



Governance of rural livelihoods and adaptation to climate variability and change in Zimbabwe: Enhancement considerations in Chadereka

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ABSTRACT: Governance and institutional arrangements are key components in rural livelihoods development and adaptation to climate variability and change in developing countries. This research explores the governance system in practice, critically considering its enhancement in Chadereka of Muzarabani Rural District. Zimbabwe for decades has not been having a standalone policy on climate change until June 2018, let alone adequate and appropriate capacity to deal with the climatic disturbances. Using mixed methodologies in a survey involving 310 households; the research established the natural resource management systems governing the execution of sustainable rural livelihoods under extreme climatic conditions of flooding and drought in one of the most vulnerable communities in Zimbabwe. The paper draws from the literature on climate change governance to assess the governance system of rural livelihood practices and their adaptation to climatic events. It emerged that governance frameworks for rural livelihoods and adaptation to climate change depict principles of centralization. Thus, they are flawed, flouted and require more collaboration, partnership, consultation and inclusion from grassroots level. Systems of communication using various media need alignment to gain support and confidence at various levels of the governance system. Essentially, the political will is significant in fostering uptake of sustainable adaptive strategies to climate variability and change.

KEYWORDS: Adaptation strategies, Climate variability and change, Governance, Rural livelihoods, Enhancement

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I. INTRODUCTION

The governance of rural livelihood assets and adaptation to climate variability and change globally is increasingly becoming a research imperative. Despite compliance with the United Nations Framework Convention on Climate Change (UNFCCC)'s Conference of Parties (COP) 21 in Paris 2015 that saw the submission of the Nationally Determined Contributions (NDCs) or National Climate Action Plans (NCAP) by the majority of the African countries, Zimbabwe included, the governance of climate change issues remains problematic internationally. It is full of controversies and unfulfilled targets and agreements (Dodman and Mitlin, 2015; Keys et al., 2016; Well and Carrapatoso, 2017). Such governance, which is more bureaucratic, with wealthier countries pledging financial assistance in the form of bilateral and multilateral climate funds for adaptation use in developing countries and percentage reduction of carbon dioxide (Afful-Koomson, 2015; Well and Carrapatoso, 2017; Wyborn, 2014), cascades down to the regional, national and local level causing complexities and lack of trust among stakeholders (Barton et al., 2015; Mah and Hills, 2016). Climate variability and change governance demands resource commitments and prioritization which are found lacking in most developing countries. On financial resource mobilization, some of the pledges are yet to be fulfilled and depend also on the prevalent socio-economic and political systems in the different receiving countries. It is behind this briefing that the current paper seeks to explore the governance system of rural livelihoods assets and their adaptation to climate variability and change in Zimbabwe, paying special attention to the natural resource assets in the marginal and vulnerable community of Chadereka in Muzarabani Rural District. The ultimate objective of this study is to guide policy development on climate adaptation governance. Important to note is the fact that governance systems are dynamic and unpredictable, necessitating constant research for updates.

Though the governance of livelihood assets and adaptation to climate variability and change issues have received substantial coverage at global and national levels (Ayers et al., 2014; Chanza and de Wit, 2016; Dodman and Mitlin, 2015, Howard, 2017; Keys, et al., 2016, Manyani and Bob, 2017), more is still needed at local level, and this research contributes in filling up the knowledge gap. While Barton et al. (2015) and Mah and Hills (2016) consider integration and participation at inter-sectoral level in governing livelihoods and adaptation to climate change in urban areas; this should not be taken as an end on itself as rural areas, where the majority of the populace live, particularly in developing countries including Zimbabwe (more than 67%) (Zimstat, 2014), need inclusion. Aldunce et al. (2016), Derak et al. (2017), Howard (2017), Keys et al. (2016), Manyani and Bob (2018) and Prager et al. (2015) noted community engagement as key to successful environmental management policies and practices. Falkowski et al. (2017) discussed constraints generated by collaborative institutional structures set up in rural areas. Given the contradictory views, political system selection regarding management of climate variability and change is critical in fostering the development of sustainable rural livelihood and adaptation strategies (Burnell, 2012).

Notwithstanding the differing views on climate variability and change management, Intergovernmental Panel on Climate Change (IPCC) (2014) stresses that their governance still lacks international commitment and national political will. This is seen in some nations like in the case of New Zealand (Harker et al., 2016). Any national government foresees the coordination of adaptation policies, measures being implemented and the capacity of its citizens to implement agreed strategies (Shemdoo et al., 2015). Thus, it is one of those factors that are critical in enforcing adaptation to climate variability and change as stated by the IPCC (2014:110) that “Adaptation and mitigation responses are underpinned by common enabling factors. These include effective institutions and governance, innovation and investments in environmentally sound technologies and infrastructure, sustainable livelihoods and behavioral and lifestyle choices.”

From the citation, governance of climate variability and change is directly and indirectly a determinant of the type of response given by stakeholders particularly households who are in direct contact with natural resources on which their livelihoods are anchored. Thus, the present research examines the views of households whose livelihoods are predominantly natural resources dependent and how the utilization of locally available natural capital shapes the governance system. It advances the argument given by Keskitalo et al. (2016) that the management of climate change still lacks sufficient integration into the regulative structure of legislature and policy-making of various nations making it topical and center of current debates.

II. GOVERNANCE OF CLIMATE VARIABILITY AND CHANGE

Climate variability and change management is a phenomenon whose agenda can be traced from 1979 (Bodansky and Rajamani, 2015). By then there were no major talks about the issue until 1988 when commitment was shown through the establishment of the IPCC (Gupta, 2016). Events continued to unfold which included the signing of some major agreements by Heads of States like the UNFCCC in 1992, the Kyoto Protocol in 1997, Copenhagen Accord in 2009, only to mention a few (Bodansky and Rajamani, 2015; IPCC, 2014). The COP series, with the most recent one being Katowice, Poland in 2018, though always lacking global consensus, continue to pursue the climate change governance agenda (Brechin, 2016; Gupta, 2016; Ross et al., 2013). Annually, there are conferences and or summits to share experiences and map the way for a green and sustainable future. It is from this background that the governance of climate variability and change issues is considered crucial and universal. It therefore draws interest to assess local level-based governance systems. Table 1.1 further describes some of the significant events in the global governance of climate variability and change issues. Bodansky and Rajamani (2015), Brechin (2016), Gupta (2016) and Mah and Hills (2016) all concur on the problem confronted by the UNFCCC in reaching a consensus on the approach to consider between the ‘top-down’ (contractual), which supports the binding targets and timeframe and the ‘bottom-up’ (facilitative), which encourages unilaterally defined voluntary actions.

