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WATER TENSIONS IN SUGARCANE AREAS OF THE KINGDOM OF ESWATINI FOLLOWING THE 2015-2016 DROUGHT: A WATER ACCESS PERSPECTIVE

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Advisor: Associate Professor Alexandros Gasparatos

Co-Advisor: Associate Professor Mayumi Fukunaga

ROLAND NIKOLE VANESSA

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ABSTRACT

Industrial crops do not contribute significantly to local diets but can be used for other industrial uses such as fiber, oil, rubber, sugar, and tobacco. The production of industrial crops may potentially compete with food crop production for land, water, and other agricultural inputs (Wiggins, Henley, & Keats, 2015). Depending on the context, the large-scale production of such crops can have different environmental and socioeconomic impacts (Gasparatos et al, 2015; Hess et al, 2016).

Swaziland was the fourth largest producer of sugarcane in Sub-Saharan Africa in 2014-15. The sugar industry accounts for approximately 18% of the national GDP and has an especially high contribution in the agricultural and industrial sectors (Terry & Ogg, 2017). In Swaziland significant quantities of sugarcane are cultivated in areas considered as 'high' water risk (Hess et al, 2016). Irrigation consumes 90-95% of the national water resources, with sugarcane absorbing the bulk of this irrigated water (Mhalanga-Ndlovu & Nhamo, 2017). Climatic phenomena such as drought, are projected to intensify in Southern Africa putting a strain on scarce water resources (Hess et al, 2016; Masih et al, 2014). In 2014-16, Swaziland experienced what was considered its worst drought since 1992 (Swaziland Vulnerability Assessment Committee, 2016). The economic impact of this drought was equivalent to approximately 7% of national GDP, with the sugarcane sector being particularly hit, along with other agriculture and livestock sectors (Swaziland Economic Policy Analysis and Research Centre, 2017; in this study, the 2015-2016 drought will be referred to as the Drought). However, there is a dearth of research in the Southern African sugarcane literature that looks at a combined view of water legislation, inequality, and the sugarcane smallholder developments.

The research questions of the study are:

How has the expansion of sugarcane cultivation and the recent severe drought influenced interactions over water in the sugarcane cultivation areas of

What can be learned from the tension over water to mitigate them in the future?

The research aim is to understand if, and how, sugarcane expansion and drought has influenced perceived tensions over water in the sugarcane cultivation areas of Eswatini's Komati river basin. The research objectives include to:

1. Map the formal and informal institutional landscape for the water sectors through an institutional analysis, expert interviews, and focus group discussions
2. Elucidate the perceived tensions over water and their perceived respective, underlying reasons – distributions (water for what use, through which means?), tensions (between whom?), and reasons (because of what?) – before and during the drought of 2014-2016
3. Describe the ability to benefit from water – water access – for primary water uses and permitted water uses and between involved and non-involved groups
4. Elucidate whether the 2014-2016 severe drought exacerbated these interactions over water

The research takes a water access perspective elucidating the tensions over water, also assessing the impacts of drought in this context. Ribot and Peluso's (2003) theory of access and access mechanisms are deployed in the study with the combined view of the influences and roles of formal, governmental institutions and the informal, on-the-ground rules of the game. Semi-structured interviews and focus groups discussions with governmental representatives, government parastatals, international organizations, non-governmental

organizations, and regionally informed key informants and experts within the water and agricultural sectors were conducted between August to September 2017. These governmental interviews informed the formal institutional views on tensions over water before and during the Drought. The informal institutions are derived from community focus group discussions and local key informants that composed of traditional authority representatives, sugarcane farmer association representatives, and a community appointed water sector chairperson.

The main results reveal at the local level, the prominent determinant to access water for domestic purposes was access to technology (infrastructure, electricity) and the income to maintain the technology. Social identity between those involved in the sugarcane development scheme as shareholders differed between those were not involved in the sugarcane development scheme, thus shareholders. Social identity was linked to the controlled, gained, and maintained access to water for domestic purposes through infrastructure. Social inequalities between the shareholders and non-shareholders were heightened and pulled tight during the Drought. In times of sufficient rain, the rain mitigates the tensions due to the avaiability of alternative water sources, though inequalities already existed. Water sharing was occuring during times of sufficient rain between those who had water and those who did not. The Drought highlighted inequalities and exacerbated the tensions over water. The water legislation system was also found to be faulty were productive uses that supplement the access to domestic water are in the grey areas in the legislation. This places them in the category of illegal water use and is also not accounted for in water output calculations.

The sugarcane developments may be viewed to have influenced the tensions over water not necessarily due to decreased water availability but due to its accumulation of other resources and its secured means to obtain its full allocated amount of water. Weakness in the

water policy are argued to play the larger factor in relation to tensions. Recommendations include further research in the social identity and the practice of water sharing as possible means to improve access to water for domestic purposes to those not involved in the original development plans.

Key words: Sugarcane, Water access, Inequality, Infrastructure, Tensions

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Chapter 1: Introduction

In contemporary society, cash crops have been promoted as a poverty alleviation and food security strategy in global discourses (Kay, 2009; World Bank, 1981 a,b sited in Maxwell and Fernando, 1989) including Africa where food security has been a chronic issue (Clover, 2003). Cash-generating industrial crops, defined as "those not grown for food" and those "that undergo considerable processing even if the end product is a food", have been questioned regarding their ability to achieve their desired outputs - that is, poverty alleviation (Wiggins, Henley, and Keats, 2015). In the African context, research so far has highlighted the effects are crop-specific and situational (Wiggins, Henely, and Keats, 2015; Hess et al., 2016; Gasparatos et al., 2015). Biofuels, a sub-category of industrial crops, is projected to increase in the future for its intended purposes of energy security for domestic (African nations) and export use (Mitchell, 2010; Gasparatos et al., 2015), economic development through export, and its poverty alleviation potential (Gasparatos et al., 2015; Wiggins, Henely, and Keats, 2015).

Sugarcane cultivation, useful for human consumption and its potential as a biofuel, has made the cash crop an appealing investment in African nations (Gasparatos et al., 2015; Hess et al., 2016). Sugarcane cultivation is grown in different modes of production either plantation or contract farming with small-holder and outgrower farmers. Small-holder production is seen as a way empower rural areas and extend benefits to the poor. Yet, to maintain high production, irrigation is necessary which becomes a concern as there are cases where sugarcane cultivation overlaps with water scarce regions (Hess et al., 2016). Though the impacts of sugarcane are not unique, its scale, size, and location can produce high impact

effects, of which the Kingdom of eSwatini (eSwatini) has the highest proportion of irrigated sugarcane cultivation in high water risk areas in Southern Africa (ibid).

A water conflict analysis on the convergence of sugarcane production visa-a-vis water policies during a drought period through an equality/equity access to water perspective is the main goal of the research. In the section's below, the impacts and issues of cash and industrial crops - through biofuel impact studies - is described. Specific examples of the impacts or effects of sugarcane cultivation in Africa is provided before discussing the case nation of eSwatini and the urgency to study water access in times of climatic change. This is followed by the research gap highlighting a lack of attention on the conflicts between involved ("adopters") and non-involved ("nonadopters") groups in sugarcane production areas over access to water. Access to water is used as a unit of analysis as it has been acknowledged a key poverty alleviation mechanism (SADC Protocol on Shared Watercourses, 2000).

Several studies have reviewed the impacts and issues of cash-crops (e.g. Maxwell and Fernando, 1989; Daniels, 2008) cited in Terry, 2012) and industrial crops (Gasparatos et al., 2015; Hess et al., 2016). Two of the five issues[1] Maxwell and Fernando (1989) describe regarding cash crops include:

1. mixed ability to provide for economic growth at the household and national level;

2. the maldistribution of "wealth, income, access and power" is an issue and concern for cash crops. Cash crops worsen already existing inequalities where "adopter[s]" benefit from market access, state support, and are able to grow faster than "nonadopters". Land exclusion and the occupancy of the best land is also common. Small-scale cash crop

[1] The five issues addressed by Maxwell and Fernando (1989) are: growth, distribution, food security, dependency, and the environment.

production and contract farming were "counter examples" in terms of financial viability, yet it is unclear regarding its relationship with the inequality between "adopters" and "nonadopters".

Gasparatos et al. (2015) categorized the impacts of biofuels in Sub-Sahara Africa according to crop and production mode. Though the study does not include descriptions of inequality, the study does cover economic impacts at the national and project level and environmental and social impacts on the landscape and household level for sugarcane cultivation. Decreased water avaiability, the diversion of water, water quality pollution, competition with water, land, and input resources with food production, and lost access to land are examples of impacts. Additionally, participating in the crop cultivation provides income which may be used to buy food instead of having to cultivate the food items. The smallholder scheme projects are characterized as not losing access to land as it is not transferred to a company. A trade-off instead manifests as the land that was previously used for food crop cultivation is then converted to biofuel feedstock. Smallholder production developments are considered to foster “win-win” situations (Kydd et al., 2004).

Hess et al. (2016) reviews the potentials of smallholder outgrowers for income generation and decreased poverty rates; however, the results raise not all the literature is positive – e.g. Richardson (2010) points out the debt outgrowers face due to their irrigation infrastructure. Additionally, sugarcane cultivation on water avaiability in already high-water risk regions (which includes eSwatini) may heighten the water risks of non-sugarcane users within the region. Sugarcane competes with other uses which includes household, domestic, etc. (Hess et al., 2016). Wiggins, Henely, and Keats (2015, p.2) declares the appropriation of land and water may affect the poor and vulnerable.

eSwatini was the fourth largest producer of sugarcane in Sub-Saharan Africa in 2014-15. The sugar industry accounts for approximately 18% of the national GDP and has an especially high contribution in the agricultural and industrial sectors (Terry & Ogg, 2017). Irrigation consumes 90-95% of the national water resources, with sugarcane absorbing the bulk of this irrigated water (Mhalanga-Ndlovu & Nhamo, 2017). The sugarcane production follows a smallholder outgrower scheme where the community people were able to become owners, i.e. shareholders, of their smallholder scheme. Water avaiability is a pressing concern as climatic phenomena such as drought, are projected to intensify in Southern Africa putting a strain on scarce water resources (Hess et al, 2016; Masih et al, 2014). In 2015-16, eSwatini experienced what was considered its worst drought since 1992 – to be later referred to as "Drought" (Swaziland Vulnerability Assessment Committee (SVAC, 2016). The economic impact of this drought was equivalent to approximately 7% of national GDP, resulting in a decrease in sugarcane production and with severe impacts on maize, vegetable, and livestock agriculture (Swaziland Economic Policy Analysis and Research Centre (SEPARC), 2017; SVAC, 2016; SVAC, 2017).

Current research in eSwatini in relation to sugarcane and water discusses: the vulnerability of sugarcane farmers to climate change (Mhlanga-Ndlovu and Nhamo, 2017), barriers of small holders to the stock market (Hearn and Piesse, 2009), the profitability of the smallholder sugarcane schemes (Masuku, 2011), the values of domestic water in Swaziland considering willingness to pay (Farolfi, Mabugu, and Ntshingila, 2007), water management issues at the transboundary level focusing on water avaiability (Mililo, Mhlanga, and Senzanje, 2008), the effects of climate change on water resoucre availability (Matondo, Peter, and Msibi, 2004), factors affecting the sustainability of rural schemes using an IWRM approach, but not in the sugarcane areas (Peter and Nkambule, 2012), the impact of biofuel

projects, but not going deep into access issues (von Maltitz et al., 2018), etc. Terry (2012) presents a key paper evaluating the percolation or "trickle-down" of economic benefits to those non-participating – which are viewed as "nonadopters" – in a government supported rural economic development program through sugarcane cultivation. Though the focus of his paper is on the difference between income, farm size, cattle ownership, and wealth indicators, the overall results signify inequalities of wealth among the adopters and the nonadopters. In his conclusion, he highlights the importance of the "equitable distribution of land and water rights" with those not involved in the sugarcane schemes (ibid).

The literature has been silent on water conflicts or tensions in relation sugarcane cultivation in eSwatini and the Southern African cases. Discussions regarding water have only touched on the impacts of water avaiability and quality. The subtler issues of access and rights are kept separate, though they are well expressed in critics to privatization (Bakker, 2007; Perreault, 2014), studies on the challenges of integrated water resource management (e.g. Molle, 2009 B), and hydrosocial cycles (e.g. Swyngedouw, 2009; Boelens et al., 2016), and other human rights to water and water justice debates (Roth, Boelens, and Zwarteveen, 2015; Joy, Kulkarni, Roth, and Zwarteveen, 2014; Kemerink, Ahlers, and van der Zaag, 2009; Falkenmark and Folke, 2002). Access to water is essential not only for human needs, but for cultural and food subsistence purposes.

In these studies, the human right to water for basic needs has be in conflict and tension with the modernizing and market-oriented value of water in contemporary times even though it has been attaining formal, legal recognition (see Langford and Russell, 2017 for in-depth chapters into the theories, practice, and prospects for the human right to water). Similar, yet slightly different is the concept of citizenship rights approach to water “that demand more of the State or society in the level of access to various primary goods”

(Langford and Russell, 2017 p. 28) which extents water for productive uses. The extent to human rights to water can be extended is currently contested falling on claims of the challenges to operationalize such a concept on the international and national scale (ibid p. 29). Societal equity in relation to access to water underscores this approach (ibid p. 30). Equity, defined as "the nature of the equitable: a correction of law, where law is defective by reason of its universality" (Aristotle 1925, p.133, sited in Ikeme, 2003), leads to discussions on "equalizing access to environmental good and services" (Ikeme, 2003) – such as resources.

Taking into consideration the above-mentioned gaps, this master's research investigates the inequality of access to water through a conflict perspective. The most recent drought in eSwatini is taken a case to elucidate the characteristics of conflicts and tensions to follow the causal links to its most evident contributors. Conflicts over water are markers of differentiated access to resources (Ribot and Peluso, 2003; Zwarteveen & Boelens, 2014). The Komati river basin provides for an interesting case study because the river is regulated with a dam that is managed by South Africa, eSwatini, and Mozambique. Water allocation and water permitting are in place to govern the transboundary and local water competition.

Chapter 2: Research Aims and Thesis Structure

2.1. Importance of Research

At the moment, eSwatini is considering the development of future dams as a mitigation to drought and to increase water avaiability within the nation. Studies looking into the effects of the past rural economic development project in terms of its possible negative side-effects, such as increased inequity among social identity groups, has not been assessed in detail. Additionally, this research will contribute to the academic literature as an additional assessment of the impacts to sugarcane and biofuel projects in Southern Africa.

2.2 Research Question:

1. How has the expansion of sugarcane cultivation and the recent severe drought influenced interactions over water in the sugarcane cultivation areas of the Kingdom of eSwatini?
2. What can be learned from the tension over water to mitigate them in the future?

2.3 Research Aims and Objectives

Aim: to understand if, and how, sugarcane expansion and drought has influenced perceived tensions over water in the sugarcane cultivation areas of eSwatini's Komati river basin

Objectives:

1. Map the formal and informal institutional landscape for the water sector through an institutional analysis, expert interviews, and focus group discussions
2. Elucidate the perceived tensions over water and their perceived respective, underlying reasons – distributions (water for what use, through which means?), tensions (between whom?), and reasons (because of what?) – before and during the drought of 2014-2016
3. Describe the ability to benefit from water – water access – for primary water uses and permitted water uses and between involved and non-involved groups
4. Elucidate whether the 2014-2016 severe drought exacerbated these interactions over water

2.3 Thesis Structure

The structure of the thesis generally aligns with the objectives of the research. The results and analysis are discussed as themes. This is followed by discussion chapters.

Chapter 3 explains the theoretical foundations, conceptual framework, site description, and data collection methodology used in the research.

Chapter 4 to Chapter 6 contains the results of the research. Three themes are to be described: institutions of water access, perceptions of tensions over water before the Drought, and perceptions of the effect of the Drought – which includes perception of tensions over water during the Drought. Formal and informal perspectives are elaborated to lead to a comparison between the two in the analysis. Each of themes provide insights into the ability to benefit from water at the intra-community (i.e. within a politically-bound community) level. The regional and international views of allocations, use, and how to improve access[2] to water are described to provide the context and situate the local community(ies).

Chapter 4 describes the formal institutions – i.e. rules of the game – from the international, national, and local level. These include a brief review of Southern African Development Community water legislation and the eSwatini's national Water Act of 2002. The informal rules of the game focus on the actors involved and the access mechanisms described by local key informants and community focus group discussions.

Chapter 5 elaborates on the described tensions over water before the Drought from the formal – governmental-related – and informal – community level – perspective.

[2] This is only applicable to the SADC Regional Water Strategy as Swaziland does not have a water strategy or policy as of early 2017.

Chapter 6 details the effects of the drought. The information is decomposed into sub-sections according to stakeholder group on their perspective over tensions over water during the drought from: drought-response related key informants, the formal water and agricultural sector institutions, and from the informal, community level institutions.

There are two discussion chapters for the thesis. Chapter 7 describes the challenges non-sugarcane cultivation smallholders face within the nation and thus the indirect mechanisms to access domestic and agricultural water.

