POTENTIAL STRATEGIES FOR HARNESSING INDIGENOUS RAINMAKING PRACTICES TO COMBAT THE NEGATIVE EFFECTS OF CLIMATE CHANGE IN CHIMAMIMANI DISTRICT OF ZIMBABWE

By

Timothy Marango

(Student Number 11582404)

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Promoter : Prof. J. Francis, University of Venda

Co-Promoter : Dr. P.E. Matshidze, University of Venda

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DECLARATION

I, Timothy Marango hereby declare that this thesis for the Doctor in Philosophy in Rural Development (PhDRDV) submitted to the Institute for Rural Development at the University of Venda has not been submitted previously for any degree at this or another university. It is original in design and in execution, and all reference material contained therein has been duly acknowledged.

Student ……. **Date** ……

Timothy Marango

Promoter …… **Date** ……

Prof J. Francis

Co-Promoter …… **Date** ……

Dr. P.E. Matshidze

To my late parents Kefas Mhandu and Enesi Shwapurayi who taught me that "*Mutombo wepfuma indaramo*" (success is derived from honesty and safe life habits).

ABSTRACT

Currently, there is limited understanding, appreciation and dissemination of indigenous raining making practices. Yet indigenous rain making is part of the rich African heritage. The current study was premised on the view that indigenous rain making practices can help combat the negative effects of climate change if properly integrated with western science. A mixture of exploratory and survey designs was adopted in this study, which sought to examine the common indigenous rainmaking practices in Chimanimani District of Zimbabwe prior to developing strategies for reducing the negative impacts of climate change on the livelihoods of rural households. Various studies with the following specific objectives were carried out: to analyze the general community perceptions on the potential of indigenous rain making practices in combating the negative effects of climate change; to examine the components of indigenous rainmaking practices; analyse the means of disseminating knowledge on indigenous rainmaking; to identify the negative effects of climate change on the livelihoods of rural households; to assess the effectiveness of existing strategies used by households to cope with the negative effects of climate change; and to propose strategies for utilizing indigenous rainmaking practices to counter the negative effects of climate change on the livelihoods of rural households. Semi-structured interview guides and a questionnaire requiring responses on a Likert-type scale were used to collect data. Key informants and ordinary community members were selected using judgmental, convenient and snowballing sampling techniques. The Thematic Content Analysis technique was used to draw meaning out of the qualitative data. Chi-Square tests for Goodness of Fit were conducted using the Statistical Package for Social Sciences (SPSS) to establish if there were significant relationships among perceptions.

It was indicated that the shift in seasons as exemplified by the *Nyamavhuvhu* wind which now swept Chimanimani in September or October instead of end of July to August was evidence of climate change. Responses with respect to the negative effects of climate change included food insecurity, and drying up of streams and rivers. Availability of water for domestic, agricultural and animal use was becoming increasingly unreliable. The respondents argued that they believed in the effectiveness of indigenous rain making if it is conducted following local customs and traditions. Significant differences in the following perceptions were observed for “Besides *makoto* and Christian prayers there are other common rainmaking practices practiced in Chimanimani District” ($p < 0.05$). Similar results were observed with regard to “I believe indigenous and western knowledge of rainmaking can complement each other” ($P < 0.001$), and “There is increase in pests and plant diseases than before” ($P < 0.01$). Components of indigenous rain making

identified in the current study included rain making ceremonies (*makoto*), which entailed use of beer, sacrificial bird (normally a cock) and natural resources conservation such as keeping places for local rain making rituals sacred (zvitenguro), not destroying very big trees for example fig tree (*muonde: Ficus capensis*), *mukute* (*Syzygium cordatum*) and others, and treating forests as sacred. With respect to the negative effects of climate change, a highly significant difference was observed for duration of stay in relation to, “There is now a high risk in planting winter wheat due to changes in climate” ($P < 0.01$); “Wetlands are disappearing in our area” ($P < 0.01$); “There is general reduction in yields due to climate change” ($P < 0.001$) and “We are experiencing scarcity of water for domestic animals and for household use” ($P < 0.05$). Lastly, highly significant relationships between “Rivers are drying up in our area” and education ($P < 0.01$) and duration of stay ($P < 0.001$).

Methods used to disseminate indigenous knowledge of rain making were said to be ineffective. Information was being passed on through oral means. It was indicated that better use of modern technology and social media, in particular radio, television, Twitter, WhatsApp and Facebook might enhance people’s knowledge on indigenous rain making. By so doing, the perception that indigenous rain making was merely history and not knowledge that can be used in people’s daily lives would be eliminated. Furthermore, current strategies utilized to combat the negative effects of climate change were reported to be unsustainable. Among these were reliance on harvesting wild fruits for sale and hunting. Human activities such as veld fires, deforestation and over harvesting of wildlife were viewed in negative light with respect to combating negative effects of climate change. It was proposed that communities should revert to respecting traditional beliefs of conserving forests. This said to be key in normalizing climate, attracting back the birds and animals that used to be key in weather forecasting. Replanting and indiscriminate cutting of trees along rivers as effective prevention of stream bank cultivation were proposed. Re-introduction of heavy fines by traditional leadership was suggested as a tried and tested strategy that was no longer being applied when implementing conservation initiatives.

The observation made in this study that western science and indigenous rain making practices were similar in many respects, suggested that these were opportunities that could be used to anchor strategies for integrating them. In addition to this, the need for establishing collective deliberation or interface platforms coupled with continuous communication and careful management of intellectual property was obvious.

Key words: climate change, combat, rain making, indigenous knowledge, strategies

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LIST OF ABBREVIATIONS

AOA	Actor Oriented Approach
ATPS	African Technology Policy Studies Network
AU	African union
CC	Climate Change
COSATU	Congress of South African Trade Unions
FAO	Food and Agricultural Organisation
ICT	Information and communication technologies
IFAD	International Fund for Agricultural Development
IK	Indigenous knowledge
IKS	Indigenous knowledge system
IRD	Institute for Rural Development
IRM	Indigenous rainmaking
SADC	Southern African Development Community
SDGs	Sustainable development goals
SLA	Sustainable livelihoods approach
SPSS	Statistical Package for Social Sciences
UK	United Kingdom
US	United States
USA	United States of America
UN	United Nations
UNIVEN	University of Venda

CHAPTER 1: INTRODUCTION

1.1 Introduction

In this chapter the entire thesis is introduced. The main focus of the thesis was to interrogate the complementarity of indigenous rain making practices and modern convectional rain making. The aim was to identify potential strategies within indigenous rain making practices that could be harnessed to combat the negative effects of climate change in Chimanimani District. The thesis is structured in a paper form. Chapter 2 is written as a review paper whilst the others are research papers. In this chapter a general background of the whole study is featured. This is followed by the problem statement. The aim and objectives are also introduced. Brief literature supporting the study in general, the conceptual framework, definition of key words and concepts are also done in this chapter.

1.2 Background

Throughout the world, countries are seeking effective means of combating the negative effects of climate change. This is done particularly in order to reduce the vagaries of climate change, particularly the disadvantaged members of our society living in rural areas. Predominantly, western based approaches. They are foreign and abstract to minority and indigenous groups. Furthermore, they tend to focus on economic sectors rather than climate change per-se. this brings a missing link in the whole debate. Rarely have these efforts been focused on indigenous rain making. Indigenous rainmaking has been practised over millennia and passed the passage of times.

Baird (2008) argues that climate change researches have tended to focus on economic sectors such as water, infrastructure, agriculture, settlements rather than human groups. Studies have shown that in Africa, for example about 70 per cent of the population relies on the natural environment especially forests for survival (African Union: AU, 2015). Forests provide social, economic and environmental human needs in the form of carbon sinks, biodiversity conservation, watershed protection and household livelihoods (AU, 2015).

This is affirmed by Food and Agricultural Organisation: FAO (2013) which postulates that forests are homes to more than 80% of the world's terrestrial biodiversity, helping in protection of watersheds which supply of clean water to most human communities. Lynch & Hammer (2013) argue that more than seven billion people on the planet earth depended directly on the

environment for their food, medicinal needs, timber, fuel and fertilizers. However, climate change poses a very big challenges on forests and people who depend on it (AU, 2015). Increased incidents of fires due to increased temperatures, decreased forest health and increased water stress are the causative factors.

Kaya (2016) notes that diversity of culture, natural environments and other experiences makes climate change to impact on communities differently. This is affirmed by AU (2015) which claims that climate change is affecting people, economies, and the environment in differently in Africa. In this case there is need to look into weather and climate issues from both the local and global perspectives. Integration of indigenous and conventional science based rain making could be one way of achieving this.

Climate change refers is the long term change in the earth's climate resulting from greenhouse gas emissions namely methane and carbon dioxide which trap heat in the atmosphere, making the planet to become hotter (Brazier, 2015). Christianson (2015) sees it as changes in the earth's weather in the form of increased temperature of the earth's atmosphere as a results of increase of particular gases and wind patterns. Climate change is currently the main threat to food and nutrition security, water security, socio-economic and political stability of every nation (African Technology Policy Studies Network, 2013; Simelane, 2014; Kaya, 2016). Based on this it is important for communities to find local solutions for problems bedevilling them since these can be more compatible with local realities.

Various strategies are being practised to combat the effects of climate change. However, they seem to be abstract and complex thereby making them incompatible with local realities. Cognitive theories of learning such as those by Bruner and Gagne's Conditions of Learning theory reveal that people learn and understand by applying the principle 'known to unknown' and 'simple to complex' (Van Patten *et al.,* 1986). Indigenous rainmaking practice is a simple and known practice that has been practiced by indigenous communities for centuries and believed to work. Although, it is now poorly understood and appreciated, it has tested the passage of time. This lack of appreciation resulted lack of concerted efforts to establish how it can be integrated with conventional rain making technology.

Beartie (1964) defines rain making as inducing of rain by someone responsible in a community through use some supernatural powers. There are two main ways of rain making. The third one is being practiced but not in a formal manner. This is Christian rain making, done in churches. These are indigenous and conventional rain making practices. Indigenous rain making refers to the traditional practices which include rain making rituals and ceremonies and conventional rain making refer to science based rain making practices such as cloud seeding (Marango *et al.,* 2016)

Indigenous rain making is a coping strategy for combating negative effects of climate change among the Ndau people of Zimbabwe. Coping strategies refers to measures that communities or households take in response to events affecting normal life (Shadrack, 2011). Intergovernmental Panel on Climate Change: IPCC (2007) posits that coping to climate change or climate variability is a short time adjustment of a system to moderate it impacts and taking advantage of the new opportunities. Parry *et al.* (2005) sees coping as the action taken by people in response to, in anticipation of, or in projection of actual climate changes in order to combat its adverse effects posed.

Lynch & Hammer (2013) view indigenous knowledge as a panacea to addressing complex environmental problems. This is true from the evidence that was gathered from this study. Indigenous rain making is rooted in a community's traditions which were incrementally refined and transmitted over time across generations. Abioye *et al.* (2011) however note that documentation and dissemination of indigenous knowledge remain a challenge for librarians and other information professionals in Africa. Marango *et al.* (2016) affirms this assertion that documentation and dissemination of indigenous rain making knowledge was rare compared to western science-based practices such as cloud seeding.

This has made policy-makers and scholars such as AU, 2015; MacKenzie (2014) and Simpson (2004) among many to propose the incorporation of indigenous knowledge into the current local school curriculum. Simpson (2004) however argues that documentation of indigenous knowledge is one way of recovering and increasing access to this knowledge and practices. This then implies that there is need to look back to the past practices, document them and disseminating them for our prosperity and posterity.

The situation articulated above seems to have its roots in the fact that most development practices and programmes, as is the case and others being practiced elsewhere in most African countries, have tended to apply Eurocentric and ignored Afrocentric approaches that are compatible to local realities (Koopman, 1991; Khoza, 1994; Mararike, 1999). Le Grange (2007) compared the assumptions underlying western science and indigenous knowledge and reveals a fine relationship between the two. It is therefore possible to look critically at the indigenous practices and capitalize on them to solve the current environmental problems. Pro-Afrocentric approaches such as *sankofaism,* actor oriented approach and place based development can be the basis for realizing progress in Africa.

Quan-Baffour (2008, 2011, and 2012) defines *sankofaism* as gazing back to indigenous knowledge and skills in order to reclaim them. Eurocentric western value systems seem to give primacy to individualism and are related to self centred concepts of self-fulfillment and self-

development (Koopman, 1991). Eurocentrism often ignore and run contrary to the central tenets of Africa's rural life. Western theories are rooted in traditional dominance and are informed by a unique historical experience (Bjorn, 1995) in which the security interests of the ruling western elites dominated. For this reason, Marango (2011) argues that they are not compatible with the African realities characterizing the lives of Ndau people such as those in Chimanimani District.

Asante (2009) advocates for local culture to be part of Afrocentric development models. This is so because they are easily understood and appreciated by the affected community people. The principle of Afrocentrism "centrism", is groundedness on observation and behavior in one's own historical experience (Asante, 1990). Afrocentrism is regarded as the restoration of African experiences, making these experiences to be at the centre of their own development. Asante (1987) distinguishes Afrocentrism from Eurocentricism by clarifying that, whilst former stresses humanism and communalism; the latter stresses materialism. Afrocentrism therefore is anchored on self-knowledge, springing from the nature of human development (Verharen, 1995). Alkebulan (2007) asserts that Africa's indigenous traditions and collective historical past can be recovered, reclaimed, and reconstituted by African peoples today as they struggle to reproduce their lives and livelihoods.

Long & Long (1992, 1999) advocate for an actor oriented approach (AOP) in rural development. In this approach interface analysis is at the centre. Interface analysis focuses on points of confrontation and social difference. It entails understanding of cultural diversity, social difference and conflict inherent in processes of development intervention. Interfaces occurs at points where different, conflicting, life-worlds or social fields intersect. Indigenous and science based approaches need an interface analysis so that the different life-worlds come in terms with each other.

Complementing indigenous and science based rain making is an adaptation response strategy is for sustainable rural livelihoods. Understanding of the rural poor people's livelihood strategies improves the rural lives (Murambadoro, 2010). De Satge (2002) advocates for assessing and linking the micro situation (local/indigenous) and the macro condition (science based) knowledge in order to strengthen household livelihood. Murambadoro (2010) defines sustainable livelihood as a strategy with capabilities, assets both material and social resources, and activities required for a means of living. Sustainable livelihood approaches ensure food security. Koc *et al*. (2000) define food security as the availability of food at all times or having means to access nutritionally adequate food in terms of quantity, quality and variety. The type of food referred here should be acceptable within a given culture.

Globally, rural people are the most vulnerable group to climate change. This is so because they heavily rely on climate-sensitive resources which are slowly diminishing (Busch, 2014). Murambadoro (2010) argues that the majority of the African population rely heavily on the diminishing natural resources and have a great need to diversify their livelihood. In other words these vulnerable groups lack alternatives to adapt. Climate-sensitive resources refers to water and agricultural land related activities like arable farming, animal husbandry. It also include natural resources such as fuel wood, wild fruits and herbs (Hunter, 2007). Tutu (2014) an opinion leader on the eve of the September UN Climate Summit said that, "I fought apartheid…climate change is our global enemy…emerging as the human rights challenge of our time". The foregoing argument is a testimony that climate change is real global challenge.

Climate change poses risk to loss livelihoods and income due to insufficient drinking water, irrigation water as well as reduced agricultural productivity (Busch, 2014). According to Food and Agricultural Organisation: FAO (2009) nine million poor people out of two and half billion of the world's population live in rural areas. This population derives its livelihoods from agriculture. This implies that the natural environment, socio-economic, politics, cultures, social interactions and development are all shaped by climate.

Hunter (2007) affirms that climate change reduces access to drinking water and negatively affects the poor people's health. In order to achieve the aim of this study, there is need to understand the components of indigenous rain making practices and how indigenous rain making practices knowledge is disseminated. It is also important to understand the effectiveness of the existing strategies used by households to cope with the negative effects of climate change in order to propose strategies for utilizing indigenous rainmaking practices to counter them. The facts above necessitate this study in Chimanimani Rural District of Zimbabwe.

Currently, there is little understanding and appreciation of indigenous raining practices. Indigenous rainmaking is important since it is part of the rich indigenous African heritage that define the communities' unique identities (FAO, 2009). Preserving, managing and sharing indigenous knowledge is crucial for social and economic development (Owiny *et al.*, 2014). Owiny *et al.,* (2014) argue that eighty percent of the world's population depends on IKS to meet their medicinal needs and more than half of them of them relies on it for their food requirements. According to Mishra (2013) food and water security has potential of transforming rural areas from the traditional isolation to integrating them with national economies. Therefore integrating indigenous knowledge with science-based rain making knowledge has potential to combat the negative effects of climate change such as water and food insecurity.

Indigenous Knowledge Systems (IKS) is defined as systematic body of information. It is the totality of information, skills and practices acquired by local people through past experiences, observations, informal experiments and intimate understanding of their environment (Rajasekaran, 1993; Masango, 2010). IKS is viewed as a basis for local-level decision-making (Dunn, 2014). Food and Agricultural Organisation (2009) regards IKS as a coping strategy for the sustenance of livelihoods for millions of indigenous local communities. However, Plockey (2015) and other scholars argue that colonial rulers, missionaries, and Eurocentric biased intellectuals created an impression that indigenous knowledge was inferior, primitive, heathen, and barbaric and not worthy preserving.

It is important that communities look back critically and appreciate their past in order to shape a sustainable future. This is imbedded in *sankofaism*, which is the philosophy of 'going back for it', based on the idea that "It is not a taboo to go back for a (valuable) thing one has forgotten" (Quan-Baffour, 2012). Osei (2005) posits that *sankofaism* should motivate Africans to mobilize their moral and intellectual capacities for sustainable development of the continent. Critical reflection of the indigenous practices allows communities to decipher between the good from the bad in their traditions. Abioye *et al.* (2011) postulate that IKS offer opportunities for improved agricultural production and sustainable food security. Lack of appreciation and application of IKS threaten achievement of some United Nations Sustainable Development Goals: UN SDGs 2 and 13 according to (Long, 2015). These aim to "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture" and "Take urgent action to combat climate change and its impacts" respectively.

Research based on the fore going arguments show current debates on climate change in Africa and Zimbabwe in particular are foreign and associated with modernisation. As a result of this it is difficult for these debates to be understood and be compatible with local realities. They are abstract and complex for the locals to understand them in their entirety. Modernisation falls within two area. These are personal modernity and societal modernity (Hareven, 1976). Personal modernity refers to changes in individual attitudes and behavior and rational decision making. Societal modernity is the large scale social shifts in economic development, communication systems, higher rates of literacy, and secularization (Hareven, 1976).

Theorists see the two worlds as 'advanced' or 'developed' and 'backward' or 'undeveloped' (Matthews, 2007). As a result of modernisation, most people in developing world have in some instances became inclined to disregarding their own knowledge in favour of foreign or western science (Bentley *et al.,* 1991; Agrawal 1995; Rouse, 1999). However, Emeagwali (2003) claims

that recognition and appreciation of IK is a source of healing, a therapeutic import in the context of unhealthy imbalances, distortion, trivialisation and neglect inflicted by Eurocentrism.

Faced with immense challenges of climate change and rural under-development, there is need to look for an alternative development theory. In this study, it is argued that Africans should retrace their roots (*sankofaism*) and seek answers for the negative effects of climate change using known popular practices. This originates from the realisation that the majority of people in rural areas heavily depend on climate-sensitive resources and have limited adaptation strategies at their disposal. In this study indigenous rain making practices has strategies that can be enhanced to reduce the negative impacts of climate change on the livelihoods of rural households in Chimanimani District of Zimbabwe.

1.3 Statement of the Research Problem

Climate change is a global predicament affecting all aspects of human life including people's relationship to the natural environment. As a result of climate change Southern African states and beyond have been experiencing increased rainfall variability. Statistics show that more than 7 billion people the world over rely on the environment for their food, medicinal and all their livelihoods (Lynch & Hammer, 2013). In Africa more than 70 % rely on the natural environment for livelihoods (AU, 2015). Climate change threatens these populations not only with food and water security but also other livelihoods activities.

Efforts to avert the impact of climate change however have tended to focus on conventional practices and ignoring indigenous ones. This is despite the rich indigenous knowledge which have tested the passage of time that locals have. Little is known about how indigenous rainmaking practices can be harnessed in tandem with western science-based practices to reduce the negative effects of climate change. It is also not clear if IKS is adequately disseminated and how it is enhanced. These problems negatively impact on social, economic, political and general livelihoods of the rural households in Chimanimani District of Zimbabwe.

A possible cause is the paradigm shift from indigenous practices to modernisation. This is so because available literature seem to accuse formal education system for preparing young for colonial civil service disregarding indigenous socio-economic and political activities. Traditionally young people were informally taught indigenous knowledge, skills, ideas, attitudes and patterns of behavior either parents or tradesmen and women in the various communities for sustainable living. Therefore a study investigating the potential of enhancing indigenous rain making practices in combating the negative effects of climate change could be remedy. This helps to integrate

indigenous and conventional knowledge. It also improves forecasting of rainfall, help the local residents plan their farming and other livelihood activities thereby improving the quality of life of their households.

1.4 Research Objectives

The aim of this study was to examine the common indigenous rainmaking practices in Chimanimani District of Zimbabwe in order to develop strategies for reducing the negative impacts of climate change on the livelihoods of rural households. This was achieved through studies designed to:

a) analyze the general community perceptions on the potential of indigenous rain making practices in combating the negative effects of climate change in Chimanimani District of Zimbabwe;
b) examine the components of indigenous rainmaking practices;
c) analyse the means of disseminating knowledge on indigenous rainmaking;
d) identify the negative effects of climate change on the livelihoods of rural households;
e) assess the effectiveness of existing strategies used by households to cope with the negative effects of climate change; and
f) propose strategies for utilizing indigenous rainmaking practices to counter the negative effects of climate change on the livelihoods of rural households.

1.5 Research Questions

The main research question in this study was: What are the common indigenous rainmaking practices in Chimanimani District? This was supported by the following specific questions:

a) What are the general community perceptions on the potential of indigenous rain making practices in combating the negative effects of climate change in Chimanimani District of Zimbabwe
b) What are the components of indigenous rainmaking practices in Chimanimani District?
c) How is knowledge on indigenous rainmaking disseminated in Chimanimani District?
d) What are the negative effects of climate change on the livelihoods of rural households in Chimanimani District?
e) How effective are the existing strategies used by households to cope with the negative effects of climate change?

f) Which strategies can be utilized in indigenous rainmaking practices to counter the negative effects of climate change on the livelihoods by community members?

1.6 Research Assumptions

In this study the following assumptions were adopted:

a) Afrocentric approaches for rural development are being disregarded regardless of being part of the rich African heritage defining communities' unique identities;

b) Information on indigenous knowledge, particularly on indigenous rain making is not appropriately disseminated and that;

c) The current strategies of rain making are not religiously followed and known by the majority of the young generation and those community members who converted to various foreign religions.

1.7 Justification of the Study

Traditional approaches to rural development are not abstract to local people. They ensure genuine and active participation of community members. Afrocentric approaches are part and parcel of place-based knowledge or self-regulated learning. Local self-regulated learning refers to various processes such as own goal setting, metacognition, and self-assessment through reflecting to one's experiences in the environment he/she is located (Loyens *et al.,* 2008). Afrocentric approaches are a form of self-directed learning because they are part and parcel of socialization in Africa and in particular Zimbabwe. It has been assumed that the level of climate change globally could not have reached the level they are, had tradition been followed.Success of this social experimentation might result in improved forecasting of rainfall, help the local residents plan their farming and other livelihood activities thereby improving the quality of life of their households.

1.8 Theoretical Framework of the Study

This study was influence by alternative development theory. It is argued that there is always an alternative way of doing things and naivety in a ridged way of doing things. The modernisation theory had the aim of universalizing the globe. Modernists claimed that development would spread from the nucleus to the periphery. For them development was uniform, forgetting uniqueness of communities. This did not happen. Below are the alternative approaches that can gel well with local realities in Africa.

1.8.1 Afrocentric Approaches to Rural Development

Western based development theories such as the modernisation theory have failed in Africa. Briggs & Sharp (2004) argues that faced with this failure of development, development theorists and practitioners blamed modernisation approaches for their failure to uncritical transfer of science and technology from the North to the South. Alternative development in the form of Afrocentric theory orchestrated by Asante and others influenced this study. Pieterse (2000) views alternative development as a roving critique of mainstream development. Alternative development arose in the 1970s as a result of dissatisfaction with mainstream development theories such as modernisation.