Table 1.1: Global governance of climate change timelines (adopted from IPCC, 2014)

YEAR	EVENT
1979	1 st World Climate Conference, organized by World Meteorological Organization and the adoption of the Convention on Long-Range Transboundary Air Pollution (CLRTAP)
1985	Vienna Convention for the Protection of the Ozone Layer (Bodansky, 2011)
1987	Montreal Protocol on Substances that Deplete the Ozone Layer (Bodansky, 2011)
1988	IPCC was established and climate change was considered a “common concern of mankind” (Bodansky and Rajamani, 2015:7)
1990	1 st IPCC report noted climate change as a critical issue with global mean temperature assumed to increase by about 0.3°C per decade if no action is taken and thus solutions were proposed during the 2 nd World Climate Conference. Some developed countries (22) adopted domestic greenhouse gas reduction targets (Gupta, 2016:197).
1992	UNFCCC signed by 154 nations at Rio Conference.

1993	Cities for Climate Protection Program launched.
1995	2 nd IPCC report assessed the seriousness of climate change by various states (Gupta, 2016).
1997	Agreement of Kyoto Protocol was established to focus on specific regulations on greenhouse gas emissions reduction (UNFCCC, Article 4.2). It promulgates legally-binding emission target commitments for post 2000 with numerically assessed national performance standards processes following a 'top-down' international approach (Bodansky, 2011).
2001	3 rd IPCC reported on the Joint Implementation, the CDM, and Emissions Trading set in the Kyoto Protocol and United States announced its withdrawal from Kyoto Protocol.
2002	Association of Southeast Asian Nations (ASEAN) Agreement on Transboundary Haze Pollution
2005	Kyoto Treaty signed by all major industrialized nations except US and the Large Cities Climate Leadership Group was founded.
2007	4 th IPCC report and Western Climate Initiative was founded under the Bali Action Plan.
2008	Adaptation fund was operationalized and Poznan Technology mechanism and Nationally Appropriate Mitigation Actions (NAMAs) were encouraged (Brechin, 2016).
2009	Copenhagen Accord at 15 th session of COP and 3 rd World Climate Conference had binding emission targets replacing voluntary pledges to fund adaptation (McGee and Steffek, 2016).
2010	Cancún Agreements adopted and encouraged the reduction of greenhouse gas emissions by 25-40% by 2020 in developed countries and established Green Climate Fund. This heralded a turn from the top-down approach towards the bottom-up approach (Gupta, 2016).
2011	Durban Platform focused on "strengthening the multilateral, rules-based regime under the Convention" (Bodansky, 2012:1) and concern towards addressing mitigation, adaptation, finance, technology, capacity building, and transparency issues regarding climate variability and change.
2012	Kyoto Protocol no longer legally binding but its continuation was endorsed by Copenhagen Accord. It fostered a top-down approach in dealing with climate change.
2013	Warsaw International Mechanism for Loss and Damage, Warsaw Framework for REDD+ Climate Technology Centre and Network were discussed. Parties were urged to work on 'intended nationally determined contributions' (INDCs) which needed to be submitted by 2015 (Bodansky and Rajamani, 2015:53).
2014	Lima Call to Climate Action sets the stage for the 2015 agreement, by urging countries to declare their (INDCs) by 2015 and Green Climate Fund was to enter into operations.
2015	Paris Climate Change Agreement sought to utilize the bottom-up approach and incorporated both the developed and the developing nations in dealing with climate change. It is based on flexibility, circumstances and capacities of each country. Focuses on long-term solutions of reducing greenhouse gas emissions (Brechin, 2016; Bodansky, 2016; Kato and Ellis, 2016).
2017	The incorporation of Gender Action Plans and the Local Communities and Indigenous Peoples Platform in Climate change mitigation and adaptation processes (Mead, 2017).

The general commitment called for by the UNFCCC was for all countries to establish their "national greenhouse gas inventories; formulate their national mitigation and adaptation programs; promote and cooperate in scientific research, education, training and public awareness (Arts. 4.1, 5, 6)" (Bodansky and Rajamani, 2015:54). While at the international fora there are conventions, Conferences of Parties, signing of agreement and many governance issues being pursued such as Public-Private Partnership (PPP) (Bjarstig and Sandstrom, 2017), there is a need to consider what is happening at grassroots level. A follow up on both national and local regulations regarding greening the environment, adapting rural livelihoods to climate variability and change and reducing climate change impacts is of great importance and is one of the key issues in the case of many vulnerable communities in Zimbabwe.

The issue of climate change governance kept on attracting more adaptation and mitigation strategies and mechanisms linked to policy development (Cadman, 2013). The governance on the management of the phenomenon has changed from governmental roles to include other private and public (household) entities. Thus, the stakeholder role analysis and livelihoods practiced and their regulation are paramount in generating a better understanding of the issue as revealed by Manyani and Bob (2018). Cadman (2013:2) made the following observation: "Although it is mostly state actors who exercise authority on the basis of their control at the national level, climate change governance is simultaneously global and local, state and non-state, and it is characterized by the existence of many forms of authority through which different constellations of actors interact to shape policy outcomes."

Such a governance analysis advocates for more players to be involved in the issues of climate change. This promotes collaboration as a current way of enforcing sustainable livelihoods development (Baird et al., 2016). Muchanga (2012) in Zambia observed public participation as a better way of achieving more acceptable decisions regarding climate variability and change adaptation. Kelman (2016) further reiterated that public participation on climate variability and change adaptation is enhanced through the structural adjustment of the political and social facets. This, however, called for public education and awareness on the issues at stake.

While noting the stakeholders to climate variability and change issues and their roles, Kupika and Nhamo (2016), Lin et al. (2016) and Muchanga (2012) claim public awareness or education on the phenomenon to be the first port of call in order to achieve full and positive participation in climate regimes.

Mainstreaming educational values in communities, opens avenues for better attention by the local

government and goals are achieved (Keskitalo et al., 2016; Muchanga, 2012; Wamsler and Pauleit, 2016). Molnar (2010) and Muchanga (2012) further assert that passive participation by local communities pushes responsibility on climate variability and change issues to the government and other organizations with all members of the community being mere recipients and spectators. The participation of civil society in the crafting of the country's position or policy on climate change in Zimbabwe has been underexplored (Dodman and Mitlin, 2015). The authors argued that while consultations with the civil society organizations and the general public are done by the Zimbabwean government, they are rather few and urban based due to limited financial resources allocated. However, there was a wide involvement during the launch of the Zimbabwe's National Climate Change Response Strategy in Harare in November 2015 followed by the launch of the Climate Policy in June 2018. Generally, the task is left to the government bureaucrats and a small section of the research community mainly in towns who are ill funded (Shackleton et al., 2015). This is problematic as it breeds exclusivity and unsustainability in climate change adaptation strategies.