Chapter 8 begins with a summary of the results as according to the research objectives (refer to 2.3). This is followed by a brief discussion of the results in relation to the Southern African sugarcane literature. The study suggests that though the industrial crop project took the form of smallholder schemes where the smallholders became the owners of the scheme – i.e. shareholders – the project follows similar paths of other cultivation approaches in not addressing inequalities or percolating benefits beyond income generation to those not involved in the smallholder scheme as shareholders.

The thesis concludes with Chapter 9 that provides a summary and main points of the research. If future sugarcane development seeks to be pro-poor, reaching out to the non-adopters population, A) the development should keep in mind the current governance system is not perfect – the current water governance institutions should not be considered as working properly, B) innovation focusing on the interaction between involved and non-involved groups should be further explored to address inequalities.

Chapter 3: Methodology

3.1 Theoretical Foundations

The research leans towards the perspective that knowledge is situational, situated in history (i.e. historical relevance cannot be denied), and contextual. Objective knowledge in the social world is subjectively formed.

Political ecology perspectives are often used in water rights, water conflicts, class and power conflict, natural resource distribution studies, etc. Political ecology, described as "a community of practice…directed at finding causes rather than symptoms of problems" (Robbins, 2012, p.20), investigates the role of power in socio-ecological systems (Ingalls and Stedman, 2016). An earlier definition of political ecology by Blaikie and Brookfield (1987:17) described:

the phrase 'political ecology' combines the concerns of ecology and a broadly defined political economy...[and] the constantly shifting dialectic between society and land-based resources, and also within classes and groups within society itself. We also derive from political economy a concern with the role of the state. The state commonly tends to lend its power to dominant groups and classes.

Classical political ecology papers have stringed lines between local over consumption, environmental degradation, poverty, to global and national political and economic pressures. Key themes in political ecology include justice, power relations, vulnerabilities (refer to Perreault, Bridge, and McCarthy, 2015).

3.2 Conceptual Framework

Water Contestation due to Access

From the political ecology perspective situating local realities into the larger political, economic, and social arenas, I further narrow the research lenses on water avaiability and tensions through a water rights perspective of a political ecology of water[3], specifically through the water access lenses. I take inspiration from the water rights perspectives developed Boelens (Boelens, 2009; Duarte-Abadía, Boelens, & Roa-Avendaño, 2015; Roth, Zwarteveen, Joy, & Kulkarni, 2014; Stoltenborg & Boelens, 2016; Zwarteveen & Boelens, 2014) embodied in the echelons of rights analysis framework that distinguish forms of water contestations (Zwarteveen & Boelens, 2014). Zwarteveen and Boelens (2014) explains: "First, the very distribution of the *resource* is contested: Who has access to water, to hydraulic infrastructure, to the material and financial means to use and manage water resources".

A focus on water access for this research is considered ideal as, though there are descriptions of inequities between those associated with sugarcane associations and those who are not (Terry, 2012), the implications of inequities in the context of water rights in the Southern African sugarcane areas have been neglected; albeit, the results may be assumed.

[3] For more information on political ecologies of water conflicts, see "Political ecology of water conflicts" (Rodríguez-Labajos & Martínez-Alier, 2015).

Definitions of Access and Use

Ribot and Peluso's (2003) theory of access which seeks "to faciliate grounded analysis of who actually benefits from things and through what processes they are able to do so" refers to access as "access retains an empirical "… focus on the issues of *who* does (and who does not) get to use *what*, in *what ways*, and *when* (that is, in what circumstances)" (referencing Neale 1998:48–italics in original; ibid). In other words, access is "the ability to derive benefits from things" (ibid). Ribot and Peluso (2003) adopt Hunt's (1998) perspective on "use" and takes "use" to "mean the enjoyment of some kind of benefit or benefit stream". The definition incorporates the influence of power and the enabling or constraining effect of social relationships and political-economic frames. I adopt Ribot and Peluso's (2003) definitions of access and use. Means to access (aka "access mechanisms") resources include access to technology, capital, markets, knowledge, authority, access through social identities, and access via the negotiation of other social relations (Ribot & Peluso, 2003). Though this study in eSwatini utilizes an inductive approach for the analysis adopting a thematic analysis approach (refer to Section 3.4), the results for the reasons of contestations, or tensions, in terms of access to water adopt Ribot and Peluso's (2003) concepts for added clarity. The access mechanisms align well with water contestation level of access to resources described by Zwarteveen and Boelens (2014) and Stoltenborg and Boelens (2016)[4]. Access to water has also been used to assess the effects of water grabbing (e.g. Mehta, Veldwisch, and Franco, 2012).

[4] Stoltenborg and Boelens (2016) describes the first echelon of water contestation as "conflicts over access to and withdrawal of resources. In order to materialize these access and withdrawal rights, technological artefacts, infrastructure, labour and financial resources have to be in place. In this echelon the conflicts regarding access to and distribution of the resource(s) in question are examined".

Formal and Informal Institutions

In natural resource studies, the overlap between formal and informal institutions of resource governance have created challenges in the developing world and rural areas. Integrated water resource management, used by formal institutions, is internationally advocated to mitigate competition and tensions over water between its various purposes. Means to do so include water allocation systems according to the priority of the water use, water permitting to account for the outputs of the water resource, decentralization to involve water users at the local level in the water decisions, and to elevate water to higher economic purpose. Even if there are formal institutions that stipulate a right to a resource such as water, however, local – customary (informal[5]) – may be active within communities which may or may not have different ways to govern a resource. Additionally, formal institutions do not incorporate all water users and uses. For example, large-scale irrigators have water permits while smallholder farmers do not (see for example, Kemerink et al., 2013; van Koppen and Schreiner, 2018). Sokile and van Koppen (2004) provide an interesting example of the Rufiji basin in Tanzania where informal institutions and values overcome weaknesses of the formal, governmental institutions that benefit formal institutions like Water User Associations. In the informal institutions, water sharing occurs between irrigating farmers, while those who were already disadvantaged – those who are not irrigated farmers – do not benefit (Kemerink, Ahlers, and van der Zaag, 2009). Technology – part of techno-social systems – shapes how was water is used, used by whom, and for what purposes (Swyngedouw, 2009).

[5] Differences between informal and customary are beyond the scope of this research.

Conceptual Diagram

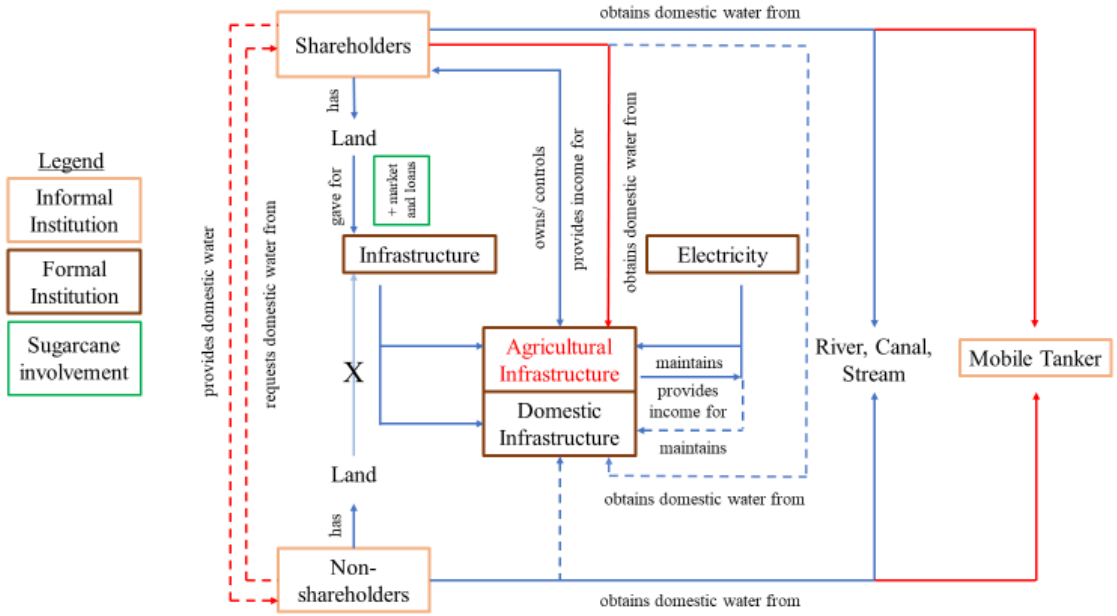

Figure 1. Conceptual diagram of the means for domestic and agricultural irrigation water access according to formal and informal institutions

Taking from the research results and the above-mentioned concepts of water contestation, access, and formal and informal institutions, Figure 1 presents the conceptual framework of community level water tensions over access to domestic and agricultural water. The internationally influenced formal, governmental institutions (formal institutions) regulate the technological components (infrastructure and electricity) and the water extraction points for agricultural and domestic purposes. The water extraction points include: agricultural infrastructure, domestic infrastructure, river, canal, stream, and mobile tanker. The formal institutions dictate what is considered legal – sanctioned – or illegal – unsanctioned – according to the water constitution, the Water Act of 2002. Informal institutions regulate how water is distributed between social identities within a politically-bound area, or social

identities of close proximity. The social identity groups differ due to investment in technology (i.e. agricultural irrigation infrastructure) through the exchange of land for the technology[6]. Those who invested land to gain access to markets and loans provided by sugarcane form one social identity. Those who did not – or could not – invest land form another social identity group. For example, mon-shareholders, though they have land, may not invest in agricultural infrastructure due to the lack of market and loan. The investment in land leads to the control/ ownership of agricultural infrastructure. Contestations, conflicts, or tensions[7] (red text and lines in Figure 1) occur when water sharing decreases or stops, and water is obtained through illegal means[8]. Dotted lines represent unsecure maintenance or access to water from the respective means and changes according to the avaiability of alternative water sources, thus is time dependent. As the literature on water rights, access, and resource conflict is broad, the research will situate itself in the smallholder sugarcane scheme literature to add an additional perspective to the negative or positive impacts of the smallholder scheme approach in the unique (Hess et al., 2016) scale of sugarcane cultivation.

Though "ecology" is flexibly used, the ecological units of this study are the natural resources of land – i.e. land use changes – and water availability. The study is delimited to the impacts of nature – i.e. drought – and resource depletion on the interactions between people groups and the diverse uses of the resource. This thesis will not look into how humans have degraded water recharge systems or possible impacts land-use change onto regional weather patterns. From an institutional stand-point, information regarding the Water User Associations, the lowest level of a decentralized water governance unit, are beyond the scope

[6] It may also be viewed that social identities form between people that have gone through a challenge or difficulty together. The perceived impact of land use change is an example.
[7] Contestations, conflicts, and tensions are used interchangeably within this thesis.
[8] Illegal means refers to the illegal according to the formal institutions.

of the study. The study focuses on specifications for water distribution between domestic and agricultural uses and household level access to water sources. Though relevant, the study will not incorporate variations of seasonal springs near politically-bound communities as the study aims to elucidate broader ties. Incorporating the water access lens, the study will use formal and informal institutions to elucidate the distribution and access of water resources that the national and local level. At the local level, the main data collection categorization will divide households in respect to whether or not the household is, as of 2017, a shareholder of a sugarcane farmer association.

3.3 Site Description:

As of 2017, the total population in Swaziland reached 1,093,238 people according to preliminary results of the 2017 Census (from Swaziland releases population count from 2017 census, 2017 http://sz.one.un.org/content/unct/swaziland/en/home/news-centre/news/swaziland-releases-population-count-from-2017-housing-and-popula.html).

Table 1. Human population of the eSwatini in 2017 (Source: Swaziland releases population count from 2017 census, website article).

Year	Total (inhabitants)	Manzini	Hhohho	Lubombo	Shiselweni
2017	1,093,238	355,945	320,651	212,531	204,111

In 2004, the total population was 1,083,000 of which 76% lived in the rural areas. In the rural areas, 42% of the populace had access to improved drinking water sources[9]. eSwatini has four ecological zones according to rainfall: Highveld, Middleveld, Lowveld, and Lubombo Plateau (see Table 2). The rainy season is from October to March that accounts for approximately 75% of the nation's rainfall (FAO Aquatstat for Swaziland, 2005).

[9] This does not imply sustained and continuous access to water through improved water sources.

Table 2. Rainfall in ecological zones of eSwatini (Source: FAO Aquastat, 2005).

Ecological Zone	Rainfall (mm)
Highveld	700 – 1550
Middleveld	550 – 850
Lowveld	400 – 550
Lubombo Plateau	550 – 850

As of 2013, eSwatini heavily depended on South African Customs Unions for approximately 41 % of its government revenue and an estimated amount between 20 % to 40 % was from the Coca-Cola Company's involvement in sugar production and the refinery of Coca-Cola concentrate in the manufacturing sector (Vandome, Vines, & Weimer, 2013). From another perspective, the sugar industry accounted for almost 60 % of agricultural output, 35 % of agricultural wage employment by 2014-15 (Terry & Ogg, 2017). The sugar industry in Swaziland dates back to the colonial period.

3.3.1 Colonial Swaziland and the European Settler Affairs up to Independence

The Kingdom of eSwatini, previously known as the Kingdom of Swaziland, was a British protectorate between 1904 and 1967, though land concessions to European settlers began much earlier in the 1880s. The Swazi geography was divided into four sections, characterized by climate and soil differentiations. Prior to the European colonization, the Middleveld and the Lebombo regions were regions the Swazi indigenous, "Swazis" preferred

to inhabit, utilizing the Lowveld as a hunting and grazing ground. “Good soils, moderate temperatures, reliable rainfall, and adequate grazing made the regions more attractive to the Swazis…” having diets considered self-sufficient (Packard, 1984).

Cattle, hunting, and some agriculture were a source of livilihood and food for the Swazis prior to the European colonialization (Packard, 1984). Cattle provided income during times of special occasions and emergencies and was considered as a status of prestige (Simelane, 2008, in reference to Low, Kemp, and Doran 1980:226). A shift from self-sufficiency to wage labour for cash began to occur after a rinderpest disease outbreak decimated most of the Swazi cattle in 1896-1897 (Packard, 1984, referencing D. Doveton, *The Human Geography of Swaziland* (London, 1937), 37-8). For the following decades, the Swaziland rural economy decreased (Packard, 1984; Simelane, 2014). The dependence on maize and agriculture increased as sources of milk and meat decreased with the declined population of cattle (Packard, 1984). Swazis’ grew dependent on maize and grain from South Africa and the cultivation from European farms in Swaziland overlapped with the decreased agricultural cultivations from the Swazis in Swaziland. Cash was relied upon for the purchase of food and income (Packard, 1984).

With the European settlement, the Swazi’s were shifted to the Highveld and Lowveld as the European settlers preferred the Middleveld and Lebombo regions for themselves. Land was tied with capital production leading to the resettlement and displacement of the indigenous Swazi people to one third of the nation’s land (Levin, 1990). The land may be characterized into three categories: title deed land, land held by European “settlers and companies”; Swazi Nation Land (SNL) with customary rights – i.e. held in trust by the Swazi king that is allocated to individuals by “pledging allegiance to the chief” who was appointed by the king; SNL that is managed by the king and the Swazi government came into existence

after Swaziland's independence in 1968 (Terry & Ogg, 2017). Land avaiability for future generations was a concern for the Swazis as the avaiability of land for the Swazis had decreased with the European colonization (Packard, 1986; Simelane, 2014).

The European settlers did not invest in agriculture, industry, nor the Swazi resettlement areas. The rural economies decreased leaving the Swazi men to either work in South Africa or in the Swazi mines. Packard (1986) described the colonial view of European settlers on Swaziland: "The Swazis were in fact viewed primarily as exporters of labor within the wider southern Africa regional economy."[10] After World War II, Swaziland became "part of Britain's post-war effort to increase overall colonial production levels" (Packard, 1986). The Colonial Development Committee (CDC) saw the establishment of an irrigation project for sugarcane in the "rich-soils" of the lowveld, also characterized with sporadic rainfall. Another sugarcane project was initiated with British and South African capital funds in the southern lowveld (Terry & Ogg, 2017). From 1945 to around 1956, the lowveld underwent malaria and parasite control measures to secure the population, considered labour forces, from decimating malaria outbreaks. Construction for the northern Lowveld sugarcane irrigation project began in the mid-1950s (Packard, 1986). Mining, forestry, and agricultural industries – which includes the irrigated sugarcane estates and cotton plantations – increased from the mid-1950s to late 1960s, along the increased foreign capital investment. Attracted by the avaiability of economic activities, and the belief that malaria had been controlled, there

[10] After a malaria outbreak which killed 5,000 Swazis in 1937, an attempt to begin a malaria control scheme was initiated. However, the initial attempt was unsuccessful as there were no large-scale industries, such as sugarcane estates, to fund the project (Packard, 1986).

was a migration from the highveld and middleveld to the lowveld. The population of the lowveld was said to increase "by 144% between 1956 and 1966" (Packard, 1986).