Alternative development is viewed as people-centred and satisfies local development needs. Briggs & Sharp (2004) posits that the recognition of indigenous knowledge present the development community with alternative experiences, from which to challenge conventional development praxis and to empower hitherto the long neglected populations. The Afrocentric in school of thought developed out of a desire to reconstruct the consciousness of African American youth who were failing in public schools.

Asante (1985) argues that Africans share elements of a common culture, implying that there is one African cultural system manifested in diverse ways. Afrocentricity is an intervention paradigm which aims at facilitating the transformation of the Africans from a state of dependence to a state of independence and self-reliance (Asante 1980; 1987). Self-reliance was advocated by Julius Nyerere in Tanzania. According to Asante (1987), Afrocentricity is placing African ideals at the centre of any analysis that involves African culture and behavior. Long & Long's (1992; 1999) call it interface analysis. Afrocentricity philosophy stems from the recognition that Africa is the centre of the universe. It is the origin of all mankind (Asante, 1988).

Alkebulan (2007) argues that whilst the West finds its intellectual, political and cultural matrix in Greece, Afrocentrists find their origins in Eqyptian civilization. The tenets of the Afrocentric thought claim that Egypt was the origin of civilization and that Ancient Greece was an imitator of the Egyptians. For Afrocentrists all art and philosophy h originated in Egypt. Mutisya & Ross (2005) posits that Afrocentricity should motivate Africans to be proud of their cultural identity. Simpson (2004) postulates that, indigenist thinkers advocate for the recovery and promotion (IKS) systems as an important in decolonizing Indigenous.

Sankofaism advocates for the reclamation of the lost indigenous sustainable livelihoods practices. It looks at the traditional past with critical eyes to select those elements that would be of use to one's present life and helpful to building a better life in future. *Sankofaism* is derived from and

symbolises the *sankofa* bird among the Akan people of Ghana. The bird is popular for its forward and backward gaze which symbolizes that it is not wrong, shameful or too late to go back for something one had previously forgotten (Osei, 2005). According to Quan-Baffour (2012) "*Sankofa* is both a philosophical thought and a cultural custom of the Akan, the single largest ethnic group in Ghana.

Sankofa comes from three Akan words- *san* (return), *ko* (go) and *fa* (take) which literally means, 'go back to reclaim'". Quan-Baffour (2012) further argues that the backward gaze implies wisdom in learning from the past for the purpose of understanding the present and to shape the future.

Actor oriented approach (AOA) to development is another Afrocentric biased theory propounded by Long & Long (1992). In this any social setting is influenced by three basic principles namely: human agency, life worlds and interface. Human agency refers to actors or individuals in communities. It is founded on the understanding that individuals have the capacity to bring about change in their own communities. This allows for elucidation of factors, interpretations, strategies and how they inter-lock through processes of negotiation and accommodation. The theoretical framework is shown diagrammatically in Figure1.1.

1.9 Definitions of Key Terms and Concepts

Many terms and concepts are used in this study. These are climate change, sustainable livelihoods, indigenous knowledge and western knowledge. *Climate change* refers to a significant and lasting change in the statistical distribution of weather patterns over long periods, ranging from decades to millions of years (Naanyu, 2013). The anticipated impacts of climate change will manifest in the form of; floods, storms, prolonged droughts and increased atmospheric temperature.

In defining a *livelihood*, Chambers 1992 argues that it "comprises the capabilities, assets and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term." A sustainable livelihood is one which can cope with and recover from shocks and stresses and maintain and enhance its capabilities and assets both now and in the future, whilst not undermining natural resources (DFID, 1999).

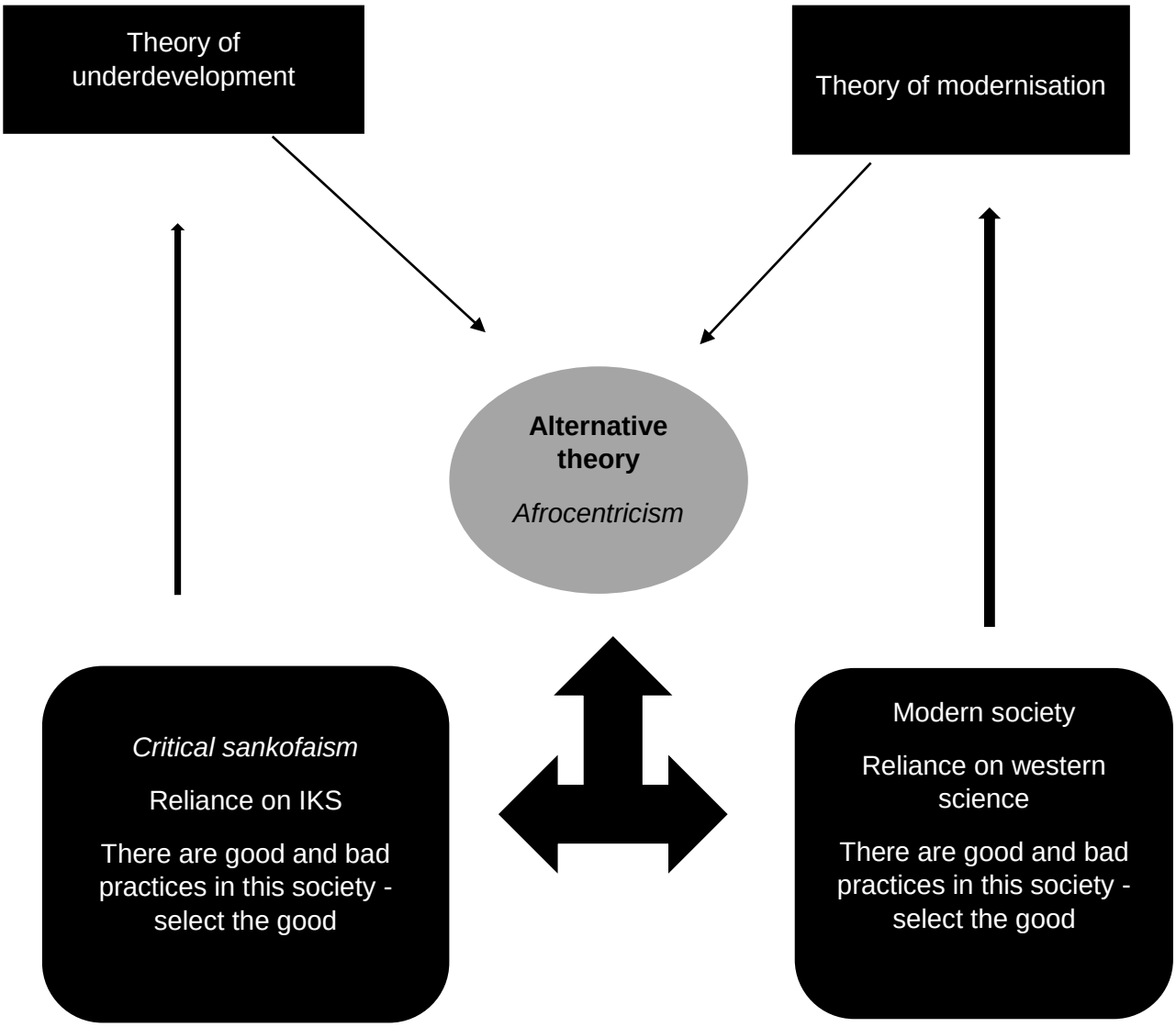

Figure 1.1: Theoretical framework of the study

Indigenous knowledge is at times known as traditional knowledge. Sharma (2014) defines it as knowledge belonging to a specific ethnic group. It is unique to a given culture or society and the basis for local-level decision-making in agriculture, health care, food preparation, education, natural resource management, and a host of other activities in rural communities (Sharma, 2014). IK is locally bound, indigenous to a specific area; culture- and context-specific; non-formal knowledge; orally transmitted, and generally not documented; Dynamic and adaptive; holistic in nature; and closely related to survival and subsistence for many people worldwide (Sharma, 2014). Indigenous Knowledge refers to the ideas, beliefs, values, norms, and rituals, which are native and embedded in the minds of people, local knowledge which is unique to a given culture or society (Haumba, 2014).

The term *potential* refers to the attribute of something having some capacity to lead into success in future. It is these inherent or latent qualities of something that makes it possible to change something into success. In this case the components of indigenous rain making. *Western science* is knowledge based on an academic and literate transmission. It is knowledge which isolates its objects of study from their vital context by putting them in simplified and controllable experimental environments (Mazzocchi, 2006).

1.10 Organization of the Thesis

This thesis is packaged following a paper format. Each chapter (apart from Chapters 1-3) begins with an abstract followed by introduction, research methodology, results, discussion, conclusion and references. Chapter 1 contains the background to the study. The statement of the research problem also feature in this chapter. This is followed by the research objectives and the theoretical framework of the study. Key terms and concepts are also defined in this chapter. In Chapter 2 related literature to the study is reviewed. Furthermore the importance and potential of indigenous rainmaking as a coping strategy to climate change are reviewed in Chapter 2. Various Afrocentric development strategies and the components of indigenous rain making practices and dissemination knowledge on indigenous rain making are also done. This is followed by identification of the negative effects of climate change on the livelihoods of rural households. Last but not least this review of literature on the effectiveness of existing strategies used by households to cope with the negative effects of climate change and strategies for utilizing indigenous rain making practices to counter the negative effects of climate change on the livelihoods of rural households features.

In Chapter 3 a description of the site of the study area is done. This is followed by research designs for the each of the various objectives in the study. Each objective's population and sampling procedures are explained, and so are the data collection methods and tools in a diagrammatical form. Data storage and data analysis will follow. Ethical considerations will be explained. This will be followed by some expected outcomes for each objective in the study. Chapter 4 explore the components of indigenous rainmaking practices. These components include the significance of traditional beer, environmental conservation, sacred forests and certain animals in weather forecasting and climate in general. This is followed by Chapter 5 in which an analysis of means of disseminating knowledge on indigenous rainmaking is done.

In Chapter 6 negative effects of climate change on the livelihoods of Chimanimani rural households is done. This is followed by an assessment of the effectiveness of existing strategies used by households in Chimanimani District to cope with the negative effects of climate change in Chapter 7. In Chapter 8 community based proposed strategies for utilizing indigenous rainmaking practices to counter the negative effects of climate change on the livelihoods of rural households is explained. Finally, in Chapter 9 a detailed summary of the research problem for each chapter, methodological features, major findings and their implications are articulated.

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CHAPTER 2 LITERATURE REVIEW

Abstract

This review paper on indigenous knowledge of rain making and climate change provides important update on an earlier work in this field of study. There are debates surrounding climate change causes, its effect and how they can be combated. Harnessing the potential of indigenous rain making can be a sustainable strategy for combating the negative effects of climate change. Debate on rain making practices has been around since the early 20th century. ReShel (2017) argues that rain making represents the sacred relationship between humans and the Divine. It also represents the relationship between man and science. Now the debate ranges from whether rain making can be a prerogative of man or God. An Afrocentric approach will be the focus in this review. However, a review of conventional rain making is crucial in order to establish how best the two can complement each other.

Key words: rain making, cloud seeding, sankofaism, Afrocentrism, place-based knowledge

2.1 Introduction

In the preceding chapter the general background and rationale of the study were presented. A review of related literature is presented in the current chapter. The aim is to share some insights from a global view and synthesize the available knowledge in order to generate new one. Adam (2015) quotes an adage that “Knowledge is the only treasure you can give entirely without running short of it.” Rain making practices, both from the indigenous knowledge and conventional perspectives are reviewed. Afrocentrism and various sustainable development strategies which are Afrocentric are interrogated.

2.2 History of Rain Making Practices

Rain making practices have existed since time immemorial in various communities. However, literature on the topic is scanty and generally old. This requires action on the part of researchers to document it. Indigenous rain making is not only confined to Africa. It is a global phenomenon. For example in traditional California, rain-making traditions existed (Parkman, 1993). Rain making has a long history and has been at the centre of all life. Verma (1998) argues that adequate water

been a major worry of man over time thereby leaving mankind susceptible to any activity that could bring rain. This prompted people over the globe to devise some rain making methods which later became part of their identities.

The researcher noted that rain makers were not necessarily the traditional leaders themselves but other families. This was also the practice historically that tribal chiefs delegated the responsibility of rain making to someone else, as a hedge against possible failures. If there was no rain, it was the luckless assistant and not the chief who was punished (Verma, 1998). Rain making started as magic, then religious, pseudo-scientific and later conventionally scientific. From magic and religion, pseudo-science gained importance (Verma, 1998). It is not known when rainmaking turned from magic to religion in which the Gods took a centre stage. It is argued that people started to believe that prayer could bring rain.

In order to be assured of rain it is believed non-living gifts were presented to the rain God during the prayers. Powers (1891) notes that extraordinary rains generally followed after great battles. The question was whether it be that some deity chooses to wash and purify the earth with water or whether it was a result of moist of the blood and heavy vapours emitted from the weapons of war. Analysis from science today this points to the history of cloud seeding. The gases that were emitted in the form of gun powder could have been responsible for this. It was from quest to know why it rained after great battles that it rained. Hazen (1891) having read Powers (1891) was curious to know why rain fell after an interval of a few minutes after the explosions in a battle. Hazen (1891) doubtfully felt that smoke and carbon from the gun powder might have had some influence.

Verma (1998) argues that early rainmakers who are the fore-runners of present day meteorologists were in fact among the most intelligent (yet claimed primitive) men who had to guess the scientific reasons for the phenomenon of rain. Evidence of their intelligence lie in their often success in duping their chiefs to preserve their own lives. Rainmaking was and remains a preserve of few members of society. Initial attempts for rain making started with magic. At different times, in different countries, rain makers performed strange ceremonies like invoking the spirits of the dead, mock ploughing, and even hurling curses at the Gods (Verma, 1998). In Chimanimani rain making ceremonies are still common.

2.2.1 Indigenous Rainmaking

Indigenous rain making practices in different parts of the world have mostly been recorded through anthropological studies as alluded in Chapter 1 (Jellicoe, 1963; Beartie, 1964; Gelfand,

1984; Matsuhira, 2013; Haruna, 2015). Verma (1998) argues that among the Himalayas, people sang the song *Singaitoo* up to mid night during the prolonged hot dry summer. A feast (*Havan*) would be organized. Collections were made from community members in honour of (*Khawaja*) God. It is claimed the rain Gods would be appeased and within two to three days it would rain. A similar feast (*varisty Puja*) were organized by villagers in the event of a prolonged dry spell in Punjab. All the adults would cry and the children would sing for rain. Verma (1998) notes evolution in rain making which was marked by use of sacrificial offerings, initially in the form of live human sacrifices and later animals.

Studies done in China revealed that huge paper dragons were used as part of religious festivals (Verma, 1998). These dragons were angrily torn apart if it failed to rain. Religion was followed by pseudo-science. It is claimed rainfall coincided with the aftermath of great battle. Religious people claimed that it was because the Gods were offended by the carnage and that the rain was sent to purge the land of blood. Those who claimed to know science argued that this was a result of condensation of blood, sweat and tears of the warriors.

Modern rain making is documented with its history pointing to the United States (US). From around 1880 patents for conventional science based rainmaking began to be issued in the US. The first patent was issued for using balloons loaded with explosive for rain making because during this time of pseudo-science there was great belief that explosions were responsible for rain. Powdered lime was used to stop rain in certain areas and other chemicals were used to induce rain. In 1899, meteorologist Aitken discovered condensation nuclei particles to explain the phenomenon of condensation. So then these nuclei were added to induce rain. As alluded in Chapters 1 and 2, another patent was issued to Charles M. Hatfield in 1916 by the City of San Diego (The Stanford Law Review, 1948).

In Africa it is not clear when rain making started but what is clear is that it has existed since immemorial. Literature reveals that today, the long vilified as sorcerers the Kenyan Nganyi rainmakers, are enlisted to be using their traditional rain making accessories namely trees, pots and herbs to combat the negative effects of climate change (Mojon, 2010; Kaya, 2016). Another Kenyan by Kwanya, (2013) revealed that traditional communities practiced traditional rain making rituals as a food and water security coping strategy and use IKS to predict, cause, redirect or dispel rainfall. Anthropological studies carried out in Tanzania made reference to a pile of rocks which local people described as “a house of God” (Jellicoe, 1963). The place was used for rainmaking or ancestral ceremonies. Beartie (1964) also explains how a man who lived in a bush induced rain through some supernatural powers. There was a site used for rain making or

ancestral ceremonies among the Bunyoro people of the Biseruka area near the Lake Albert rift in the Congo. To make rain the rain maker collects special herbs and prepares them and puts them in a horn then pray to the ancestors.

There is a school of thought that rain making is a prerogative of God and it is inappropriate to tamper with it (Stanford Law Review of 1948). In this case indigenous rain making becomes appropriate because the Ndau people believe that rain comes from God through ancestors as the intermediaries. Indigenous rain making is part and parcel of the African culture and religion. Mbiti (1988:2) argues that "Wherever the African is there is his religion: he carries it to the fields whether he is sowing or harvesting crop….if he is educated, he takes his religion with him to the examination room…". Therefore ignoring indigenous rain making is like dehumanising the indigenous people. Haruna (2015) posits that to ignore the traditional beliefs, attitudes and practices lead to lack of understanding of the people's behaviour and problems. Indigenous people have strong belief in sustainability of their traditional practices.

2.3 Western Science-based Rain Making

Cloud seeding is one of the main methods of conventional rain making. This methods in modern days make use of an airplane, chemicals and expert rain makers. It is expensive and the technologies involved are a preserve of a few people. Weiss (1975) asserts that cloud seeding operations to increase rainfall have been carried out in at least fifty-five countries by the year 1975. To this day cloud seeding has been practiced in almost every country. Different chemical methods are used in cloud seeding. Cloud seeding is getting taking the biggest part of funding in meteorological spheres world over. According to Kriege (1969) cloud seeding started in 1946 when Schaefer discovered that dry ice could be used to induce the formation ice crystals in super cooled cloud. Moran (1970) argues that later in that same year Schaefer and Langmuir made use of dry ice into an alto-cumulus cloud and observed snow falling.

In the year 1946 Vonnegut discovered that small crystals of silver iodide crystals could be an effective seeding or nucleating agent. They could acted as efficient ice forming nuclei if the temperature was below -5 Celsius degrees as proved by Langmuir and Schaefer; and by Kraus and Squires experiments. These experiments proved that these agents certainly induced a cloud of suitable type. Kriege (1969) concurs that an excellent example of localized environmental manipulation of weather has occurred in through the experiment in Santa Clara Valley, Califonia,

which pioneered weather modification for increasing rainfall. Shortly after Schaefer and Langmuir. However, criticism of cloud seeding has been leveled at the methods.

It was argued that this could be a source of long term climate variability and that it has possible huge damage basing on the 1916 experiment (Stanford Review, 1948). To this day controversy of scientific rain making rages on. Aim (1997) and Zehr (1994) agree that acid rain issue came into prominence as a result of scientists who kept on telling the world acid rain's potential devastating effects. Therefore in order to get the most out of the two worlds of thought that is scientific and indigenous there is need to complement the two.

Like in indigenous rain making whereby rainmaking ceremonies are conducted when there is possibility of raining towards the rain season seeding clouds is only done when clouds are almost saturated for rain (Brier, 1972). With this in mind the researcher propose harnessing indigenous rainmaking practices to combat the negative effects of climate change since there is a relationship between the two.

2.4 Theories Influencing the Study

Some theories influenced the indigenous rain making research. These theories have some Afrocentric bias. The theories include are place based. As alluded in Chapter 1 there was need to Africanize this study since in this study the researcher proposed use of theories that speak to the local realities.

2.4.1 Place-based Knowledge Development Strategy

Place based development strategies are currently viewed as the best practice in rural development because it is more compatible with local realities. Afrocentrism is one place-based or self-regulated knowledge approach. Afrocentric learning is done through reflection to one's past experiences in the environment one is located (Loyens *et al.,* 2008). Johnson (2010) posits that indigenous people's knowledge is written onto the landscapes. Landscapes are the storied, histories, cosmogonies, philosophies and sciences of indigenous people. Landscapes are indigenous knowledge which is increasingly being pushed aside by the 'gray uniformity' of globalization and its progenitor, European colonization. According to Johnson (2010) local knowledge is despised through the foreign education systems embedded in theories of modernisation.

Johnson (2010) claims that modernisation is a rhetoric which is out of touch with local realities. Modernisation is a product of globalization which erase the storied landscapes. Modernization destroyed the libraries embedded within indigenous toponyms and created 'terra nullius' (an empty land) awaiting a colonial or neo-colonial history and economy. Koopman (1991) argues that Eurocentric landscapes give primacy to individualism and self-centredness.

A French educationist Freire (2000) views these landscapes as a demeaning, since the locals are treated as *tabula rasa* (blank sheets), as if they are an infant at birth stage who require knowledge to be printed on them. Freire (2000) compared the Eurocentric landscapes to a "jug-mug" theory. In this theory the outsiders in this case are the "jugs" who dominate with the view of having all the knowledge and the locals are on the receiving end as the 'mugs' waiting to be filled. Johnson (2010) argues that, "Being and place are conceptually linked. This is an Indigenous principle and therefore, is maintained as such within indigenous cultural philosophy and expressed in the most common or ordinary way". These arguments motivates everyone to revisit traditional ways of doing things.

2.4.2 Actor Oriented Approach

Afrocentricity puts culture at the centre of development. Asante (1987) argues that culture might have be addressed in order to determine its impact on new or existing development strategies, particularly with respect to resource management and environmental protection. Communities are willing to accept and embrace development strategies but this depend largely on cultural factors. It is therefore vital that problems and potential solutions are defined in a manner that is consistent with the local culture. Actor Oriented Approach acknowledge the fact that people have life worlds that are worth making most of and building upon.

A life world refers to human everyday experiences. Culture refers to these everyday experiences or the people's way of life. It comprises situated activities of human agency reproduced across time and space. Long & Long (1992) claim that people with different life worlds must share them so as to appreciate their differences. This is termed interface analysis, which can be regarded as the negotiated outcome among various actors participating in development interventions. Special emphasis is placed on the development of people rather than the landscapes alone.

2.4.3 The Look Back and Looking Forward Theory: *Sankofaism*

Quan-Baffour (2012) sees *sankofaism* as gazing back to indigenous knowledge and skills in order to reclaim them. *Sankofa* is Akan implying going back for what is in the past. Critical *sankofaism*

is the approach in which one looks at his traditional past with a critical eye to select those elements which would be of use to one's present life and helpful in building a better future life. *Sankofaism* reminds all Africans to look back to the past practices and revive that which have served their communities for millennia to solve the present problems. *Sankofaism* is derived from a mythical bird the *sankofa*. The *Sankofa* bird flies forward with its head turned backwards most of the time and an egg in its mouth.

This symbolizes the wisdom in learning from ones past to understand the present and shaping the future. The egg symbolizes a 'gem' or knowledge of the past from which wisdom is derived and the new generation to come that benefits from the wisdom (Quan-Baffour, 2012). The Akan people believed that the past illuminated the present and reflect on important past so that one plans a suitable action to bring about change. *Sankofa* philosophy intimates that humans can progress only through reflecting back to their past (Quan-Baffour, 2012). This argument intimates that indigenous people had rich climate change coping strategies, which were however disrupted by the modernisation. Indigenous knowledge systems however, can be harnessed as a potential answer to local problems.

2.4.4 Social Interface Approaches in Rural Development

Two approaches are vital to understand rural development biased data. These are phenomenological and anthropological approaches. To start with there is also need for phenomenological approaches if rural development is to be achieved. Currently, there is much emphasis on interpreting people's action from what people see without taking into account the deeper meaning of the actions. Phenomenology is one of the sociological theoretical perspectives. Lester (1999) defines phenomenology as being concerned with studying experience or actions from the perspective of the individual. This entails understanding of the normally taken-for-granted assumptions and usual ways of perceiving. It emphasizes the importance of personal perspective and interpretation.

Phenomenological approaches illuminate the specific, i.e. identifying phenomena through how they are perceived by the actors in a situation rather than how others perceive the action. Lester (1999) argues that phenomenological approaches and associated approaches can be applied to single cases or to serendipitous or deliberately selected samples. Phenomenologist argue that positive inferences are less easy to make without a small sample of participants. Multiple participant research considers the strength of inferences. Phenomenological approaches give importance to the distinctions between statistical and qualitative validity. Analysis of phenomenological data however is in most cases difficult due to the general disorganization of

data. Thematic data analysis is in most cases used. Creswell (2009) defines themes mind-maps or set of 'post-it' notes.