Self-mobilization and interactive participation categories are recommended as they promote creativeness and strengthen local participation in issues concerning their lives (Muchanga, 2012). Under these typologies of participation, the individuals are able to make independent decisions, are empowered and aim for high performance. As Few et al. (2006) state, national governments or other institutions like NGOs cannot solve effectively the issues of climate variability and change on their own without the local community. Current environmental governance since Agenda 21 promotes democratic approaches to societal issues as they yield more results once accepted by the community, which also formed part of the discussion during the COP 23 in Bonn.

III. INSTITUTIONAL CONSTRAINTS IN ADAPTATION TO CLIMATE VARIABILITY AND CHANGE

A proper understanding of the impact of political or institutional constraints to climate variability and change adaptation paves way for sound decision-making regarding the phenomenon (Milder et al., 2011). According to Shackleton et al. (2015), political, among other socio-psychological or religious constraints to climate variability and change adaptation have been underpublicized. The current research therefore included this identified gap for a discussion with reference to Chadereka. Political constraints encompass failure by government institutions to provide full commitment to issues pertaining to climate change adaptation (Milder et al., 2011). Further, adaptation in some regions of Africa, according to Sonwa et al. (2016:12), is hindered by "conflict or post-conflict situations, which inhibit communications, learning, and innovation." Furness and Nelson (2016) further mentioned lack of physical capital such as infrastructure as a hindrance to climate change adaptation and the development of sustainable livelihoods. Since adaptation to climate variability and change requires the mobilization of resources, decision-making, planning and implementation of specific policies by societal institutions like the local authorities, religious sectors as given by Murphy et al. (2016) and Watson and Kochore (2012), political will is therefore of fundamental importance (de Leon and Pittock, 2016; Keskitalo, et al., 2016; Milder et al., 2011, Manyani and Bob, 2017).

Kneil et al. (2014) acknowledge that institutional capacity is directly linked to the level of priority assigned to adaptation. Despite these issues, Keskitalo et al. (2016) indicate that there is no full coverage or integration of climate change adaptation into the state regulatory structure of legislation and policy-making, thus, funding schemes for adaptation present further challenges (de Leon and Pittock, 2016). Abid et al. (2016) and Yoseph-Paulus and Hindmarsh (2016) note the role of local government in the provision of infrastructure as weak and limited in dealing with climate change adaptation issues. However, the political or governance role is critical in considering, among other aspects, the proper allocation of resources, legal and regulatory responsibilities and authorities (Keskitalo, et al., 2016).

Due to the complexities of governance networks comprising of many actors who include government agencies, market actors, NGOs, community-based organisations and social networks, different perceptions for the need for adaptation as well as the factors that constrain or enable adaptation are indispensable (Matthew et al., 2015). Perry (2015:1) observed that, "action is constrained by institutional mandates focused on preserving existing conditions rather than recognizing a dynamic future." The greatest political hindrance to climate variability and change adaptation generally is the resistance to change. Adaptation processes should be mainstreamed into both formal and informal sectors with a supportive political sphere (Nhemachena, 2014). Without the political good will, the response to climate change issues at any scale is obscured (Government of Zimbabwe, 2013; 2015). Thus, the issue requires further debate in the case of Chadereka community under investigation. For Zimbabwe, climate change issues are broadly included in the country's National Environmental Policy and Strategies and the recently enunciated Climate Policy. However, the execution of livelihoods, especially rural needs close monitoring to enhance their sustainability.

IV. METHODOLOGY

A geographical study is so extensive and broad that it cannot suffice through the use of one methodological paradigm of the natural sciences (Wilson, 2016). In fact, given the mandate that it studies the human-nature environmental linkages, it calls for more robust research methodologies that unveil the intricate synergies inherent to the geography discipline (Castree, 2016). Simply put, geography bridges the social sciences (human geography) with the natural sciences (physical geography) (Kong et al., 2016). Castree (2016) further suggests that solutions to the current problematic global human-natural events like rural livelihoods and adaptation to climate variability and change require a multidisciplinary or mixed methods (qualitative and quantitative) (Figure 1.1) approach routed in an informed selection of appropriate research instruments. This has been given special attention in this research. The main geo-physiographic features of Chadereka are presented together with the research instruments employed. These helped in responding to the following research questions:

- What are the rural livelihoods management strategies in adapting to climate variability and change in Chadereka Ward 1in Muzarabani Rural District in Zimbabwe?
- How is the governance system of the rural livelihoods and their adaptation to climate variability and change in the study area?
- What enhancement measures can be pursued to promote sustainability of the rural livelihoods in the face of climate variability and change?

As a social research, the research adopted the case study design which allowed descriptive and explanatory nature of research questions as provided above (Punch, 2012; Rajasekar et al., 2013; Sarantakos, 2013). The present research is an applied descriptive case study given that the findings are locally based and may be used to reinforce solutions, reduce or adapt to the impacts of climate variability and change at household level in the study area, simultaneously improving their rural livelihoods. A mixed methodological approach pursued captured both textual and numerical data at once which were useful in responding to the research questions. Creswell (2013) and Plastow (2016) referred to this type of mixed methodology as convergent, concurrent, parallel or simultaneous studies designs. It also makes the triangulation (comparison or relation or confirmation) of a diversity of data collection techniques possible for the validity and reliability of the research findings (Adam et al., 2014; Below et al., 2012). Plastow (2016) observed that the weaknesses of one approach are compensated by the strengths of the other thus, enhancing the validity of the results.

