project</th>
<th>After project</th>
</tr>
</thead>
<tbody>
<tr>
<td>local government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>chiefs/traditional authorities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>water/land governing bodies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>market authorities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other, namely:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In general, do you agree or disagree with the following statements? (1. Strongly Agree; 2. Agree; 3. Neutral; 4. Disagree; 5 Strongly Disagree)

<table>
<thead>
<tr>
<th>Statement</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All water users are represented in the water committee managing the water during droughts</td>
<td></td>
</tr>
<tr>
<td>The water committee is able to prevent disagreement/tensions between different water users such as farmers and pastoralists</td>
<td></td>
</tr>
<tr>
<td>Institutions are needed to regulate the water use at the hot spring to prevent contamination/overuse of the water and maintain the water supply</td>
<td></td>
</tr>
<tr>
<td>The water committee stimulates equal use for all different water users</td>
<td></td>
</tr>
</tbody>
</table>
11.3 To what extent do local government and local leaders take into account concerns voiced by you and people like you when they make decisions that affect you? Has this changed since the intervention?

<table>
<thead>
<tr>
<th></th>
<th>Before project</th>
<th>After project</th>
</tr>
</thead>
<tbody>
<tr>
<td>A lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A little</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. Groups and networks

12.1 Of which organisations or networks are you currently a member? Consist these organisations with similar water users, or consist out of different groups of water users (such as farmers and pastoralists)? Has this changed as a result of the MM Community Water Project?

Examples of organisations: Water Management Committee, Farmer group or cooperatives, Traders association, community committee, religious organisation, finance/credit/savings group, youth group, women’s group.

Name the two most important to you

1  ........................................................................................................................................

2  ........................................................................................................................................

12.2 What is the main benefit which membership of the organisation gives?

...................................................................................................................................................

12.3 Thinking of the Members of the Groups, are most of the same:
Encircle:

Community  Kinship/Family  Religion  Gender  Age  Ethnicity  Occupation

12.4 Since the MM Community Water Project, has membership in the group declined, remained the same, or increased? Encircle: Declined/the same/increased

12.5 Does this group work or interact with other groups with similar water uses? Has this changed since the MM Community Water Project? Encircle: No/Occasionally/Frequently

12.6 Does this group work or interact with other groups with different water use purposes? Has this changed since the MM Community Water Project? Encircle:

No/Occasionally/Frequently
13. **Information/communication**

13.1 Do you own a mobile phone?

13.2 How often do you listen to the radio? Encircle:

- Every day
- A few times a week
- Once a week
- Less than once a week
- Never

13.3 How often do you watch television? Encircle:

- Every day
- A few times a week
- Once a week
- Less than once a week
- Never

13.4 What source of information do you use to hear what the government is doing or about market information? (Newspaper/TV/radio/family/friends)

- Every day
- A few times a week
- Once a week
- Less than once a week
- Never

13.5 In general, compared to before the intervention, has access to information improved, deteriorated, or stayed about the same?

- Improved
- Deteriorated
- Stayed about the same

13.6 In case your access to information changed, how did this happen? Explain.

- ...........................................................................................................................
Appendix II – Interview question list on the impacts of the Maji Moto Community Water Project on social capital, water abundance and conflict/cooperation

Participation in the project

The Maji Moto water project was conducted in 2006/2007. The main aim was to improve the water supply and the management of the water sources by the community. Were you involved in any of the activities?

- Rehabilitate the windmill and train community members on its maintenance
- De-silt the water pan, fence the pan area and plant grass and trees
- Train the community members on project management
- Operationalize a management system for sustainability of the project
- Rehabilitate the cattle dip, trough and storage tank
- Install a demonstration drip irrigation kit in the secondary school plot
- Train the community on drip irrigation
- Operationalize the government policy to encourage communities to initiate, implement and manage their own water projects.
- Host a conflict resolution workshop with all stakeholders

To what extent were these objectives completed?

How did you participate, and

Did it help to increase cooperation and reduce disagreements between different water users?

Water access/availability

For whom is there not enough water during droughts? Has this changed after the project?

Do some of the user groups affect the water quality? (Who, how)

What water users are the most vulnerable for droughts? Has this changed after the project?

Are certain groups excluded from using the water? During droughts? Who, why and how do excluded people cope with this? (Pastoralists?)

Scarcity is perceived more by people far away from the hot springs that the people living nearby. Does competition over water use ever cause problems? Will this increase in the future?