3.3.2 Swaziland Sugar Developments

The sugar industry in Swaziland began in the 1960's in the northern Lowveld through the large-scale estate plantations initiated and supported by South African investments and the Commonwealth (then Colonial) Development Committee. Originally dominated by large-scale state plantation development – in 1994, 88.9% of the sugarcane area was composed of large-scale commerical and miller-cum growers[11] – the involvement of smallholder schemes took off with the Komati Downstream Development Project (KDDP) in the northern Lowveld and the Lower Usuthu Irrigation Project (LUSIP) after 1999. The National Development Strategy of 1999 promoted the cultivation of commercial irrigated sugarcane in comparison to subsistence farming that was previously promoted. By 2010, 29 sugarcane farmer associations (FAs) were formed. The smallholder FAs feed near-by sugar mills. Sugarcane smallholder developments have become poverty alleviation strategies in eSwatini (Swaziland) (Terry and Ogg, 2017). Figure 2 illustrates the sugarcane cultivation area in eSwatini.

[11] Miller-cum growers refers to the estates that own a sugar processing mill and the direct fields that source the mill.

3.3.3 The Drought

Signs of what the Swazi government considers the 2015/16 (or the 2015-2016) El Nino induced drought (SEPARC, 2017) began in 2014[12]. For this reason, throughout the thesis the Drought phenomena will referred to as either the 2014-2016 drought or the Drought. Rainfall decreased by 50% during the 2015/16 rainfall season (Swaziland Drought Assessment Report, 2016). According to the Swaziland Economic Policy Analysis and Research Center (SEPARC) policy brief on the socioeconomic impacts of the Drought, rainfed crops were significantly affected, increasing the population of food insecure from 308,059 to 638,251 in 2016/2017 (ibid). Maize production reduced by 63% compared to the last five-year average (2012-2017). Regions of the Eastern Hhohho (of which includes the case study) experienced levels of high-water stress (Swaziland Drought Assessment Report, 2016).

[12] This is according to interviews with key informants and experts collected by the author between August and September 2017.

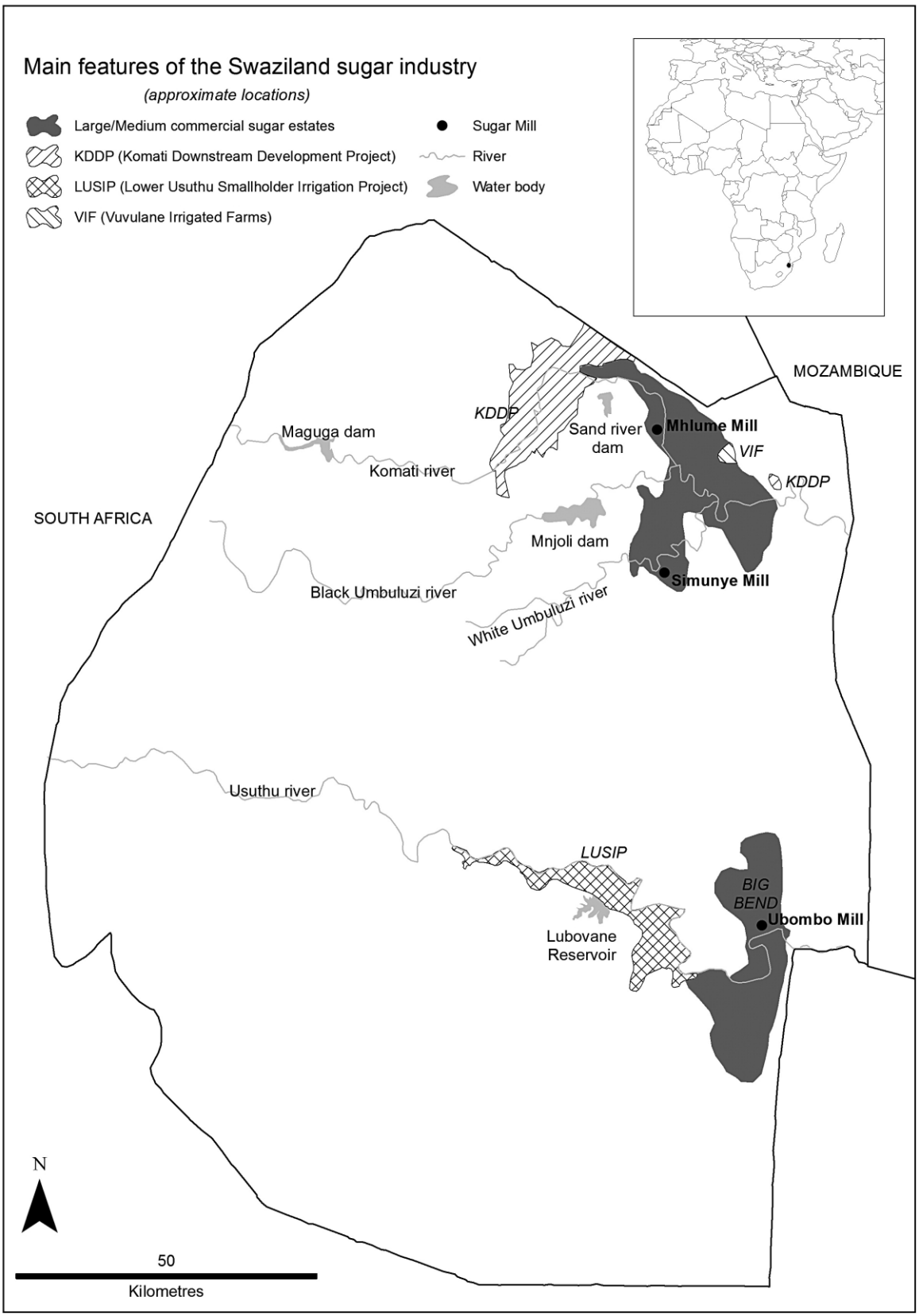

Figure 2. Map of eSwatini (Swaziland) and the main features of its sugar industry (Source: Paul Satchell, University of the West of England found in Terry and Ogg, 2017).

3.4 Data Collection

The national level institutional landscape for the water, agricultural, and sugar sectors was used to identify key informants. Additional snowballing on the field was completed to verify the inclusion of relevant stakeholders. Relevant stakeholders include those whom should be knowledgeable on water governance processes, on the sugarcane cultivation in the communities and at the national level, the challenges small scale farmers face, and insights on the challenges non-sugarcane subsistence agriculture sector face in relation to access to water. Stakeholders at the local, river basin (within the paper, this will be referred to as regional stakeholders), and national level were targeted to obtain perspectives from each level (Tables 3 and 4). Interviews and focus group discussions were conducted in person by the main researcher in Eswatini between August and September 2017.

Table 3. Key informant and expert interview stakeholder descriptions according to organization.

Organization	Stakeholder	Abbreviation
Government	Ministry of Natural Resources and Energy, Department of Water Affairs, Water Control Manager	DWA 1 DWA 2
	Ministry of Natural Resources and Energy, Department of Water Affairs, Rural Water Branch	DWA_RWB
	Ministry of Agriculture and Cooperatives, Sugarcane Promotion Unit	MoA_SCPU
	Ministry of Agriculture and Cooperatives, Agribusiness Unit	MoA_AU

	Ministry of Agriculture and Cooperatives, Extension Services	MoA_ExS
	Ministry of Agriculture and Cooperatives, Horticulture Unit	MoA_HU
	Ministry of Agriculture and Cooperatives, Rural Development Area	MoA_RDA
	Irrigation District, Emandla Ekuphila Water User District	EEWUD
	Irrigation District, Mhulume Water	Mhulume Water
	Komati Basin Water Authority	KOBWA
Government Parastatals	Swaziland Cane Growers' Association	SCGA
	Swaziland National Agricultural Union	SNAU
	Swaziland Economic Policy Analysis and Research Centre	SEPARC
	Swaziland Water and Agriculture Development Enterprise	SWADE
	National Agriculture Marketing Board	NAMBoard
International Organizations and Non-governmental Organizations	United Nations Development Programme	UNDP
	Red Cross	Red Cross
	United Nations International Children's Emergency Fund	UNICEF
Local Non-governmental	Maguga Dam Resettlement Expert	Maguga Dam Resettlement Expert
	Medium-scale Farmer	Medium-scale Farmer
	Large-scale Citrus Manager	Citrus

Table 4. National and regional stakeholders organized according to the group they are referred to in the Results section.

Stakeholder Category	Respective Stakeholders
Water Distributors	
	Komati Basin Water Authority (KOBWA) SCGA* EEWUD Mhulume Water
Water Users	
Agricultural Sector	Rural Development Area (RDA) Swaziland Water and Agricultural Development Enterprise Sugarcane Promotion Unit (SCPU), Ministry of Agriculture Horticulture Section, Ministry of Agriculture Extension Services, Ministry of Agriculture Agribusiness Sector, Ministry of Agriculture Swaziland Cane Growers' Association Swaziland Sugar Association Swaziland National Agricultural Union National Agricultural Marketing Board
Water Sector Experts	Rural Water Branch Water Expert
Drought Response	
Governmental-related Drought Response	Swaziland Economic Policy Analysis and Research Center (SEPARC) National Disaster Management Agency (NDMA)
Non-governmental Organization and International Organization Drought Response	United Nations Development Programme (UNDP) Red Cross UNICEF World Vision

A purposeful sampling strategy was used to select three communities within eSwatini's Komati river basin and their respective focus group. Selected communities had adopted sugarcane cultivation as part of the Komati Downstream Development Project (KDDP) and represented communities within the two Irrigation Districts – part of the water governance structures – of the river. Variation in the case study communities was found in the different histories of each community with the sugar industry (Table 6). A local consultancy group familiar with the communities was contracted to mediate interactions between the research team and the communities. The consultancy group worked with a trusted individual in each community to bring-together volunteers for the focus group discussions. Four separate focus groups where held within the communities: males who were sugarcane association shareholders (shareholders), females who were sugarcane shareholders, males who were not shareholders of the sugarcane associations (non-shareholders), and female who were not shareholders of the sugarcane associations. FGDs were conducted separately to create an atmosphere conducive for conversation based on the assumption each group may have had a different perspective or experience within the communities. Individual, semi-structured interviews were conducted with purposively-selected representatives of the communities which included the water sector chair of the communities' development committee, the traditional authority whom handles routine tensions within the community, and a representative of a sugarcane farmer within the politically-bound community[13].

[13] Once an individual or household has gone through the cultural process to "rent" a piece of land within the politically-bound community, culturally, they are part of the community. However, this does not guarantee the use of resources within the community (derived from the community focus group discussions). The community areas could not be crossed with the Google maps image provided in Figure 3. Figure 3 provides an estimated area of the location of the politically-bound community.

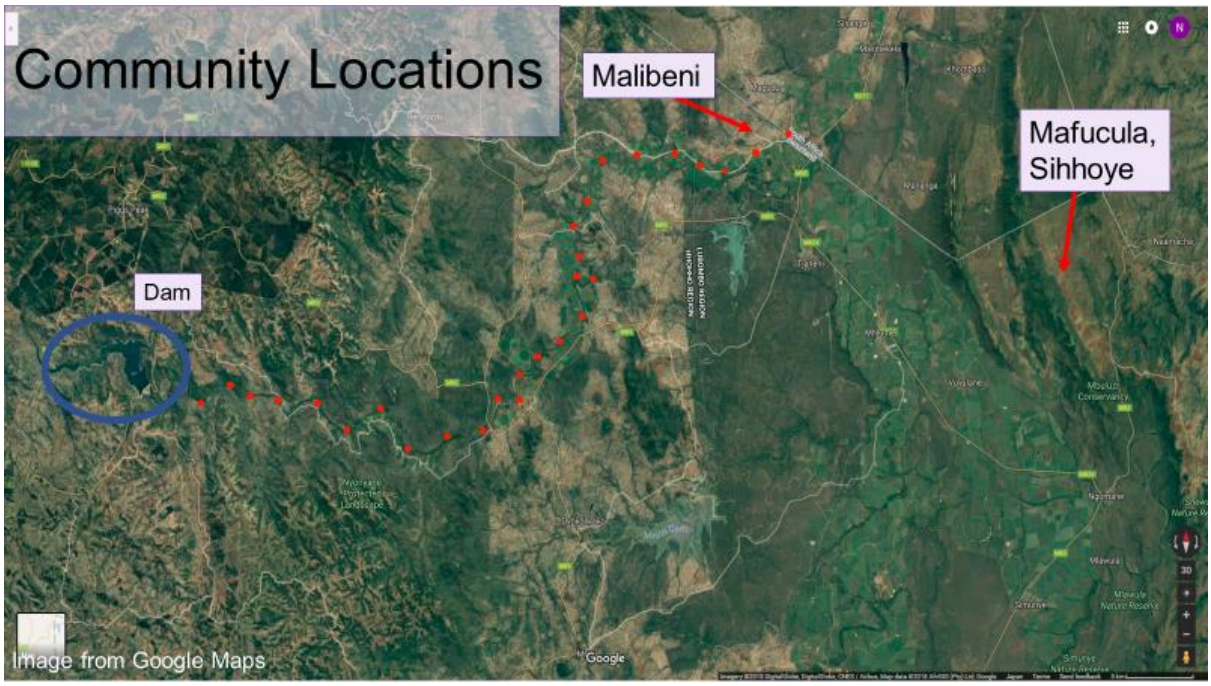

Figure 3. Community locations along the Komati River basin (Image source: Google maps).

Table 5. Community histories and stakeholders for data collection.

Politically-bound Community	Historical Developments Related to the Sugar Industry	Local Key Informants and Focus Group Discussions	Abbreviations
Mafucula	In 1983, relocated to current location of Mafucula as their original location was transitioned to sugarcane cultivation under/induced the Simunye estates, owned by the then King of eSwatini. Sugarcane cultivation in Mafucula began in 2002. Part of the relocation compensation was complete in 2002 with the adoption of sugarcane cultivation. Prior to 2017, another identity group combined with Mafucula identity group.	Local KI: Traditional authority representative, Development Committee Water Sector Chairperson, a sugarcane farmer association representative Male shareholders Female shareholders Male non-shareholders Female non-shareholders	Mafucula TA Mafucula WC Mafucula FA Mafucula MSH Mafucula FSH Mafucula MNSH Mafucula FNSH
Malibeni	Sugarcane cultivation was adopted in 2000. There are sugarcane shareholders living within the sugarcane association fields (Malibeni TA, personal communication). The shareholders share a social identity that does not include the non-shareholders (specifically, those who migrated to the area) (Malibeni FGDs; Malibeni WC, personal communication).	Local KI: Traditional authority representative, Development Committee Water Sector Chairperson, a sugarcane farmer association representative Male shareholders Female shareholders Male non-shareholders Female non-shareholders	Malibeni TA Malibeni WC Malibeni FA Malibeni MSH Malibeni FSH Malibeni MNSH Malibeni FNSH
Sihhoye	In 1954, segments of the land were handed to the development of the Mhulume Canal which brought water to large sugarcane plantations, passing between homesteads and the Komati river (Sihhoye TA, personal communication). Sihhoye is composed of those who lived in the land during the FA developments and those who moved to the area after their development (Sihhoye FGDs).	Local KI: Traditional authority representative, Development Committee Water Sector Chairperson, a sugarcane farmer association representative Male shareholders Female shareholders Male non-shareholders Female non-shareholders	Sihhoye TA Sihhoye WC Sihhoye FA Sihhoye MSH Sihhoye FSH Sihhoye MNSH Sihhoye FNSH

Semi-structured interviews were held with key informants and experts. Focus group discussions also followed a semi-structured protocol (refer to Appendix files A and B for the interview protocols). Questions to all stakeholders included an inquiry whether there was perceived tension before the Drought, tension during the Drought, and what were the (perceived) causes of the tensions. At the local level, questions included what the sources of water were for domestic, home garden, cattle, and sugarcane irrigation purposes. Interviews and FGDs were recorded, transcribed, then coded. The focus groups served as the main basis for the analysis. Thematic analysis was used to generate themes from the responses to the semi-structured interviews (Grant and Booth, 2009). The themes were related to the research objectives.

Within the semi-structured and focus group questions, the words “tension” and “community” were left flexible for the inclusion of various perceptions on the terminology. “Tension” tended to refer to interactions or experiences the respondent considered as negative or unpleasant. “Competition” was also used in the interviews and focus groups discussions as respondents seemed to be more palatable to discuss competitions instead of tensions or conflicts.

4. Institutional Analysis of Water Access

The formal and informal rules of the game are elaborated to elucidate the right to water and the ability to benefit from water. The formal perspective describes the right to water – what I consider the means to obtain legally-sanctioned water from the formal perspective and the "theoretical" water allocations and distributions. The informal perspective provides the rules of the game that describe the "real" water allocations and distributions. At the community level, income, technology, social relations, and social identity are mechanisms to obtain, gain, and maintain the ability to benefit from water from the informal perspective.

4.1 Formal Institutions

4.1.1 International Level

4.1.1.1 SADC: Protocol on Shared Watercourses

At the international level, South Africa, Swaziland, and Mozambique fall within the Southern African Development Community (SADC). In 1998, SADC enacted the Protocol on Shared Watercourse Systems in the SADC Region signed in 1995. This was replaced with the Revised Protocol on Shared Watercourses in the Southern African Development Community (SADC) in 2000. One of the sub-objectives to achieve the overall objective of the Revised Protocol is to "advance the sustainable, equitable and reasonable utilisation of the shared watercourses" (ibid, Article 2 (b), 2000). Domestic[14] use is defined as "means use of water for drinking, washing, cooking, bathing, sanitation and stock watering purposes". Agriculture use is defined as "water for irrigation purposes".