Secondly, anthropological approaches are important in rural development researches. This is so because they allow for epistemological and phenomenological eyes in the interpretation of rural development data. In anthropological approaches researchers invest time and energy to have a first-hand experience of their perceived respondents. This counters biases associated with generalizations based observations that are divorced from the 'feel' of the actors. Phenomenological and anthropological approaches allow for what Long & Long (1992) termed interface analysis. This is so because the development arena is a "battlefield of knowledge", where different life-worlds converge.

2.5 Africanizing Development Strategies

Afrocentric development models as alluded above are more compatible with the local realities of communities due to the fact that they incorporate people's culture. Asante (1987) believes that local culture plays a role in development. Culture consists of ideas, rules and material dimensions. Ideas encompass values, knowledge and experience within a particular cultural setting. A major characteristic of Afrocentricity is communalism, or the favoritism of a more culturally-oriented worldview over an individualistic one. It is inclusive and stresses that one should live life robustly (Mutisya & Ross, 2005). Afrocentric behaviour is shaped by *unhu* (Ndau/Shona) and *Ubuntu* (SiNdebele/Zulu). Khoza (1994) argues that Afrocentricity is premised on the principle of *unhu/ubuntu.*

Ubuntu/unhu refers to a sense of 'being' (Rukuni, 2007). *Unhu* encompasses the feeling and sense of belonging; approachability of individuals and an atmosphere of informal communication. Mbigi (1997) notes that at the heart of *unhu* is the idea of unity, working together and love for each other. Rukuni (2006) posits that *unhu* permeates all aspects of African life, particularly in rural communities. Khoza (1994) postulates that Afrocentricity remains a broad concept but has largely to do with use of the African home base in addressing challenges, including socio-economic issues. In their daily lives indigenous people come together with a sense of oneness and respect for each other to make decisions to solve problems they encounter. From the Tables 2.1, 2.2 and 2.3 it is evident that Eurocentric and Afrocentric thinking run parallel and have a fine line between them. Integrating them rather than antagonism is the panacea to rural development in Africa.

Table 2.1 Key Tenets of Eurocentric and Afrocentric Development Models

Basic Question	Eurocentric Approaches	Afrocentric Approaches
1. Theoretical base	Informed by Modernization and Dependency theories. Traditional dominant western thinking.	Informed by Actor Oriented Paradigms. Local realities based thinking.
	Exclusivism/Individualism/Self Centred/Self Development and Self-Fulfillment	Inclusivism value based system/Collectivism
2. Information flow	Bureaucratic/Hierarchical flow of information	Informal/Free flow of information
3. Decision making	Decision Making based on power relations and adversarial	Decision Making is participatory and all-encompassing
4. Leadership style	Autocratic/Authoritarian top-down instructions of leaders	Inspiring and empowering leadership
5. Nature of relationship	Very formal relationships and personal touch	Supportive/cooperative/intimate relationships and solidarity
	Insensitive relationships	Sensitive relationships which creates a sense of belonging in everyone
	Instrumentalistic	Humanistic
	Depersonalizing the individual Lack of a place for dreams of the people	Personal touch maintained Ensures achievement of the people's dreams

Adapted from: Asante (1987; 1988); Koopman (1991); Khoza (1991; 1994); Mbigi (1994).

Table 2.2 Development theories and their respective key features

Theory/period	Assumption it holds	Implications for rural development
Modernization Theory 1940s -1960s	a) Developed from positivism. b) Subsistence economies needed transformation into modern capitalist societies. c) Development was to start from the developed countries (the nucleus) and that would naturally trickle down to the developing countries. d) The major agent of economic development is the elite who placed emphasis on order and control.	a) It gave prescriptions or a one best way of doing things. b) It is incoherent. Its assumption was that all 3rd world countries are poor and traditional (with people who cannot think for themselves). c) The trickle-down effect predicted never took place.
Dependency Theory 1980s 1990s	a) Inflows of foreign investment give rise to interests and profits (outflows from underdeveloped economies) b) Asserts that the modernizing elites will inflict the land owners who serve their own interests not those of their people. c) The world is divided into the centre and the periphery. The centre being the developed countries. The periphery depends on the centre.	a) Fails to acknowledge the tendency of exploitation of the periphery by the nucleus. b) Looks at assumptions and not the practical part of development.
Actor-oriented Approach	a) Critical of the two theories above for their technological and institutional bias. b) Gives importance to human agency i.e. individuals have capacity to bring about change in their own community. c) Considers life-worlds i.e. human experience on the day to day basis. d) Consider the interface analysis i.e. the negotiated outcomes of actors.	a) There is always an alternative view to structural analysis of development. b) The point of departure is quest to understand social change in fullness. c) Acknowledges resourcefulness of local people. d) Development should be a negotiated outcome

Source: Coetzee (1989) and Long & Long (1992). Adapted from Marango (2011).

Table 2.3 Assumptions underlying Western Science and Indigenous Knowledge Systems

Variable underlying assumption	Assumptions underlying Indigenous Knowledge	Assumptions underlying Western science
Nature	Real, partly observable and testable.	Real, observable and testable.
Space	Space is real, has definite dimensions but is ultimately incommensurable.	Space is real and has definite dimensions.
Time	Time is real, continuous and cyclical.	Time is real and has continuous, irreversible series of duration
Matter	Matter is real and exists within time, space and the ethereal realm.	Matter is real and exists within time and space.
Events	Events have both natural and unnatural causes.	All events have natural causes.
Universe	The universe is orderly, metaphysical, partly predictable and partly unpredictable.	The universe is orderly and predictable – that is, nature is not capricious.
Generalisations	Generalizations have causal, personal, rational/non-rational, logical/ non-logical dimensions.	Scientific laws/generalizations are causal, logical, rational, impersonal and universal. Science is culture free.
	Generalizations are relative statements which do not purport to have universal application.	Scientific generalizations (laws and theories) are declarative statements with universal application.
Language	Language is important as a creative force in the workings of both the natural and the unnatural worlds.	Language is not important to the workings of natural world.
Facts	Facts are both tested and experiential Knowledge is based on a monistic worldview.	Scientific facts are tested observations.
Knowledge	Knowledge is a critical part of culture.	Science is based on a dualistic world-view.
Humans	Humans are capable of understanding only part of nature.	Humans are capable of understanding nature.

Source: Le Grange, 2007: 587. Adapted from Ogunniyi, 2004: 292-293.

Within the Actor Oriented Paradigm there is always an alternative view to the structural analysis of development. It castigates the over-reliance on external initiatives which curtails the achievement of sustainable development. In order to understand the social reality within which the people live, development standards must come to grips with the way in which the participants themselves experience social situations. Afrocentric development approaches are based on local realities. They are inclusive of all people and stress that one should live life robustly (Richards, 1980). They are participatory and empowering. In order for development planners to understand the beneficiary communities they enable community people to participate. In this process they either buy-in or reject, implying that they feel empowered to make decisions in the development process.

2.6 Preservation, Documentation and Dissemination of Indigenous Knowledge Systems

Preserving, managing and sharing of indigenous knowledge is crucial for social and economic development in rural Africa. According to Adam (2015) indigenous knowledge is profound, detailed, shared beliefs and rules with regards to the physical resources, social norms, health, ecosystems, culture, and livelihood of the people who interact with environment. Lipphardt & Ludwig (2015) remind us of the importance of knowledge documentation, sharing and transfer. They cite why most of us are aware of the daring voyages of discoverers and enlightenment. However Simpson (2004) notes that the colonial powers attacked virtually every aspect of our knowledge systems rendering our spirituality and ceremonial life illegal.

Furthermore the attempt to assimilate African children and destroying their languages through the residential school system, outlawing traditional governance. Simpson (2004) goes on to claim that this destroyed the lands and waters which were intrinsically tied to the people. Whatman & Duncan (2005) also argue that both colonial and postcolonial education excluded indigenous knowledge thereby affecting its transmission. This notion is also affirmed by Eyong (2007) who posits that IK suffered decades of disinformation which was embedded in colonial and post-colonial education, western religion, science and technology resulting in distortions of data. To this day indigenous knowledge is perceived outdated and primitive. Ulluwishewa (1993) feels that the younger generation of community members are underestimate the handiness of IK in its influence on modern technology.

Swanepoel & van der Westhuizen (2010) asserts that the colonial governments influenced local perceptions about IK such that it was perpetuated into the post-colonial era. Ajani *et al.* (2013) notes that indigenous knowledge is rarely taken into consideration by planners when designing

and implementing modern mitigation and adaptation climate change strategies. Whilst that is the case indigenous adaptation strategies that have been practiced in sub- Saharan Africa can be of benefit if integrated with formal climate change adaptation strategies.

Mundy & Compton (1991) argue that IK is the basis for local-level decision-making in for most rural community people. These arguments imply that the importance of preserving, documenting and disseminating indigenous knowledge cannot be overemphasized. According to Mundy & Compton (1991) Indigenous knowledge not only has value for preservation of culture but also for scientists, policy makers and planners in their quest to improve conditions in rural people.

It is argued that in the recent time there is a wide growing body of literature on the importance of Indigenous knowledge, however empirical evidence is that much of this work has been too bookish and not practical (Abdulrashid, 2013). Indigenous knowledge is described as a systematic body of knowledge gained by people who settle in a specific location through accumulation of experience, informal experiments and understanding of the environment (Robinson & Wallington, 2012). African Technology Policy Studies Network: ATPS (2013) posits that it is vital to preserve, document and disseminated IK since it is directly related to local knowledge which can be used to change and improve, the local people's livelihoods for example agriculture and natural resource management.

In Africa, indigenous knowledge is anchored on Afrocentrism. Richards (1980) sees Afrocentricity as having pertinent cultural values which should be passed down from generation to generation. Therefore documenting indigenous knowledge, juxtaposes it against the modern knowledge systems. Indigenous knowledge facilitates sustainable agricultural technology than standard technical packages (Philips 1995; Warren 1993). Primarily documenting indigenous knowledge is very important since the oral paths are getting extinct as a result of heterogeneous living set up and death (Rouse, 1999). Thus as the elderly who are the living libraries are dying, IKS is threatened with extinction.

Haumba (2014) calls for the establishment of community libraries as the platforms for capturing, keeping and disseminating traditional knowledge. Food and Agricultural Organisation (2009) sees full participation the locals in as a fundamental. Warren (1993) calls for an active community network of members in order to make the most of IK since it is an under-utilized resource. There is a lot of community features which communities see on a daily basis and take for granted yet they have meaning. These have to be explored.

A study in Ethiopia by Adam (2015) reveals that dissemination of IK requires a number of integrated steps. These include firstly a study on the indigenous knowledge covering aspects such as IK asset at community levels, community structures and networks in support of indigenous knowledge systems and how information and communication technologies may enhance this. Secondly research to map out social and cultural barriers to the flow of knowledge and lastly development of pilot interventions to learn how Information and communication technologies (ICT) impact on IK that in turn improve livelihoods. Therefore use of ICT is important considering that it has become part of the modern society's culture and the main source of information today. It can be used for capturing, storage and dissemination of knowledge.

Akinde (2008) posits that ICTs can reduce social stereotypes and prejudices. It empowers the disadvantaged and minority language community members. Banuri & Apffel-Marglin (1993) advocate for the introduction of national indigenous knowledge resource centers in communities to act as clearinghouses for collection, documentation, comparison with global knowledge systems, dissemination and utilization of indigenous knowledge. This is important because the young generations spend time at school and use ICT to search for knowledge. As a result IK becomes transferable from one ecological zone to another within and outside a country (Banuri & Apffel-Marglin, 1993). Dissemination of IK technologies useful in one part of the world may be used to solve problems faced by another society (Agrawal, 1995). Basing on the arguments above it is important to document and disseminate IK so that that younger generations do not only experience but are informed about the vagaries climate change poses.

2.7 Effects of Climate Change on Livelihoods of Rural Households

The South African National Energy Act 34 of 2008 states that greenhouse gases are gases in the atmosphere which reduce the loss of heat into space and thereby contributing to an increase in global temperatures as a result of the greenhouse effect. It is estimated that by the year 2050 global temperatures would have risen by as much as 2 degrees Celsius in many parts of Southern Africa. Murambadoro (2010) argues that oceans, forests and plants which act as carbon sinks for the oxygen needed by living creatures including man to breathe. For some time the amount of gases has been stable enough for survival but this is presently changing. Because of this there is need to act now, otherwise all life on earth will perish. Indigenous rain making strategies are compatible and eco-friendly because they that do not emit any obnoxious gasses into the atmosphere.

The Congress of South African Trade Unions (COSATU, 2011) asserts in its Policy Framework on Climate Change that climate change is part of a larger economic and ecological crisis posing a serious challenge for the working class. Christianson (2015) affirms that the working class, the poor and developing countries are more affected by climate change. Climate change subject the poor and the working class to food insecurity, energy source challenges, clean water and all this impacts on health. Murambadoro (2010) puts weight to the fact that climate change poses threat on food security, energy, access to clean water as well as flora and fauna's health.

The Government of South Africa (2014) postulates that there is possibility of increased disaster risks and specific hazards such as floods, droughts and sediment loads. These pose danger to infrastructure such as roads, dams, power lines and bridges in South Africa. Brazier (2015) posits that climate change results in reduction of rainfall and recharge of ground water, shift in seasons, climate hazards such as droughts, heat waves, wild fires, intense rain and floods, threats to soil fertility, accelerated expansion of deserts especially in Namibia and Botswana and into southern Zimbabwe. Brazier (2015) also claims that climate change accelerates extinction of species and destruction of wildlife. All these impacts on human social, economic political as well as other flora and fauna as well as infrastructure. Hunter (2007) also argues that climate change reduces access to drinking water, negatively affecting the health of poor people, and a real threat to food security in many countries in Africa, Asia, and Latin America. With these in mind, it is prudent to search for homegrown coping and adaptation strategies.

Climate change reduces water supply both for domestic and agricultural purposes. Climate change also exacerbate the expansion of Natural Region V and shrinking of Natural Region 1 (Brazier, 2015). This leads to reduced food security, increased under nutrition and increased incidence of diseases. Bates & Rudel (2004) and DeSouza (2006) argue that climate change forces people to migrate. Weather changes reduce families' livelihood options thereby acting as a push factor. Migration is a big force of social change as people leave resource dependent rural areas.

2.8 Current Coping Strategies and Potential of IRM in Combating the Vagaries of Climate Change

There is limited indigenous rain making literature on coping strategies for climate change. Most of the current coping strategies short term and not effective for example overharvesting of wild fruits, stream and river bank cultivation. Brazier (2015) included conservation agriculture, traditional food storage, dry planting and traditional flood proof building designs, temporary

migration and dual cropping as some of the coping strategies. Brazier (2015) however, suggest that these adaptation strategies can be more effective if used in conjunction with conventional strategies.

Nzenza (2014) witnessed and testified the usefulness of indigenous rain making. Food and Agricultural Organisation: FAO (2009) claims that there is need for mobilisation of knowledge networks among communities and households in the preparation, mitigation and management of climate change related disasters. FAO (2009) argues that rural communities have vast knowledge of previous climate and weather variations that threatened food and water security. Indigenous rain making is one sustainable livelihoods approach in combating negative effects of climate change without disturbing the natural ecosystem.

Sustainable livelihoods approach (SLA) is used as a framework to help identify livelihood activities or strategies, identify livelihood aspiration as well as to identify barriers (Njagi, 2005). The Sustainable Livelihoods (SL) framework is an important analytical tool in the approach that is used to illustrate how external factors generally impact on 'the poor.' Scoones (1999) argues that the ability to pursue different livelihood strategies is dependent on the basic material and social, tangible and intangible assets that people have in their possession.

From the above arguments indigenous knowledge can be harnessed as a potential answer to local problems. As alluded local people have vast knowledge of previous variations in climate and weather and have developed mitigation and adaptation strategies that can ensure food security (FAO, 2009). Nyumba (2006) posits that the majority of the world's population depends on IK indigenous knowledge to meet their basic livelihoods. Robinson & Herbert (2001) postulate that incorporating indigenous knowledge into climate change policies can lead to development of effective adaptation strategies that are cost-effective, participatory and sustainable.

A study in Tanzania by Shadrack (2011) revealed that there are social, economic and environmental copying strategies for food insecurity. These strategies in other words addressed. Economic activities included hunting and gathering, animal owned, and both non-hunting and off-hunting supplements to household income as well as petty business. These would address some depressed livelihoods caused by the negative effects of climate change such as poor crop yields. Social responses included labour sharing in the Zimbabwean context (*humwe*) Brazier (2015); gifts or loaning food, livestock, or cash; and in some cases sending members of a distressed family to live with more fortunate relatives or friends (Shadrack, 2011). It was also revealed that dependence on donor community (NGO) was another strategy. Shadrack (2011) noted that

people in Tanzania people collected wild foods (hunting and collecting wild fruits) to generate income by collecting and selling.

2.9 Summary of Literature Review

In this chapter Afrocentric approaches have been reviewed. In Chapter 2 it has been established that there are different components of rain making ranging from indigenous, religious and conventional practices. However, due to cultural relativity skepticism surrounds the different rain making paradigms. On the other hand while the conventional rainmaking practices are documented and disseminated in the formal education system, the same does not apply to indigenous rain making practices. Indigenous rain making has potential for improving weather forecast weather.

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CHAPTER 3 RESEARCH METHODOLOGY AND ROADMAP FOR RAIN MAKING RESEARCH IN CHIMANIMANI DISTRICT

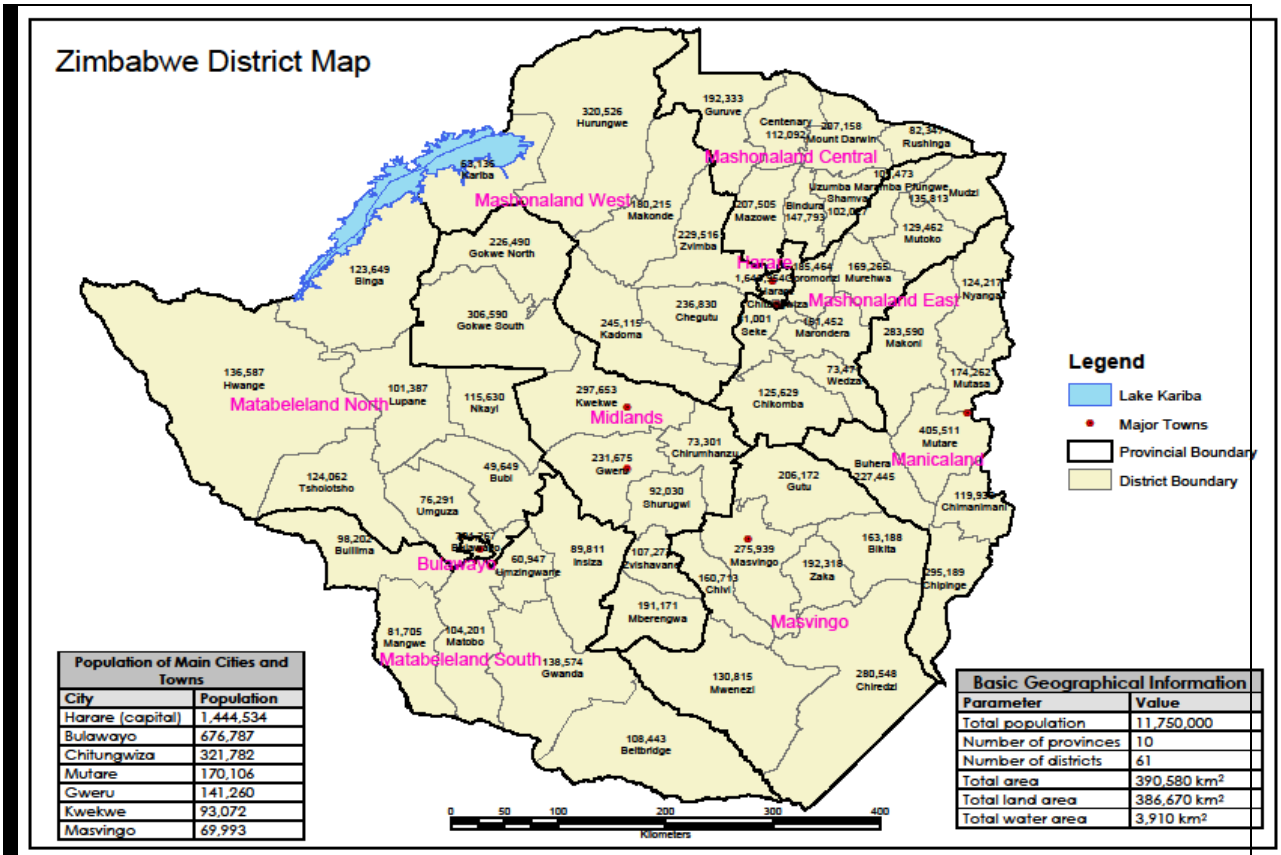
3.1 Introduction

In this chapter, a general roadmap which was followed in carrying out this study is explained. The chapter starts with the description of the site where the study was carried out. This is followed by an overview of the research methodology. According to Mouton (2005) research methodology helps the investigator to focus on the study process as well as the tools and procedures to be used. A mixed research design was used in carrying out the study. In this chapter an explanation of how awareness and securing of commitment to participate in the study is given. A summary of research designs, sampling procedures, data collection methods and analysis for Chapters 4 to 8 is diagrammatically given (see Table 3.2). This is followed by an explanation of how ethical issues were addressed. Lastly the expected outcomes are clarified.

3.2 Description of the Study Area

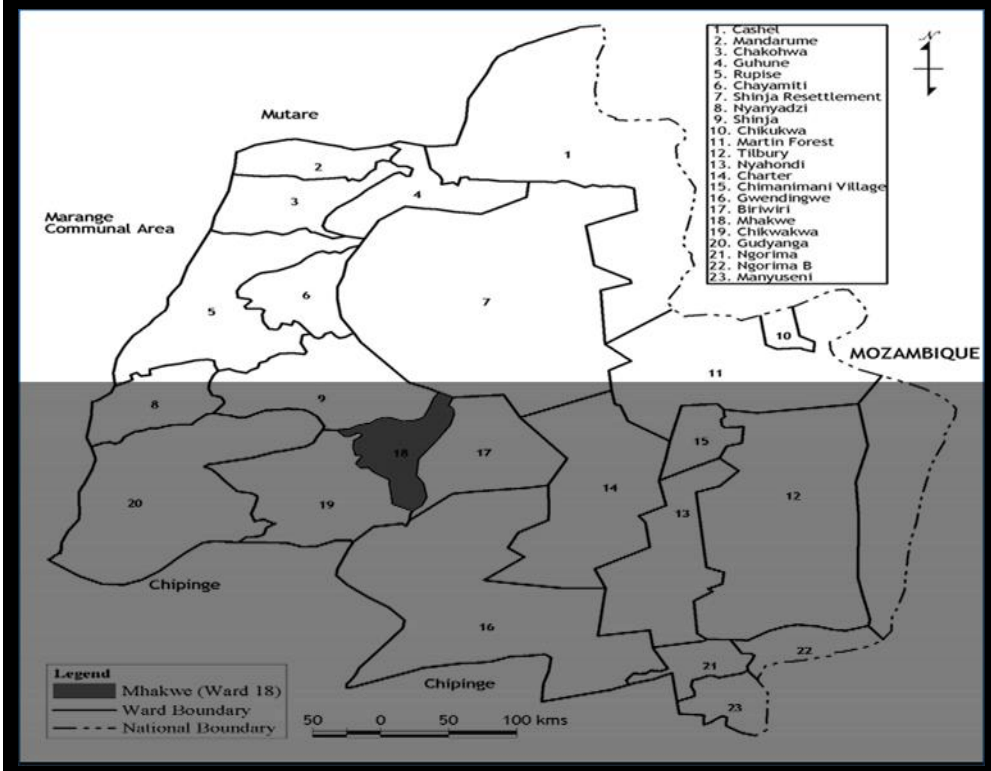
The description of the study site in this chapter applies for all the studies in this thesis. The study site was Chimanimani District. Chimanimani District was chosen because it is predominantly rural. Secondly there is still a strong belief in indigenous rainmaking practices among the Ndau people. The Ndau people are found predominantly in Chimanimani and Chipinge Districts of Zimbabwe. Thirdly the researcher worked in council (municipality) in a decision making position about ten years. He found most rural development decisions were difficult to reach at due to sharp differences on beliefs. Chimanimani District is found in Manicaland Province eastern of Zimbabwe (Figure 3.1). It shares borders with Mozambique in the east, Chipinge District in the south, Buhera District to west and Mutare District to the north respectively.