Water management/governance structure

Only a small proportion of people in MM got plots allocated near the dams. On what basis were these allocated? Does inequality in location ever cause tensions due to difference in water access?

By whom is the hot spring/water pans/windmill managed? How did this group get this position?

Are there sanctions in place when people use too much water, or when they contaminate the water?

Are the different user groups, as well as the managers themselves sanctioned equally?

Has the use of generators been regulated yet?
**Bonding social capital**

Are certain water user groups given priority of using the water? And during droughts? Why?

Is livestock given priority in droughts? Why?

Is this related to Masaai cultural values? Is there difference in priority between men and women in using the water? Does this cause conflicts?

Do people with similar water use purposes (pastoralists/farmers) trust each other? Know each other? Do they communicate a lot with each other, and how?

Do people with different water use purposes (pastoralists-farmers) trust each other? Know each other? And people from other villages? Do they communicate a lot with each other, and how?

Has this changed after the project?

**Collective action**

Has a certain water user groups ever done activities for the benefit of the wider community?

Has this changed after the project?

Have the different water user groups ever done activities together for the benefit of the community?

**Dynamics of cooperation**

Does cooperation take place between the pastoralists in using the water? And between the farmers? And with each other? How?

Has this changed after the project?

Did this cooperation change after the intervention? For example, as the project aimed to train the community on project management?

Sometimes, there is not enough water during droughts. Does cooperation take place between different water users in managing the lack of water? Are people accountable to one another? Why or why not? Did this change after the project?

**Dynamics of conflict**

Has the emergence of farming activities using the water created tensions/competition between the different water users?

Farmers: stealing water out of turn

Were there disagreements over the water use between different water users before the project? What kind of disagreements, between who?

Farmers using generators, no water left for pastoralists
Pastoralists contaminating the water

How are these disagreements coped with?
Are there any other disagreements or conflict that take place between people? Related to land? Has this changed since the project?

How are these disagreements coped with?

Has this ever lead to violence or destruction of property?

Did these disagreements change after the project? How? Did the conflict resolution workshop help?

**Reflection on the project**

How do you think that the MM Community Water project could have improved cooperation in the water use more? Within and between user groups

Stimulate with incentives / sanction free-rider behaviour

How do you think that the MM Community Water project could have reduced conflict/disagreement within and between the different user groups better?

If a similar project is to be implemented again, what should be taken into consideration in order to increase cooperation / negate conflict within and between user groups?

**Appendix III – Interview code tree**

<table>
<thead>
<tr>
<th>Codes</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Conflict</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Domestic use conflict</td>
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<tr>
<td></td>
<td>Farmer-farmer conflict</td>
</tr>
<tr>
<td></td>
<td>Farmer-pastoralist conflict</td>
</tr>
<tr>
<td></td>
<td>Pastoralist-pastoralist conflict</td>
</tr>
<tr>
<td>Cooperation</td>
<td></td>
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<tr>
<td></td>
<td>Domestic cooperation</td>
</tr>
<tr>
<td></td>
<td>Farmer cooperation</td>
</tr>
<tr>
<td></td>
<td>Farmer-pastoralist cooperation</td>
</tr>
<tr>
<td></td>
<td>Pastoralist cooperation</td>
</tr>
<tr>
<td>Information</td>
<td></td>
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<tr>
<td></td>
<td>Market information</td>
</tr>
<tr>
<td></td>
<td>Political information</td>
</tr>
<tr>
<td>Social capital</td>
<td></td>
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<tr>
<td></td>
<td>Collective action</td>
</tr>
<tr>
<td></td>
<td>Farmer-farmer bonds</td>
</tr>
<tr>
<td></td>
<td>Farmer-pastoralist bonds</td>
</tr>
<tr>
<td></td>
<td>Pastoralist bonds</td>
</tr>
<tr>
<td>Reciprocity</td>
<td></td>
</tr>
<tr>
<td>Water availability</td>
<td></td>
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<tr>
<td></td>
<td>Exclusion</td>
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<tr>
<td></td>
<td>Gender</td>
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<td></td>
<td>Water accessibility</td>
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<td>Water sufficiency</td>
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<td>Water governance</td>
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<td>Distribution</td>
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<td>Maintenance</td>
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<tr>
<td></td>
<td>Sanctions</td>
</tr>
<tr>
<td></td>
<td>Water project participation</td>
</tr>
</tbody>
</table>