[14] No definition is provided for primary water use.

4.1.1.2 SADC: Regional Water Strategy

Though eSwatini, as of 2017, has not ratified a water policy nor water strategy, SADC's Regional Water Strategy (2007) can provide insight to the region's view of water, especially in relation to strategies of access to water resources. Figure 4 from the Regional Water Strategy illustrates the relationship between SADC and the member nation state's national legal documents on water governance. The Regional Water Strategy highlights and calls for the optimal economic use of water stating a "lack of appreciation of the economic value of water … [that has] an adverse impact on the effort and commitment to better allocate and manage the resource for optimal benefits (economic and social)" (Regional Water Strategy, p. 30). IWRM is to achieve social equity and environmental sustainability. The adoption of technologies is promoted to "exploit alternative sources of water in a sustainable matter" (Regional Water Strategy 2007, p.5). Chapter Four: Water for Development and Poverty Reduction elaborates "as access to water resources plays a vital role in poverty reduction and economic development, sustainable use and management of the resources is required ultimately to ensure poverty eradication and prosperity" (ibid, p.29). It further describes "these problems of poverty in the SADC region have mostly affected women, children, the elderly and the disabled" (ibid, p 29). Poverty reduction strategies are to refocus "the socio-economic and environmental importance of water" to "assist in the diversification of economic development from a low base to serve both domestic and international markets" (ibid, p. 30). The Regional Water Strategy places emphasis on technology, the economic value of water, and cost recovery mechanisms alongside IWRM and participation to achieve water for socio-economic development and to supply human needs.

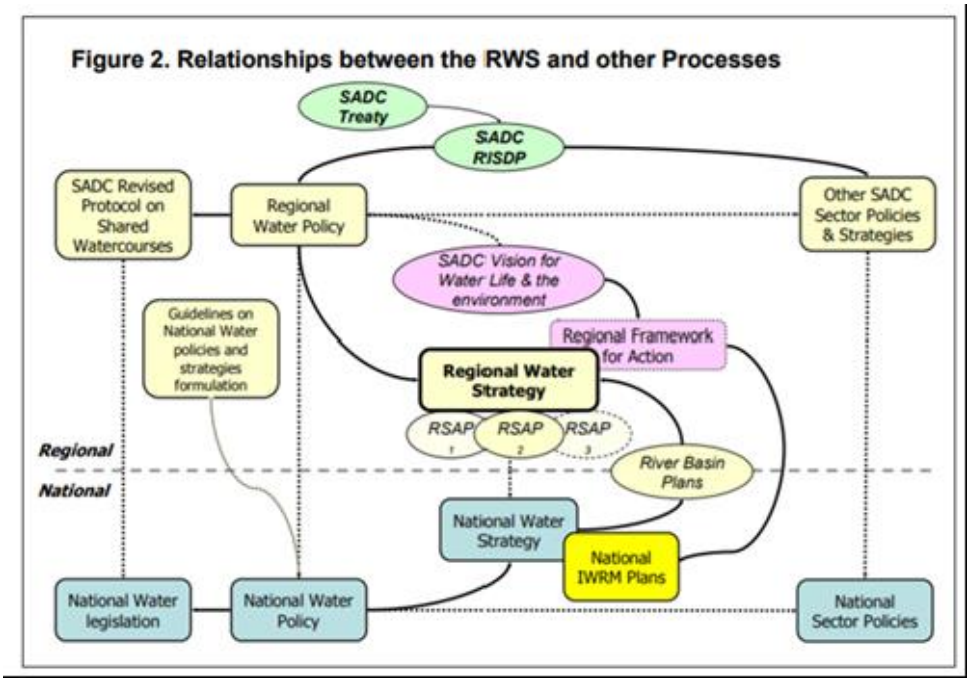

Figure 4 shows the relationship between SADC's Regional Water Strategy and the national water legislation of member states.

4.1.1.3 Komati River Basin Transboundary Agreements

The Treaty on the Development and Utilization of the Water Resources of the Komati River Basin signed between South Africa and eSwatini in 1992 established the Komati Basin Water Authority (KOBWA, personal communication) and specified the allocations of water between the two nations according to the categories of high assurance and low assurance (KOBWA Experience). High assurance is described as "allocated for strategic purposes such as domestic and industrial use and is avaiable 98% of the time". Low assurance is described as "water for low risk uses such as irrigation" (ibid p. 43). The three nation-states of South Africa, eSwatini, and Mozambique established the Piggs Peak Agreement of 1991 and the

later Tripartite Interim Agreements of 2002[15]. The treaties regulate/determine the flows (unit of measurement for water in the Piggs Peak agreement) and volume (units of measurement of water in the Interim agreement) that can be used within each member country. KOBWA explains the Piggs Peak Agreement is currently followed regarding the allocation of water between and within Swaziland and South Africa. The allocations are determined by estimated values from a baseline year. Though a definition of domestic water use is not provided, according to the water use calculations provided by KOBWA Experience (p. 45), the definition of domestic appears to be similar to the definition used in SADC's Revised Protocol of Shared Watercourses (see Section 4.1.1.1) which includes "stock watering purposes"[16].

4.1.2 National and Local Level

4.1.2.1 Governance Structure

At the nation-state level, the Water Act of 1967 was replaced with the Water Act of 2002, both dealing with the allocation and management of water resources within eSwatini. According to the Water Act of 1967, water permits were only allocated to users with deeds to their land (TDL), excluding the majority of the population whom lived on customary land (i.e. SNL) (FAO Aquastat for Swaziland, 2005). The governance structure of the Water Act of 2002 adopts the IWRM approach follows a decentralized style of governance, demonstrated in Figure 5. At the lowest organized level are the Water User Associations composed of water permit holders. Permits at the local level are obliged to be submitted and

[15] To see the specific allocation amounts, refer to the KOBWA Experience Table 2, 8, and 9.
[16] The Agribusiness representative describes domestic water supply as for "consumption" along the Komati River Basin.

assessed by a River Basin Authority (RBA) who then sends it to the DWA. The RBA of each respective river will approve or reject the application according to the availability of water along the river basin. The DWA provides the final approval of permits. The water distribution and management of the water allocations – permitted, primary use, and environmental – is passed on to an Irrigation District. Water requirements for uses are decided by the National Water Authority.

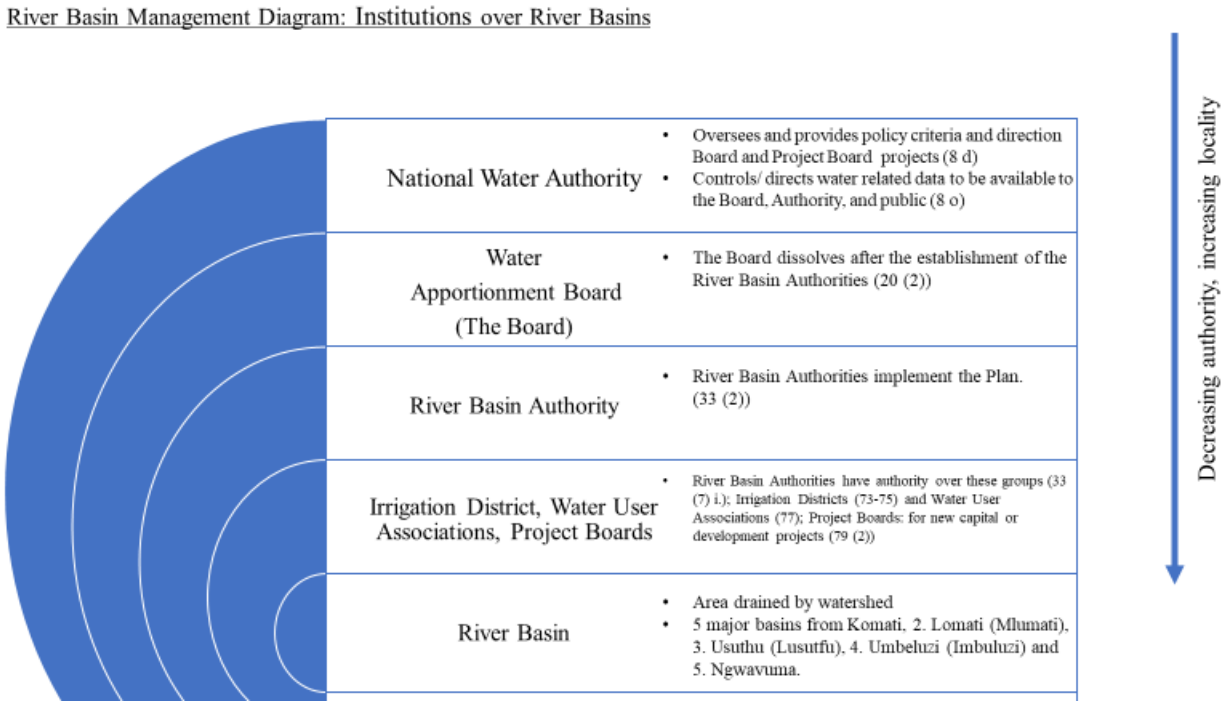

Figure 5 River basin management structure as according to the Water Act of 2002. A description of some of the responsibilities and coverage of the management structure and the respective reference in the Water Act are provided.

4.1.2.2 Water Permits

The authorized use of water according to the Water Act of 2002 is via formal water permits – e.g. for domestic, agricultural, business, industrial, etc. purposes – or through the right to water through the primary water use stipulation. Permits and primary water use are meant to reflect the local use of water. Within the permits for irrigation purposes, permits which would provide economic benefits to a larger amount of people are preferred compared to a lower economic benefit for a fewer number people (DWA 2, personal communication). The requirements to acquire a permit for agricultural purposes is described as obtaining a letter of consent from a local authority – i.e. a traditional authority, if on SNL – or a "certified copy of the certified lease agreement" if on leased land and is dependent on the water availability along the watercourse; "only if the water in that site is above the normal flow… normal flow… [is according to the] September flow which is the lowest flow within the year" (DWA 1, personal communication). The DWA sends for a field visit to the site of water permit application to "check the competition" over water (DWA 2, personal communication). A market for the product or agriculture may be beneficial during the water permit application process (SCPU, personal communication). This corroborates the description provided by the DWA that a water permit benefitting more people, providing the example of cooperatives, is desirable compared to one that benefits a fewer number of people (DWA 2, personal communication). Expressed grey areas in water allocation and accounting[17] include the water extraction for non-permitted or calculated cattle use as well as the irrigation allowance under the stipulation of primary water use (ibid). (See Appendix for permit related illustrations as according to the Water Act of 2002 Appendix Figures 5 - 6.)

[17] The term accounting was not used in the interviews. The term is used to describe discussions related to the estimation and amount calculated for specific purposes and how much water is expected to be used for the purposes in water allocations.

4.1.2.3 Descriptions for the Komati River

In the case of the Komati River, though the Komati River Basin Authority is established, KOBWA, due to its financial capability, is described to play a more active role than the RBA[18] (UNDP, personal communication). Two Irrigation Districts handle the distribution of water allocations: EEWUD and Mhulume Water. Mhulume Water is affiliated with RSSC (Mhulume Water, personal communication). EEWUD handles mainly the farmer associations from the KDDP while Mhulume Water manages some smallholder associations, medium, and the large-scale plantations which include parts of the miller-cum plantations (EEWUD, personal communication; Mhulume Water, personal communication). To provide an example of the distribution of permits within the basin, 23 out of 24 permits of one Irrigation District were for sugarcane cultivation in 2016-2017 (personal communication with an Irrigation District). Some domestic water allocations have been added to the allocations of sugar associations (insight from Malibeni FA) but this was not common (EEWUD, private communication). Water from permits is usually accessed via hard infrastructure such as pumps and are required to have a water meter to gauge the water extraction. These extractions are monitored by the Irrigation Districts which adhere disincentives for wasting water by charging for over extraction and under extraction (EEWUD, personal communication; Mhulume Water, personal communication).

Surface water for primary use — to sustain life such as domestic use and cattle — may be extracted, currently, by two authorized ways: directly extracted from the river through means of physical labor or through domestic water systems installed as rural water provision projects (these will be later referred to as domestic water systems or DWS) (derived

[18] It was discovered during the course of the data collection, Komati's RBA as of 2017 is associated with RSSC, the largest sugarcane plantation in the Northern Lowveld and the owner of the two sugar mills of Simunye and Mhulume.

from FGDS and Irrigation district interviews). Other means to obtain domestic water such as mobile tankers or from farmer associations, which will be discussed later, fall under the category of illegal as they are not registered through the formal organization such as the Irrigation District and the River Basin Authorities (EEWUD; Mhulume Water; DWA 1). The Irrigation Districts work with traditional authorities to settle disputes regarding legal and illegal ways to extract water and educate traditional authorities and law enforcement on the Water Act of 2002 (EEWUD). Mhulume Water (personal communication) describes monthly meetings with primary water users to "raise their opinions".

4.2 Informal Institutions

The actors in the informal institutions that manage the distribution and access to water include:

- The traditional authorities which mitigate and resolve community level tensions
- The Development Committee Water Sector[19] that maintains and records the domestic water infrastructure within politically-bound communities
- The sugarcane farmer associations which provide domestic water first to its shareholders then to non-shareholders within the politically-bound community

Non-actor *rules of the game* that influence the ability to benefit from rights to water resources, specifically for domestic, primary, and agricultural water use, are:

- Income (i.e. capital) to maintain access to legally-sanctioned, from the formal perspective, domestic water systems or to purchase water from non-sanctioned (illegal) mobile water tankers according to the formal perspective
- Gained, controlled, and maintained access to technology, such as pumps, pipes, electricity, and infrastructure to extract water (e.g. sugarcane farmer associations water allocation, water infrastructure, and domestic water systems)
- Controlled, gained, or/and maintained access to technology through social relations, such as friends and family, and social identity, such as the identity of shareholders or

[19] The Sihhoye WC describes the water sector's role as "discuss[ing] issues of water in the community; has a responsibility to the community, checks and fixes leaks, sit and discuss the challenges with facing water development (6:52) and… divide[s] the community into 3 areas; We (through three (3) water zonal groups) check the water infrastructure if its working properly and there are no leaks)".

owners of a sugarcane association (e.g. sugarcane farmer associations shareholders obtaining water from the sugarcane FA)

- The land of homesteads is to be near farmer associations or sources of water to obtain access to water to irrigate crops (refers to not relying on rainfall to water the crops)

For further examples of these institutions at play within the communities, refer to Section “Informal Perspective of Tensions over Water Before the Drought” (Section 5.2) and “Informal Perspective of Tensions over Water During the Drought” (Section 6.3). Brief examples from community level insights are provided below.

4.2.1 Community Level Insights

During times of sufficient rain, farmer associations willingly provided water for domestic use to both association members and non-members (in Malibeni and Mafucula). Some associations also provided irrigation infrastructure to the members (in Malibeni). EEWUD, the Irrigation District managing water mainly for the small-holder sugarcane farmer associations, described a verbal agreement between the soon-to-be shareholders — the people in the politically-bound community who lived near the river and had land to pool for the farmer association — and the community members not part of the project during the early stages of the KDDP. An interview with a farmer association revealed that the Constitution of the farmer association stipulates the water is to be shared with the shareholders (see Malibeni FA transcript; the Constitutions without able to be obtained due to time and access limitations). Mobile tankers as a provider and access point of water was not described to be heavily used during times of sufficient rain (Malibeni, Mafucula, and Sihhoye FGDs). During the times of rainfall, home agriculture (home gardens) are able to be cultivated.

To be able to access water from the domestic water system infrastructure, a subscription fee ranging from 30 - 40 E is collected per household to help pay for the electricity to bring the water through a water treatment facility and into the water stations within the communities (SWADE, FGDs, EEWUD, DWA_RWB personal communications). If a household is unable to pay for the subscription fee, the household's access to the water station will be cut. Maintaining the payment for the electricity to run the pumps for the domestic water system is a group effort. If a certain number of households are either unable to afford the subscription fees or are unwilling to dedicate that amount to obtain water from the domestic water system (i.e. a sign of a lack willingness to pay), the entire domestic water system is unable to be supported, that is, it stops functioning, it fails (Malibeni, Mafucula, Sihhoye). In Sihhoye, it was reported that there may be cases where Orphan and Vulnerable Children (OVC's) are cut off from the domestic water system due to being unable to pay the subscription fee, which was understood to be against the community or governmental rules (male FGD, Sihhoye).

At Mafucula, the farmer association supplies water to the community by connecting its irrigation infrastructure to the pipes of the previously installed water stations. In Malibeni, some farmer associations provide water for the community through stations alongside the tar road that divides the sugarcane plantation fields and the residential area. The Malibeni focus group discussions mention at least one farmer association that does this. The focus group discussions reveal the priority of domestic water first goes to the members of the farmer associations than to nonmembers (refer to Tensions Before the Drought Section 5.2.1 and Effects of Drought Section 6.3.1).