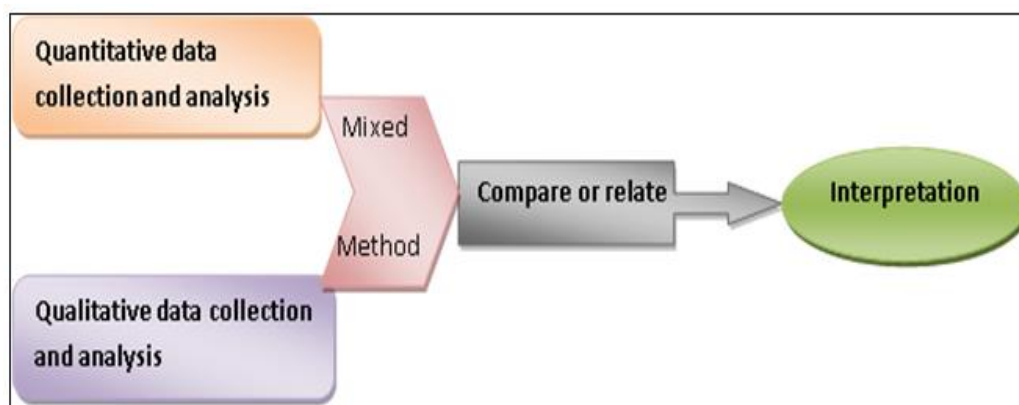


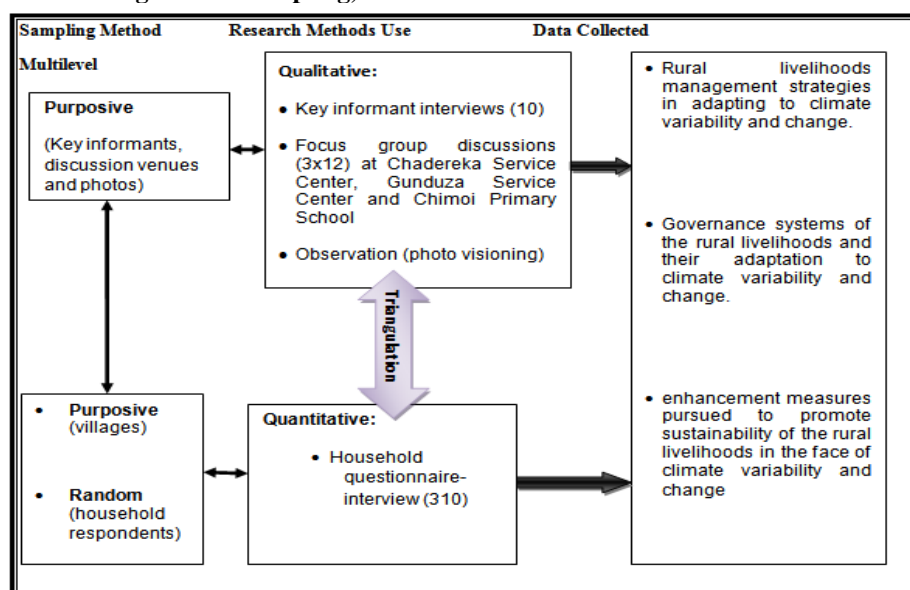
Figure 1.1: Concurrent mixed method adopted (Source: Creswell, 2014:220)

The concurrent research design considered in this research (Figure 1.1) requires more effort on the part of the researcher as more data is collected from structured household questionnaire interviews, key informant interviews, focused group discussions and the observation instruments as affirmed by Sarantakos (2013). Similar to the approach suggested by Baran and Jones (2016) and Ryan (2016), in this work, assistant researchers were trained and engaged to help in speeding up data collection. In cases where gathered data were dissimilar, verification was done by re-examining the collected data, revisiting the area and re-engaging some key informants or households as advocated by Plastow (2016) and Mudavanhu et al. (2016).

This research used a case study of Chadereka, which was purposively chosen given its contrasting climatic conditions of flooding and drought annually. These events increase its vulnerability to food insecurity and disease outbreaks. The area has therefore become one of the hotspots for humanitarian organizations like the Zimbabwe Red Cross Society and the World Vision. These NGOs try to capacitate households in the area with various life skills and materials. Figure 1.2 summarizes the sampling methods, research methods and data collected.

For the focus group discussions, household representatives who participated in questionnaire and key informant interviews were randomly selected considering their willingness to participate in further discussions on the key issues covered by the research. The key informants were known due to their designations and were approached at their usual social or work places. Thus, for the focus group discussions and the key informant interviews, purposive sampling was useful as indicated by Adams et al. (2014) and Malleson et al. (2008).

Figure 1.2: Sampling, research methods used and data collected



The mixed or qualitative and quantitative approaches are not an end by themselves without criticism. Methodological purists challenge the combined use of the two paradigms (Bryman, 2008; Creswell, 2013). As pointed out by Bryman (2008) and Wirtz and Strohmer (2016), quantitated qualitative data is vulnerable to misconstruction and obscurity. While the mixed approach is popular currently, it calls for researchers who are well versed with the two approaches, otherwise statistical or textual issues would suffer analysis (Hartas, 2015; Hussein, 2009; Plastow, 2016). The approach is also feared to be time consuming and expensive (Creswell, 2013; Sheperis et al., 2016). The present research safeguarded against all this by focusing on one ward and engaging three research assistants.

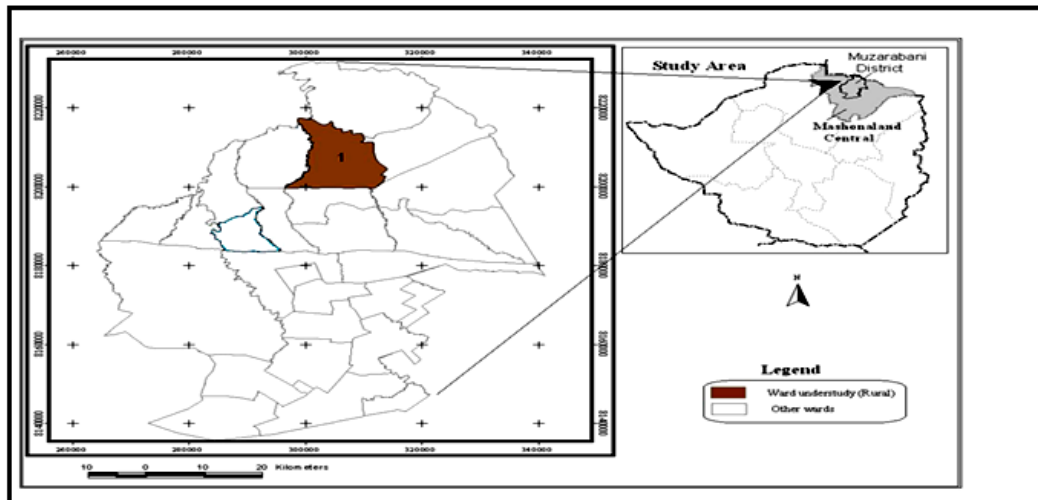
The total number of household respondents was obtained using the computerized sample size calculator. Demographic statistics of Chadereka households were obtained from Zimbabwe Statistics Agency (ZimSTAT) (2012). Chadereka has a total number of 1 594 households within 51 villages. “At 95% confidence level using a confidence interval of 5 the sample size was calculated to be 310 households” (Manyani and Bob, 2018:78). This was statistically significant and representative. Thus, an average of 6 households per village was selected at random to minimize bias. During the random selection of the households, the village heads from the Ward supplied lists of household names per village which then were assigned computer generated random numbers by the researcher and the assistants. Thus, a multilevel mixed sampling method was followed as also explained by Adams et al. (2014), and Malleson et al. (2008), Manyani and Bob (2018) and Teddlie and Yu (2007).