The population of the District is estimated to be around 133 810 (Zimbabwe National Statistics Agency: ZIMSTAT, 2012). Females constitute slightly more than half of the people (52 %) in Chimanimani District. The District is highly rugged in terrain. This is typified by the Chimanimani Mountains have an altitude ranging from 6 000 m and low lying lands in west which are as low as 600 m above sea level. Average annual rainfall for the District ranges from 1 000 mm in the east and around 200 mm in the west. Chimanimani boasts some spectacular tourist sites such as the Bridal Veil Falls, Pera Falls and Vhimba Botanical Reserves and Chimanimani Mountains. The latter sites make the District a viable tourist destination.



Population of Main Cities and Towns	
City	Population
Harare (capital)	1,444,534
Bulawayo	676,787
Chitungwiza	321,782
Mutare	170,106
Gweru	141,260
Kwekwe	93,072
Masvingo	69,993

Basic Geographical Information	
Parameter	Value
Total population	11,750,000
Number of provinces	10
Number of districts	61
Total area	390,580 km²
Total land area	386,670 km²
Total water area	3,910 km²



Figures 3.1 and 3.2 Zimbabwe District Map and Chimanimani District Ward Map

3.3 Awareness Creation and Securing Commitment to Participate

The study started with the creation of awareness relating to the proposed work. The researcher made appointments for meetings with key stakeholders such as the traditional leaders, Rural District Council (RDC), District Administrator's Office, the police and the Central Intelligence Organisation (CIO).This was done to secure consent and permission to carry out the study in addition to securing permission. This was also done so that the respondents would not be harmed at any stage of the study by getting some reprisals. Therefore these initial engagements helped to promote good ethical conduct in the research.

3.4 Developing and Pilot-testing of Data Collection Instruments

Data collection tools were pre-tested and then used to collect data. Pre-testing of data collection tools was done in order to correct ambiguous questions together with the respondents. Thus respondents were given room to give comments to improve the questionnaires. Pre-testing the questionnaires improved neatness and composition of questions (Borg & Gall, 1983). It also helped to correct mistakes, identify sensitive questions and revise them before final questionnaire administration.

These data collection instruments were used to seek factual information for determining opinions and attitudes of rainmakers, traditional leaders and the general citizens of Chimanimani District on potential of indigenous rain making strategy in combating the negative effects of climate change. Structured interview guides that contained entirely closed-ended questions and requiring responses on a Likert-type scale of 1 (strongly disagree) to 5 (strongly agree) were used in the confirmatory stage of the study. Initially, other guides that were either semi-structured or open ended were used.

The data collection tools were pre-tested to randomly chosen respondents in Ward 15 of Chimanimani District. Two enumerators were recruited from the local communities and trained to administer the questionnaires. The enumerators spoke the local Ndau language proficiently and understood the local culture, customs and norms well. Recruiting local people as enumerators solved the problem of cultural relativism. The enumerators were trained to ensure that they were familiar with the questionnaire and how to administer it with ease and confidence. Pre-testing of the questionnaire was completed within two weeks. The principal researcher supervised the pilot data collection process and ensured that sufficiently high quality data were collected.

3.5 Details of Methodology Terms Used in the Studies

3.5.1 Research Design

A mixed design technique was used in this study. The two designs were underpinned by phenomenological and anthropological approaches which were perceived to allow some streamlined communication and interface analysis. A research design is the overall strategy chosen by a researcher to integrate the different components of the study in a coherent and logical way. Its function is to ensure that the researcher effectively address the research problem (De Vaus, 2001). It is a research plan or mapping strategy (Singh, 2006). The research design constitutes of data collection tools, measurements, and data analysis. In this study two research designs were employed. This is known as the mixed design approach. The reason behind was to triangulate the research methods.

3.5.2 The exploratory design

An exploratory and descriptive designs were be employed. A mixed design is when quantitative and qualitative methods are combined (Creswell, 2013). Exploratory design was employed through use of semi-structured interview guides and unstructured interviews in facilitating responses of key informants other community members. Patton & Cochran (2002) define interviews as a resemblance of everyday conversations which are more or less focused on the researcher's needs for data. They differ from everyday conversation however in that they are conducted in a rigorous way to ensure reliability and validity. Kothari (2004) points out that the interview method involves presentation of oral-verbal stimuli and reply in terms of oral-verbal responses.

According to Cuthill (2002) & Taylor *et al.* (2002), exploratory designs are conducted on research problems where few or no earlier studies to refer to or rely upon to predict an outcome have been conducted. Exploratory studies focus on gaining insights and familiarity for later investigation or undertaking research problems that are in preliminary stages of being understood.

Cuthill (2002) & Taylor *et al.* (2002) cite some advantages associated with the exploratory research design. Firstly, it is a useful approach for gaining background information on a particular 'virgin' topic. Moreover, its flexibility can help address research questions of all types, thereby giving answers to questions that seek answers to the what, why and how dimensions. The design also provides the opportunity to define new terms and clarify existing concepts. The exploratory design also generates formal hypotheses and formulate more precise research problems. In the

policy arena or applied to practice, exploratory studies help establish research priorities and highlight where resources should be allocated (De Vaus, 2001).

The limitations of the exploratory design are cited by various authors. Cuthill (2002) and Taylor *et al*. (2002) argue that it utilizes small sample sizes. It has some biases. This makes generalization of the results to the larger population difficult. Definitive conclusions about the findings therefore become a challenge. The other flaw is that it is often unstructured. This leads to tentative results that gives a challenge for decision makers. Some argue that the exploratory design lacks rigorous standards of data gathering and analysis Cuthill (2002) & Taylor et al. (2002).

3.5.3 Descriptive design

The descriptive design in the form of a survey was used as well. In this design, close-ended questionnaires in the form of a Likert-scale was employed to collect information from the general residents. A survey as a sociological investigation method that use question based or statistical methods to collect information about how people think and act (Shuttleworth, 2008). Wisconsin Survey Center (2010) posits that surveys are used get information and feedback used in planning, program improvement and gathering data. In this regard a survey is a valuable tool for assessing opinions and trends. Surveys can be implemented using various ways depending on the issue under investigation. These are mail, telephone, online surveys and interviews (Parasuraman, 1991).

Surveys have the following strengths. They allow researchers to collect a large amount of data in a relatively short period of time. Surveys are less expensive than many other data collection techniques. Surveys can be created quickly and administered easily. Surveys can be used to collect information on a wide range of things, including personal facts, attitudes, past behaviors and opinions. The following weaknesses are said to mar surveys. Firstly, poor survey construction and administration can undermine otherwise well-designed studies. The answer choices provided on a survey may not be an accurate reflection of how the participants truly feel. Lastly, while random sampling is generally used to select participants, response rates can lead to bias of the results (Parker, 2002).

3.5.4 Phenomenological and Anthropological Development Approaches

As alluded in the previous chapter, human studies require gathering ‘deep’ information and perceptions through inductive, qualitative methods such as interviews, discussions and

participant observation, and representing it from the perspective of the research participant(s) (Lester, 1999). Thus there was need for streamlining communication. Phenomenological and anthropological approaches were employed. This is so because Hanover College (www.hanover.edu) argue that anthropological studies are holistic. Alternative ways in which human beings meet their needs and examine overall integration and dissonance within a culture. The researcher lived among the Ndau ethnic group. Phenomenology was used in which some single cases in addition to other qualitative and quantitative. The motive was to get deeper meanings of actions rather than making crude conclusion of what he observed and heard. The purpose of this was to allow proper triangulation of data.

3.5.4 Data triangulation

Using both exploratory and descriptive designs was done for the purpose of triangulation of data collection and analysis. Triangulation facilitates combination of both advantages and counteract weaknesses of qualitative and quantitative approaches. According to Dawson 2002; Yeasmin & Rahman (2012) triangulation is a method of verifying and increasing validity of viewpoints. This reduces intrinsic biases and problems associated with single methodology, observer and single-theory studies.

3.6 Population and Sampling

3.6.1 Population

Population refers to the characteristics of a specific group (Singh, 2006). It is a number of units/cases or objects that are involved in the study. For example if one once to study about the perception of students on Mathematics teachers, the students are the population. Each student is a unit or a case.

3.6.2 Sample and sample size

The exact units selected for use of in a study is the sample. For example from the students a researcher may opt to make use of certain group e.g. disabled student. The sample size refers to how big the population one wants to use is. Sampling therefore is the criteria one uses to select his/her population. In this study three sampling methods were used.

3.6.3 Convenience sampling

It is simple selection method where the units that are selected for inclusion in the sample are the easiest to access. It is in contrast to probability samples in which the selection of units is made randomly. Taking the above example. If the researcher wants a sample size of 20 students. He will continue inviting disabled students in the school until the number is 20 or may simply choose to stand at one of the main entrances of the school and select any disabled student who enters. The aim is easy access. The strengths and limitations of all the sampling methods are in Table 3.1

3.6.4 Judgment sampling

This method involves selection of a group from the population on the basis of available information thought (Singh, 2006). It is selection of a group by intuition on the basis of criterion deemed to be self-evident or the knowledge of the researcher. Singh (2006) thus warns investigators to be extra careful since judgment sampling can be highly risky due to some inherent biases.

3.6.5 Snowballing sampling

This is not a very common sampling procedure. In brief it involves identifying the first key informant. From there the key informant select the others basing on their knowledge about the others on the topic in question. The challenge is on the question of "*how many interviews are enough to reach data saturation"* (Fursh & Ness, 2015). Data saturation is a point whereby a researcher finds respondents repeating the same responses as the previous participants. Data saturation is reached when there is enough information to replicate the study (O'Reilly & Parker, 2012).

3.7 Ethical Considerations

Ethical clearance was sought from the University of Venda Research (UNIVEN) Ethics Committee (Project No: SARDF/17/IRD/03/2802). The researcher informed the participants about the purpose of the research before they participated. No incentives were given as payment for participating. Participants were assured that the information they gave would be kept confidential and that in the event that this information is made public through publication only pseudonyms would be used to keep their identity anonymous.Informed and written consent of respondents was sought through signing letters of consent. Respondents were informed and made aware of every stage of the engagements the research. No participant was coerced to participate and only volunteers participated. Entry to rain making *biras* and taking pictures was well planned. The researcher while being part of the Ndau people was allowed entry. The traditional leadership and local government allowed him entry into villages, take photos and even publish the work.

Table 3.1 Advantages and Disadvantages of Sampling Techniques used

Type	Advantages	Disadvantages
Convenience	• Easy to carry out with few rules governing how the sample should be collected • Relatively cheaper in cost and time required to carry out a sample (fast and inexpensive) • Helpful to gather useful data and information that cannot be possible using probability sampling techniques, that require more formal access to lists of populations	• It suffers from biases e.g. under-representation or over-representation • The other bias is the fact that the sample frame is not known undermines one's ability to make generalizations
Judgmental	• Knowledge of the investigator can be best used in this technique of sampling • This technique of sampling is also economical	• This technique is objective • It is not free from error • It includes uncontrolled variation.
Snowballing	• Like in the judgmental sample, key informants are able to identify respondents with same characteristics as themselves	• It is difficult to tell whether data saturation has been fully reached

Adapted from: Singh (2006); Fursh & Ness (2015)

3.7 Expected Outcomes

The results of this study are expected to provide a framework of what the practitioners and elders in Chimanimani District might do to integrate indigenous and conventional rain making. It is expected that there will be improved forecasting of rainfall. Consequently, this will enable the local residents to plan their farming and other livelihood activities thereby improving the quality of life of their households. Further it is expected that there will be increased dissemination and documentation of knowledge on indigenous rain making thereby reducing the knowledge gaps in this area. This study is a pacesetter for further studies in this 'virgin' topic.

Table 3.2 Summary of research methodology

Key: TCA -Thematic Content Analysis of Creswell (2009)

Objective	Population, Sampling method, Design, Technique, Data collection Tool, Analysis					
	Rain makers	**Chief**	**Village Headmen**	**Community elders**	**Adults**	**Youth**
To analyse the general community perceptions on the potential of indigenous rain making practices in combating the negative effects of climate change in Chimanimani District of Zimbabwe	Exploratory Interview guide Convenient Analysis- TCA	Exploratory Interview guide Convenient Analysis-TCA	Exploratory Interview guide Convenient Analysis-TCA	Exploratory Interview guide Convenient Analysis-TCA	Exploratory Interview guide Convenient Analysis-TCA	Exploratory Interview guide Convenient Analysis-TCA
To examine the components of indigenous rain making practices	Exploratory	Exploratory	Exploratory	Exploratory	Survey	Survey
	Interview guide	Interview guide	Interview guide	Interview guide	Likert-scale	Likert-scale
	Judgmental	Judgmental	Judgmental	Snowballing	Convenient	Convenient
	Analysis-TCA	TCA	TCA	TCA	Chi-Square Goodness of Fit Test	Chi-Square Goodness of Fit Test
To analyse the means of disseminating knowledge on indigenous rain making	Exploratory	Exploratory	Exploratory	Exploratory	Survey design	Survey design
	Interview guide	Interview guide	Workshop Discussion Group	Workshop Discussion Group	Workshop Discussion Group	Workshop Discussion Group
	Judgmental	Judgmental	Judgmental	Snowballing	Convenient	Convenient
	Analysis- TCA	TCA	TCA	TCA	TCA	TCA
To identify the negative effects of climate change on the livelihoods of rural households	Exploratory	Exploratory	Exploratory	Exploratory	Descriptive	Descriptive
	Interview guide	Interview guide	Interview guide	Interview guide	Likert-scale	Likert-scale
	Judgmental	Judgmental	Judgmental	Snowballing	Convenient	Convenient
	Analysis-TCA	TCA	TCA	TCA	Chi-Square Goodness of Fit Test	Chi-Square Goodness of Fit Test
To assess the effectiveness of existing strategies used by households and propose strategies for utilizing indigenous rain making to cope with the negative effects of climate change	Exploratory	Exploratory	Exploratory	Exploratory	Survey	Survey
	Unstructured questionnaire Citizen jury Unstructured questionnaire	Unstructured questionnaire Citizen jury Unstructured questionnaire	Unstructured questionnaire Citizen jury Unstructured questionnaire	Unstructured questionnaire Citizen jury Unstructured questionnaire	Unstructured questionnaire Citizen jury Unstructured questionnaire	Unstructured questionnaire Citizen jury Unstructured questionnaire
	Judgmental	Judgmental	Judgmental	Convenient	Convenient	Convenient
	Analysis-TCA	TCA	TCA	TCA	TCA	TCA

3.8 Conclusion

In this chapter readers were given a general outlook of the study area and studies in this whole research. The chapter gave a general insight of the research designs, sampling procedures and research methodologies that were employed in order to achieve the objectives of the studies that follow in Chapters 4 to Chapter 8. This chapter also gave some assurance of the relevance of the whole thesis by alluding to the expected outcomes.

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CHAPTER 4: INSIGHTS INTO THE POTENTIAL OF INDIGENOUS RAIN MAKING PRACTICES IN COMBATING THE NEGATIVE EFFECTS OF CLIMATE CHANGE

Abstract

Modernisation continue to overshadow indigenous knowledge in Africa many decades after the struggle against colonization was won. For example, cloud seeding is a technology commonly used for rain making. However, in Zimbabwe those who believe in western science look down upon renowned traditional rain makers. Considering the fact that climate change causes water and food insecurity, there is need to build an understanding of how indigenous and scientific knowledge systems can be integrated to combat this problem. Thus, an exploratory study was conducted in Chimanimani District of Zimbabwe focusing on this theme. A semi-structured interview guide was used to facilitate conversations with a judgmental sample of five Shona-speaking rain makers and thirteen community members who predominantly were more than 70 years old. These were regarded as key informants.

Thematic content analysis was used to analyze the qualitative data. It was noted that climate change was a reality as evidenced by shift in seasons exemplified by the *Nyamavhuvhu* wind which now swept through the area in September or October instead of end July to August. The respondents lamented the erosion of the rain making tradition, which they argued had helped conserve flora and fauna for centuries. This was attributed to the failure of co-existence of scientific and indigenous knowledge, religious orientations, political interference, poor environmental management and general decay in human factor. It is concluded that the suggestions that the rain makers made on the integration of scientific and indigenous knowledge to combat the negative effects of climate change on water and food security be tested.

Key words: climate change, negative effects, rain making, indigenous practices, western knowledge

4.1 Introduction

In the previous chapter readers were introduced to the research methodology in a summary for all the studies in this thesis. As alluded in Chapter 3 the site of the research was Chimanimani District. The purpose of this study was to analyze the various aspects of indigenous rain making practices so as to set the scene for all the other studies in this research. Foreign and western modernity continue to influence indigenous knowledge in Africa many decades after the struggle against colonization was won. For example, cloud seeding is a technology commonly used for rain making. Modernist thinkers look down upon and disregard renowned traditional rain makers. Considering the fact that climate change causes water and food insecurity, there is need to build an understanding of how indigenous and scientific knowledge systems can be integrated to combat this problem. Thus, an exploratory study was conducted in Chimanimani District of Zimbabwe focusing on this theme.

4.2 Research Design

An exploratory study was conducted in Chimanimani District of Zimbabwe. The aim was to find out how potential of indigenous rainmaking practices could be harnessed to combat the negative effects of climate change. An anthropological approach was used to underpin the study. Anthropological studies refuse to reduce the motive and meanings of human behaviour to factor. Factor like biological, structural, political, technological or geographical. Cuthill (2002) and Taylor *et al.* (2002), argue that exploratory designs are conducted on research problems where few or no earlier studies to refer to or rely upon to predict an outcome have been conducted. Such studies focus on gaining insights and familiarity for later investigation or undertaking research problems that are in preliminary stages of being understood.

Cuthill (2002) and Taylor *et al.* (2002) further indicate that an exploratory design is a useful approach for gaining background information on a particular 'virgin' topic. This topic is virgin. The design was flexible and helped the researcher to address research questions of all types, thereby giving answers to questions that seek answers to the what, why and how dimensions. The design provided an opportunity to define new terms and clarify existing concepts. The researcher discovered that this design was useful to generate formal hypotheses and formulate more precise research problems. In the policy arena or applied to practice, exploratory studies help establish research priorities and highlight where resources should be allocated (De Vaus, 2001). The exploratory design is beset with various shortcomings.

It was noted that generalizations were difficult to reach at due to the general small sample size. This is supported by Cuthill (2002) and Taylor *et al.* (2002) who argue that the exploratory design makes it impossible to generalize the results to the larger population. Because of the latter weakness, definitive conclusions about the findings cannot be made. Although it provides significant insights on a phenomenon, it fails to give definitive conclusions. The other flaw of this design is that it is often unstructured, thus leading to only tentative results that have limited value to decision makers. There are also arguments that the design lacks rigorous standards of data gathering and analysis Cuthill (2002) and Taylor *et al.* (2002).

4.3 Population and Sampling Procedure

The population of this study was all the adults who resided in Chimanimani District. A sample size of 18 respondents predominantly above 70 years of age were selected judgmentally. Judgmental sampling was used because the researcher wanted to identify people with vast knowledge on indigenous rain making in the District (Polit & Beck, 2008). The pros and cons have been given in Table 3.1. In this sample were rainmakers, members of the royal families and community elders. All the categories of people described above were regarded as key informants with respect to rain making. The sample was relatively small by virtue of the categories of people involved. Old people are declining in number due to natural causes mainly death. For example during the course of this research two key informants died. There are also few rain makers and those in the royal families who are in the age group that was require are now few as well.

4.3 Data Collection Methods and Techniques

A semi structured interview guide was used in the collection of data. A face to face technique was employed so that the researcher would able to probe as much as possible the information required in the next studies. The interview guide had the following questions: Based on your own experience and knowledge of this area, where you live, what is climate change? Is it true that climate change is really taking place? Why do you say so? What are the negative effects of climate change, especially with respect to water and food? Do you believe that indigenous rain making can effectively counter the negative effects of climate change? Why? Let us talk more deeply about indigenous rain making. In the past, what did you use to do when there was too much rainfall? In the past, what did you use to do when you received too little rainfall? If the practices you cited in (a) and (b) worked, why were they abandoned? Do you believe indigenous and western knowledge of rain making can complement each other? Explain your reasons. What do

you suggest should be done now for indigenous and western knowledge of rain making to complement each other more effectively in order to counter the negative effects of climate change?

4.4 Data Analysis

The thematic content analysis technique of Creswell (2009) was used to consolidate the results of the qualitative data into sub-themes. Thematic content analysis as a method for identifying, analysing and reporting patterns within data (Braun & Clarke, 2006). The method minimally organizes and describes data set in rich detail. Furthermore thematic content analysis is flexible. A theme is important idea, a topic related to the data in the research question and a level of a patterned response within a data set. Data was be collected and questions under each theme were recorded. Detailed description of entire data set collected was presented in such a way that readers get a sense of all predominant issues. Data was collated in a manner that responses for each question and the whole theme is reflected to make easy see the trend of answers for each question and theme collectively.

The first step of the process was to be familiarizing with the data. The second step was transcribing the data into written form. The enumerator then generated some codes to identify different features of the data. After the all data was coded and collated by way of placing similar perceptions into aggregate sub-themes, the researcher then re-focused the analysis to a broader level of themes rather than codes and collate all the relevant coded data extracts within the identified themes. This was the starting point of analysis of codes, and considered how different codes combined to form an overarching theme. Mind-maps were then be done. These themes were then reviewed. Finally a report was produced underpinning what the interpretations actually entailed.

4.5 Results

4.5.1 Demographic information of the respondents

Eighteen community representatives, among them rain makers, royal family members and community elders, participated in the study. Out of these five were rainmakers and the rest were either senior citizens or members of royal families. Four chiefs were involved in the study. There were seven female respondents. Fourteen of the 18 respondents were more than 70 years old.

Fourteen were married while four were widowed. Seven of them had not received any formal education while five had attained primary schooling, and the rest had received tertiary education.

4.5.2 Potential of indigenous rainmaking practices in combating the negative effects of climate change in Chimanimani District of Zimbabwe

It was interesting to note that traditional boundaries and the boundaries created by delimitation government exercises were different. Traditional boundaries overlapped to other districts. As a result part of the respondents were drawn in modern Chipinge District. It was also noted that all the Ndau chieftainships were related to some extend though they had different totems. The rain makers were respected regardless of the chieftainship they came from. According to a *svikiro* from the Mutema chieftainship and an aide to the one for chief Musikavanhu said that *svikiros* were not found in every chieftainship.

Respondents from Ngorima, Chikukwa, Muusha and Ndima revealed that they consulted a *svikiro* from Mutema. However, a *svikiro* at chief Musikavanhu was only consulted during desperate times. Regarding the meaning of climate change, fluctuations in weather patterns with respect to wind, rain and the seasons of the year were cited as important issues. For example, it was revealed that the *Nyamavhuvhu* wind now swept through the area in September or October instead of August. Respondent C added that "We used to have *hukurambuwa* (rain that removed chaff after harvest) and various other types of rain but now it is a thing of the past". According to respondent J, climate change referred to "Changes in what we saw and what we see now in weather patterns. For example, we used to predict seasons in terms of changes that took place in certain trees".

All the respondents agreed that climate change was taking place. Their justification for this argument ranged from changes in tree behaviour, seasons, rainfall patterns and environmental changes to altered wind patterns. Respondent A said that local people used to predict rainy seasons using changes in tree features. Another dimension of climate change emanated from Respondent that removed the remaining chaff of the harvest now stored in granaries) were received." Respondent M added that rain was now very erratic and winds which ordinary people found difficult to understand had become prevalent. In addition to this, there was a lot of unpredictable flooding compared to yesteryears.

Responses with respect to the negative effects of climate change varied from food insecurity, drying up of streams and rivers, lack of water for domestic, agricultural and animal use. For

example respondent Q said the following, "wells dry up, and there is siltation, flooding, shorter rainy season and long dry spells". Respondent B pointed out that "food insecurity and streams are drying up". For respondent C, the following was happening, "we now live in the era of boreholes. Yet, we still we do not have enough water. We compete for water at the boreholes". The latter respondent also lamented that "some very important trees are dying. There is drought. This is causing food insecurity and water shortages. Sometimes there is too much rain causing floods over a very short period".

The Ndau people have strong ties with their indigenous rain making practices. All the respondents gave an affirmative response to the question, "Do you believe that indigenous rain making can effectively counter the negative effects of climate change?" For example, respondent A said that "yes if done in earnest, rain comes. People would celebrate soon after the rituals. A case in point was that we had a rain making ceremony last Friday and it rained heavily". Respondent B said "yes, as long as people do agree and believe in the same way, God (*Mwari/ Musikavangu*) will have mercy and bring back the old times. Believing is the key".