During periods of sufficient rain, tensions are expressed when others steal or take water from the infrastructure that is financially supported by a certain group of people, a

social identity. This may be either the politically-bound community that pays the subscription fee to the domestic water system to maintain its functioning or this may be the farmer associations. "Others" are described as neighboring politically-bound communities in the proximity of the community who has the water access points (such as a water station or a farmer association irrigation infrastructure) (e.g. Mafucula) or the newcomers to the area that moved for economic purposes (e.g. Malibeni, Sihhoye).

4.3 Summary

There is a mismatch between the governance of the formal institutions and the informal institutions. The formal institutions portray idealistic situations, focus on economic return and value of water, and promote equal access, but not directly equity: that is, they do not address assisting those who are disadvantaged. On the other hand, the informal institutions provide insight to the “real”, on the ground situations within the communities. Though technically the formal institutional provisions within the communities, such as access to domestic water systems and permits, are open to everyone, not everyone has the ability to benefit from them. The ability to access resources are skewed to those who are in direct connection with the sugarcane farmer associations through means of social relations, having control of the irrigation infrastructure (technology), and income. The result of the differentiated ability to access water is explored in the next Chapter.

5. Water Tensions before the Drought

The analysis of tensions over water before the drought uses perceived tensions to elucidate the "real" access and access mechanisms, specifically highlighting differentiated and skewed access at the local level. The formal perspective on tensions over water before the drought highlights "grey areas" and challenges within the nation's water legislation. At the community level, the ability to benefit from water for primary purposes was in tension with the permit holders who controlled the maintained water infrastructure.

5.1 Tensions Emerging from Formal Institutions

From the formal perspective, a main cause of tensions is described to be the illegal extraction of water and water extractions either not accounted for or unverified for in water extraction estimations, such as households not using their full allocation. It can be understood the sugarcane farmer associations maintain their rights to water via their adherence, and payment, of their water permits. The FA's control their water extraction infrastructure. Primary water use may be legally attained from domestic water systems or river/canal. Other means of water extraction are not legally sanctioned as long as the means has not acquired permission to extract water. Tensions between irrigated permit holders and non-permit holder arise due to control over the infrastructure and maintained access to DWS.

5.1.1 Water Distributor Perceptions on Before the Drought Tensions

The Water Distributor perceptions will be discussed below according to the spatial scale of tension. Details regarding what is considered illegal water extractions from the formal perspective reveal weakness or gaps in the water legislation.

Competition along the Komati river between the transboundary nations date back to the 1950s as the Komati "has been fully allocated" (KOBWA, personal communication) historically (SCGA, personal communication). Tensions were described to exist between the farmers downstream the weir of the Mhulume canal with the Mhulume canal operators (ibid). Yet, illegal water users is not accounted for as "it is a requirement that all extractions … are metered and measured and reported" (KOBWA, personal communication). Historically, the competition was between countries. During the Drought, tensions manifested between treaty countries (see Section 6.2). This was not the first time for tensions between neighboring nations as "varying degrees of shortages" occurred prior to the Drought. "…[T]here were years where there was not a classical drought, but [there was] not enough water for everybody. Rationing was in place during those times" (SCGA, personal communication).

Tensions over water at the community level existed prior to the Drought: "We had conflicts even way back, but they were aggravated by the drought" (EEWUD, personal communication). There was once a verbal agreement obliging those to be shareholders of the farmer association to provide water to non-shareholders of the area. "As time went by, the local communities have been extracting water from the irrigation system, I think as per their verbal agreement". With the enforcement of permit compliance, tensions began to rise between permit holders (the farmer associations) and non-permit holders[20] (ibid). One cause of this is described as "the hectarage, the demand of the water, has increased in recent years. Whereas the size of the canal has not increased, it is still the same size" (Mhulume Water, personal communication). The residents have challenges accessing their water allocation for

[20] EEWUD describes non-permit holders as "the community" and as those who were blocked access to the river.

domestic use (Mhulume Water, personal communication; EEWUD, personal communication).

The rural domestic water sector was considered unable to extract their full allocations. The populations at large are considered to lack the infrastructure to extract their allocated water, as well as lack the ability to maintain these infrastructures (ibid). However, the assumption at the national allocation level (i.e. Department of Water Affairs) was that all the water allocated is being used (DWA 1, personal communication). That is, the water allocated for rural domestic use is fully utilized. Examples of illegal water extractions include putting in pipes to the rivers or canals that had not been authorized, the use of mobile tankers that are not authorized, and not registering cattle once exceeding the 30 count (EEWUD, personal communication; DWA 1, personal communication; SCGA, personal communication). Illegal and un-verified calculations of water extractions before the Drought were described to include: vegetable gardens, marijuana farms, and illegal expansions without a permit (DWA 1, personal communication; EEWUD, personal communication; RDA, personal communication), some of the forestry industry within the Komati River Basin, and high water demand invasive trees (DWA 2, personal communication).

5.1.2 Water User Perceptions on Before the Drought Tensions

Agricultural sector (see Table 4) stakeholders described tensions between the sugarcane farmer association, maize farmers, and the distribution of water for "cattle rearing" before and/or during the drought as well as the extraction of water for dagga (SCPU, personal communication). SSA (personal communication) described minimal competition as "each person gets their share that he has ordered" while there are challenges with maintaining the flows to neighboring countries. SSA does not describe any tensions before the Drought. Any

manifested competition was due to mismanagement. There is faith in the governmental structures such as DWA and the River Basin Authorities to "make sure that the water is used equitably within each basin" (ibid). Beyond the Drought – or droughts - "Competition… all depends on the allocations" (Agribusiness, personal communication).

According to Water Experts, though competition and tensions manifested during the water shortage of the Drought, illegal extractions[21] of water also occurred prior to the drought (DWA_RWB, personal communication). The Water Expert (personal communication) explained before the drought, competition over water was within the same sector. Additionally, “Prior to water shortages, you will find that most communities for domestic purposes they access water from the ungauged streams, the unmonitored small streams. Then they always get access to water. But the challenge would be what if they get dry, where would they get access?” (ibid). Knowing the inputs and outputs of water to be allocated is a challenge for nation's water permitting system (ibid). Not knowing how much water from an already granted water allocation is actually used – and not used, for example – leads to uncertainty of how much water is really avaiable.

5.1.3 Regional Key Informants Perception

According to regional key informants situated within the Mhulume Water Irrigation District and classified as medium- to large-scale irrigators, before the drought, tension over water would have occurred if, for example, a sugarcane farm would start to grow vegetables (Middle-scale Farmer, personal communication) and for political reasons, such as being unable to manage the financials of a farm (Citrus, personal communication). The dam

[21] The Water Expert was not asked a question regarding illegal water extractions, nor mentioned it during the interview.

resettlement expert explains before Maguga dam, there was no one competing for water with the Mhulume Estate – the historic affiliation of the Royal Swaziland Sugarcane Company (DRE, personal communication). Afterwards, these small farmers started competing for water with Mhulume. No intra- nor inter-community tensions are specifically described.

5.2 Tensions Emerging from Informal Institutions

For this section, the ability to access water from water infrastructures such as domestic water systems and water provided by sugarcane farmer associations – what I consider as "easy-to-access water" – are central tensions described before the Drought within the case communities. Farmer associations control the infrastructure to extract water and maintain access by paying for the electricity with the water is ordered through the Farmer Associations (Farmer Associations, personal communications). Income is needed to maintain access to domestic water systems. When the DWS are no longer accessible, people obtain water either from the FA, legally or illegally according to the community and FA, or from means considered illegal according to the government. Social relations and social identity are means (i.e. mechanisms) to gain and maintain legally-sanctioned "easy-to-access water" within the community. The sources of water for different purposes according to each community may be found in Appendix Table 1.

5.2.1 Malibeni

While the domestic water systems face challenges to be maintained, non-shareholders obtain water from farmer associations either legally (i.e. with the acknowledgement of the FA) or illegally. Social identity as – or a social relationship with – a shareholder is used to gain access to FA infrastructure. Non-shareholders are considered people from the outside

who moved to the area or who lived in disadvantaged land during the sugarcane association development.

Water from the domestic water system was sanctioned to be used for domestic use but not for home gardens (Malibeni WC, personal communication). Individual households and the broad community face challenges to pay the electricity bill to maintain access to the domestic water system. When the domestic water system is functioning, it extracts water from the Komati river. Before the drought, there are no described tensions between people over water according to community representatives (Malibeni TA, personal communication; Malibeni WC, personal communication). This is contrast to descriptions provided by other informant community members. No tensions arebdescribed between associations but with "those people who are outside… far from the river" taking water from the farmer association that is meant for irrigation (Malibeni FA, personal communication).

Both the male and female shareholder groups (personal communication) described they obtain water for domestic and home garden purposes from the farmer association. For domestic purposes, the water is extracted from the Komati River and to their homesteads through the FA and water tanks within the shareholder's property. The male shareholder group (personal communication) elaborates the non-shareholders who obtain water through the domestic water system face challenges paying the electricity bill to maintain the domestic water system. When the system is not functioning, non-shareholders obtain water from a tap provided by the farmer association installed along the border of the association.

The male shareholders (personal communication) complain before the drought there were tensions between water vendors and the association as people would take water from the association provided tap to sell to those who are far from water sources. This would increase the electricity cost of the association. The female shareholders (personal communication)

group describes tensions with what was considered another community - confirmed to be non-shareholders but still part of Malibeni - who would abuse the pipes and steal water from the association.

Neither of the non-shareholder groups describe obtaining water from a domestic water system (Malibeni MNSH, personal communication; Malibeni FNSH, personal communication). The various sources they described to obtain water for domestic purposes are from: a community service project provided by a farmer company [assuming a sugarcane association], the use of mobile tankers, directly from the river, or negotiating with a farmer association. There once was a domestic water system however it could not be maintained (Malibeni MNSH, personal communication).

Before the drought, the male non-shareholder group explains "there were no conflicts. The reason is there were enough springs and there was enough rainfall" (ibid). The female shareholders group described "these water issues are not something of today... It has been a problem" (Malibeni FNSH, personal communication). They describe there were times when the association would stop non-members from obtaining water from the association-provided taps. Additionally, it would take several days to obtain water from water tankers (ibid).

5.2.2 Mafucula

In Mafucula, all focus groups – shareholders and non-shareholders – seem to share a similar social identity, describing tensions over water are with people from another social identity – i.e. from their perspective – belonging to another community. Water for domestic purposes is sanctioned via the DWS, but not for home gardens (Mafucula TA, personal communication; Mafucula WC, personal communication). They do not mention anything

about the challenges of maintaining the function of the domestic water system. Water for the DWS is extracted from the Mhulume canal (ibid).

The WC (personal communication) describes that there were no tensions over water before the drought. The TA (personal communication) elaborates, however, that there was competition over water between people and livestock before the installation of the domestic water system. After the installation of the domestic water system, tensions over water are described between Mafucula and a nearby community – who does not have "taps at their homesteads" – who obtain water from Mafucula' s taps.

According to the Mafucula male and female shareholders (personal communications), water from the domestic water system may be used for domestic and livestock purposes but not for home gardens. It is described by the female shareholders group (personal communication) water may be obtained twice a day before the drought. The female shareholders revealed irrigation water from the farmer association is diverted into the DWS pipes to provide the system with water (ibid).

The male shareholders (personal communication) describe tensions over water before the drought with people from other communities obtaining water from the domestic water system "yet the people who are situated next to the source, they don’t have enough water". The female shareholders describe no tensions over water before the drought "because they were educated and that there [was a] limit of water which will be given to people who were not even paying for the water" (personal communication).

According to the Mafucula male and female non-shareholder group (personal communication), water from the domestic water system may be used for domestic use but not for home gardens. The male non-shareholders (personal communication) explain irrigation

water from the farmer association is diverted into the domestic water system. No further challenges regarding individual household access in terms of payment is described. Both non-shareholder groups describe tensions over water before the drought with another community(ies) who would obtain water from Mafucula' s domestic water system. They describe the issues continue during the drought. Refer to Section 6.3.2 for more details.

5.2.3 Sihhoye

As the nearest source of water, beyond the domestic water system is the Mhulume canal, it can be understood tensions are described between those who are not unable to maintain access to water for domestic and home garden purposes from the DWS and the controller of the Mhulume Canal. The domestic water system is used for both domestic and home garden purposes (Sihhoye TA, personal communication; Sihhoye WC, personal communication). Challenges to maintain access to water from the DWS was the electricity payment, especially during the drought, for both households and the broad community, as well as, infrastructural limitations, such as the pump and pipe size. Water for the DWS is extracted from the Mhulume canal (ibid).

When asked about tensions over water, the traditional authority representative states "there are no misunderstandings and there are no conflicts because the system so clear. When the water is diverted from the Komati River, there is a clear allocation of this goes for domestic use, domestic uses for own consumption and livestock, and then this one is for commercial water and irrigation.... because everyone has got their own different bucket. but the challenge is that for their bucket, that is called domestic use, it is difficult to get the water into their houses due to the price of electricity" (Sihhoye TA, personal communication). This comment was received in relation to what was described as a challenge to maintain the

function of the domestic water system due to electricity bills[22]. The WC (personal communication) described that there were tensions between natural residents and newcomers as the ability to distribute water to the populated was strained. The cause for not being able to extract were described to be an infrastructural limit. A community imposed rationing strategy was initiated to distribute water to different sections of the community (ibid). The Sihhoye FA explains enough ("sufficient") rain mitigates crises that arose the drought.

The male shareholder group (personal communication) stated they obtain water from a domestic water system. However, "gardens had become a white elephant. because there is no water. the only gardens that are functional and operational are those situated or located right next to the sugarcane fields" (ibid). The female shareholder group (personal communication) explains when there is rainfall there is no competition over water because the home gardens do not need to be watered. The female shareholder group explains they obtain water for domestic and home gardens from a domestic water system, that is, if "they have paid". Otherwise, water is obtained from the canal using wheelbarrows (ibid).

The male non-shareholder group (personal communication) describes challenges to water home gardens. Though it seems to be possible to obtain water from DWS to water the home gardens, since it is not consistent, the home garden would not be able to yield. The group describes though there is domestic water system infrastructure in the region in which they live, water is not flowing. They are not able to pay for the electricity to bring the water as "We are not employed, there is no employment, there is no jobs. We cannot even start a business because there is no water" (ibid). It was not clear when the group began to face

[22] This is especially a challenge during the drought as money went to food instead of paying for water.

challenges maintaining the infrastructure. Water is obtained from sugarcane overflows for domestic use (ibid).

When the taps are not flowing, domestic water is obtained through mobile tankers (Sihhoye FNSH, personal communication). The female non-shareholder group explains the canal is a popular source of water. This leads to competition, even during the drought (ibid). The male non-shareholder group (personal communication) describes Mhulume Water blocking access to the Mhulume canal after the domestic water system was installed. It is inferred when there is sufficient rainfall, this is not a problem.

5.3 Summary

This chapter explored whether tensions (conflicts) over water existed prior to the Drought in the sugarcane areas of the Komati. Though Terry (2012) study describes inequity/inequality in the KDDP project, there are no or limited descriptions of conflicts in his study, nor other studies on sugarcane cultivation in Africa according to the biofuel impact reviews. The stakeholders that are not on the ground in the KDDP area show little awareness of tensions/inequities between shareholders and non-shareholders. Macro-scale effects – i.e. tensions between neighboring nations - of accumulated illegal water extractions were described. The illegal extraction of water for dagga is assumed to be the largest illegal water extractor. The formal institutions revere the Water Act as the mitigator of tensions and conflicts because of the water allocation system. On the ground, the water allocation devised by the Water Act show relatively little impact. The ability to truly distribute the water for the respective purposes is challenged as technology and ability to maintain the technology is faulted or under-developed. Government assisted domestic water systems were unable or not-maintained in the case communities.

Within the sugarcane adopted communities, those who gave land to be shareholders of the associations have preferential access to water and are described to share water with those of their social identify (Malibeni, Mafucula, Sihhoye) or as part of an understanding (Malibeni). Rain acts as mitigator by providing alternative water sources; though, according to the governmental systems water is allocated for domestic and home gardens, yet they are not utilized. The formal institutional issue is with the distribution of the allocated water and water accounting the proper estimates of what is actually used or not. In the next chapter, the changes that occur to the tensions over water under a declared drought disaster are illustrated.

6. Water Tensions During the Drought

The perceived effects of the Drought from the formal and informal perspective are discussed here to highlight how existing tensions at the community level were exacerbated.

6.1 Drought-Response Organization Perceptions

All Drought-Response key informants – composed of SEPARC, NDMA, UNDP, Red Cross, UNICEF, and World Vision – have formal reports on the effects and impacts of the 2014-2016 drought. In 2015, the drought was declared a national disaster by the Government of Swaziland. Points related to food security and household level impacts are discussed in the official reports. No in-depth analysis of the differentiated access to water is described nor the tensions between permit holders and non-permit holders – i.e. domestic and irrigated agricultural use. Competition over water during the drought was highlighted to be between people and livestock as people wanted to care for the livestock.