The collected data (qualitative) was subjected to content analysis technique and some direct quotations were presented. Quantitative data (household responses) were coded and analysed using the Statistical Package of Social Scientists (SPSS) version 21. Similar to Ofuoku (2011), some of the collected data was subjected to descriptive statistical analysis such as frequency counts and percentages from the likert scales used.

V. SOME GEOGRAPHICAL CHARACTERISTICS OF CHADEREKA

Zimbabwe is a sub-tropical African country vulnerable to varying climatic conditions of flood and drought. The study is located to the extreme north of the country (Map 1.1). The geophysical, socio-economic and political conditions exacerbate its vulnerability thus considerably retarding the adaptive and copying capacity in the area. The area experiences seasonal climate given its geographical location.

Map 1.1: Map of Zimbabwe showing Chadereka Ward 1 in Muzarabani Rural District of Mashonaland Central Province (Manyani and Bob, 2018: 74)

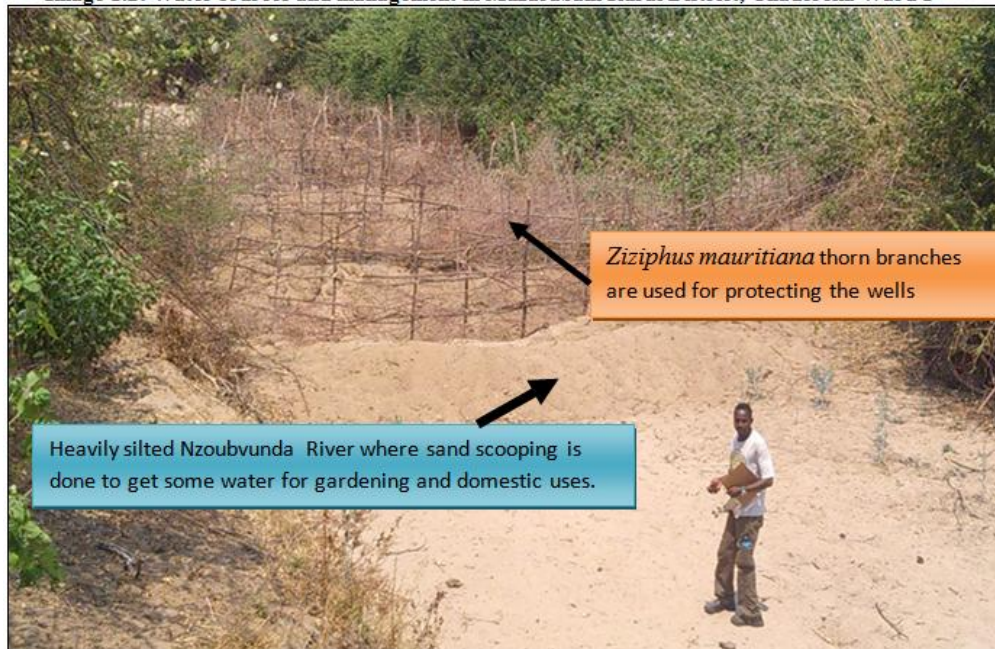


Based on the agro-ecological boundaries of the country, the study area is located in region IV, which has a dry climate with an average rainfall of 550 mm per year and extremely high temperatures of over 40°C during the spring and summer months (Campbell et al., 1997; Murwira et al., 2012; Mugandani et al., 2012).

Manyani et al. (2017) and Murwira et al. (2012) noted that floods and drought are experienced occasionally in Zimbabwe. This calls for proper management of resources which fosters resilience and improves the well-being of the households particularly in marginal areas like Chadereka. The perceived causes for the climatic variations have been publicized by Matarira et al. (2013) and Unganai (1996). Such climatic conditions have rendered the community to base its socio-economic activities on gathering of wild berries and drought resistant crops and livestock production. Thus, the area has limited livelihoods portfolios.

The term 'muzarabani' is an indigenous concept referring to a flat and low-lying area which is a floodplain. According to one elderly community member interviewed, the term describes the area explicitly: 'muzara' literally meaning 'full of' and 'bani' signifying a 'vlei' or 'flood plain'. This was also revealed by Chanza (2014). The Lower Muzarabani area stretches from the piedmont zone of Mavhuradonha Mountain Range in the south to the Zambezi River in the North. The main drainage systems which affect Chadereka are Hoya, Nzoumvunda, Musingwa and Musengezi Rivers. Initially, the extensive floodplain used to be covered with fertile alluvium associated with wet conditions. While soils display variations due to the Pedogenesis processes, currently the soils are chromic luvisols, which are sandy textured making them prone to wind and fluvial erosion (Nyamapfene, 1991). The author further pointed out that these soils have low nitrogen, phosphorus and other organic content. Their water retention capacity is generally poor and the rivers are always silted and dry for a longer period of the year affecting livelihood practices in the area.

Image 1.2: Water sources and management in Muzarabani Rural District, Chadereka Ward 1



Households practice sand scooping during the dry season to water their gardens and for other domestic uses as shown in Image 1.2. The image further shows how households protect the temporary sand scooped wells from wild and domestic animals using the thorn branches of ‘musau’ trees (*Ziziphus mauritiana*), riverine vegetation and poles of mopane-terminalia woodland (*Colophospermum mopane* and *Terminalia stuhlmani*) and mopane-combretum woodland (*Colophospermum mopane* and *Combretum apiculatum*) (Chanza, 2014), abundant in the area. Generally, Nzoumvunda River remains silted with no surface water flow for almost two thirds of the year from April to November. However, the alluvial soils on the banks along Nzoumvunda and Hoya Rivers are rich soils with a favorable water retention capacity and have the ability to sustain the flood recession cultivation of maize, a practice known as ‘mudzedze’ by the locals during the autumn and winter seasons.