The view that Respondent I expressed was, "yes but we are not doing it right. Even the royal families now mix scientific beliefs at the expense of theirs. Because of this they fear entering sacred places where rain making rituals are supposed to be conducted. If we do it right, definitely we will have the climate of yesteryears". Respondent Q concurred by saying that "yes, but if God becomes angry due to human sins, the sins lock up the rains". However, one respondent said that he did not believe in rituals. He was of the view that human behaviour affected climate, in particular the emissions from industrial plants.

More than half of the respondents said that rain making rituals were conducted when too much rainfall was received. Respondent J said, "they organized mukweverera/ *mutoro/makoto* (rain making rituals) in which they made *mabota* (literally meaning porridge but a humble way of referring to beer for this specific purpose) and took them to *zvitenguro* (some scared forests) to request for rainfall that was only adequate for what the people wanted and not associated with any destruction. Respondent M revealed that "we used *mabota*, which we gave to our ancestors (*kuzvitenguro*) and our ancestors would grant our wishes. However, some evil members of our societies seem to use witchcraft to stop rain (*kushirika mvura*).

Respondent A said "we would ask our ancestors to close the "water gates". This was done by taking a small hoe, which was wrapped with some leaves of a certain tree. Then we would put the handle in the ground with the hoe facing skywards". Respondents Q and R explained this

further saying that community members approached their elders who in turn relayed the messages to chiefs when rainfall challenges were experienced. Chiefs then approached the *makopa/svikiro*. Beer was eventually brewed and during the subsequent ceremonies, livestock such as cattle, goats and chickens were slaughtered as sacrifices. At the same time, members of local communities who had committed abominable sins were called upon to confess to the ancestors.

Similar responses as those indicated above were given regarding what was done when too little rainfall was received. Respondent A said "We would do a local *mabota* and in addition we would roast a chicken slaughtered by twisting its neck. People then ate the meat used for the sacrifice without applying any salt to it. If this failed, we would go to Chief Musikavanhu with *zviyo* in the form of *mungoza/rukweza* or *mapfunde*, referring to *rapoko* or millet for making *mabota* via Chief Mutema". Chief Musikavanhu (which means creator) is a very revered paramount chief among all the Ndau people. Respondent M confirmed this view. The latter respondent added that this was done after requests were received from various chieftainships, namely Mutambara, Muusha, Chikukwa, Mapungwana, Ngorima and Ndima. Chief Mutema's svikiro and the aide to Chief Musikavanhu svikiro shaded more light, pointing out that village elders used to visit their chiefs and remonstrate. In response, Chiefs would then approach the local svikiro with the request to appease the spirits.

Another study question was "why was the rain making practice abandoned?" Responses ranged from western education that gave too much credit to "science", invasion of Christianity, disrespect of cultural and moral practices, party politics and corrupt tendencies that leaders displayed. Respondent A said "Today's people say these practices are now old, the practices cannot be proved, but science can." In addition, respondents A and B were of the view that Christianity was the major cause. Respondent B added that the practices were now done privately because of Christianity, which now overshadowed traditional practices and beliefs. Some elders contracted with the view that westernization was responsible for abandonment of indigenous rainmaking practices. They said that the white farmers believed and supported rainmaking ceremonies. This was done in the form of them coming to observe and material support.

Respondent C said "those who were normally sent to seek the help of ancestors could not be trusted. Some were corruptly identified political appointees and did not have the mandate to do this type of work. We even suspect they steal part of the tribute which should be delivered to the *svikiro*". Respondent D said that "Christianity must be blamed. Young people who are still sexually

active are being involved in rain making rituals yet this is a taboo. They believe in science." For respondent E, "Christianity associates our tradition with sin and the dark world."

Moreover, according to respondent I, "there are too many churches. Some of them look down upon our cultural practices. Even village leaders who should lead in these rituals have become westernized and are Christians who find it difficult to practice both." This argument found support from respondent G who argued that "westernization, modern science and Christianity made people to abandon traditional rain making practices. As a result, this has made it difficult to pass the knowledge to the younger generation." Also, respondent M indicated that "people of today are lost", they sell their identity, look down upon it and think they are sophisticated. They detest our practices". Respondents Q and R contributed the view that changing times and beliefs were the major issue. Both blamed colonization, inferiority complex and conversion to Christianity, which disregarded African tradition.

In response to the suggestion that indigenous and scientific knowledge of rain making be harnessed in tandem so that they complement each other more effectively to counter the negative effects of climate change, the respondents indicated that this was possible. However, there was need for promoting mutual respect and acceptance of diversity in belief systems, reducing political intervention on traditional issues, fixing cultural moral decay, reorientation of the young to embrace their own culture and change in human behaviour towards the environment for this to work out.

Respondent A said "knowledge systems should reflect respect for each other. Also, people should understand and not feel guilty. I am a Christian but I do not feel bad when I perform my rituals." Respondent Q recommended the restoration of scared places and sound environment management to fulfil that dream. For respondent R, gathering people *matare* (a traditional platform for frank discussion) to interrogate the complementarity of indigenous and western systems was of paramount importance. Respondent B said "this is a difficult area, but people should look forward to *Musikavanhu* (the creator). We do not believe much in their cloud seeding concept, but we respect their belief system. They should do the same to ours".

Respondent I expressed the view that "those who believe in the work of churches should contribute to the sacrifices and rituals even if they do not participate in person. They should do exactly as expected when at the rituals and then do what is expected in their churches". Respondent J added another dimension, recommending that "we should reorient our children to respect our tradition." This found support from respondent O who said "let us look for elders to

teach our children what our tradition is all about. Then our children will respect our tradition and use it together with some western knowledge". Respondent E said that "western value systems such as moving around almost naked have affected us. In order for the two to complement each other there is need for complete restructuring of our own culture to embrace our tradition again." Both respondents O and P said "we should encourage people to conserve the environment. This will counter the negative effects of climate change. Human behaviour change is the answer".

For indigenous and western knowledge of rainmaking to effectively complement each other, respondent A argued that "people should not be ashamed and be forced to follow practices they did not believe in." The respondent went on to contend that there should be dialogue even at government level to include the indigenous traditions and knowledge in school curricula. Respondent C observed that "modern western systems look down upon our beliefs yet the Whites who came first to Zimbabwe encouraged us and even paid for the rituals to be done and they had good harvests." Respondent L expressed the view that "there should be civic education and policies at government level so that our practices are not looked down upon". Some respondents said nothing was impossible. They argued that although people were taught western lifestyles, there was ample scope for synergizing them through cultivating appreciation of both. Some argued that western knowledge was the same as IKS and wondered why it was also not labelled the same in the countries where that knowledge originated. It was pointed out that weather reports were not always accurate.

Various explanations were given for the causes of climate change and how they were connected to the Ndau chieftainships. Respondent A said "the causes of climate change include the cutting down of indigenous trees. These trees used to show us when rainfall was about to come and made us understand possible changes in seasonal patterns." Also, overpopulation and lack of knowledge were blamed on climate change. Respondents J, M and N suggested that the local people should ensure that ancestors remained happy and protected them. One respondent recommended that "Children should be taught our culture. Some children commonly use obscene language even in the presence and also to insult adults. This is an abomination, disrespectful and disgusting. Also, *Chisi* (Shona people day of rest similar to the Christian Sabbath) is no longer respected. Our children should stop all forms of blasphemy to our ancestors, including abomination. Our children are moving naked and cutting down trees in sacred forests we used as *zvitenguro*. We should not disturb our wells such as washing with soap in wells and rivers". In support of African tradition, respondent E said that "The Bible did not come to destroy our tradition but to complement it". A *svikiro* and one assistant *svikiro* suggested that people must be taught

how to make the two systems work in tandem. The *svikiro* articulated this view in the following way: "This will help them find their similarities and how they can be strengthened. They should also look for differences and reconcile them."

4.6 Discussion

The fact that the Christian God and indigenous God is the same gave hope of integration of indigenous rain making and the western ones (*Mwari/Musiki/Marure/Nyadenga*). The results of this study revealed that there was convergence in Eurocentric and Afrocentric perspectives of the meaning of climate change. In fact respondents were of the belief that both side believe in one God. Climate change was a major concern in both knowledge systems. Moreover, it highlights the richness of IKS, contrary to the view of 'mugs' to be filled from the 'jug' theory of Freire (2000). Anthropological studies have shown that since time immemorial, most "primitive people" from the American Indians, natives of Afghanistan, African communities of Ethiopia, Nigeria, Uganda and Zimbabwe practiced some form of religious rain making (Stanford Law Review of 1948; Matsuhira, 2013; Nzenza, 2014; Haruna, 2015).

It was also common among the Spaniards and the Chinese (Taylor, 1954; Miles, 2010). Although the debate around this issue seems to have abated now, Courtwright (2015) notes the rain making arguments resurfacing after the 1980s. However, disregarding these beliefs is beset with problems. For example, Machoko (2013) explains that the disdain for and rejection of water spirits has contributed to the observed failure to sustainably manage the environment. Shoko (2012) extends this argument by claiming that failure to honour ancestral spirits invokes bad luck for both the individual and community. Misfortunes such as droughts, floods, crop failure, sickness and death are blamed on the presence of angered spirits.

From the responses the researcher deduced that the respondents had respect for both knowledge systems but IKS was familiar and common to them. Taking into consideration the Zimbabwean situation, cloud seeding is a challenge. Firstly the airplanes are expensive considering the economy. Secondly the chemicals are imported. Furthermore, human capital to do this are hardly there considering the level of brain drain. Finally if rain fails after cloud seeding the community perception becomes too negative. Therefore integration of both knowledge systems is a panacea to the current impasse.

Indigenous rain making facilitated hope and empowered those who believed in it yet those who doubted it participated in indigenous rain making ceremonies. It was part of their entertainment

like what the white respondents said. Rain making rituals have been part of the indigenous people's life worlds. The term life worlds is used here to refer to people's experiences, including constructions of culture in line with the views of Long and Long (1992). It is evident from the foregoing arguments that rain making is a worldwide practice that must be respected and better understood, taking into account the diversity of prevailing local community realities. This ensures that human factor development is achieved. Adjibolosoo (2015) explains human factor as the spectrum of personality characteristics and other dimensions of people's performance that enable social, economic and political institutions to function and remain functional over time. The continued existence and functionality of African societies to this day are attributable to harnessing of IKS. For this reason, there is need to uphold IKS and complement it with western scientific beliefs.

The Shona people of Zimbabwe have always worshipped *Mwari/Musikavanhu/ Marure* (God) through their ancestors. Matsuhira (2013) carried out a study on rain making in the Nyandoro Region of Zimbabwe. He found that the people believed that apart from influencing rainmaking, ancestors were also responsible for the positive achievements realized in the area, including waging a successful war of liberation in the country. Ancestors were consulted in times of difficulties and when making socio-political decisions such as the appointment of a chief and holding ceremonies to thank them.

It was revealed that animals and people competed for water at the wells and boreholes in Chimanimani District. This has negative effects on peoples' health. Bell *et al*.'s (2015) argument that climate change is a major foreseeable threat to public and community health as well as to human wellbeing in the 21st century. Linked to this was the general view that climate change was taking place and worsened the unavailability of water, which most of the respondents highlighted. It was revealed that moisture stress was causing changes in behaviour of trees that had in the past been associated with certain weather patterns. Seasons were said to be now short and were associated with floods and negative environmental changes which threatened people's lives.

The respondents in the current study were concerned about water and food insecurity. This is so because water is life. Sarkar *et al.* (2015) notes that water insecurity puts the communities at the risk of multiple adverse health outcomes. For example, as people compete for water with both domestic and wild animals, they develop severely compromising personal hygiene and water intake. Health hazard high sugar content beverages are the most common alternatives to lack of accessible and affordable potable water, particularly for children (Sarkar *et al.,* 2015). Sharing of water sources increases the likelihood of drinking water that is contaminated with animal excreta.

Mental stress that arises from water insecurity and chronic back and shoulder injuries due to carrying heavy water buckets every day also often result in adverse health outcomes (Sarkar *et al.,* 2015).

It was noted that western knowledge systems were concerned with good environment management, taking care of the environment was part of the IKS and culture too. The fact that some modernisation theories emphasize good custodianship of the environment amidst industrialisation which causes considerable environmental damage through emission of gases and deforestation as a result of extraction of raw materials is paradoxical. The paradox is that industrialisation brought in ideas of heavy deforestation as capitalists scramble for raw materials. Presumably, complementing western science and IKS might address this challenge. Machoko (2013) also argues that there is potential to integrate the traditional and modern approaches to natural environmental conservation into a new conservation paradigm.

This might be the reason why some IKS followers view climate change as God's response to sin. Taylor (1954) notes that religious objectors were worried about artificial rain making because it interfered with the Lord's plans. Courtwright (2015) argues that rain making facilitates hope and empowers believers. However, it does not interfere with the atmosphere. The respondents in the current study in Chimanimani District said they asked for rain from God through their ancestors. Although some methods in the literature on rainmaking seem cruel to animals, none of them result in loss of human life, washing out dams, and considerable loss of property. This highlights the need for the two knowledge systems to be harnessed in the quest for more reliable rainfall patterns that might guarantee improved food security.

Almost all the respondents agreed that rain making rituals using *mabota* and chicken killed by twisting its neck and consumed without adding salt was done to ask for rain from *Musikavanhu* was a form of sacrifice meant to influence rainfall patterns. In all this, the rain maker was universal feature and crucial. Gelfand (1984) argues that among the duties of a *mhondoro/svikiro* is rain making. The *svikiro* works under a chief, but the chief consults the *svikiro* in all critical decisions that are made. Apart from the *svikiro* being a rain maker, it influenced politics and foretold the future. Beattie (1964) and Matsuhira (2013) supported this observation. The *svikiros* seem similar to the Chinese deities. In China, Ruppert (2002) notes that deities are petitioned to make rain.

Moreover, Bourdillon (1981) contends that *svikiros/mhondoros* such as Mutota of the Korekore people, Kaguvi and Nehanda of the Karanga people of Zimbabwe, were territorial spirit mediums that also influenced the politics of their country. This was all in addition to the roles they played in

the rain making function.In this study, the respondents blamed the disregard for indigenous rain making practices on western science, politics and Christianity.

Machoko (2013) made similar observations and argued that the majority of Zimbabweans in their thinking and action encouraged and promoted the western mind-set in determining how the natural environment could be protected, treated and managed without respecting water spirits *(mhondoros).* Gelfand (1984) articulates the importance of *mhondoro* in the Zimbabwean culture, in particular with respect to rain making. Haruna (2015) brings out striking similarities between indigenous rain making and those in the Middle East during biblical times. This implies that it is vital for both knowledge systems to respect each other. Yet Christianity did not recognize the importance of IKS in African culture and tradition.

The need for the two knowledge systems to reconcile is evident from the strong negative view towards Christianity, which they believed had disturbed working systems in African societies in Chimanimani. Matsuhira (2013) notes reconciliation among previously warring foes in Zimbabwe soon after independence could be used as a model that might build bridges between modernity and IKS. Rain making as a political activity was reported to be common among the Shona people. Miles (2010) notes rain making was a major political activity that involved local officials. Local elites recruited Buddhist and Daoist clerics to conduct rain making ceremonies.

In this study, it was indicated that there was need for reorienting Africans to take advantage of their culture and tradition while simultaneously respecting other's practices. As already been alluded to above, Machoko (2013) made similar observations. A suggestion was made that indigenous rain making should be integrated into the school curriculum in the same way modern science was studied in subjects such as Geography. Furthermore, the respondents called for good environmental management as a strategy for improving the reliability of rainfall.

Figure 4.1: The Rainmaker Performing a Rain Making Ritual at Jiho in Chief Ngorima

4.7 Conclusion

From this study it can be concluded that modernity, which was of western origin, can complement IKS in rainmaking for the benefit of the broader society. Although there are differences in approaches used, there were some commonalities between modernity and IKS. For example both western science and indigenous rain making were carried out at the onset and during the rainy season. For example cloud seeding was carried out focusing on clouds that appeared to be almost releasing rain. The need for infusing indigenous rain making into the school curricula suing official languages was obvious. Also, awareness or advocacy campaigns on environmental issues should be considered in the fight against the causes of climate change. There is also need for phenomenological enquiry to establish the authenticity and how genuine was the white farmers belief and support for indigenous rain making.

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CHAPTER 5: COMPONENTS OF INDIGENOUS RAINMAKING IN CHIMANIMANI DISTRICT

Abstract

There is limited understanding and appreciation of indigenous raining practices (IRM) among the converts of the globalised philosophies. This has resulted in local people to increasingly lose touch with local realities and their beautiful past. However, the components of IRM forms the richest part of indigenous African heritage which define their communities' unique identities. Effectiveness of indigenous rainmaking is a result of attitudes depending on community people's experience and the outcomes of the practice overtime. The aim of this paper was to examine the components of indigenous rainmaking practices in Chimanimani District in order to understand how they are coping with negative effects of climate change.

A quantitative design, was employed one-on-one interviews with closed ended questions was used to collect community members' perceptive views on their belief in the effectiveness of indigenous rain making. A sample of 34 community members consisting of youths, adults and elderly community members of both sex constituted the population of the study. The respondents were judgmentally and conveniently selected. The following components of indigenous rain making identified in this study were the rain making ceremonies (makoto) which entail use of beer, sacrificial bird (normally a cock) and natural resources conservation e.g. keeping places for local rain making rituals scared (zvitenguro), not destroying very big trees such as fig tree (muonde), mukute and others, and treating forests as sacred. The paper closed with the assertion that indigenous rain making is an effective strategies which if religiously followed has potential to eliminate the negative effects of climate change with its natural resources conservation property.

Key Words: component, effective, negative effects, conservation, indigenous rain making, community perceptions

5.1 Introduction

This paper was a confirmatory study to the Chapter 4 paper which set the scene for this one in order for the readers to understand deeper the Ndau indigenous rain making practices. As new themes emerged from the first study the researcher was determined to explore further. This justifies why the anthropological approach was preferred. This was done by exploring the components of indigenous rain making practices. There are many components of indigenous rainmaking as evident from the anthropological studies alluded to in Chapter Two.

Interestingly, Kaya (2016) notes that lately indigenous rainmakers are slowly gaining national and international recognition after having been despised for a long time. Kaya (2016) argues that modern climate experts in Africa are looking up to African indigenous knowledge as a probable salvation to the current vagaries of climate change. This is so because indigenous practices are dynamic and scientific by their nature (Rawat & Kharwal, 2016). It is therefore important to understand the components of indigenous rain making in order to understand, appreciate and to integrate them with conventional science based rain making practices.

5.2 Research Design

In order to validate the qualitative data collected in Chapter 4, a survey was conducted. This was in order to generate the respondents' views for use in planning, programming and implementation (Shuttleworth, 2008; Wisconsin Survey Center, 2010). Lazarsfeld & Sieber (1964), view a survey as a systematic data collection. A survey is a logical and statistical procedure for collecting and analyzing data. It allows the researcher to obtain standardized information in all subjects in a sample. Data collection tools used in surveys normally allow for future replication of the study if similar tools are used in the administration (Borg & Gall, 1983).The survey was predominantly quantitative.

5.3 Population and Sampling Procedure

A sample size of 34 adults was selected. The aim was to collectively confirm the veracity of the components of indigenous rain making practices in Chimanimani District. A convenience sample was employed. Convenience sampling was chosen because it was relatively cheaper compared to other probability sampling techniques. According to Patton & Cochran (2007); Singhs (2006); and Boxill *et al.* (1997) convenience sampling method is helpful in gathering useful data and

information that may not be possible using probability sampling techniques which require more formal access to lists of populations.

5.4 Data Collection Methods and Techniques

A Likert-type scale was used. The scale was chosen because of its acceptability and intelligibility in getting respondents perceptions (Singh, 2006). The Likert-scale also made collation of data easier to code, interpret and analyze using most the Chi Square Test of Goodness. The data collection tool was prepared in the English language but translated into ChiNdau language the local vernacular to maintain a common understanding between the researcher and respondents. These were administered in a face-to-face mode which enabled the researcher to probe on issues that needed clarity. Ethical protocols were observed. A journal of field notes, especially incidences heard, seen, experienced and thought about throughout the data collection period was kept to buttress the results.

5.5 Data Analysis

In this study data analysis started with coding of absolute and frequencies. The data was then entered into the computer using the Microsoft Excel software package, and The Chi-Square test for Goodness of Fit was conducted using Statistical Package for Social Sciences (SPSS) version 24.0 for windows (SPSS Inc: Chicago, IL, USA). Descriptive statistics and charts were used to present the results. The Chi-square was used to test for association between community people's characteristics (sex, age, educational level, marital status and duration of stay in the area) and their perceptions on the components of indigenous rain making. The test is 2-sided (non-directional) and was conducted at 95% confidence level ($p<0.05$). Cramer's V is a chi-square based measure of association which was used to measure the strength of the association described by the Chi-square test. The measure is defined as:

$$V = \sqrt{\frac{\phi^2}{t}} = \sqrt{\frac{\chi^2}{nt}}$$

Source: (Cohen, 1988)

Where ***t*** represents the smaller of the number of rows minus one or the number of columns minus one. For example, if ***r*** is the number of rows, and ***c*** is the number of columns, then ***t*** = minimum

(r − 1, c − 1). Cramer's V equals 0 when there is no relationship between the two variables, and has a maximum value of 1. A large value of Cramer's V indicates a strong relationship between the variables. Thus, 0.1=Small strength; 0.3=Medium strength and 0.5= Large strength. These standards were used by Fort Collins Science Centre, adopted from Cohen (1988).

5.6 Results

5.6.1 Demographic Information of Respondents

In this study 34 community members participated.Out of these 53 % were males. Only 3 % were youth below 20 years of age and 9 % were youths aged between 20 and 35 years. Adults aged 36 to 50 years were 44%. Senior citizens aged between 51 and 65 constituted 29 % of the respondents whilst 15 % were above 65 years old. None of the respondents had not attained some level of formal school. 12 % of the participants had done only primary schooling while 30 % had gone up to secondary school. Out of these respondent 38 % had a tertiary qualification and 21 % had a university degree. In terms of marital status, 12 % were single, 65 % married, 21 % widowed and 3 % living together but not married. The majority of the respondents (77 %) had stayed in Chimanimani for more than 10 years, 9 % had stayed in the District for between 6 to 10 year and the minority had stayed in the District for less than five years. See Table 4.1.

5.7.2 Components of Indigenous Rain Making in Chimanimani District

Table 4.2 gives an insight of the components of indigenous rain making in Chimanimani District in percentages as well as the Pearson's Chi square Test of Goodness Fit (p) values. The majority (79 %) agreed with the perception that "I believe Christian prayers are part of indigenous way of rainmaking", only 18 % disagreed whilst a negligible 3 % were neutral. On the question "Besides *makoto* and Christian prayers there are other common rainmaking practices practiced in Chimanimani District". The majority 68 % disagreed, 15 % were unsure and only 18 % agreed. The knowledge among the participants was significantly different from guessing among the respondents based on age (Chi-square = 34.103, df = 16, $p < 0.05$).

Table 5.1 Demographic Information of Respondents

Variable	**Proportions, %** per category				
Age	>20	21-35	36-50	51-65	>65
	3 %	9 %	44 %	29 %	15 %
Marital Status	**Single**	**Married**	**Divorced**	**Widowed**	**Living Together**
	12 %	65 %	0	21	3 %
Highest Qualification	**Non Formal**	**Primary**	**Secondary**	**College**	**University**
	0 %	12 %	30 %	38 %	21 %
Duration of Stay	**-5 years**	**5-10 years**	**+10 years**		
	14 %	9 %	77 %		
Sex	**Male**	**Female**			
	53 %	47 %			

On the perception “I believe in the effectiveness of indigenous rain making (*makoto*)”, slightly more than half the respondents (51 %) agreed, 9 % were neutral and 41 % disagreed. Only about half the respondent (56 %) confirmed that “I have witnessed an indigenous rain making”, 38 % had not and only six percent were not sure. On the statement “I agree that only homemade beer (*mabota*) is used in indigenous rain making)”, the majority (68 %) agreed, 18 % disagreed and 15 % were not sure. This perception had a follow up question “Any beer can be used in indigenous rain making” and almost all the respondents 88 % disagreed with only three percent agreeing and nine percent neutral.