6.1.1 Government-related Drought Response

NDMA seems to point that there were tensions between water for rural households – i.e. domestic water – and the water for irrigation in the sugarcane associations. Other government-related key informants highlight, however, macro-level impacts on the agricultural sector of which cotton, cattle, and vegetable were amongst the hardest hit and social security issues. "The reason that we are so affected by drought is that 1. we need the water to produce the GDP in the country. A lot of our GDP comes from the sugar industry which uses a lot of water. We also have families or households which [live] in rural areas that especially depend on subsistence agriculture to feed themselves. But without water they are not able to produce food to supplement their needs". Sugarcane "drives the foreign exchange

earnings sot that we [Swaziland] can purchase food" (NDMA, personal communication). "But also, water security intends to be something that is sort of intertwined with agricultural production. So, you find that the rural water development schemes, throughout rural Swaziland, they go hand in hand with the agricultural sector to make sure that communities have access to water for their livestock as well as for crop production" (SEPARC, personal communication). Food production is said to take a backseat to homestead or commercial development on the "11%" arable land of Swaziland (ibid). NDMA (personal communication) does explain the sugarcane industry were accused of consuming " a lot of water". The challenges were due to the not being able to direct water to "where people are living" (ibid).

6.1.2 Non-Governmental and International Organization Drought Response

Red Cross, UNICEF, and World Vision (personal communications) focused on drought relief, providing food, water, etc. Macro-level impacts, social security, including impacts on school attendance are discussed in their reports and their respective in-person interviews. Effects include water rationing, crop failure, and the rivers drying. In agricultural areas, UNDP described one portion of the community benefiting from water access while the other falling "under the issue of inequality". UNICEF (personal communication) described the competition over water during the Drought to be between livestock and people over the source of earth dams. Part of the community benefiting and livestock versus people scenarios are examples of competition but do not illustrate the tensions between involved groups.

6.2 Tensions Emerging from Formal Institutions

In this section, all regional Water Distributor perceptions are provided. Only those in the Water User Sectors that showed familiarity or were part of the sugar industry are included. From the formal perspective, competitions over water are perceived to be generally mitigated as there are specific allocations for the various purposes. Illegal water extractions are described to be a central cause for manifested tensions over water during the drought, with the largest illegal water extraction for Swaziland's second gold, dagga. See Table 4 for which individual stakeholders form the Water Distributors and the Water User Sectors.

6.2.1 Water Distributors Perception During the Drought

KOBWA (personal communication) and SCGA (personal communication) described tensions were experienced between South Africa and Swaziland during the Drought. KOBWA stated primary water is "assumed to be taken as per the treaty allocations". The ex-CEO of KOBWA described primary water as "water for what you call basic human needs" that is "not regulated" (SCGA, personal communication). He claimed, "people are abusing it; they are taking ¼ ha and saying that there is a 100 of us". SCGA (personal communication) highlights tensions in water scarcities between large-plantations (the Royal Swaziland Sugar Company, RSSC) and the shareholder farmers as well as between shareholder farmers.

EEWUD (personal communication) and Mhulume Water (personal communication) elaborate tensions over water along their Irrigation Districts, there, though Mhulume Water does not provide more details. Mhulume Water (ibid) explained instead "the hectarage, the demand of the water, has increased in recent years. Whereas the size of the canal has not increased, it is still the same size". Illegal water use is described to be the extraction of water without a permit or the taking of water when a farmer association has not ordered the water.

Extracting water from the canal with the pump and generator is also considered illegal as well as washing close to the canal are next to the canal but taking water from the canal with a mobile tanker. "The tanker has to go through the office. If it goes straight there, it becomes illegal" (ibid). EEWUD (personal communication) seemed to agree with interpretations. Regarding water for domestic use, it is described that people are not able to utilize the full allocation allotted to them by the government as a have trouble paying for the electricity to obtain this water. These are similar statements described for non-drought situations. (See Section 5.1.1)

6.2.2 Water Users Perception During the Drought

6.2.2.1 Agricultural Sector Perception

The RDA (personal communication) representative described a source competition before the Drought to occur when people who "branch the water and all sorts of ways" to irrigate "other crops", most likely referring to dagga, prevent water to reach downstream users of the extraction. This branching of water for non-permitted irrigation causes tensions between the sugarcane farmer associations, who have permits, and those irrigating yet do not have permits. Though these occurred before the drought, the became more pronounced during the Drought (ibid). During the Drought, households lost the water rights to irrigate home gardens initiated for food security (SWADE, personal communication).

The SCPU (personal communication) highlighted tensions between the sugarcane farmer association, maize farmers, and the distribution of water for "cattle rearing" before and/or during the drought as well as for the irrigation of dagga. It was revealed along the Komati River, the large-scale plantations would request the smallholders to use higher efficiency irrigation systems. At the international level, there were challenges to maintain the

flows to neighboring countries according to treaty agreements. The Agribusiness (personal communication) representative described tensions amongst the large, medium, and small-scale sugarcane plantations to be aggravated by the Drought. Additionally, home gardens[23] were stopped during the drought "because it was deemed to be a practice that consumes a lot of water". The Agribusiness (ibid) representative described the larger farms were more prepared for the drought as they have storage dams within their properties. SSA (personal communication) described minimal competition as "each person gets their share that he has ordered". Manifested competition was due to mismanagement. The representative explained there are governmental structures such as DWA and the River Basin Authorities that "make sure that the water is used equitably within each basin". Each of the Agricultural Sector key informants provide different perspectives for the situation during the Drought. Overall, the local/household level home gardens were stopped during the Drought. Within the sugarcane sector, there was friction between the small- and large-scale plantations. Also, illegal water extractions became a more evident problem.

6.2.2.2 Water Experts Perception During the Drought

The Rural Water Branch (personal communication) described "communities fighting over allocated water". The main reason is the illegal branching for dagga, "the Swazi gold". Though it is understood that the illegal branching took place before the drought but, "Once there is no water, people start competing. Because of the drought that was the reason for the competition." According to an assessment undertook by the Rural Water Branch (ibid), "the competition was between the portable water users and animals" where people preferred to

[23] The Agribusiness representative uses the term of "small garden".

"give the water to their animals, like livestock". The Water Expert described the allocations and use of water for irrigation does not affect domestic use, providing the example of domestic use of water in Mbabane, the capital. The Drought raised also "social security issues" at the household level such as "violence in households because the man is probably angry that the animals are dying" (ibid). There was an impact on food avaiability and those relying on HIV/AIDs medication[24]. Both the Rural Water Branch and the Water Expert described the water table decreasing around the country resulting in boreholes to be unusable. Along the northern river basins (of which the Komati River is found), "there was a very tight competition between domestic and irrigation" (Water Expert, personal communication). The town of Piggs Peak along the Komati is provided as an example of domestic water. Domestic water is described to include small gardens and livestock. In order to address climate change, the construction of more storage facilities is described as a strategy for the nation (ibid).

6.2.3 Regional Key Informants Perception

The Regional informants described the tensions over water during times of water shortages to be between large and small farmer associations (Maguga dam resettlement expert, personal communication); those that did manifest were mainly due to mismanagement (Medium-scale farmer, personal communication) and politics (ibid; Citrus, personal communication). Further details were not provided.

[24] Other KKI also highlighted this when speaking about the effects of the drought.

6.3 Tensions Emerging from the Informal Institutions

The drought exacerbated already existing tensions (refer to Section 5.2). Like previous, the ability to access water from water infrastructures such as domestic water systems and from sugarcane farmer associations – what I consider as “easy-to-access water” – are central to the described tensions during the Drought. Farmer associations control the infrastructure to extract water and maintain access by paying for the electricity (and the water ordering; Farmer Associations, personal communication). Income is needed to maintain access to domestic water systems. When the DWS are no longer accessible, people obtain water either from the FA, legally for a certain amount or illegally beyond that according to the informal institutions. Social relations and social identity are means (i.e. mechanisms) to gain and maintain legally-sanctioned “easy-to-access water” according to the informal institutions.

6.3.1 Malibeni

As the avaiability of alternative water sources decreased during the Drought, the water infrastructure controlled by the sugarcane farmer associations becomes even more important to obtain water. Social relations and social identities are central in the ability to gain and maintain access to the sugarcane farmer association water infrastructure.

During the Drought, the Malibeni TA (personal communication) described no tensions were experienced as "there were no conflicts for others to come and fetch water because they understood that they should also have [a] livelihood". On the other hand, the Malibeni WC (personal communication) described tension over water between the farmer association and the people. The farmer association decreased the amount of water for shareholders of the association that was previously granted water access. Non-shareholders

were restricted to obtain water from the farmer association, leading them to steal water for domestic use from the association fields (Malibeni WC, personal communication). The Malibeni FA (personal communication) described that people continued to steal from the FA until at least September 2017.

During the Drought, the male shareholders (personal communication) described tensions over water between shareholders of the farmer association and those who are not shareholders as all were "rushing for the same source". Both the male and female groups expressed there were tensions between the farmer association and its own members who are living in the plantation fields because the illegal irrigation of the shareholder-granted agricultural plots[25] (Malibeni MSH, personal communication; Malibeni FSH, personal communication).

During the Drought, both the male and female non-shareholder groups described the discrimination between members and non-members heightened during the Drought (Malibeni MNSH, personal communication; Malibeni FNSH, personal communication). The female non-shareholder group described they would hear "you guys are invaders into our community, you are foreigners here, you cannot have this water." They would only receive these comments when they were trying to obtain water from an association; there were no tensions or fighting when obtaining water from the Komati River (ibid). The male non-shareholders group corroborated this highlighting the interaction with shareholders forced them to obtain water directly from the river or to buy from mobile tankers. Additionally,

[25] Shareholders both those who live within the plantation and the rest have an agricultural plot within the Association fields. They are normally allocated two sprinklers to irrigate the field. During the Drought they were only sanctioned to use one (Male and female Malibeni FGDs, personal communication).

connections to the farmer association allowed prior to the drought were cut during the Drought (Malibeni MNSH, personal communication).

6.3.2 Mafucula

During the Drought in Mafucula, people stole water beyond what the farmer association had already sanctioned/ provided. This highlighted tensions between primary use and permitted use who has control over the water infrastructure and the income to maintain it. The tensions with a group of people from another social identity to theirs continued and are described to increase, or at least be a larger concern, during the Drought.

During the Drought, the Mafucula TA (personal communication) described the tensions to be with the livestock of the nearby community. The Mafucula WC (personal communication) elaborated a rationing exercise mitigated tensions over water. He described complaints made by those far from the association field regarding the privilege of those near the field were able to irrigate home gardens by connecting pipes to the Mafucula canal.

The male shareholders (Mafucula MSH, personal communication) described tensions over water during the Drought with a community that later joined Mafucula yet did not want to invest in the sugar association and another nearby community. Individuals from these communities would come to Mafucula to obtain water. The female shareholders (Mafucula FSH, personal communication), one the other, described no tensions over water during the Drought.

Both the male and female non-shareholder groups explained the tensions over water they experienced before the Drought continued during the 2014-2016 drought (Mafucula MNSH, personal communication; Mafucula FNSH, personal communication). Tensions were

experienced with a neighboring community who obtained water from Mafucula' s water infrastructure near the Mafucula community. The female non-shareholders (personal communication) complained about the ques to obtain water from the stations of the DWS which serviced water only for a limited time of the day. The water is distributed within the community according to community sections, a type of rationing. The male non-shareholders (personal communication) further elaborated that members of Mafucula would steal water from the farmer association which "… caused a huge problem between the sugar company itself and the community members... We're still doing it because we think our life is more important than the crop".

6.3.3 Sihhoye

The tensions over water during the Drought in Sihhoye highlight a tension with, when not able to obtain water from domestic water systems, and permit holders, the operators/managers of the Mhulume Canal[26]. The Sihhoye traditional authority representative explained there were no tensions or "misunderstandings" during the Drought (Sihhoye TA, personal communication; Refer to Section 5.2.3 for more detail of before the Drought tensions). The Sihhoye WC (personal communication) described there were tensions between natural residences and newcomers as the ability to distribute water to the population was strained. The cause for not being able to extract where water is described to be an infrastructural limit. A community imposed rationing strategy was initiated to distribute water to different sections of the community. Though the Sihhoye FA (personal communication) described "a few crises" arose "after 2015", no further details are provided.

[26] The Mhulume Canal supplies water for large and medium scale sugarcane plantations (Mhulume Water).

The Sihhoye female shareholder group (personal communication) explained there was competition during the Drought for water because people "are watering their homestead plots". The people who have tanks at their homestead will have "enough water", while others do not have tanks. The male shareholder group (personal communication) provided examples of people stealing water or collaborating with neighbors who can afford to pay the subscription fee to the DWS to obtain water. Though a timeline for this was not specifically provided, it is understood to have overlapped with the Drought, but may have also occurred prior.

As the Mhulume Canal water decreased during the Drought, the pumps for the DWS became unable to function, stopping water through the system (Sihhoye FNSH, personal communication). The group mentions "they had to walk all the way to the canal or the river". When the DWS was functioning, not all water stations were able to be supplied with water as the system relied on gravity (ibid). The male non-shareholder group (personal communication) explained "there was no competition because it is quite clear there was no water available for them to do whatever they wanted to do with the water". It is implied Mhulume Water blocked and/or limited water extraction directly from the Mhulume Canal.

6.4 Summary

The Drought exacerbated the tensions over water, also causing the informal sharing of water to decrease (Malibeni) and people to migrate to obtain water from sources beyond their social identity (Mafucula). Sihhoye provides an example of access and retrieval from the canal being limited during the Drought situation. The disconnect between the informal *real* use/extraction of water with the formal perspective's water accounting most likely contributed to the transboundary national tensions regarding water flows. Inequality is visible

between shareholders and non-shareholders in terms of differentiated access to water due to means of social identity, control of technology, and the ability to maintain the technology. Though both are considered to have a right to water, first to domestic, then to agriculture, tension between water for domestic purposes and the water permits for sugarcane cultivation are described to escalate during the Drought. The new roles of domestic water provider in the communities – the farmer associations – are not formally recognized, leading them to decrease the provisions of water for human needs they previously provided prior to Drought conditions. The indirect mechanisms which faciliate/allow individuals the ability to obtain and maintain access to water should be considered in terms of historic or situations inequalities. Perspectives on challenges on obtaining these indirect mechanisms are explored in the next Chapter.

7. Discussion 1: Challenges of Indirect Mechanisms

The challenges of non-sugarcane cultivation and the advantages of cultivating sugarcane are explored in this chapter. The perceptions from key informants in the Agricultural Sector are provided. Access to loans and markets – both of which are interconnected – are shown to be a recurrent theme.

7.1 Agricultural Sector Perceptions

A farmer must have a supply of water prior receiving help to find a market[27]; (NAMBoard, personal communication). The supply of water for these farmers may not be constant: Referring to the Drought, a NAMBoard representative stated "They have developed their own systems and they are on mostly small streams and seasonal rivers. They were the first ones to suffer" (ibid). To have a small-scale agricultural scheme, like a vegetable scheme, means to have a dam, water storage, or reservoir and a permit (RDA, personal communication). Yet, during times of drought, for example the 2014-2016 drought, home gardens lose water rights for irrigation (SWADE, personal communication; EEWUD, personal communication; Agribusiness, personal communication). An Rural Development Area (RDA) installed by government is tasked to help farmers find markets, develop budgets, and provide machines to assist in farming activities, yet the RDA is under employed to service the entire area (RDA, personal communication). Within its regulations, NAMBoard does assist farmers to access loans from banks (ibid). Yet, to find markets and the reliability of famers to deliver to a market is a challenge for farmers (Horticulture, personal

[27] NAMBoard, the eSwatini governmental parastatal mandated to assist small-scale farmers to find markets and access loans works solely with irrigated farms. Other parastatals of the Government of the Kingdom of Eswatini see: http://www.gov.sz/index.php/component/content/article/141-test/1995-swaziland-enterprise-parastatals?Itemid=799.

communication) as well as to acquire loans from banks (Horticulture, personal communication; SCPU, personal communication; Agribusiness, personal communication; SNAU, personal communication). The SCGA entity provides an advocacy voice to the government for water infrastructure development for sugarcane farmers, while NAMBoard is to play a similar role for other agricultural production. NAMBoard struggles to secure markets and to buy produce from its members (SCPU, personal communication).

The explains he does not believe the diversification portion of the KDDP that is also is established (Diversification in the KDDP project that has been allocated water and land according to the project is not well established (SCPU, personal communication). There are small gardens/ home gardens, yet they are not allocated water rights. They are viewed as “stealing from the sugarcane fields from those owners [shareholders]" (ibid). In reference to other crops that should also be part of the KDDP, the SCPU explains "It is difficult to finance the other crops because of marketing problems. So, the financers are recommending that “maybe we can put our money on the sugar cane. Since its marketing structure is better" (ibid). A similar concern is described by the representatives of DWA, the national agency administering water permits.

7.2 Indirect Mechanisms of Community Level Access to Water

In this section, the categorization among rights-based access and illegal access is to be reviewed followed by access mechanisms that lead to the ability to benefit from the resource of water.