Chadereka occupies the interfluvium sandwiched between Hoya River to the east and Nzoumvunda River to the west. It stretches from the confluence of these two rivers towards the south. From the focus group discussions with household heads and some key informants like the Ward counselor it emerged that flooding in the area is caused by the back flow of Hoya and Nzoumvunda rivers which fail to drain in Musengezi River after some heavy downpours within the catchment areas of these rivers. Roads in the area are always in a deplorable state making the area inaccessible during the rainy season. Institutionally, customary law continues to be practiced evidenced by the Traditional Leadership Act with a mandate on natural resources management or conservation and Communal Lands Act which deals with land allocation (Chanza, 2014). Chadereka is one of the Wards under Chief Kasekete. Under the Chief there are the Ward Councilors and kraal heads or Headman who assist in enforcing environmental laws.

VI. RESULTS AND DISCUSSION

a. Rural livelihoods natural assets regulation, governance and management strategies

The research explored the laws, policies, regulations or management strategies governing the execution of rural livelihoods in Chadereka from the household respondents’ and key informants’ points of view. Given that rural livelihoods in the Ward are based principally on natural resource assets (land, water, vegetation, and wild animals), an overview of regulations (management strategies) used in Zimbabwe to protect the environment from excessive degradation are points of reference. In Zimbabwe, the Ministry of Environment, Water and Climate is the custodian of environmental management systems and has put up some structures and instruments or policies which monitor the proper use of the environment. For instance, there is the Environmental Management Agency (EMA) whose mandate is to certify proper management of the natural resources in any developmental project at all levels. The Agency expects the carrying out of an Environmental Impact Assessment (EIA) before any developmental project is done. The local leadership (through chiefs and counselors) has been entrusted to foresee some of the communal laws governing the use of natural resources without questioning their appropriateness in the area (Dube and Guveya, 2013). As such this analysis and discussion helps to examine management practices employed by households in the area to safeguard the sustainability of the livelihood assets essential for their survival.

Table 1.2 provides a content analysis of responses by households on how they manage the natural resource assets. Participants during the key informant interviews and focus group discussions revealed knowledge about regulations governing natural resource use. It emerged that the households were aware of the management strategies as stipulated by Environmental Management Agency (EMA), and were expected to adhere to them. However, the focus group discussants pointed out that the management strategies were not strictly being followed. For instance, households, especially those in the local administration, were flouting the regulation which restricts stream bank cultivation (flood recession cultivation locally called *mudzedze*) and ploughing at least 30 m from the river bank for that was also their practice. The Ward counselor for instance commented:

Households are hard pressed with food shortages and limited livelihood options due to these climatic changes and socio-economic challenges currently affecting the country. As such, they end up engaging in some of the prohibited activities like hunting, cutting down and selling of fuel wood. Some even practice flood recession cultivation (mudzedze) on river banks not considering the distance of 30 m from the river bank which is allowed by EMA before any cultivation takes place. Thus, the majority of the regulations are flouted as these natural resources are our only source of living.

From the narration it is clear that the top-down management strategy presents some challenges. Rather community engagement would yield better responses as members would analyze the pros and cons of the management strategies coming up with their own productive solutions.

Table 1.2: Content analysis of responses by households on how they manage natural resources in Chadereka Ward 1

Natural Resource	Summarized Management Strategies
Land	Minimum tillage, land furrowing, destocking, fencing, contour ploughing, prohibition of pulling logs or ploughs, ploughing at least 30m from the river banks, destocking and resettlement, use of green fertilizer.
Vegetation	Use of dry fuel wood for heating and cooking, prohibition of veld fires and deforestation, fencing and the expropriation of the indigenous natural fruit trees (like <i>Ziziphus mauritiana</i>) within their fields, reforestation, destocking, use of fuel wood conserving homemade stoves.
Water	Digging and protecting wells and boreholes against animals, sand scooping, water recycling (used domestic water is reserved to water animals), use of water storage containers and mulching.
Wild animals	Using statutory law of Zimbabwe which prohibits hunting without a licence or poaching, migration of some wild animals to areas with water and more vegetation like the Zambezi River banks and Mavhuradonha Mountain Range.
Other (Solar energy)	Construction of shelters at homesteads and the acquisition and use of solar panels for lighting, for powering radios and mobile phone charging and use of biogas digesters for cooking and lighting.

In addition, it was revealed that natural resource assets management strategies, for land, minimum tillage and destocking are not being followed by all. Some families face labor shortages in practising minimum tillage due to small household sizes, while destocking is not done as their livestock numbers are already low due to sale in meeting family needs. The use of green manure is selectively done due to the variations in livestock ownership. Given the increasing aridity and financial constraints, households no longer use artificial fertilizer in their fields though they sometimes spray pesticides similar to what was noted by Rahman and Alam (2016).

More contradictions exist in the management of vegetation as indicated by Thomas and Twyman (2005). Vegetation is the main source of fuel wood and material for field and sand scooped water protection (Image 1.2) and shelter building in the area. Hence, controlling deforestation using EMA regulations is a challenge. Households argue that there are no other alternative energy sources for heating and cooking except fuel wood. Not all households have embraced the use of fuel wood saving stoves. For the few with the solar panels they argue that these cannot power the cooking processes.

Selling firewood is also another source of income and survival strategy. However, they agreed in their community to protect fruit trees and those which are for building purposes and browsing by their livestock. This has been effective since households are found fencing their fields and expropriating *Ziziphus mauritiana* natural fruit trees within their homesteads. Afforestation is limited due to water shortages. However, local authorities continue to encourage the use of naturally dry fuel wood and planting more indigenous trees.

Management of water is also a great challenge. Due to surface water scarcity, watering points like wells and boreholes were erected to tap water from underground sources with the help of mainly NGOs and the government. These sites are protected by branches and logs against animals. The sites for boreholes are generally far from the homesteads and households secure plastic and other types of containers for fetching water by use of animal drawn scotch carts or wheelbarrows. In some places the water is saline. Thus, households spend a lot of time in accessing water as also revealed by Jonah et al. (2015). Water management issues have been cited in different studies by Chisanya and Mafongoya (2016), Liernet and Burger (2015), Rahman and Alam (2016) and Svubure et al. (2016). Those households located near rivers practice sand scooping (Image

1.2). Water recycling is done as households make use of used domestic water in watering their animals and some plants. Moisture in vegetable production is maintained by mulching but not done on a large-scale.

Wild animals are protected by the statutory laws of Zimbabwe which prohibits hunting or poaching unless given permission to do so as cited by Balama et al. (2016). Some wild animals have since migrated to areas with water and pasture like the Zambezi River and Mavhuradonha Mountain Range. There is no management strategy for mineral as these are non-existent in the Ward. For other natural resources, like solar energy, households still need more assistance for them to acquire the solar devices like panels and utilize energy from the sun. There is abundant sun which when fully taped the Ward would not have energy crisis. When it is very hot they seek shelter under tree shade or artificially constructed structures to avoid direct heat.