The statement “I believe *zvitenguro* places for local rain making rituals should be kept scared in order to have enough rain” had the following responses. The majority (68 %) agreed, 24 % were not sure and only nine percent disagreed. On the perception “Some trees like the fig tree (*muonde), mukute* and other very big trees should not be destroyed in order for indigenous rain making to be effective”, 76 % agreed, 21 % disagreed and 3 % were neutral. This had a follow up that “I believe that there are no scared forests for rain making purposes”, in which almost all the respondents (79 %) rejected, with only 17 % agreeing. Almost all the participants disagreed (83 %) with the statement that “Brewing of beer and other rain making preparations can be done by any woman regardless of age” and only nine percent agreed. On the perception “Snuff is one component of indigenous rain making” the majority (79 %) agreed, 12 % disagreed and only nine percent were not sure.

On the view “A sacrificial animals such as a cow/bull or a cock is a component of indigenous rain making practice”, the majority respondents (79 %) agreed and only 12 % disagreed. The researcher went on to check if there indigenous and science based rain making could be complementary through the statement “I believe indigenous and western knowledge of rainmaking can complement each other”. Only a few respondents (36 %) agreed, 18 % were not sure and slightly less than half (47 %) disagreed. A very high significant difference based on age was observed (Chi-square = 40.404, df = 16, $p < 0.001$).

Table 5.2 Component of IRM Practices in Chimanimani District

Perception (Proportion of respondents (n = 34)	Pearson Chi-square (p)values					Perception Responses				
	Sex	Age	Educ	Marst	DurS	SA	A	U	D	SD
I believe christian prayers are part of indigenous way of rainmaking	0.118	0.356	0.189	0.339	0.417	50	29	3	15	3
Besides makoto and christian prayers there are other common rainmaking practices practiced in Chimanimani District	0.830	*0.05	0.502	0.230	0.588	12	6	15	47	21
I believe in the effectiveness of indigenous rain making (*makoto*)	0.214	0.648	0.846	0.316	0.610	24	27	9	29	12
I have witnessed an indigenous rain making	0.728	0.063	0.263	0.104	0.606	24	32	6	35	3
I agree that only homemade beer (*mabota*) is used in indigenous rain making	0.420	0724	0.49	0.958	0.193	41	27	15	15	3
Any beer can be used in indigenous rain making	0.716	0.819	0.882	0.131	0.766	0	3	9	44	44
I believe *zvitenguro* places for local rain making rituals should be kept scared in order to have enough rain	0.467	0.344	0.967	0.813	0.699	47	21	9	15	9
Some trees like the fig tree (*muonde*), *mukute* and other very big trees should not be destroyed in order for indigenous rain making to be effective	0.293	0.499	0.639	0.778	0.554	47	29	3	15	6
I believe that there are no scared forests for rain making purposes	0.870	0.611	0.588	0.979	0.47	3	12	6	38	41
Brewing of beer and other rain making preparations can be done by any woman regardless of age	0.658	0.093	0.726	0.593	0.190	9	0	9	27	56
Snuff is one component of indigenous rain making	0.138	0.719	0.228	0.929	0.228	32	44	6	12	6
A sacrificial animals such as a cow/bull or a cock is a component of indigenous rain making practice	0.522	0.436	0.264	0.752	0.615	29	50	9	9	3
I believe indigenous and western knowledge of rainmaking can complement each other	0.961	***0.001	0.081	0.059	0.485	9	27	18	41	6

Key: * = $p < 0.05$ ** = $p < 0.01$ *** = $p < 0.001$ ns = $p > 0.05$

5.8 Discussion

Climate change is a fact in Chimanimani. It was evident that the residents were getting the feel of it. They defined climate change in simple terms that the researcher was able to understand. All the participants alluded to the fact that there were changes they were noticing in tree behaviour, seasons, rainfall patterns, the environment and altered wind patterns. The respondent also argued that they were now facing challenges in forecasting weather patterns as a result of these changes. Abdulrashid (2013) argued that indigenous knowledge for a long time has been used for weather forecast among the indigenous communities. In this study Respondent A pointed out that they used to predict rainy seasons using changes in tree features. For example people would start preparing for the farming season around August when the *musasa* tree leaves changed red after their leaves would have been blown off by *Nyamavhuvhu* wind (wind that started around mid-July to early September).

Another elderly respondent noted that from around 1950 to the end of the 1960s there was a lot of rain and that streams that now look liked galleys were always flowing. Different types of rain, namely *bumharutsva* (rain that made grass germinate early and trees to shoot soon after winter) and *gukurahundi/hukurambuwa* (rain that removed the remaining chaff of the harvest now stored in granaries) were received. One Respondent M added that rain was now very erratic and winds which ordinary people found difficult to understand had become prevalent.

In addition to this, there was a lot of unpredictable flooding compared to yesteryears. Having noticed changes in climate patterns the community elders said well before they were born, their forefathers had already put in place some indigenous environmental mechanisms to combat the negative effects of these harsh changes in climate. Based on the above argument Mutisya & Ross (2005) argue that indigenous rain making is part of Afrocentric worldview is rooted in the historical, cultural, and philosophical tradition of African people. Koster (2011) argues that when there was lack of rain which was viewed as drought indigenous people would feel that it was a moment that required divine intervention which could be done through a ritual.

Rawat & Kharwal (2016) in a study among the North-West Himalayan region people of India also noted the use of indigenous knowledge. For them this knowledge was generated inter-generationally. The communities used this inter-generational wisdom to perform their livelihood operations in a most eco-friendly manner under remote, isolated and inaccessible conditions; characterized by harsh climate and limited survival options. It was revealed in this study that whilst the indigenous people had embraced Christianity, they still believed in their traditional religious

practices. This was evident through the revelation that the majority of the respondents believed that Christian prayers were part of indigenous way of rainmaking.

Combining tradition and Christianity is not unique of the Ndau people but common among most African communities where Christianity became a second religious culture as a result of colonization. Babane & Chauke (2015) did a research in South Africa among the Vatsonga people. They observed that Bandu rainmaking ritual was practiced when there was slight drought. This rainmaking ritual among the Vatsonga was practiced both traditionally and according to Christian belief. In addition to rainmaking ritual practices, Babane & Chauke (2015) also investigated the Biblical beliefs and practices of Shikundu communities pertaining to rainmaking. Their study revealed that praying for rain was usually done during severe drought. In this elders, pastors and members of different churches would gather for this ritual at the Tribal Authority and pray for rain.

This was echoed by one elderly chief who said that he was a Christian but was not ashamed to perform rain making rituals with his subjects. It was the same mouth that prayed to the Christian God and to God through the ancestral spirits. God (*Mwari/ Musikavanhu/ Marure*) meaning the creator was the same regardless of differences in the way they prayed. Mapara (2011) argues that European missionaries had the misconception that African Traditional Religion promoted practices like witchcraft and that it encouraged people to worship ancestors instead of God. In fact ancestors were only the way to God just like the Biblical Jesus or the Islamic prophet Mohammed. Mapara (2011) contends that Africans were wrongly called feticist, animist or paganist and primitive until they adopted western culture, but truly they carried their culture with them.

As alluded in Chapter 2, Mbiti (1988) argues that “Wherever the African is there is his religion: he carries it to the fields whether he is sowing or harvesting crop….if he is educated, he takes his religion with him to the examination room…”. From this argument the Ndau people have managed to export the African traditional religion into the Christian church. Babane & Chauke (2015) argue that rituals of various kinds are a feature of almost all known human societies. They are not just unique for Africa. In fact various rituals are used for different life changes for example, there are rituals for initiation, death, mourning, birth, naming, mothering and rainmaking. The majority of the Chimanimani people, besides *makoto* and Christian prayers there are no other common rainmaking practices practiced in the District. However it was revealed that the disagreement was slightly above half only due to differences in perception across ages through a post-hoc test.

Figure 5.1: Beer under a sacred tree

The young generation through their exposure to schools outside the District could have experienced or learned about other rain making traditions. Some younger generations are even ashamed to be associated with their traditional culture. This is due to Eurocentric influence brought about by predominance of foreign education and religious systems that disregarded the Afrocentric way of life colonial rulers, missionaries, and Eurocentric biased intellectuals created an impression that indigenous knowledge was inferior, primitive, heathen, and barbaric and not worthy preserving (Bentley *et al.,* 1991; Agrawal, 1995; Plockey, 2015). However, recognition and appreciation of the inter-generational wisdom could be a source of healing and therapeutic import in the context of the unhealthy imbalances, distortions, trivialisations and neglect inflicted by Eurocentrism (Emeagwali, 2003).

The distortions and impressions created by science based beliefs also influenced the outcome on the perception about the effectiveness of indigenous rain making. Slight above half the respondents said they did believe the effectiveness of *makoto*. It was revealed in this study that rain making rituals using *mabota* use of snuff and chicken (*makoto*) killed by consumed without adding salt was done as a sacrifice meant to influence rainfall patterns from *Mwari*. In all this, the rain maker (*svikiro/mhondoro*) was universal feature and crucial. Gelfand (1984) argues that among the duties of a svikiro is rain making. The svikiro works under a chief, but the chief consults the *svikiro* in all critical decisions. Apart from being a rain maker, the *svikiro* influenced politics and foretold the future.

It was revealed from this study again that whilst the majority of the people were in a way influenced by their traditional culture, they did not want to be publicly associated with it. This was evident in the fact that regardless of adults and elderly members dominating the composition of the respondents, only slightly more than half confessed having witnessed *makoto,* yet in the majority of the perceptions they reveal full knowledge of this practice. This could be a result of modernisation influence in which people no longer want to be associated with backwardness. Koster (2011) argues that rain dances are often regarded as outdated, backward, unused, and irrelevant practices. However scholars have argued that indigenous practices such as *makoto* could be the basis for sustainable development because they are believed to be in harmony with nature and tapping IK can lead to the attainment of sustainable development (Abdulrashid, 2013). The majority of the respondents believed that *zvitenguro* or places for local rain making rituals should be kept scared in order to have enough rain.

They were also convinced that some trees like the fig tree (*muonde*), *mukute* and other very big trees should not be destroyed in order for indigenous rain making to be effective. Above all they

agreed in the sacredness of some forests for rain making purposes. The elderly respondents said that they believed in water mermaids that influenced rain and these lived in forests. They argued that destroying, or disturbing forests through defecating in them scared away the mermaids. This was a very scientific way of thinking in that in the modern education system they believe in keeping forests which mostly are the sources of water to be kept smart to prevent spread of water-borne diseases. Further the natural forests influenced the water cycle.

Forests are also a habitat for flora and fauna. This shows how well the indigenous people lived in harmony with the natural ecosystem. Rawat & Kharwal (2016) argues that discarding indigenous knowledge on connotations of superstition, conservatism, primitivism by modem science result into failure of developmental networks. Marango *et al*. (2016) also argue that local knowledge is handy in that it is common and familiar to its users and that it has tested the passage of time in saving the flora and fauna.

On the perception “I believe indigenous and western knowledge of rainmaking can complement each other”. Both the side on agreement and disagreement received less than half votes. A post-hoc test revealed significant differences among the respondents on the basis of age. The community elders believed that it was possible whilst the younger generations were against this. The elder members argued that they had managed to embrace their tradition into Christianity without problems and that in the same way it was possible to embrace science based beliefs. However the younger generations said that they did not see the link between the two and wanted to be dissociated with traditional practices. One respondent former white farmer said to the researcher, “Timothy what you are doing is a waste of time because that is useless and heathen”. However after a discussion and further probing the respondent she said there was a lot of science in the traditional practices done by the indigenous people and that is why they supported the rituals by availing resources for the success of the events.

Recent studies are now revealing the science behind indigenous practices. And from this it is vital for traditional practices and science based knowledge to complement each other in order to achieve sustainable development. The purpose of science is to solve society’s problems and so are indigenous practices. Makwara (2013) postulates that from time immemorial indigenous knowledge has been used by society for various purposes depending on the needs. Makwara (2013) argues that indigenous knowledge has significant value in improving of accuracy and reliability of weather forecasting if it is systematically researched, documented and subsequently integrated in conventional forecasting system. Jiri *et al.* (2016) posit that integrating indigenous

knowledge and scientific based seasonal forecasting is the key possible thrust in reducing vulnerability, enhancing resilience of rural farmers and in increasing their adaptive capacity.

5.9 Conclusion

In this chapter readers familiarised themselves to the components of rain making practices in Chimanimani. It was evident that these components are also scientific in nature and ensured success of indigenous rain making. For example undisturbed forests allow for the natural rain cycle. Furthermore was evident that it is possible to complement science based and indigenous knowledge. In the next chapter the readers will be introduced to the level of dissemination of indigenous knowledge in general and then in particular rain making.

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CHAPTER 6: DISSEMINATION OF KNOWLEDGE ON INDIGENOUS RAIN MAKING

Abstract

There is little understanding and appreciation of indigenous knowledge, specifically indigenous rain making practices. This is a result of globalised philosophies. The advent of globalisation has led to stereotyping and disregard for indigenous knowledge systems leading to the decline of African traditions and their associated practices. Globalised philosophies disregard and despise indigenous rainmaking, resulting in the erosion of the practices. Currently, there is rare if any dissemination of indigenous rain making practices. Given this situation, it is crucial to document and archive the current and past ways of disseminating knowledge on indigenous rainmaking. Thus, an exploratory study was conducted in Chimanimani District of Zimbabwe focusing on this issue.

Snow balling sampling buttressed with saturation concept was used to identify key informants. An interview guide was used to facilitate conversations with 16 elderly community members predominantly above 70 years old. Data analysis was done using thematic content analysis. The respondents lamented the loss of effective dissemination of indigenous rainmaking knowledge. The respondents argued that the methods that were being currently used were not effective. Information was being passed on through oral means which was getting extinct. No one was in fact trying to embrace the use of modern technology and social media such as the radio, television, Whatsapp or Facebook.

People lamented treatment of IKS as being mere history rather than active knowledge for use in daily lives by today's generation. It is believed indigenous rain making is a potential strategy for combating the negative effects of climate change. The study recommended an integrated approach to rain making practices. Use of school curricular, *matare*, and modern information and communication technology were suggested.

Key words: *matare,* agro-ecological zones, indigenous knowledge systems, *makoto*, negative impacts,

6.1 Introduction

Incorporation of indigenous knowledge is central to sustainable rangeland management. However, there is in reality little attempt to integrate scientific and indigenous knowledge (Velempini & Perkins, 2008). Integration is possible if both knowledge systems are accorded equal recognition and equally disseminated. Makwara (2013) asserts that local strategies of combating it are not widely researched and documented. At the same time there is little understanding and appreciation of indigenous rain making practices (Marango *et al*., 2016). This is regardless of the fact that it is a potential strategy for combating the negative effects of climate change if complemented with science based rain making. Chang'a *et al.* (2010) argue that lack of systematic documentation; lack of coordinated research into accuracy and reliability of indigenous knowledge forecasting; and death of old people who are the main custodians of indigenous is leading to loss of this dearth knowledge.

In the previous chapter readers were made familiar with the history of rain making thereby making them aware of the components of rain making across the globe over time. Components of indigenous rain making in Chimanimani as a strategy of combating the negative effects of climate change was thereafter revealed. Owiny *et al*. (2014) claims that preserving, managing and sharing indigenous knowledge is vital for the world's social and economic development. However lack of appreciation and understanding of IK has led to its rare dissemination as opposed to science based rain making e.g. cloud seeding (Marango *et al.,* 2016). The attempt to get back to indigenous practices has been and still an uphill task.

Kaya (2016) notes that the Kenya Meteorology Department (KMD) and traditional rainmakers are coming together to produce more accurate forecasts and disseminate them to a wider number. Briggs, & Sharp (2004) contends that indigenous knowledge has potential of offering a way out of the development impasse in contrast to modernisation advocates who viewed traditional knowledge as obstacles to development. Based on this, the aim of this study is to analyse how knowledge on indigenous rain making is disseminated in Chimanimani District of Zimbabwe. This comes against F. C. G. (1993) who quoted Professor Cornel West, a Religion and Director of the Afro-American studies at Princeton University who wrote in The New York Times Magazine of 2nd August (1992: 9) arguing that "Afrocentrism, is a…species of black nationalism,…a gallant yet misguided attempt to define an African identity in a white society perceived to be hostile….and retrograde views on black women, homosexuals and lesbians and a reluctance to link race to the

common good." World views in this line of thinking militated against appreciation, promotion, dissemination and documentation of indigenous knowledge systems.

An opinion leader President Thabo Mbeki of South Africa once said that; "*We must proceed with ongoing African studies and research, into our rich creative and cultural past and rekindle interest into African knowledge systems, so as to make younger generations aware of the achievements emanating from our continent and impress upon them their inherent creativity, that is setting the stage for new developments and discoveries"* (Bhola, 2002). However indigenous knowledge did not die but at some stage remained dormant. This purpose of this study is to revive sharing and dissemination of indigenous rain making knowledge as a strategy for combating the negative effects of climate change for sustainable development.

6.2 Research Design

An exploratory design was used in this study. Cuthill (2002) and Taylor *et al.* (2002) argue that exploratory designs are usually conducted on research problems where relatively few or no earlier studies to refer to have been done. This was the case with this study. This study focused on gaining insights and familiarising with documentation of indigenous rain making for further investigation. This design was effective in collecting data from both literate and people with limited literacy, especially the elderly members of the community. Furthermore, the data collection tool used had an empowering effect on respondents by virtue of its narrative nature in response (Government of Australia, 2015). In addition interviews resembled everyday conversations, although they focused on the researcher's needs for data (Patton & Cochran, 2002).

6.3 Population and Sampling Procedure

Sixteen community elders predominantly above 70 years old and adults from royal families participated as key informants in this study. The sample size of was selected through snowballing to participate in this research. The sample size was a result of data saturation which was reached at after interviewing the sixteenth respondent. Data saturation is reached when there is enough information to replicate the study, when it becomes evident that it is no longer possible to obtain new information and when further coding is no longer feasible (Fusch & Ness, 2015). Above all this study involved community elders are getting fewer naturally. As alluded in the earlier study two of the key informants passed before the conclusion of this research project. In addition to the

16 key informants, six former white farmers and long residents of Chimanimani participated in the research to confirm some issues that arose during interviews with key informants.

6.4 Data Collection Methods and Tools

A semi structured interview guide was used. The strength of this data collection tool was explained in the previous chapter. The interview guide was prepared in the English language but was translated into ChiNdau language the local vernacular to ensure there was common understanding between the interviewer and interviewees at all the stages of the study. Ethical protocols were observed at all the stages of the study in order to ensure that the respondents were not harmed.

The interview guide had the following questions: Taking into account each of the following categories (local community members, indigenous rain makers and western science researchers) 1. a) What evidence exists to suggest that indigenous rain making practices are known? b) How is the knowledge being disseminated? c) Who is disseminating the knowledge? 2. Do you believe that the means of disseminating the knowledge are effective? a) Why do you say so? b) What available technologies can be used to improve dissemination of indigenous rain making? c) What else needs to be done to make the dissemination even more effective? 3. a) What might make it difficult to disseminate this information to the different groups e.g. children, adults, and the elderly? b) What is making it difficult to more effectively disseminate the knowledge?

6.5 Data Analysis

Thematic content analysis of data was done. Ibrahim (2012) posits that thematic content analysis is a type of qualitative analysis used to analyse classifications and present themes (patterns) that relate to the data. It illustrates the data in great detail and deals with diverse subjects via interpretations. Namey *et al.* (2008) further contend that thematic content analysis moves beyond counting explicit words or phrases, but it identifies and describes both implicit and explicit ideas. In this, analysis codes were developed for the themes which linked to raw data as summary markers for later analysis. This included comparing the relative frequencies of topics within a data set and looking for code co-occurrence or relationships. Similar perceptions from the respondents were put into aggregate sub-themes. The number of reflection circles identified were used as a measure of its importance thus adopting this as the priority ranking procedure.

6.6 Results

6.6.1 Demographic Information

Two distinct groups of 22 respondents participated in this study. All the 22 participants were key informants. Six were former white farmers who were contacted only to verify a theme on belief and support of indigenous rainmaking by whites which emerged in both Chapter 4 and this one. Sixteen were then the main participants of this study. Out of the 16 key informants only four were below 70 years old. Three of them were between 70 and 80 years of age. The rest were above 80 years old. Half the key informants (8 out of 16) were married and eight were widowed. The majority (15 out of 16) of the participants never attended any formal school and only one had a highest qualification of a junior certificate (equivalent to the South African matriculation during their time). Out of the six former white farmers who were interviewed to verify some facts, only one of them was in his 40s, and the rest were between 50 and 80 years old.

6.6.2 Dissemination of Indigenous Rainmaking Practices in Chimanimani District

On the questions about the evidence that existed to suggest that indigenous rain making practices were known, how this knowledge was disseminated and who was responsible; the respondents said that the concept *makoto* were still done and that it always rained after *makoto* rituals. Furthermore, rainmakers were still known and respected in their communities especially in the rural parts of the District. *Zvitenguro* and *makwasha anoera* (sacred places for local rain making rituals and sacred forests) was another indicator. The respondents said the practices were disseminated through oral means at (*matare*) either family or community gatherings. Community elders also moved around announcing the impending ceremony.

The revealed participants revealed that the traditional leadership, i.e. chief (*mambo*), village headman (*sabhuku*), their aides (*makurukota*) and some selected village elders were responsible for the dissemination of information. The informants said that means of disseminating the knowledge were not effective. Respondent A said “There are now very few elders in the community who have full knowledge. Many have died” and Respondent B said that “The young do not care. They do not listen to us, they say we are old fashioned and cannot carry on this legacy. Former white farmers were better because they believed in our traditional practices better than our own children. The whites gave us support”. Respondent C said “Not quite effective, the young say *zvave zvenguva yenyu* (its old fashioned). Some of the rainmakers are too young and

some of our traditional leaders have become political as a result of the current laws whereby they are appointed by the Minister. Corruption is rampant appointments. As a result they concentrate on the political wishes of those who appoint them rather than our culture".

Another Respondent E said that "The young spend time at school and are pre-occupied with their education". Respondent K said that "These days' people spend their time busy at work. There is need for using modern media like the radio or TV rather listen to those who shout" Respondents L and M said "Using word of mouth is not effective there is need for some form of technology e.g. a local radio station" Respondent O said that "It was effective long back but not now, use of a radio is more effective".

The old man Respondent P said that "It is effective, we are good at networking despite the fact that some young black administrators in government frown at or scold us. This is unfortunate because in the past the white administrators and farmers supported and respected our tradition. The white farmers gave us beasts and roller meal as support to ensure makoto were successful. They believed in the effectiveness of our rituals". After the issue of whites supporting the rain making rituals came out at various stages of the study, the researcher had no other option but to interview some former white farmers.

The following questions were asked: "From my research work on indigenous rain making practices here in Chimanimani, the elderly respondents showered you with praises for believing and supporting some indigenous rain making practices. They are blaming disregard of these practices on the young black traditional leaders and the education system. Is it true that you believed and supported them? If yes what type of support and why did you support them? The following responses were anonymously agreed upon.

They said that, "We did not believe in this at all. Yes we supported them but not because of believing. We gave them a cow for meat and mealie-meal for their food. We supported them because for us it was partly entertainment, but mainly we wanted to keep community members from where we drew our workforce happy. Lastly we knew if they were happy they will not sabotage our farming activities and help us indirectly to guard our farms". Only one out of the six said he saw the science behind what the local people were doing.

Fig 6.1: Community elders sharing experience with the researcher

This gets support from Doxtater (2004) who claims that Euro-scholarship has ignored Indigenous knowledge in order to promote its own narrative structures which are based on Western knowledge on what could and what could not be regarded as truth. Doxtater (2004) further asserts that over years anthropologists succeeded in burying Indian communities completely beneath mass of irrelevant information to the extent that scholarly community on Indian people became one of simple authority. Bhola (2002) reveals that traditional values and institutions were rendered to have little or no value compared with their Western equivalents.

On the question of available technologies used to improving dissemination of indigenous rain making, all the respondents said there was none and that did not know of any modern technologies for disseminating information. The question what else needs to be done to make the dissemination more effective, Respondent A said that "There is need for communication among traditional leaders, community elders the rest of the community members. I suggest use of *matare* to resolve this big problem, so that solutions are jointly owned". Respondent B, G, H and J said that there was need to lobby the government to put policies that support and protect the practitioner of these practices. Use of libraries, and incorporation of the practices in education curricular was advocated for because there was the attitude that anything traditional was inferior. Respondents C and D said Christianity was supposed to do more accommodate indigenous practices if people are serious with revitalization of this knowledge.