In our case, the primary water users and the permitted water users both have the right to access water, that is, as long as they adhere to the stipulations in the Swaziland: Water Act of 2002. For the primary water users, less than a quarter hectare of land adjacent to their

households may be irrigated, 30 heads of cattle are exempt from water extraction permits, as well as water for domestic and sanitation purposes. In practice, not all households' properties are near sources of water making it difficult – to possibly impossible – to irrigate land for subsistence agriculture, those with more than 30 heads of cattle do not acquire water extraction permits, to acquire water for domestic – and sanitary – purposes requires physical labor or illegal means to obtain their allocation, and those with permits should update permits when expansions are to occur and should stay within the limits of their allocation. Grey zones exist, however, and in these grey zones' tensions can be described to manifest. For example, farmer associations providing domestic water to households goes beyond the stipulations of their water permit yet supply already alloted water.

To place the analysis in relation to access presented by Ribot and Peluso (2003), the "object of inquiry" here refers to the ability to benefit from the extraction of water resources for the use of domestic, subsistence agriculture in the form of home gardens, and commercial sugarcane cultivation purposes. Below, how each of the purpose's benefit and the mechanism through which they are able to benefit from the resource of water is discussed. As rights-based access is characterized by the perspective, we speak about rights-based accessed from the formal, governmental rules of the game perspective and the informal, social/community-level rules of the game perspective. The mechanisms of access are through means of "technology, capital, markets, labor, knowledge, authority, identities, and social relations" (ibid). The mechanisms will discuss who, in the case communities and the specific time frames, "has resource access priority" (Ribot and Peluso, 2003; see also Blaikie, 1985). As labor, knowledge, and authority mechanisms of access were outside the scope of the data collection framework, the analysis will mainly focus on technology, capital, markets, social relations, and skim the surface of social identities.

7.2.1 Use for Domestic Purposes: Shareholders and Non-shareholders

A) Formal rules of the game perspective

In view of who controls and who maintains access to water, the Water Act of 2002 declares water as a national resource (Swaziland: Water Act of 2002, 34 (1)), thus the national government controls the rights to water. If households – shareholders and non-shareholders – are either unable to pay or chose not to pay the subscription fee to the domestic water systems, the other extraction points of water are viewed as illegal since those means are not permitted or sanctioned to extract or divert water. The mobile tankers households rely on during times of sufficient water and during times of insufficient water (See Section 5.2, Section 6.3, or Appendix Table 1) are illegal means to benefit from water, even if for domestic purposes. To obtain water from farmer associations is also considered an illegal means to benefit from water as the association is not permitted to do so. Using property as the "right to benefit from things" (Ribot and Peluso, 2003), the Water Act of 2002 invests the right to benefit from water for domestic purposes to individuals equivalent to property holders of water. However, the "ability to benefit from" water is not guaranteed.

i. Mechanism of access

In communities that have domestic water systems (i.e. a form of technological mechanism) and when the domestic water systems are functional, access to the domestic water system is stopped if households are either unable to pay or chose not to pay the subscription fee to the domestic water systems. To maintain access to water from the DWS, either some sort of income or capital (e.g. wealth; a form of capital mechanism) is needed for both the shareholders and non-shareholders alike. If they are unable to access water from the

DWS directly, they may indirectly access water using social relation mechanisms (e.g. family or friend networks) to those who have direct access to the technology. Other forms of legally-recognized technologies to extract or obtain water is from boreholes/ wells and jo-jo tanks[28].

Though further research is needed to draw tight the causal strings/links, the capital mechanism such as wealth to maintain access to legally-recognized technologies of water extraction may show differentiations of wealth within the politically-bound communities. For example, household A's income sources can be the dividends of the sugarcane association (which has a secure market), some source from selling produce from home gardens situated on land near a farmer association that can be irrigated using water illegally extracted (from the formal perspective) but sanctioned in the informal perspective and so on. The informal perspective represents the actors that control the technological mechanism, e.g. a farmer association, to access water. Due to the various advantages, household A would have a higher likelihood to maintain or gain access to water compared to household B. Household B does not receive dividends from farmer associations, does not have land near extraction points of water (such as the farmer association) and does not have technologically advanced means (such as pipes or irrigation sprinklers) to irrigate their home gardens. The home gardens are left to be mainly rainfed or requiring strenuous effort to bring water from far extraction points such as streams or rivers. Additionally, broad connections between income and the challenges to develop or sell non-sugarcane agriculture or off-farm jobs can be loosely strung (See Section 7.1). These would have indirect impacts on the households or community's ability to control, maintain, or gain access to water for domestic purposes.

[28] Rainwater harvesting systems also fall under this category, but limited information was collected regarding rainwater systems since one of the baselines of the research was the Drought.

In the rural areas, not every community in the broad sense nor household in a politically-bound community controls legally-recognized technological mechanisms (such as domestic water systems) to extract water for domestic purposes; which corresponds to easy-to-access (i.e. easier-to-obtain) water. For example, in a politically-bound community, a household may be a one hour walk from the nearest flowing river or stream but a 30-minute walk to water station from a DWS that either the household cannot or choices not to pay for or of which is controlled by another community. To obtain this easier-to-obtain water, the household will use an illegal mechanism, such as stealing or vandalism. The hypothetical examples provided are in line with the descriptions provided by the focus groups which illustrate other communities or households stealing water from domestic water stations and farmer association irrigation infrastructure.

B) Informal rules of the game perspective

From the informal institutional point-of-view, shareholders have a type of "right" to obtain water from the technological mechanisms provided by the farmer associations since they owners of the association. The farmer association pays for the electricity to bring the water to water stations (points of easier-to-obtain water), pays for the maintenance of the canal or dam to have rights to water via their water permit, and the land of which sugarcane is cultivated was allotted to them via the customary processes, thus is a type of property to them. The non-shareholders do not contribute to this process; thus, it is can be said from the shareholder and non-shareholder interactions (manifested in tensions before and during the 2014-2016 drought), non-shareholders had a lower priority to mechanisms of access to water.

i. Mechanims of access

Though more information is required about the verbal agreement, it presents an interesting social relational mechanism that most likely through their social identity as a "community" the households that eventually became the shareholders were customarily obliged to provide water to household's beyond their lands; that is, households that were not going to, were able to, or wanted to join into the rural development project. In Malibeni for example, the households beyond the tar road were on "disadvantaged" land. The social identity of a "community" would foster the sharing of access to water that is controlled only by a fraction of the population. When identities were not matched – e.g. the foreigners of Malibeni, the new households that had joined the political-bounds of Mafucula – access to water from technological mechanisms can be taken to be viewed as unsanctioned or not within obligation. When the other social identity obtains water from the technological mechanism controlled by the first social identity it considered illegal or stealing because the social relations to gain access through this means is not present. A social identity that does not have the technological/infrastructural mechanisms to access water resorts to using capital mechanisms (e.g. wealth) to purchase water through mobile tankers (which from the informal perspective appears to be neutral) or water vendors, through force, stealing from DWS or irrigation infrastructure from farmer associations, or physical labour.

7.2.2 Use for Home Garden Purposes: Shareholders and Non-shareholders

A) Formal rules of the game perspective

According to the information received, households in Malibeni, Mafucula, and Sihhoye were formally sanctioned to extract water from DWS to water home gardens at one point in time. This was the original arrangement as according to the KDDP rural development proposal. In time however, the government declared that using water for home gardens was to be stopped; overlapping most likely with the 2014-2016 drought to conserve water (EEWUD, personal communication; Agribusiness, personal communication). Subsequently, to obtain water for home gardens from the DWS became an illegal activity. In non-drought periods, the rural areas were described to be seasonal farmers, thus cultivating with the rains. The households did not depend or rely on extracted water. When the rains became unable to water the home gardens, to sustain a home garden meant to find water from different means.

Under the primary water use stipulation in the Water Act of 2002, irrigation of less than one quarter hectare of land adjacent to homesteads (the land a household resides upon) is exempt from acquiring a water permit. In reality, shareholders and non-shareholders alike face difficulties in securing continuous water to sustain home gardens, especially in times of drought. Agricultural land, regardless of its size, that is not adjacent to homesteads but extracts water for subsistence agricultural purposes are not exempt from acquiring a water permit according to the Water Act of 2002. Households that practice this or have this type of land meant for agricultural purposes do not have the right to benefit from water for subsistence purposes without a permit from the government.

i. Mechanisms of access

A permit is an embodiment of a mechanism to access water from the legal perspective. The descriptions of the process to acquire a permit provided by the DWA highlights a disadvantage for small-scale farmers. The reliance on technological mechanisms to access continuous/consistent water was emphasized by shareholders and non-shareholders in all the case communities especially during times of water shortages, such as droughts, when rainfall pattern is disrupted[29]. The home gardens are vulnerable to the climatic variations. Consistent supply of water plays a fundamental part in crop cultivation as interrupted watering may be detrimental to crop growth and health. Mechanisms of access may mean to extract and use of water from DWS or other sources/extraction points. Besides physically extracting from a water body, these would be perceived as illegal as the means is not formally acknowledged nor has a permit.

Some households may have surplus water to water a home garden – see the hypothetical case of household A. Since the household has the ability and right to do so as it owns/controls its water to benefit from its surplus, then the household has the ability to benefit from a home garden due to its ability to indirectly gain access to and/or control the use of the water it has[30]. See Section 7.2.1 A.i. for example descriptions of indirect mechanisms to access water.

[29] In all FGDs in Malibeni, Mafucula, and Sihhoye, people were declaring their desire for water to irrigate their home gardens.

[30] It is assumed, only in relatively minor circumstances during the Drought, can the household maintain a legally-sanctioned rights to extract water from DWS for home gardens. An exemption may have been Orphan and Vulnerable Children.

B) Informal rules of the game perspective

It was noted in the Mafucula and Sihhoye politically-bound community, internal rationing was informally, locally enacted prior to the 2014-2015 drought in order to service or distribute water to different geographical locations within the politically-bound community. For this purpose, the right to benefit from water through DWS for home agricultural purposes was viewed as illegal.

i. Mechanims of access

During times of sufficient rain and water in Maguga dam, the shareholders in Malibeni are informally given the right to benefit from water through the technological mechanisms granted to them through the farmer associations. Shareholders have the right to a piece of land for agricultural purposes within the sugarcane plantation fields and the right and ability to use a sprinkler connected to the FA for water extraction and water distribution (pipes) infrastructure. The FA covered the cost of the pump and electricity. Non-shareholders do not have this right nor access. It was described that only the "lucky" shareholders who had land near the FA were able to connect, either legally or illegally, to the FA to irrigate their own field or home garden. During times of water shortages or locally enacted water rations, restrictions were placed on what can or cannot be supplied from the DWS or FA-supported water stations.

7.3 Summary

Key informants in the Agricultural Sector explain sugarcane has a well-developed and structured market structure. Non-sugarcane, non-large-scale export crops, face challenges in marketing and finding markets thus face challenges acquiring loans. Banks are hesitant to

loan to them, the non-secured agricultural products. Relying on the rivers and streams, the small-scale non-sugarcane crops are vulnerable to climatic variations. Access to water for domestic and home gardens purposes are indirectly affected by the different mechanisms of access to water such as access to income, technology (e.g. infrastructure), and obtaining a market and loans. Challenges of non-sugarcane cultivation highlight the challenges to obtain and maintain the mechanisms or means of water access. Non-shareholders are a higher disadvantage to the shareholders of the sugarcane farmer associations.

8. Review and Discussion 2:

Juxtaposing the formal institutions with the informal institutions, I make the argument to describe the differentiated access of water for use of primary water purposes versus access of water for use of permit holder purposes, and those associated with them. Primary water use is included in the formal perspective rights to water. Their actual (in)ability to use their allotted water according to the formal allocations, I argue, act as a form of exclusion, or is similar to the David Harvey (2003) concept of "dispossession by accumulation". Accumulation of resources can be viewed through institutions such as permits which add an economic value to something that did not previously have such an attachment.

The formal institutions paint an unrealistic picture of reality – for a real picture, take for example the tensions over water before and during the drought for Malibeni and Sihhoye Section 6.3.1 and 6.3.3 – and thus do not address or consider inequity within the communities. Primary water users face challenges in the ability to obtain water through a formal, legally-sanctioned manner. Their extractions thus fall within the "grey areas" of the national water legislation (refer to Section 4.1.2.2 Water Permits for more details). The poor must afford the cost of electricity to maintain the functioning of the domestic water systems; however, their sources of income may be limited. Those able to move within the parameters of the Water Act are able to secure a right and have means to maintain their ability to benefit from these rights. The sugarcane associations indirectly influence conflicts/tensions between social groups through their accumulation of resources, even as a smallholder scheme. The accumulation of wealth is within one group while non-involved groups are left with less resources.

In this Chapter, I will discuss the results first from the formal perspective followed by the informal perspective. This will lead to the discussion of the role of drought, sugarcane cultivation, and policy.

8.1 Chapter Review

8.1.1 Formal Institutions

The formal institutions trust in the law to prevent competition and conflicts, focusing on the rights to benefit from water. In the fine text, the economic value of water and the right to use water for primary purposes is underscored. Beyond primary purposes – such as water from mobile tankers for domestic consumption – a right to benefit from water must be attained according to governmental procedures. Not incorporated or considered in this system is the ability and challenges people may have to access capital such as loans, infrastructure, and income (See Chapter 7). Historical and current inequalities are not captured or neutralized. Only those who fit into the system can benefit from it. Those who do not are at a disadvantage. In this context, permitted water users are at a higher advantage compared to the rural primary water users in the sugarcane cultivation areas of the Kingdom of Eswatini. The formal institutions monitor/govern water avaiability within a water course through the water permits, the installed infrastructure for agricultural irrigation purposes, and the installed infrastructure for domestic water purposes (i.e. the DWS). The water distribution within a community is governed by the informal institutions.

8.1.2 Informal Institutions

At the community level, the informal rules of the game delegate/faciliate the "real" right to water. When alternative sources of water such as springs become unavailable, people

begin to retrieve easy-to-obtain water from installed infrastructure, whether sanctioned or not by the owners and controllers of the point of water extraction. The water extraction point can have formal rights to extract water for particular purposes according to the agreement between the permit holder and the government. How the water is distributed and used once it reaches the permit holder is left to the social norms within the community. It can be viewed the community is distributing already allocated domestic and primary water. The formally unrecognized distribution mechansims of the informal institutions transpire to tensions: tensions between households who control, maintain, and gain access to water with those who can/do not and informal institutions with the formal on the argument of legality. The informal institutions of income, technology, social relations, social identity, and land – i.e. the location of land in terms its relation to water – act as gatekeepers to gain and maintain the ability to benefit from water.

8.1.2.1 Malibeni

The non-shareholders were already at a disadvantage as they faced challenges to obtain and maintain water to domestic water systems for domestic water and water infrastructure for the continuous watering of home gardens. Home gardens required rainfall or manual labour to be watered. When alternative sources became unavaiable then the control and access to infrastructure to extract water from the water-avaiable river became central to obtain "easier-to-access" water. The shareholders were generally in control or easier means to access water from infrastructure.

8.1.2.2 Mafucula

It was when alternative sources of water dried and the farmer association was relied on for water, tensions were expressed to be located within the Mafucula-identity group. Prior to this, tensions were with another identity group obtaining water from Mafucula identity group-controlled infrastructure.

8.1.2.3 Sihhoye

When alternative sources of water that were relied upon for domestic and primary water purposes became unavaiable, as well as the functioning of the formally-sanctioned means to extract water (i.e. the DWS), the priority of their right to water compared to water use of economic value becomes questionable according to the Sihhoye Focus Group Discussions.

8.1.3 Role of Drought, Sugarcane, and Policy

Sufficient water covers up the "weak links" or "weaknesses" that the 2014-2016 drought reveal. The descriptions of tensions demonstrate the tensions occurred not simply because of water shortages or the decreased avaiability of water, impacts of sugarcane cultivation (Hess et al, 2016). Water policy, the challenges of water legislation to accommodate water use of different purposes beyond its economic value, and unequal access to continuous water are significant variable in tensions over water in the rural, water scarce regions of sugarcane cultivation in Eswatini. The ability of “non-adopters” to obtain, gain, and maintain continuous, easy-to-access water in rural economic developments is stressed.

8.2 Discussion:

The analysis of the results highlights discussions on water access and water rights are interconnected with the discussions on the land used for sugarcane cultivation. As non-shareholders described their challenges gaining and maintaining access to water through domestic water systems, the significance of the location of their homestead manifests not only in its proximity to alternative water sources, but also in relation to having informally protected rights to irrigate home gardens. Inequalities/inequities between shareholder and non-shareholder, raised from the wealth perspective by Terry (2012), extend to water access. Though utilizing water according to illegal means according to Swaziland: Water Act of 2002, shareholders are able to obtain, gain, and maintain access to "easier-to-access" water via their affiliation with the sugarcane farmer associations.