In analyzing household respondents' perceptions on the number of management strategies on each natural resource in Chadereka Ward 1, Table 1.3 illustrates the percentage responses.

Table 1.3: Household respondents' perceptions on quantity of management strategies on each natural resource under consideration (n=310) (in %) (Multiple response)

Rural livelihood (natural) resource	Few management strategies (less than 3)	Several management strategies (more than 3)	None
Land	87.7	1.9	10.3
Vegetation (trees and grass)	88.1	1.0	11.0
Water	88.7	1.0	10.3
Wild animals	9.7	0.3	90.0
Other resources (solar)	0.3	0	99.7

Few management strategies (less than 3) were reported on land (87.7%), vegetation (88.1%) and water (88.7%). Wild animals had 9.7% and other resources had 0.3% in the same category. Respondents who cited more than three management strategies per natural resource were less than two percent. That is, 1.9%, 1.0%, 1.0% and 0.3% for land, vegetation, water and wild animals, respectively. For wild animals and other natural resources like solar energy, 90% and 99.7% suggested no management strategies, respectively. One focus group discussant reiterated:

Here our lives are based on land, vegetation and water. In as much as we would want to conserve these, we find ourselves over exploiting them since we have limited options for survival. Wild animals used to be many but population growth in the area due to immigration and natural increase has scarred them away to the Zambezi Valley and the Mavhuradonha Mountain Range and some were hunted for meat.

The quantity of management strategies has an implication for the deterioration and sustainability of the natural environment. The more the natural resource management strategies are (and if they are implemented), the more their sustainability is promoted. As such, more management strategies for the dominant natural resources used need to be developed in a manner which considers indigenous knowledge and customary practices to ensure their sustainability and adaptation to climate variability and change in the area. The imposition of government statutory laws is a source of conflict in most countries of sub-Saharan Africa where rural livelihoods are natural resource based (Thomas and Twyman, 2005). Harmonization with the customary tenure systems prevalent in a given community promotes cooperation and proper execution of the management strategies by all. Wright et al. (2016) commended the improvement of the local community attitudes and perceptions towards conservation and good management of the natural resources and mutual cooperation between resource users and the law enforcers as the best strategy in dealing with the problems of natural resource management. This enhances community ownership and empowerment, which promote environmental sustainability and individual well-being.

The research further sought to establish the existence of policies or regulations governing the promotion of sustainable adaptation strategies in times of drought and floods. Figure 1.3 shows that the respondents generally acknowledged the presence of regulations governing the use of water and vegetation and crop and livestock production during drought and flood times. More than 2 in every 3 respondents acknowledged the existence of regulations for water, vegetation and livestock management during drought with 70.6%, 73.5% and 63.5%, respectively. The lowest percentage (33.5%) was for crop management since infrastructure for irrigation is not yet in place and some crops like cotton have lost their market value. In the case of floods, more than 70% confirmed the practice of all the four management systems. These are livestock management (72.3%), crop management (74.2%), vegetation management (78.7%) and water management (73.2%). Thus, more attention is placed on flood challenges than drought.

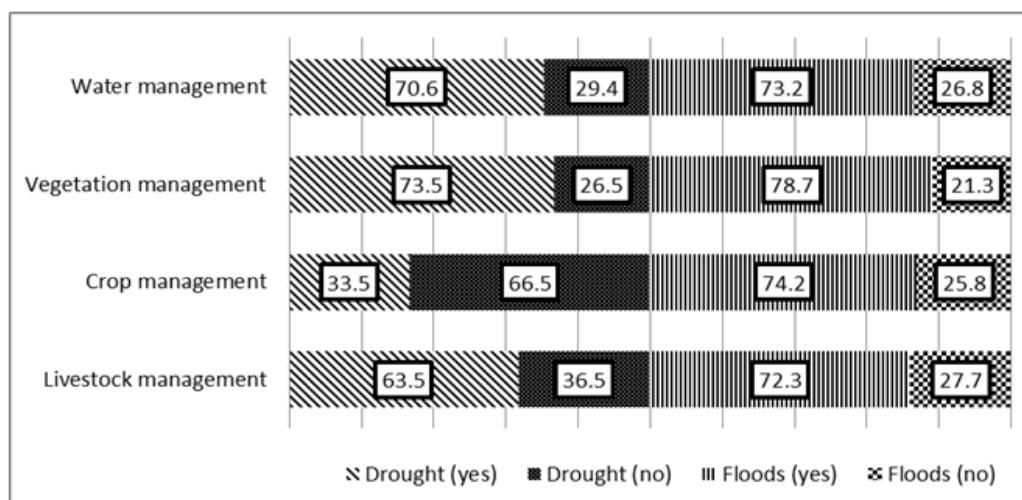


Figure 1.3: Policies or regulation systems (laws) to promote sustainable adaptation to drought and floods (n=310): Multiple responses (in %)

These results were also confirmed by one focus group discussant who said:

The Ward members are not allowed to cut down trees willy-nilly, neither are they allowed to pull logs which loosens the soil making it prone to erosion by water during floods and by wind during drought periods. They are not allowed to gather unripen natural fruits like Ziziphus mauritiana berries. Stream bank cultivation is not allowed as well. The households are allowed to keep a limited number of cattle but no restrictions on small livestock like chickens, goats and pigs. Anyone found on the wrong side of the law is fined a goat which is taken to the chief and eaten by the elders of the Ward. We have had challenges with stream bank cultivation. The anti-poaching law is effective as the Zimbabwe Republic Police (ZRP) currently has a base at Chadereka Service Center and monitors the situation. Generally, for other regulations, there is minimum monitoring as households are concerned in securing food for their families.

From the expression given, it is clear that some regulations are put in place governing the use of resources and livelihoods. However, monitoring is ineffective given that some of the elders in the Ward normally breach the laws. Furthermore, the locals are aware of the existence of regulations governing the use of their natural resources. However, compliance is a challenge given the over-reliance on the natural resource base for survival. This is compounded by the rarity in physical visits by EMA officials to effectively monitor the enforcement of the regulations as well as engaging the community on how they would want to manage their resources.

b. Enhancing rural livelihoods through sound and appropriate natural resource governance

While farming emerged as the main rural livelihood in Chadereka, its governance and execution were reported to be affected by management issues with regards to the natural resources in the area. Land degradation is accentuating leading to deforestation and siltation of the two main rivers, Hoya and Nzoumvunda. Water scarcity has become a major issue. The people responsible for upholding and enforcing the environmental regulations or laws are found being the perpetrators. This complicates the climate change governance system. Thus, the ordinary people upon viewing this tend to do the same as their leaders. This contradicts the observation by Reingewertz (2017) who noted non-reciprocity regarding climate change mitigation and adaptation. In the case of the study area, households, like their leaders, continue to freely use their natural resources with limited management. However, given that as it were, more water harvesting and management technologies need to be a top priority in the area.