Respondents E and F said that we should start with "Respecting ancestors and God so that we are on their side" and that "Use of our traditional *matare* and the school system to include our tradition in the curriculum respectively was a possible solution". Respondent K said that "Teaching children at school because they believe anything learnt at school is more important than what they learn at home. Use of the traditional *matare* is important too as a learning platform". Respondent M said that "The young and new traditional leaders needs a paradigm shift first, to show love for their tradition first. Parents and elders should invite the young to witness and appreciate *makoto*". This sentiments was shared by Respondent P who said that "We need to start inviting the young to our *makoto* in order to catch them young. We need to inculcate an appreciation of our tradition in them".

On the perception "What might make it difficult to disseminate this information to the different groups e.g. children, adults, and the elderly?" the respondents mentioned four things namely the Christian church system, *Chirungu* (westernization) and its education system, lack of technology and government support. They argued that the Christian church system shaped attitudes and that it was failing to fully embrace the traditional culture. They blamed modern science for its failure to

approve of indigenous science systems. Respondent C said that “The young who are inheriting traditional leadership to do not give the seriousness our tradition deserves. The government should put in place legislature to protect rainmakers”. Respondent G posited that “Lack of technology and attitude that regards our tradition as old fashioned is the impediment”. Respondent I said that “The young traditional leaders who are supposed to be the custodians of tradition are now very greed. They have attitude problems. Some are full time Christians and view our tradition heathen. They ask for community contributions in cash instead of kind”. Respondent J said that “The young generation believe in working in the confines of the modern laws. There are no policies to support traditional practices”.

The follow up question “What is making it difficult to more effectively disseminate the knowledge?” had the following responses. Respondent A said that “Church people look down upon tradition, there is no law to support rainmakers which make them perform rituals in fear of being arrested”. Respondent B said that “We now have relatively young chiefs and rainmakers. Sometimes they do not understand the practices deeply. Furthermore the education system has instilled bad attitudes and bias towards traditional practices”. Respondents C, D, E, F and G agreed that the education system that did not fully include tradition in the curriculum. They also so blamed Christianity for being deep rooted in the young generations and the government’s reluctance to put clear policy which is enforceable to guard the rainmakers.

Respondent H further said that “Our children say we don’t listen to pagan. For example, the white men successfully took Chief Musikavanhu, Chief Mutema and Chief Mutambara’s sons and send them to overseas universities and on return they become reluctant to take over chieftainship”. Respondent I said that “It is unfortunate that children and youths have not been allowed to attend all along, but I feel we should start consider inviting them so that they carry the legacy with enough knowledge”. Respondents J said that “Lack of technology, community attitudes and the Christian churches that invaded or use our shrines as church places”. Participant K said that “*Chirungu* has destroyed everything including the thinking of the young”. Lastly respondent P gave a recommendation that “We have to resuscitate the traditional *matare* as well as using the school system and the media”.

6.7 Discussion

Indigenous knowledge is the society's base for communication and decision making for their development. It is knowledge that developed through their close and unique connection with the land and environment in which they live (Karthikeyan *et al*., 2007). Such type of knowledge needs to be shared and disseminated for the benefit of the society's posterity. In this study it was revealed that some indigenous knowledge particularly on rain making still existed. However from what the respondents said this knowledge is threatened with extinction. Three hierarchies existed in indigenous rain making. These were the *bira, makoto* and *zvitenguro*, though these were at times all referred to as *makoto*. Bira was the highest and was normally done at the chieftainship level (at the chief's shrine). This was followed by *makoto* at villages level (two up a number of villages) to appease the local spirits (*marombo enharaunda* or *magwasha enharaunda*) and lastly *zvitenguro* at family level (one village is regarded a family).

This knowledge was evidence that indigenous rain making still exist. However some elderly respondents said that in some areas distortions were common since some of those who led the ceremonies were young with little knowledge. Some were both Christian converts did not want to be seen practicing pagan in public. As a result they would do it in private. On this fact Claxton (2010) argued that some people associate anything indigenous with derogatory connotations right from the beginning European dominion in Africa. It is this cunning association which appear to influence attitudes, life styles and choices of development techniques, models, and strategies in Africa (Claxton, 2010).

It was revealed that dissemination of indigenous information on rain making was done mainly by community elders or traditional leadership, i.e. chief (*mambo*), village headman (*sabhuku*), their aides (*makurukota*) and some selected village elders. At the same time this was found to be ineffective due to lack of modern information communication technology such as the radio or televisions. Furthermore there were no information storage mechanisms in the locality. This was as a result of non-existence of local radio, TV stations and community libraries.

Haumba (2014) argues that the elderly bearers of knowledge were slowly dying with their knowledge without passing it to the next generation. Haumba (2014) puts it like "When an elder dies, a library is depleted". During the course of this study this this fact was proved by the passing on of two aging key informant. Their knowledge and wisdom is buried and greatly missed. This affirms the ineffectiveness of oral means in knowledge dissemination.

Abioye *et al.* (2011) notes that oral means of disseminating knowledge puts it at risk of extinction. Kothari (1995) postulates that oral paths are being blocked and that people are no longer stay in homogenous community blocks. Warren (1993) posits that disruption of information within one generation puts knowledge at risk of being lost forever. It was noted that there are now few elders in the community who have full knowledge yet one respondent said “The young do not care. They do not listen to us, they say we are old fashioned (*zvave zvenguva yenyu*) they spend time at school and are pre-occupied with their education”.

In order to improve the effectiveness of the oral path of knowledge dissemination, there was need to look back and re-consider the *dare/inkundhla/imbizo* concept. Marango (2011) notes that Afrocentricity is anchored on the principle of dare (singular tense) *matare* (plural tense). *Dare* provides a platform for checks and balances thereby allowing total participation by all members in arriving at consensus on a common issue. The dare concept exists in the family, community, business, and government, civic, social and global organizations in African settings. From history books the flaws with oral tradition are distortions and forgetting. The library of this type of knowledge are people.

Secondly there was need to consider the school curricular and modern information communication technology (ICT) to improve knowledge dissemination. Marango *et al*. (2016:119) argue that today the importance of investing in modern communication systems cannot be overemphasized in disseminating ideas and building social capital. It is important to incorporate ICTs in disseminating knowledge because today people’s attitudes are shaped by them. Naanyu (2013) ICTs have the potential to foster inclusiveness and participation in the design and implementation of adaptation processes through accessing relevant information & social networking.

There was a total absence of knowledge dissemination technology in Chimanimani District. This is despite the existence of elderly people who still have the right knowledge. In their study on indigenous knowledge and its role on sustainable agriculture in Samoa. Tikai & Kama (2010) argues that it is important to get people with knowledge about the past people who know in order to tap the right source for data to truly reflect indigenous knowledge in the community when documenting.

Abioye *et al.* (2011) argue that documentation can be done in the form of descriptive texts such as reports, inventories, maps, matrices and decision trees; audio-visuals such as photos, films, videos or audio cassettes as well as dramas, stories, songs, drawings, seasonal pattern charts

and daily calendars. This can then be stored in local libraries and museums. These were absent in Chimanimani.

Lwoga *et al*. (2010) observe that research libraries have not been particularly active in documenting indigenous knowledge. Nakata & Langton (2005) assert that libraries have to incorporate indigenous knowledge not simply part of history, but as contemporary body of active and useful knowledge.The informants revealed that influence of the church system, *Chirungu* (westernization) and the education system, lack of technology and lack of government support militated against effective dissemination of indigenous knowledge. Marango (2011) posits that western development models tend to disregard the social fabric of African societies. Western thinking tends to leave out the local people and their cultures when making decisions on development issues. This is particularly so in rural areas where most poor and disadvantaged people reside.

Haumba (2014) argues that lack of information on indigenous knowledge systems has resulted in its low acceptance. This has disoriented the local people to the extend they became ashamed of their own traditional practices. This has resulted for example in some people to despise traditional medicine during the day yet they secretly visit traditional healers at night (Haumba, 2014). Semenya (2013) notes that when a drought is severe, even the religious people also approach a chief for a mass prayer for rain in a village. The visits are done in private for fear of being associated with pagan practices. According to *sankofaism* there is nothing shameful about grazing back to the past that has sustained the community over time (Quan-Baffour, 2012).

In this study the elderly respondents blamed the young for neglecting their traditional practices whilst praising the former colonizers (white farmers) for respecting and supporting the rain making rituals. Interviews with the some Zimbabwean white farmers affirmed that the whites in the country never supported indigenous practices. If ever they pretended to support it was for ultra-motives. The whites took the serious and revered practices by Africans as entertainment and as security of their entrepreneurship. They did it with egocentric motives. It was for their capitalistic gain. The result like this demonstrate the need for phenomenological enquiry rather than making judgments by actions only. For the white farmers indigenous rainmaking was primitive and a form of intertainment. Plockey (2015:32) asserts that past colonial rulers, missionaries, and Eurocentric intellectuals have created the impression that African indigenous knowledge is inferior, primitive, heathen, barbaric and simply not worthy of preserving.

Based on this the young and the old Africans should critically look back to their traditional practices and revive it. No other people can genuinely support other people's tradition if the owners of the

tradition themselves do not revere it. Quan-Baffour (2011) argue that in order to achieve stability, peace, progress, educational, socio-economic and political development, Africans must have to revisit their indigenous thoughts, knowledge systems and practices and integrate them into their adopted western ways of life.

6.8 Conclusion

It is argued by scholars that systematic documentation of indigenous knowledge and its subsequently integration in seasonal rainfall forecasting is one of the promising initiatives that need to be explored (Chang'a *et al.,* 2010). In this chapter the flaws of oral means of disseminating indigenous knowledge particularly on rain making have been noted. Oral means are subject to distortions and threatened with extinction in the advent of Eurocentric dispensations. The only ray of hope lie in incorporation of indigenous rain making practices into the mainstream metrological systems. This is done through a recognition that the components of indigenous rain making practices have potential to combat the negative effects of climate change. In the next chapter the readers are put into picture of the how the communities in Chimanimani District are affected by climate change.

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CHAPTER: 7 NEGATIVE EFFECTS OF CLIMATE CHANGE ON THE LIVELIHOODS OF RURAL HOUSEHOLDS

Abstract

In this chapter negative effects of climate change are explored. The Chapter is a follow-up of issues that emerged in the first and preliminary study carried out in Chapter 4. Scholarly evidence reveal the pivotal role of greenhouse gas emissions as being fundamental both the world's energy system and to its food production. The same gases are implicated in bringing negative effects in climate. A good example in which greenhouse gases are emitted is thermal energy. Thermal energy is a result of breaking the chemical bonds the carbohydrates oil, coal, and natural gas as well as oxidizing the components to carbon dioxide and water. The result is climate variability which include global warming, shift in seasons, winds and occurrences such as cyclones, heat waves and floods. A descriptive design using a Likert scale was use as a data collection tool.

A sample size of 32 community people including rain makers, chiefs and other traditional leaders, men, women and youths of both sex was used in this study. These respondents conveniently selected to participate in the study. It was revealed in this study that climate change the current challenge in Chimanimani District which required multiple approaches to handle. The respondents argued that dissemination of indigenous knowledge of rain making methods that were being currently being used were not effective. Information was being passed on through oral means which was threatened with extinction. No one was in fact trying to embrace the use of modern technology and social media such as the radio, television, Whatsapp or Facebook. People lamented treatment of IKS as being mere history rather than active knowledge for use in daily lives by today's generation. One of these approaches being complementarity of indigenous rain making practices with the conventional ones.

Key Words: climate change, indigenous rain making, negative effects, greenhouse effect, conventional rain making

7.1 Introduction

This paper examines the negative effects of climate change in Chimanimani. From a global perspective climate change threatens food and water security, socio-economic and political stability of every nation (Brazier, 2015). Tol (2009) argues that climate change is the mother of all externalities. Climate change is therefore by and large more complex and uncertain than any other environmental problem of this day. Rural people are the most vulnerable group due to their heavy reliance on climate-sensitive resource, which are diminishing at an alarming rate. Rural people however, lack alternatives to adapt (Murambadoro, 2010; Busch, 2014). However, current debates on climate change are foreign in nature and are associated with modernisation, yet not compatible with local realities. Basing from the facts above it was proper to find out the local people's negative experiences with climate change in order to find local solutions to combat them.

Climate change is a reality the world over but the missing link in the effort to combat its negative effects is the disregard of local knowledge systems. Agrawal (1995) argues that indigenous knowledge has permitted its holders to exist in harmony with nature over time. This is as a result of the general disregard of Afrocentric bias in development in Africa. Quan-Baffour (2011) argue that colonialism and its concomitant introduction of western ideas, values, socio-economic and political institutions down played indigenous African thought, values and practices. This is despite the fact that indigenous people throughout the world have sustained their unique world views and associated knowledge systems for millennia (Barnhardt & Kawagley, 2005). Faced with these immense challenges there is need for Africans to go back to their roots and seek answers for climate change. In this quest to seek answers to life challenges, there is need not to divorce people from what they know. This then calls for the complementarity of Afrocentric and Eurocentric approaches to cater for diversity of life worlds.

7.2 Research Design

A descriptive design was employed in this study to verify the results of a study carried out in Chimanimani District of Zimbabwe (see Chapter 4). This enabled the researcher to probe the respondents further and deeper in order to get deeper understanding of indigenous rain making practices and its contribution to combating the negative effects of climate change. As alluded in Chapter 4 descriptive design was used because of its strengths. It enabled the researcher to describe and explain the issues using many subjects. Shuttleworth (2008) posits that a survey

research design is a very valuable tool for assessing opinions and trends. The descriptive design was an efficient way of gathering quantitative data (University of Oregon, 2015). The design also allowed the researcher to collect a large amount of data in a relatively short period of time, rendering it a less expensive data collection techniques than many other.

7.3 Population and Sampling Procedure

Rainmakers, chiefs, village headman, and community elders, adults and youths were the population for this study. A sample size of 32 respondents was involved in this quantitative study. These were predominantly adults and a few youths. As alluded in Chapter 4 the sample size for the initial study was relatively small due to the reasons mentioned. Convenient sampling was employed. Convenient sampling was used to select elderly community members, adults and youths. Convenient sampling was used in selecting other community members due to its relativity in cost.

7.4 Data Collection Methods and Tools

A Likert-type questionnaire was used to collect quantitative data. This was done through a one-on-one interview method. This entailed the interviewer asking questions face-to-face with the respondent (Kothari, 2004). This process however required proper planning of questions. Using a Likert questionnaires permitted a wide coverage of questions and respondents at a minimum cost both in terms of money and effort (Singh, 2006).

7.5 Data Analysis

In this design absolute and frequency data coding was done. The data was then entered into the computer using the Microsoft Excel software package, then The Chi-Square test for Goodness of Fit was conducted using Statistical Package for Social Sciences (SPSS) version 24.0 for windows (SPSS Inc: Chicago, IL, USA). Descriptive statistics and charts were used to present the results. The Chi-square was used to test for association between community people's characteristics (sex, age, educational level, marital status and duration of stay in the area) and their perceptions on the components of indigenous rain making.

The test is 2-sided (non-directional) and was conducted at 95% confidence level ($p<0.05$). Cramer's V is a chi-square based measure of association which was used to measure the strength of the association described by the Chi-square test. The measure is defined as:

$$V = \sqrt{\frac{\phi^2}{t}} = \sqrt{\frac{\chi^2}{nt}}$$

Source: (Cohen, 1988)

Where ***t*** represents the smaller of the number of rows minus one or the number of columns minus one. For example, if ***r*** is the number of rows, and ***c*** is the number of columns, then ***t*** = minimum ***(r − 1, c − 1).*** Cramer's V equals 0 when there is no relationship between the two variables, and has a maximum value of 1. A large value of Cramer's V indicates a strong relationship between the variables. Thus, 0.1=Small strength; 0.3=Medium strength and 0.5= Large strength. These standards were used by Fort Collins Science Centre, adopted from Cohen (1988).

7.6 Results

7.6.1 Demographic Information

Thirty four community members participated in the second stage of the study 62 % were males and the rest were females. Only three percent respondents were below the age of 20 years and six percent were between 20 and 35 years. Half the respondents (50 %) were between 36 and 50 years old. Of these participants, 21 % were between the ages 51 and 65. The rest (21 %) were above 65 years. In terms of educational attainment all the respondents had had some form of education. Twelve percent went up to primary school only, 24 % secondary, 50 % college and 15 % had university qualification. The majority of the respondents (71 %) were married, 21 % widowed, 6 % single and only 3 % divorced. Almost all the respondents (79 %) had stayed in the District for more than 10 years. A few (15 %) had stayed in the District for 6 – 10 years whilst only six percent had stayed in Chimanimani District for less than five years. Table 6.

7.6.2 Negative effects of climate change in Chimanimani District

This study revealed that almost all the respondents (91 %) agreed, only six percent disagreed, whilst three percent were not sure of the perception that “There is general increase of temperature in my area compared to the previous years”. Chi-square test results showed significant differences among the respondents basing on duration of stay (Chi-square = 19.089, df = 6p, $p < 0.001$). On the statement “There is a general shift in the seasons” once again almost all (96 %) agreed with only three percent disagreeing. Respondents in the initial study were asked the question “Is it true that climate change is really taking place? Why do you say so?” All the respondents agreed that climate change was taking place.

Their justification for this argument ranged from changes in tree behaviour, seasons, rainfall patterns and environmental changes to altered wind patterns. Respondent A said that local people used to predict rainy seasons using changes in tree features. For example, it was revealed that *Nyamavhuvhu* (wind season) now swept through the area in late September or October instead of end of July to August. Respondent C added that “We used to have *hukurambuwa* (rain that removed chaff after harvest) and various other types of rain but now it is a thing of the past”. According to respondent J, climate change referred to “Changes in what we saw and what we see now in weather patterns. For example, we used to predict seasons in terms of changes that took place in certain trees”. Respondent M added that rain was now very erratic and winds which ordinary people found difficult to understand had become prevalent. In addition to this, there was a lot of unpredictable flooding compared to yesteryears.

On the perception “There is now high risk in planting winter wheat due to changes in climate”, the majority (79 %) respondents said it was true, 12 % was neutral and 9 % rejected. There was significant differences basing on duration of stay (Chi-Square = 19.089, df = 6, $p < 0.001$).Of the participants 76 % agreed and 12 % were either unsure or disagreeing with the statement “Rivers are drying up in our area”. Based on educational attainment and duration of stay significant differences were observed (Chi-Square = 26.550, df = 12, $p < 0.001$) and (Chi-Square = 20.385, df = 6, $p < 0.001$) respectively.

Table 7.1 Demographic Information of Respondents

Age	**<20**	**21-35**	**36-50**	**51-65**	**>65**
	3 %	6 %	50 %	21 %	20 %
Marital Status	**Single**	**Married**	**Divorced**	**Widowed**	**Living Together**
	6 %	71 %	3	21	0 %
Highest Qualification	**Non Formal**	**Primary**	**Secondary**	**College**	**University**
	0 %	12 %	24 %	50 %	15 %
Duration of Stay	**-5 years**	**5-10 years**	**+10 years**		
	6 %	15 %	79 %		
Sex	**Male**	**Female**			
	62 %	38 %			

Table 7.2 Negative Effects of Climate Change on the Livelihoods of Rural Households

Statement	Pearson Chi-square (p)values					Perception Responses				
	sex	Age	Edu	MarS	DurS	SA	A	U	D	SD
There is general increase of temperature in my area compared to the previous years	0.433	0.435	0.769	0.984	***0.004	50	41	3	6	**0**
There is a general shift in the seasons	0.407	0.261	0.802	0.665	0.415	56	41	0	3	**0**
There is now high risk in planting winter wheat due to changes in climate	0.290	0.381	0.279	0.943	0.459	32	47	12	9	**0**
Rivers are drying up in our area	0.055	0.767	***0.009	0.615	***0.002	32	44	12	12	**0**
Wetlands are disappearing in our area	0.319	0.060	0.644	0.770	***0.008	38	38	9	15	**0**
Fish have shifted locations in local rivers	0.280	0.280	0.228	0.603	0.305	24	41	24	12	**0**
Animals have shifted location to other places	0.497	0.071	0.639	0.793	0.795	35	47	15	3	**0**
Certain species of animals, fish and plants are getting extinct	0.234	0.713	0.542	0.940	0.031	35	56	6	3	**0**
There is reduction in population of birds, animals and reptiles	0.523	0.473	0.554	0.363	0.147	32	56	9	3	**0**
There is general reduction in yields due to climate change	0.496	0.964	0.800	0.832	***0.004	38	53	3	3	**3**
There is increased malnutrition due to reduction in food production	0.349	0.160	0.586	0.370	0.758	29	47	3	21	**0**
We have experienced events such as heat waves and cyclones	0.442	***0.000	0.55	*0.035	0.869	32	62	3	3	**0**
We have experienced severe droughts in recent years	0.834	0.191	0.220	0.908	0.663	15	71	3	12	**0**
We have experienced storms in the recent past in that destroyed crops, vegetation and some homes	0.651	0.827	0.676	0.770	0.149	6	62	6	27	**0**
There has been shift in the behaviour of migratory birds such as the (*shuramurove*) stork and others	0.464	0.498	0.462	0.636	0.279	35	41	24	0	**0**
We now have fewer wild fruits compared to the past	0.725	0.419	0.953	0.863	0.335	53	44	0	3	**0**
We are experiencing scarcity of water for domestic animals and for household use	0.583	*0.030	0.534	0.99	0.132	44	38	3	15	**0**
There is increase in pests and plant diseases than before	0384	***0.006	0.301	0.365	0.109	41	41	9	9	0

Key: * = p < 0.05 ** = p < 0.01 *** = p < 0.001 ns = p > 0.05

Responses with respect to the negative effects of climate change in the initial study varied. They varied from food insecurity, drying up of streams and rivers, lack of water for domestic, agricultural and animal use. For example respondent Q said the following, “wells dry up, and there is siltation, flooding, shorter rainy season and long dry spells”. Respondent B pointed out that “food insecurity and streams are drying up”. For respondent C, the following was happening, “we now live in the era of boreholes. Yet, we still we do not have enough water. We compete for water at the boreholes”. The latter respondent also lamented that “some very important trees are dying. There is drought. This is causing food insecurity and water shortages. Sometimes there is too much rain causing floods over a very short period”.

Seventy six percent of the respondents said that it was true that “Wetlands are disappearing in our area” whilst only 15 % disagreed. Significant differences was noted on duration of stay (Chi-Square = 17.355, df = 6, $p < 0.001$). On the perception “Fish have shifted locations in local rivers”, more than half the respondents (65 %) agreed, 24 % were not decided and only 12 % disagreed. In the other study respondents were asked the question, “What are some of the negative effects of climate change on rivers?” The following responses came out. Respondents A, C, D, F, H, J, K, L M and N agreed that rivers had either dried or had very little water and that excessive soil erosion (*gukuravhu*) is leading to siltation.

Respondent B supported the others by adding that “Rivers have become more of gulleys, they are drying and siltation is common”. Respondent E also agreed with others by saying that “Rivers are necked. Some trees are uprooted by winds and worse people cut trees along the river”. Participant G said that “Flooding causes massive erosion, some people drown and die. Uprooted trees leave rivers necked and vulnerable to dry”. Respondent I said that “Farming in (*zviteetee*) wetlands or swamps has made water scarce as these places dry up”. Finally Respondent O said that “We no longer have wetlands and dams along the rivers”.

On the statement “Animals have shifted location to other places” the majority (82 %) of the participants agreed, only three percent disagreed while the others were undecided. Almost all the respondents (91 %) said it was true that “Certain species of animals, fish and plants are getting extinct” with only three percent disagreeing. The view that “There is reduction in population of birds, animals and reptiles” was agreed to by the majority respondents (88 %), with only 3 % disagreeing. The perception “There has been shift in the behaviour of migratory birds such as the (*shuramurove*) stork and others” got a 76 % agreement, 24 % indecision and no disagreement. On the statement “We now have fewer wild fruits compared to the past” almost all (97 %) agreed. And on the view that “We are experiencing scarcity of water for domestic animals and for

household use" 82 % agreed compared to 15 % who disagreed. Tests revealed significant differences on duration of stay (Chi-Square = 22.765, df = 12, $p < 0.05$).

In the preliminary study participants were asked "What are some of the negative effects of climate change on wild plants, animals and birds?" The participants gave the following views. Respondents A and Chad the view that plants are dying and some now extinct. Respondents B and E said that wild plants are drying and some are now extinct for example the medicinal muranga tree. Respondent D had the view that "Winds uproot trees". These three views were share by all the respondents.