The research results add additional perspectives to the "hidden benefits" of the sugarcane associations: that is electricity and irrigation infrastructure (Richardson-Ngwenya and Richardson, 2014). Both Terry and Ryder (2007) and Richardson-Ngwenya and Richardson (2014) describe the increased ability to produce home gardens via the irrigation infrastructure provided by the KDDP project (i.e. for associations that allotted land within the association fields for non-sugarcane cultivation). Though the benefits do not extend to non-shareholders, during the 2015-2016 declared drought disaster, even shareholders were requested to stop and minimize their use of water for agricultural (See Section 6.2 and 6.3). Though the KDDP project is a smallholder scheme, the ability to maintain and deliver its intended outcomes is questionable as proposed by critics of cash crops in general (e.g. Maxwell and Fernando, 1989). Through its accumulation of resources, it may be considered to be within the land and water grab debate (Daniel and Mittal, 2009; Rulli, Saviori, and D'Odorico, 2013; Mehta, Veldwisch, and Franco, 2012). According to the special issue of

introduction by Mehta, Veldwisch, and Franco (2012), controlling of resources is one key characteristic to water grabbing, as well as "flawed legal procedures" (ibid, p.197). Though smallholder schemes present a different approach to plantation approach of sugarcane cultivation (Gasparatos et al., 2015), this case study research finds the smallholder scheme approach is comparable with the concepts of water and land grabbing, albeit a re-framing of the traditional water and land grabbing concepts may be necessary.

The decreased water avaiability and land appropriation as described by Gasparatos et al. (2015) and Hess et al., (2016) that were perceived to be the main influencing factors for conflicts/tensions. The water accounting challenges were faced in the rural areas for purposes beyond sugarcane which was closely monitored. The "grey zones" of the national Water Act leads to an unfamiliarity with the outputs or needs of the area. "The human right" does not "always align with constitutional rights" (referring to Hellum et al., 2015 in van Koppen and Schreiner, 2018) leading to conflict in water shortage areas.

8.4 Recommendations

The water sharing found within Malibeni and Mafucula provide for the beginnings of further research on hybrid nature between informal and formal institutions. Hybrid approaches between informal and formal institutions are also suggested by in van Koppen and Schreiner, 2018. Financial support must be considered and also be friendlier for diverse agricultural investment for uses that may not be the of the highest economic value (Kydd et al., 2004). Innovative water estimating systems are recommended to be further developed and researched to improve the estimations of water use and the need/demand for primary and beyond primary purposes.

Chapter 9: Conclusion

Cash crops have been promoted globally for poverty alleviation, not without critic. The ability of cash crops to alleviate poverty of non-involved or non-adopters of the cash crop has been called into question. Smallholder schemes of agricultural development have been advocated as "win-win" situations as the communities own the land compared to the large-estate plantation agriculture developments. Sugarcane cultivation as a cash crop and industrial crop used for purposes beyond human consumption plays a key role in rural and national development agendas in Africa. Yet the crop presents an additional variable with its need for irrigation water and infrastructure to sustain ideal yields along with its scale of production. Water competition is projected to intensify as water availability and drought are to become pressing issues. Additionally, water for domestic or primary water purposes competes with market-oriented, cash generating water. The conflicts or tensions over water in communities who cultivate sugarcane in smallholder schemes in Southern Africa have been quiet and have worked isolated from the dynamic literature of water governance: the challenges of formal, governmental water governance systems with the informal, on-the-ground systems. The Kingdom of eSwatini was selected as the research case study nation as it has one of the highest cultivation areas of sugarcane in water stressed regions.

The research focused on the nexus between agricultural/ sugarcane development, water legislation, and drought in smallholder scheme areas to elucidate the interaction between shareholders – the involved group – and non-shareholders – the non-involved group. The direct and indirect mechanisms of access to water of (non-)shareholders in the Komati Downstream Development Programme (KDDP) rural development project area along the dam regulated Komati river was analyzed to reveal inequalities. Formal and informal institutions – rules of the game – are used to clarify the means of access to water and

differentiated ability. Access is an extension of rights to a resource and is defined as the ability to benefit from water.

The results show belonging to a social identity group and the control of technology were key mechanisms to access water within communities. Additional means such as income and access to markets are indirect mechanims that faciliate the maintained access to certain water sources for domestic use. From the primary water versus market-oriented, sugarcane cultivation purpose of water point of view, gaining, maintaining, and monitoring water for sugarcane cultivation is highly supported. Formal institutions are challenged to monitor and evaluate water for primary purposes. Though primary purposes have an allocation according to international treaties and nationally, it is assumed their allocation is fully utilized; this does not reflect the on-the-ground challenges to obtain and maintain the ability to benefit and use the allocation, however.

Times of sufficient rainfall mitigate yet hide the challenges and inequalities the non-shareholders face. The 2015-2016 drought Eswatini experienced revealed the weak links of the context in which the sugarcane developments are situated. If future sugarcane development seek to be more pro-poor/inclusive, reaching out to the population beyond job creation: A) the development should keep in mind the current water governance system is not perfect – i.e. the current water governance institutions should not be assumed to be without flaws, B) innovation focusing on the interaction between involved and non-involved groups should be further explored to address inequalities.

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Appendix

Appendix Table 1

Table 6. The sources of water for different purposes according to community.

Politically-bound community (# of Participants)	Source of water for personal consumption/ domestic	Source of water for home agriculture	Source of water for livestock
Mafucula: Shareholders	(M) (before DWS) From the Tongaat Hulett sugar estate (after the domestic water system) from domestic water system at "central points" but are still inconvenient (came after they were told to form a sugarcane association to get water). There are some boreholes (F) (before DWS) Provided water by Simunye estate, from Tongaat Hulett (after DWS) some say from DWS, some say from SC fields, says SC irrigation water is channeled through DWS infrastructure	(M) No not have home gardens (most likely rain fed) (F) Some have home agriculture, limited by water. Getting water to water home agriculture is inconvenient.	(M) From the Tambakulo river (F) From a basin is left for the cattle, from the overflow of a community, from extra water bought for the cattle
Mafucula: Non-shareholders	(M) (after DWS) Water meant to irrigate the SC from the DWS taps (F) (before DWS) Second-hand from nearby sugarcane cutter village, from rain, from small stream when it was flowing	(M) From rain (F) From rain. Tried to bring water from the river, canal, or sugarcane fields but too strenuous	(M) From a near-by river/tributary (F) From the Tambakulo river

	(after DWS) From the DWS infrastructure (but only got clean water for a while from 2008/9-2014) from rain harvesting technique when it rained		
Malibeni: Shareholders	(M) For homesteads living within the association fields and for shareholders on the other side of the tar road: there are piped infrastructure bringing water to water tanks at each homestead. On the tank is a filter to clean the water. For those who are not shareholders: they are supposed to get water from community-supported DWS (but it has not functioned for 3-10 years). When the DWS is not working, non-shareholders source water from farmer association-supplied water stations. (association is having problems paying for the electricity) (F) For shareholders: domestic water system bringing water to those who are inside the association fields. Filter located at tank outlet to clean the water. For non-shareholders: from the Komati river	(M) For shareholders and homesteads living within the association fields: their garden plots are within the association field, are provided an irrigate sprinkler, and irrigation water supplied by the association. For non-shareholders not living within the association fields: from rain (F) For shareholders and those living within the association fields: their garden plots are located within the association field, are provided an irrigation sprinkler,	(M) Komati river (F) Komati river

		and are supplied water by association	
Malibeni: Non-shareholders	(M) For non-shareholders: before the 2014-2016 drought, the association allowed non-shareholders to obtain water from association-provided water stations, there were seasonal springs; there was a DWS but could not provide water for everyone; from the Komati river; from mobile water tankers (tank outlets do not have a filter to clean the water); from sugarcane runoffs. (F) For non-shareholders: a community-service association-supported water station that is available during certain parts of the day which can obtain a certain limit per week (an example provided is 3 25-L jugs per week); If the time is inconvenient, then hires a mobile water tanker or some negotiate with an association; there was at one point (possibly from 2012-2014) a DWS that was used to obtain water for domestic water; for those who cannot afford to hire a mobile water	M) For no-shareholders: Rainfed. For the people within the association: they have home gardens but did not specify how they water the gardens (F) For non-shareholders: when DWS was running, used to obtain water – against social norms/illegally – from the DWS for the home gardens. When possible, used grey water. (They mention that they do not use water from mobile tankers for watering the home gardens because they want to use it for other purposes)	(M) Komati river (F) Komati river

	tanker, they walk to the Komati river (an example time to river provided is 2-3hrs one way). For shareholders: technically, the association-provided water station is for their own shareholders.		
Sihhoye: Shareholders	(M) There are taps installed in the households to be supplied with water from a DWS. If the household has not paid the subscription fee for access to the DWS, then water is obtained from the Mhulume Canal. (F) If the household has not paid the subscription fee to a DWS to receive water into their household, then water is obtained from the Mhulume Canal using wheelbarrows.	(M) Rainfed; one person from focus group has a plot near the sugarcane fields that is functional. (F) Taps may be used to water home gardens, but not (fruit) trees; if no running tap at homestead, then takes wheelbarrow to the Mhulume Canal.	(M) Komati river; overflow from sugarcane plantation fields; some reservoirs are avaiable in the grazing areas that catch rainfall; obtaining water from the Mhulume Canal is illegal (F) Mhulume Canal; small reservoirs if it is raining
Sihhoye: Non-shareholders	(M) There are taps installed in the households to be supplied with water from a DWS; however, unable to afford subscription to DWS. Region of the male non-shareholder group is claimed to obtain water from a sugarcane	(M) Rainfed; taps may be used to water home gardens, if they are running, but taps may not consistent. (F) Rainfed; obtain water from Mhulume	(M) Sugarcane plantation field overflow; Mhulume Canal operated reservoir for the cattle (F) Komati river

	plantation field overflow using wheelbarrows. (F) Obtains water from the Mhulume Canal; sometimes from tap infrastructure installed at the household.	Canal using wheelbarrows; some sugarcane shareholders have agricultural plots next to sugarcane fields that are functional.	

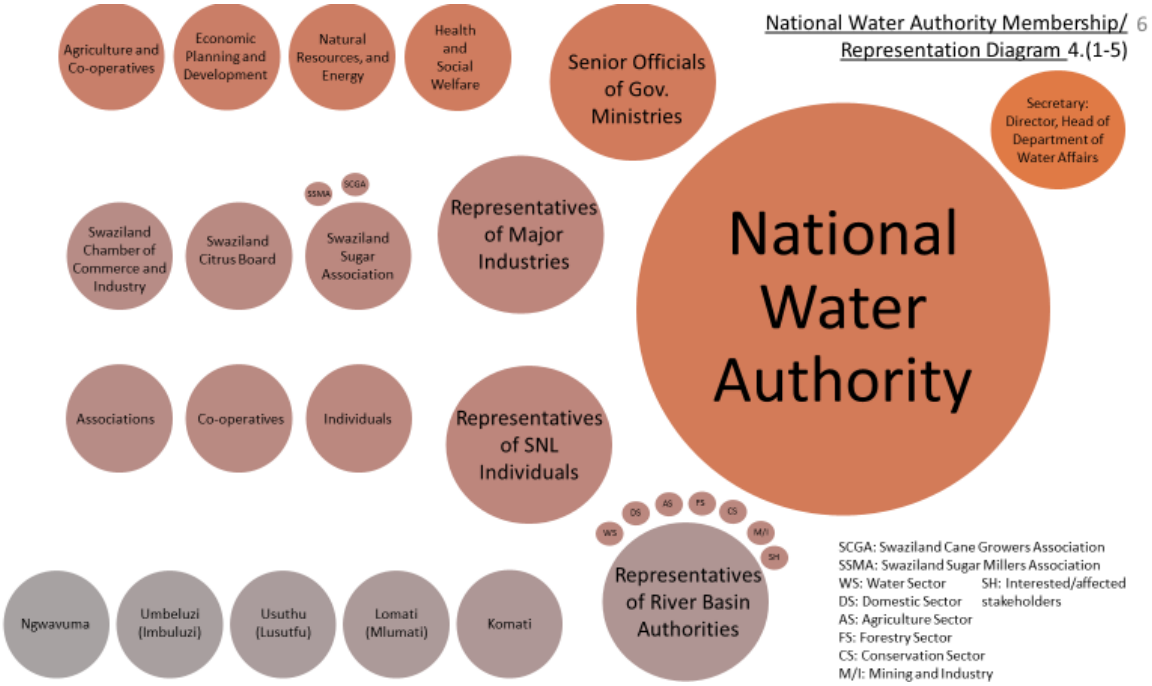

Figure 6. Breakdown of National Water Authority according to the Government of Swaziland Water Act of 2002.

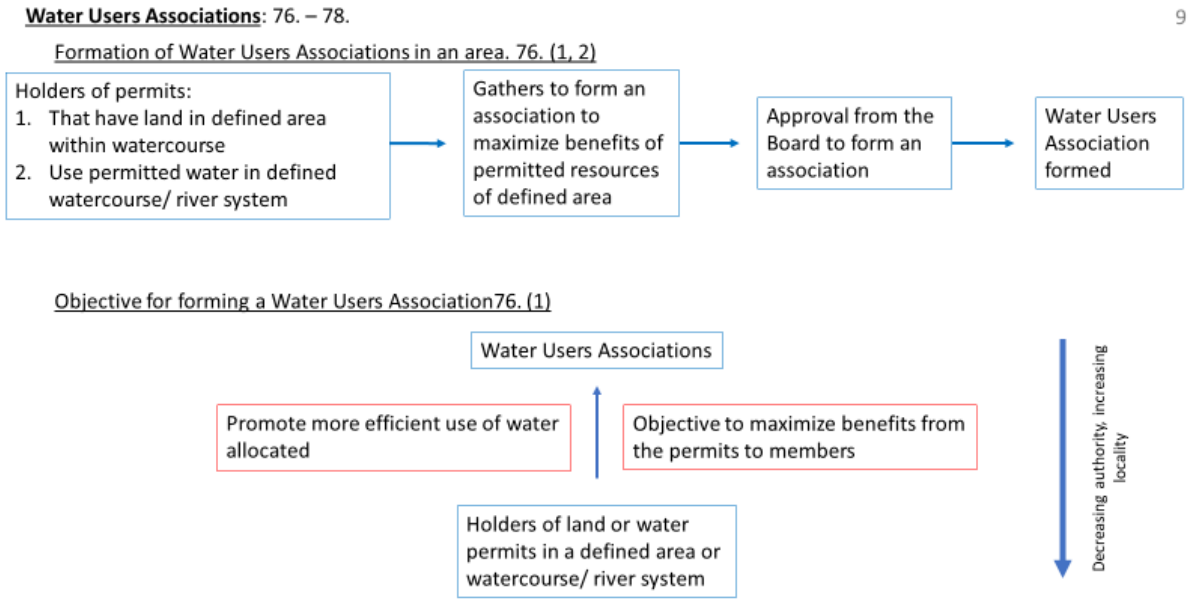

Figure 7. Breakdown of the Water User Association formation process according to the Government of Swaziland Water Act of 2002.

Appendix A: Water Distributors Questions

How is your organisation involved in water management?

What are the main water users in the area?

How do they get access to water?

Is there a different permit scheme between them?

Has it changed over time?

How are the primary water users in this area included in water decisions?

Are illegal water withdrawals happening?

What constitutes an illegal water withdrawal?

Why do these users not apply for a water use permit? (What are the restrictions of this users applying for a permit?)

Has there been competition historically for access to water between (these) users?

How has the 2015/2016 drought affected the area, especially concerning water resources?

To what extent has the access to water reduced for the different users?

Was there a change in primary user water access?

Did some users cope better with water shortages?

Explain?

Has the water competition changed in the area during the drought?

Have the incidences of illegal withdrawal changed during the drought?

Were the different water users aware of the drought coming?

Was there a difference in preparedness between users?

What was being done to mitigate?

- These water tensions
- Effects of future droughts

Appendix B: Focus Group Discussion Questions

Section A: Land

How has the way the community uses its land changed from the past? How has the production of sugarcane affected it?

Section B: Water

Generally, HOW and WHERE does the community get water for their:

Domestic use? Sugarcane? Home gardens? Other crops (this includes other plots of land for home agriculture)? Livestock?

Are there people in the community who uses more water? Please explain why so?

What rules or procedures are in place to get water from the government? Do you have some specific rules within your community on how to access or divide water?

Domestic use? Sugarcane? Home gardens? Other crops? Livestock?

Would you say there has been competition in the past for access to water sources within the community? With other communities or water users?

For domestic use? Sugarcane? Other crops? Livestock? Other interests? Within the community?

Are there any water-related projects within the community? Do community members get financial support to execute water-related projects? If yes/no, please explain.

Section C: Drought

What were the effects of the recent drought on the community, with a focus on water?

Did the way people get water change because of the recent drought?

Clarification: For domestic use? Sugarcane? Other crops? Livestock?

Would you say that there was competition for access to water sources within the community? With other communities or water users? Was there a change in this competition than normal years?

If not answered already: What was the cause of this change?

Were your community member's aware of the drought coming?

How did community members hear about the drought?

Clarification question: If they heard from the radio/ tv, was this information useful?

How could this information be made more useful and useable?

Were some people more prepared for the drought than others?

Does anyone want to add anything else related to water?

Are there any additional comments?