Furthermore, the indigenous and historic flood recession cultivation (*mudzedze*) has been reportedly linked to the problem of stream bank cultivation in the Ward as already alluded to. Curtailing the problem is being made difficult by influential leadership and elderly households who were allocated fields which stretch into the river. Thus, it is recommended in this study that the government of Zimbabwe through its organs such as EMA, Civil Protection Unit (CPU), the Meteorological Services Department (MSD) and the Department of Agricultural Extension scale up their visits to and awareness meetings with the households in the area to discuss the consequences of such practices and their sustainable management. Community engagement is of paramount importance in resolving resource management issues. In this regard various methods of disseminating information on the best practices and repercussions of malpractices in these times of climate variability and change should be developed and enforced. These include the production of pamphlets, use of mass media, literature on livelihood execution and other devices accessible by the households taking advantage of

globalization through the use of information and communication technologies (ICT). Some households are not even aware of the existence of legitimate laws governing the use of the natural resources and this should be reinforced during the meetings. Such meetings or awareness platforms improve relations with the community as pointed out by Wright (2016). Capacity building as noted by Yoseph-Paulus and Hindmarsh (2016) in this aspect should be considered without exception.

In dealing with water crisis, besides ensuring that the community properly maintains and use the boreholes sunk by the NGOs and government, dam construction on the upper parts of the rivers should be considered by all the stakeholders, including the government, civil society organizations, the private sector, NGOs and the local people. Artificial water storage mechanisms like constructed water tanks and other water harvesting technologies are also recommended on strategic positions. Construction of contour ridges by individual households which hold back soils from water and wind erosion could be enforced by the Agricultural and extension officers in collaboration with the households. Households could preserve some crop stalks made up of plant residues to supplement feed for their livestock.

Given that some homesteads succumb to floods whenever they occur, building codes for such areas could be established and followed like granaries built on top of deeply inserted logs. A government directive should enforce the resettlement of households on high ground away from flood plains and adequate support should be provided to ensure that the relocation does not result in the households becoming more vulnerable. The reconstruction of roads and bridges should be considered in order to mend or raise them in areas where these are low and easily eroded by flowing water. The tarred road which ends at Muzarabani Growth Point could be extended to link to the border with Mozambique via Chadereka Ward 1. This could promote development in the area as marketing boards could be set up and services of various kinds provided. Material for the construction could be sourced from Mavhuradonha Mountain Range which is approximately 36 kilometers away. Such development projects could also incorporate the rural electrification programme, biofuel and solar generation programmes which have since benefited the majority of Zimbabwean rural communities elsewhere (Government of Zimbabwe, 2015). Electricity grid could be extended from Muzarabani Growth Point to the area. Large solar projects could be set up in the area given the high solar insolation experienced in the area and could feed into the national grid as well. This would also promote livelihood diversification as the households can engage in other income generating projects which make use of electricity.

Human capital is noted to be in abundance but is of concern regarding the lack of relevant and specific skills despite the literacy levels being relatively high. As such, most of the households were found to be engaged in extractive livelihoods which include farming and gathering of wild berries. Capacity building in different fields involving value addition could be promoted. Similar to what has been done in other rural districts, a vocational training center could be established at Chadereka Business Center which would focus on training school leavers, in line with improving livelihoods using the locally available resources. Instead of selling the natural fruits (mainly *Ziziphus mauritiana* and *Adansonia digitata*) raw, the inhabitants could process them into finished products like jam, wine and natural soft drinks. This could create job opportunities for the unemployed youth. Once people find more value from the local natural resources, their sustainability would be enhanced through protection, conservation and proper management. The wild fruit trees would increase and improve carbon sequestration, a mitigatory measure to greenhouse gases. Soil erosion would be minimized by increased vegetation cover. Income generated from the sale of produced natural products would see the households acquiring other physical assets reported to be currently inadequate.

On the issue of social networking which has been reported as being inadequate due to the remoteness and inaccessibility, commitment to infrastructure development (including network connections) needs to be prioritized as highlighted in this discussion. Most of the drawbacks are linked to the lack of communication infrastructure, which should be prioritized. Some development committees like the Chadereka Early Warning Committee could be set up to spearhead these issues in collaboration with the local leadership and other partners like the civil society groups, the NGOs and the private sector.

While the sale of livestock and wild berries supported the financial capital in the area, these were generally seasonal and inadequate. Livelihood diversification could be encouraged as households engage in both farm and non-farm activities. Apiculture could be promoted due to the favorable climatic conditions. Petty trading with other areas, even cross border trading with Mozambique in form of labour provision and the sale of local products could be scaled up. Food security would then be improved.

VII. CONCLUSION

The governance system of rural livelihood natural assets and the adaptation to climate variability and change at local level has been explored in this study. There is a portfolio of local-based management strategies for land, water, vegetation and wild animals, albeit some challenges in the management of these assets. The natural resources are over exploited given their central role for survival. Basically, they are characterized by a top-down management system which lacks systematic monitoring thus presenting some challenges. Shortage of

alternatives for fuel wood as a source of energy, cheap building material and income generation have been noted to exacerbate the management of vegetation as it is the sole provider. However, natural fruit trees, mainly *Ziziphus mauritiana* and *Adansonia digitata* are being effectively managed. There is water scarcity and wild animals have been reduced in numbers through excessive hunting and migration. However, notable roles played by the government and the NGOs in ensuring that underground water is tapped for domestic use is worth commending. Household practise water recycling and travel long distance to fetch water from erected boreholes. The management of resources like land, vegetation and livestock in adaptation to climate change (drought and flood) has been noted but still are ineffective since the elderly breach the regulations which contradict their benefits. The research concludes by providing some measures which if implemented properly will help save and improve adaptation to climate variability and change in the area. Water harvesting and other natural resource management initiatives or technologies need to be enhanced. Community engagement and infrastructural support have been acclaimed to bring relief to the Chadereka households. Capacity building and value addition on all produce from the Ward would exonerate it from the negative publicity.

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