Respondent A said that animals die, and malnutrition is not only common to people but animals too. Respondent B said that some animals and birds are getting fewer and fewer e.g. *mhembwe* and *zvigwi* (both being in the bushbuck family). Respondent E had the view that wild animals and birds die and some migrate. The new places they migrate to also expose them to danger. Respondent G said that "Their habitat is disturbed and some die or migrate". Respondent P summed up by saying that "Few animals and certain species of birds are left in national parks, but still some die due to failure to cope.

People also hunt to subsidize as a result of food scarcity". The view that "There is general reduction in yields due to climate change", was agreed to by almost all the respondents (91 %), 6 % were not sure and only 3 % rejected (Chi-Square = 22.352, df = 8, $p < 0.001$) basing on duration of stay. On the perception that "There is increased malnutrition due to reduction in food production", 76 % said yes compared to 21 % who disagreed. On the statement "There is increase in pests and plant diseases than before", 82 % were in agreement compared to 9 % who either rejected or were not sure of it. Basing on age there was high significant differences (Chi-Square =27.741, df = 12, $p < 0.001$). In the preliminary study the question "What are some of the negative effects of climate change on people's health, food and nutrition?" was asked, and the following answers were proffered.

Fig. 7.1: Top Left drying river; Top Right drying wetland; Bottom Left deforestation and Bottom Right Bee farming

Respondent A said that “Some diseases like typhoid, bilharzia are caused by foods and stagnant water in the once flowing but drying rivers” whilst Respondent B said that “New diseases are a result of certain plants and animals now extinct that we used to eat, which had medicinal properties”. This was also echoed by Respondent I. Respondent C had this to say “Diseases are now rampant. *Makoto* are not only about rain but health. At Makoto they pray *zvirwere ngazvipere* (let diseases vanish)” Respondent G said that “*Gukurahundi* (a type of rain) would take away diseases but now that type of rain is no more”.

Respondent P also said “When weather change the body get some shock and unknown diseases result”. The rest of the respondents share these sentiments. Respondents A, B, D, E, and F agreed that without water, crops do not grow well leading to hunger and malnutrition. Respondent C said that “Little rains, little food and many diseases that are food related”. This was affirmed by Respondent L. Respondent G was of the view that “Late planting reduces yields and result in hunger” whilst Respondents H and I saw food Scarcity as the result. Respondent J said that “Malnutrition due to lack of balanced diet that was offered by the environment” and this was supported by Respondent P who said that “Lack of enough food result in malnutrition because we Africans rely on agriculture for livelihood”. These sentiments were shared by the rest.

In this study it was revealed that almost all the respondents (94 %) agreed to the perception that “We have experienced events such as heat waves and cyclones” compared to 6 % who were either against or unsure. Basing on age a very high significant difference was noted (Chi-Square = 41.681, df = 12, $p < 0.001$). On the statement “We have experienced severe droughts in recent years” the majority (86 %) agreed whilst only 12 % disagreed. The perception “We have experienced storms in the recent past in that destroyed crops, vegetation and some homes” got 68 % nod, whilst 27 % disagreed.

In the primary study the perception “What are some of the negative effects of climate change on physical infrastructure? Got the following responses. Respondent A said that “Earthquakes make buildings to crack, too much rains wash away dams, damage high ways and bridges” whilst Respondent B said that “The February 2002 cyclone for example made Chimanimani impassable since roads were washed away, trees fell on telephone and electric lines and Tonhorai Bridge collapsed”. Respondent C said that “Earthquakes shake our buildings, they crack, some collapse and kill people and animals”. Respondents D and E said that “Floods affect our houses and schools” and “Schools and clinics get destroyed” respectively. These sentiments were shared by the rest of the respondents. Respondent K added that “Earthquakes and too much rains make building like our toilets, schools, roads and houses. The Eline Cyclone made Chimanimani impassable”.

7.7 Discussion

Reality of climate change is evident. Almost all the participated except a very small percentage agreed that there is general increase of temperature Chimanimani compared to the previous years. The small percentage of rejection is attributed to the duration of stay according to Chi-square post-hoc test. Leclerc *et al.* (2013) argue indigenous knowledge is acquired through direct experience. The word experience implies time. Maybe for those who had stayed in the District for less than five years did not have full knowledge of the previous years to compare with the present. Leclerc *et al.* (2013) argue that indigenous observations of seasonal change have the potential to fill gaps in climate data. However, this is based on one's knowledge of a place over time. And indeed climate change projection indicates increased climate variability over most part of the world (IPCC, 2007).The respondents said that they started to observe a general shift in seasons as way back as the 1950s.

The respondents noted changes in the behaviour of trees, seasons, rainfall patterns, the environment and wind patterns. For example Respondent B explained that "from around 1950 to the end of the 1960s there was a lot of rain and that streams that now look liked galleys were flowing. Different types of rain, namely *bumharutsva* (rain that made grass germinate early and trees to shoot soon after winter) and *gukurahundi/hukurambuwa* (implying rain that removed the remains or chaff of the harvest stored in granaries) were received." It was revealed that communities now see high risk in planting winter crops such as wheat due to changes in climate. There was also a general agreement that rivers were drying up in our area. However post-hoc test results once again indicated that there was some few who rejected that rivers were drying up due to their duration of stay. The drying up of rivers led to scarcity of water in most parts of the District resulting in people relying on boreholes. The participants revealed that animals and people competed for water at the wells and boreholes. Sarkar *et al*. (2015) argue that sharing of water sources increases likelihood of contamination of drinking water with animal excreta.

There was an agreement that as a result of drying rivers and prolonged drought the residents of Chimanimani District were experiencing scarcity of water for domestic animals and for household use. There was however a significant differences on age of respondents. This could be to the fact that some young respondents born after some of the great changes in climate change regarded it normal to queue for water at the boreholes and wells. Sarkar *et al.* (2015) however assert that mental stress arise as a result from water insecurity. Furthermore Sarkar *et al.* (2015) claim that chronic back and shoulder injuries due to carrying heavy water buckets every day often result in adverse health outcomes.

Bell *et al*. (2015) argues that climate change is a threat to public and community health as well as to human well-being in the 21st century. The respondents argued that moisture stress was causing changes in behaviour of trees that had in the past been associated with certain weather patterns. Some community elders said that they forecasted the onset of the rain season by use of trees such as the *musasa*. They said that some of these trees were being threatened with extinction due to human activities such as deforestation and moisture stress. For them this impacted on seasons that were now short and were associated with floods. This is as a result of disregarding indigenous traditions.

Machoko (2013) argues that the majority of Zimbabweans in their thinking and action encourage and promote western mind-sets in determining how the natural environment can be protected, treated and managed without respecting water spirits. This has led to some failures in livelihood coping strategies and environment conservation. Brazier (2015) notes the following negative effects of climate change:…..reduced annual rainfall and underground water recharge, shift in rain seasons which are characterised by frequent dry spells, heat waves, droughts, intense rains and floods, accelerated expansion of deserts, species extinction, reduced quality and quantity of domestic and commercial use water and an increase in ocean acidity.

It was revealed that wetlands were disappearing and that fish were shifting locations in local rivers. In this study it was also revealed that certain species of animals, fish and plants were getting extinct and that there was reduction in population of birds, animals and reptiles. Respondents noted a shift in the behaviour of migratory birds such as the (*shuramurove*) stork and that wild fruits were becoming scarce compared to the past. This is an indication of how devastating climate change was not only on humans but also on flora, fauna and aquatic life. Disappearance of wetlands have a great implication on the life of rivers thereby posing some water and food security threat on communities. Sarkar *et al*. (2015) argue that water insecurity puts the communities at the risk of multiple adverse health outcomes. For example, as people compete for water with both domestic and wild animals, they develop severely compromising personal hygiene and water intake. As local natural food stuffs become scarce, health hazard high sugar content beverages are the most common alternatives.

Accessible and affordable potable water becomes a challenge. As a result the role of indigenous knowledge in climate change adaptation cannot be overemphasized (Egeru, 2012). Weather is the most important factor determining the success or the failure of agricultural and that food production is inextricably linked with climate and weather (Shankar *et al.,* 2008). In this study respondents observed that there is general reduction in yields due to climate change and that there is increased malnutrition due to reduction in food production. The participants also noted an

increase in pests and plant diseases compared to the past years. The respondents also were in agreement that they had experienced events such as heat waves, cyclones, severe droughts and storms in the recent past in that destroyed crops, vegetation and some homes. Age and duration of stay in Chimanimani were factors for some noted significance differences to these perceptions.

These events affected people more due to lack of preparedness due to failure to predict the weather. It is argued that indigenous people had local technological knowledge of forecasting weather but this had been disrupted by westernized thinking brought about by colonialism and its education system. Chang'a *et al.* (2010) observed that farmers in the South-western Highland of Tanzania could predict rainfall using local environmental indicators and astronomical factors. This has made scholars such as Leclerc *et al.* (2013) and Marango *et al.* (2016) to propose for an integration of indigenous and scientific climate knowledge in studies focusing on climate change. Norton *et al.* (1998) calls for linkages between science and community action as the way to foster restoration and sustainable development of marginalized lands.

7.8 Conclusion

It has been observed that climate change has become a fact of life. However, climate change is not a good story since it threatens flora and fauna with extinction. It is therefore important for scholars and development planners to explore various avenues to combat the devastating impacts of climate change. Use of indigenous rain making practices among the Ndau people of Chimanimani is one strategy that some local people seem to agree to yield some positive result. In the next chapter the effectiveness of the existing coping strategies is explored. This was done in order to make concrete recommendations.

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CHAPTER: 8 EFFECTIVENESS OF THE EXISTING COPING STRATEGIES AND PROPOSED ADAPTATION STRATEGIES FOR UTILIZATION BY HOUSEHOLD TO COMBAT THE NEGATIVE EFFECTS OF CLIMATE CHANGE

Abstract

Climate change is having both direct and indirect impact on climate dependent activities like agriculture and on flora and fauna which heavily depend on it. Climate change has rippling socioeconomic consequences that are manifested in the form of poverty, conflict, health and education. On the other hand most of the existing strategies have been found to have short term effectiveness, with long term negative effects. A citizen jury was employed to collectively collect the community perceptions on the effectiveness of the current and existing strategies that are being practiced in Chimanimani District.

Community members proposed some strategies to combat the negative effects of climate change. In this study 22 community members consisting of a rainmaker, a chief and village heads and some other community adults were judgmentally and conveniently selected. An unstructured questionnaire was used to allow flexibility and to enable the researcher probe further on emerging themes. The data that was generated was analysed using the Cresswell's (2009) thematic content analysis technique. It was revealed that most of them were short term rather than long term ones. For example reliance on harvesting wild fruits for sell and hunting.

This was so because the forests were being depleted by the negative effects of climate change such as drought and human activities such as veld fires, deforestation and over harvesting of the same. The following strategies were proposed. Firstly it was suggested that communities should revert back to respecting their traditional belief of conserving forest since this will normalize climate, attract back the birds and animals that were used in weather forecasting. Replanting and stopping cutting trees along rivers as well as stopping stream bank cultivation were proposed. Community people suggested that heavy fines were to be imposed on those violating conservation measures.

Key Word: Climate dependent activities, effectiveness, coping strategies, climate variability, indigenous

8.1 Introduction

Climate change is increasingly attracting attention from the media, academics, politicians and development agencies. Rarely, its impact on minority and indigenous groups is being mentioned. The minority and indigenous groups are being relegated to the terraces of this development debate. This is despite the fact that they are believed to be among the worst affected (Baird, 2008). The term minority to refers to groups that are numerically small, and but sharing a common religious, ethnic or linguistic identity. Indigenous people refer to groups who have a special connection with the natural environment and often seen as the first people to inhabit a particular territory or descendants of a place (Baird, 2008). The Ndau people is one of the indigenous and minority groups in Zimbabwe found in the eastern and southern part of Manicaland.

In this paper the outcome of a citizen jury on effectiveness of the existing coping strategies that are being practiced in Chimanimani District to combat the negative effects of climate change is done. Proposed adaptation strategies for utilization households to improve livelihoods is done. This is against comparative studies that have revealed that most of the existing climate change adaption strategies that were being practiced were found to be effective in short term, but with long term negative effects. A comparative study in Zimbabwe by Chanza (2015) cited by Brazier (2015) in the drought prone District of Muzarabani has shown that complementarity of indigenous and conventional adaptive strategies through participation of local communities could be used effectively to combat the negative effects of climate change.

Shadrack (2011) in a study in Tanzania reviewed some coping strategies that were being practiced in the SADC region. Shadrack (2011) affirmed that some of coping strategies used were not very effective, in some cases were short term and in most cases worsened the situation. The IPCC (2007) notes that whilst the developing countries were trying to come to terms with the negative effects of climate change, adaptive capacity is in some cases were limited by inadequate human, financial, natural resources and low institutional technological capacity. This is regardless if the fact that agricultural and forest products accounted for a large percentage of the total energy and food use in Africa and in particular 90 % in Tanzania (Shadrack, 2011). However adaptive strategies to combat the effects of climate change remain limited. Brazier (2015) argues that indigenous knowledge systems in combating some effects of climate change were proving effective in Muzarabani District of Zimbabwe.

There is therefore need for an interface of local strategies with the science based ones if climate change is to be combated. Long & Long (1992) advocate for an actor oriented approaches in rural

development. For them these approaches are more compatible with local realities. Kaya (2016) posits that through people's culture social groups are able define whom they are, conform to their shared values and contribute to their society at large. It is against this backdrop that made the researcher to see it prudent for community people of Chimanimani to gather at a *dare* and propose strategies based on indigenous rain making practices to arrest the negative effects of climate change through an introspection of the existing adaption strategies.

8.2 Research Design

A citizen jury was employed to collect data about the existing adaption strategies and their effectiveness in combating the negative effects of climate change. This was done in order to propose sustainable strategies by themselves. This design was chosen in order for community people to conclude this study in a participatory mode. It also enabled the researcher to further have a feel of how the *dare* system operated. The design also broke the monotony within the formal top-down development strategies that in most cases failed.

Furthermore there has been an increased interest in the possibilities of drawing upon and making most of the potential that was inherent in indigenous knowledge in which communities are involved, in an attempt to produce more effective development strategies (Briggs & Sharp, 2004). A jury is a gathering of members of the public who listen to facts of a case in order to make decisions. In a community jury community members discuss, make proposals and recommendations for implementation.

Convening a citizens' jury however required a high level skills of facilitation, coordination, negotiation and conflict resolution. Witness testimony had to be carefully balanced to ensure all sides received fair treatment. Processes for reporting and responding to recommendations made by citizens were carefully planned before hand and agreed by all before convening the citizen jury. With this in mind the jurors were trained. Because of proper training the jurors managed to obtain informed community opinions through a transparent process. The process promoted a culture of citizenship and participation. It helped in identifying solutions to the negative effects of climate change and provides an opportunity to develop a deep understanding of issues. The process further provided an informed feedback (Government of Australia, 2015).

8.3 Population and Sampling Procedures

The target population was the rainmakers, chiefs, village heads, elders and all the adults in Chimanimani District. A sample size of 22 participants was judgmentally and conveniently selected. Judgmental sampling was used in selecting key informants like rainmaker, chief and village heads. Convenient sampling was used to select other community members.

The citizens' jury met for two days to carefully examine and propose strategies that could be drawn from indigenous rain making practices for utilization to counter the negative effects of climate change on their household livelihoods. The jurors listened to the community representatives and can probed the jury on information gathered from various studies in this research. These were deliberated together. On the final day of the hearings, the members of the jury presented their recommendations to the whole group.

8.4 Data Collection Tools and Techniques

An unstructured questionnaire was used in collecting data. An unstructured questionnaire is when there is no list of answer choices from which to choose. Respondents were simply asked to give their response to a question. The researcher facilitated the discussion with the help of research assistants who brought out clear insights on the topic entire studies that were carried out and then on this specific study. This enabled the jury to be clear of the whole research issues and to come up with the best proposals. The citizens' jury process was well suited to determining the multi-faceted complex issues in the study. The other strength of this was that it allowed the researcher get more insight into the respondents' thoughts and ideas about a subject.

The group of respondents was split into two groups for the purpose of ensuring full participation of all. Group leaders were chosen amongst themselves. The question was full explained to all the participants by the researcher. The two research assistants' role was to regulate the discussion but the community members were given the latitude to lead the process. The principal researcher moved around only to probe on areas that needed clarity. The question "What strategies are households using to cope with the negative effects of climate change? Do you think they are effective? Please explain" was asked.

8.5 Data Analysis

The Cresswell's (2009) thematic content analysis technique was employed. As alluded in the previous chapters, data was consolidated into subthemes on the ideas that emerged from the topic on the effectiveness of existing strategies used by households in Chimanimani District in coping with the negative effects of climate change. Data was collated per question in order to isolate related perceptions from the rest. The researcher then re-focus the analysis to a broader level of themes rather than codes and collate all the relevant coded data extracts within the identified themes. The data in subthemes were then put in tabular form and given working titles.

8.6 Results

8.6. 1 Demographic Information of the Respondents

Twenty two respondents participated in this study. Of these one was a rainmaker, one chief, four headman, nine village elders (above 65 years) and seven adults. Out of these nine were females. Eleven of the 22 respondents were more than 65 years old and the rest were adults above 40 years old. The majority (17 out of 22) were married, three widowed and one single. In terms of education, ten had not received any formal education, six had only attained primary schooling, and the rest had received O-level.

8.6.2 Current coping strategies and their level of effectiveness

On their responses the groups agreed to list the current coping strategies that were being practiced in the District. On the first day of the citizens' jury, the participants listed then discussed the advantages and disadvantages of the existing climate change adaptation strategies that were being practiced in their communities.

Table 8.1 Current coping strategies and their level of effectiveness

Current Strategy	Level of Effectiveness
Stream bank cultivation	This is worsening the situation. Siltation is high making streams and rivers to dry up.
Growing of drought resistance crops	Not very effective. *Mhunga, mapfunde ne mungoza hazvicharimwi maningi* (sorghum, millet and rapoko no longer grown much). Community members are resorting to planting maize even in very dry areas such as Wengezi and Changazi.
Control access to water	Pipes are put at sources of water and one takes monopoly over it. Cement is use at the sources of water. This is relatively effective but this alters the natural sources of water. Some water veins (*nyato dzemvura*) from the water table are blocked and water sources dry.
Hunting, fishing and wild fruits gathering	There are very few wild animals and some rivers no longer have any fish. Rivers and trees are drying up. People have destroyed forests. This renders it very ineffective.
Leaving land in fallow (*kuradza munda*)	There is completion for land. If you leave a space untouched *sabhuku kana mambo* (village head or chief) will take it and give to someone else without.
Crafts	Crafts like *magudza* (mats made from baobab fibre) have made the baobab tree threatened with extinction in the low veld of Chimanimani District.
Sale of livestock	The stock is depleted as cattle die of diseases and lack of drinking water. The unfavorable economic situation force us to sell cattle, goat and chicken at unsustainably low prices.
Arranged child marriages	This is now illegal and one is threatened with being jailed. It was said to common among some apostolic sects. It is now viewed a human rights violation.
Begging and stealing	Begging (*kupemha*) is viewed very old fashioned. People are shy so it is now done privately by approaching those one knows only. Stealing among the Ndau is dangerous since there are traditional practices that can deform a person. Furthermore it is associated with laziness.
Zunde ramambo	The current crop of traditional leaders are generally young. They are at times caught in between politics and corruption in distribution of food. It because ineffective since those who really deserve at times do not get it.
Humwe or *nhimbe*	Most community members have become very egocentric as a result of modern way of life. They feel working together enriches another person who would then be above them.

Table 8.2: Proposed Strategies for Utilization in Relationship to Indigenous Rainmaking

Theme	Tradition	Proposed Strategy
Weather forecasting	We used to forecast weather using the natural environment e.g. We forecasted early or late rains based on how early or late *misasa* tree shed and shoot new leaves. Secondly forest *gutukutu* bird only made its sound towards the beginning of the rain season. Many ants also meant a good year.	We should not cut down trees indiscriminately because tree behaviour helped us to predict the rains. Secondly we should maintain forests so that the *gutukutu* and other species of birds return. Thirdly we should ensure we do not disturb the natural ecosystem it helped us forecast how good or bad the rain season was going to be like.
Harmonizing nature and people	We believed *magwasha enharaunda* (local rainmaking spirits) and *njuzu* (mermaids) all these lived in thick forests and under big trees such as *mionde, michakata, misasa* and *mikute*. We did our rainmaking rituals as well as taking first crops from our fields to do thanks giving under these trees. Cement was not used on sources of water.	We should stop destroying the trees around us forthwith and start planting some indigenous trees. Trees mentioned are known for retaining water and raising the water table. We should stop stream bank cultivation and instead we should plant trees along the rivers and streams. None use of cement on water sources.
Agriculture enhancement	We believed that *nzuzu* were responsible for rains and safeguarding our sources of water. Therefore defecating or having sex in *zvitenguro* was a taboo. We practiced *humwe* (working together) and *zunde ramambo* (chief's granary)	Sources of water should remain sacred. Once we do not disturb them *nzuzu* will return and rivers will start flowing again and we can start irrigation schemes for all our farming needs. We should resort back to collective work and the chief's granary practice.
Balancing wild animal and human food needs	We did not believe in over-harvesting of wild fruits, game animals and fish. It was not allowed to harvest wild fruits for commercial purposes. We believed if you over-harvested fruits, the spirits of the forests will be angry and stop the rains.	We should stop over-harvesting wild fruits and animals because they supplement our food requirements. Secondly wild animals rely on the natural environment for their food requirements.
Impact of veld fires on the environment	We believed veld fires scared away *magwasha enharaunda* that were responsible for bring rain in our area as well as taking care of our health and general welfare.	Heavy fines should be revived by local traditional leaders on perpetrators of veld fires. Bee keeping projects and markets for honey should be sought so that communities guard their bee hive and stop starting fires. Honey has nutritional and medicinal properties.

Fig.8.1 Top: Veld fires caused by hunters missing the target. Bottom: Drying fish harvested using pieces of cloth and stream bank cultivation

On the second day they evaluated these existing strategies then decided the level of effectiveness each one was. Later they made proposals for sustainable strategies for use in order to combat the negative effects of climate change. Tables 8.1 and 8.2 presents the results of the citizens' jury.

8.7 Discussion

Communities being faced with some challenges that emanate from the negative effects of climate change have put in place some coping strategies. The use of exploratory approach made brought to attention issues that the researcher had overlooked. New themes emerged. These were analysed in addition to those that were found in a study by Shadrack (2011), which categorized the themes into only three. These categories were environmental, economic and social.

The environmental strategies included Stream bank cultivation, growing drought resistant crop, hunting and fishing, control access to water and pasture and mobility. The economic strategies were business, crafts, beer brewing, sale of livestock, store food (grain and tubers), and migration. Finally the social strategies were having extended family links (borrow food), pray to rainmakers, raiding, sharing, reduced meals, splitting herd, arranged marriage, begging and stealing. This study confirmed Shadrack's (2011) study.

From the results a theme harmonising nature and people was selected. The respondents noted that there was an unfriendly coexistence of people and the surrounding natural environment from which they depended on. Deforestation was on an unprecedented rise and stream bank cultivation had become a norm. Hunting, fishing and wild fruits gathering was said to be the one of the coping strategy. However it was said to be less effective since there were now very few wild animals. Over harvesting of through hunting and gathering. People were said to be using Pieces of cloths and sacks to harvest fish. This was said to be a short term relief since even very small were harvested. Overexploitation of local resources for subsistence use and marketing was also reported by Velempini & Perkins (2008). As a result rivers no longer had fish left in Chimanimani. Rivers and trees were drying up due to moisture stress. People were destroying forests and as a result most animal species and fish had migrated from Chimanimani.

A transact walk by the researcher confirmed what the respondents said that farming along streams and rivers was rampant. During their feedback discussions the respondents argued that this was worsening the already bad situation. They argued that long back farming in wetlands (*matoro*) was done for plants such as yams (*madhumbe*) and bananas. These plants did not require consistent weeding and as such were eco-friendly because siltation was minimal. However due to continuous droughts all sorts of plants for example maize was being planted

there. Maize required little water and as such the community people would do some water drainage mechanisms and constant weeding to ensure the land is always clear. In the process the wetlands were being destroyed. The respondents said that stream or river bank cultivation and destruction of wetland had some long term effects. An example was cited.

One respondent explained how Tanganda River in the neighbouring Chipinge District changed its course during the 2002 Cyclone Eline. He explained how a primary school called Samhutsa which had served the community for more than 50 years had a course translocation to a new course that was about 60 metres away from the school to barely 15 metres from a classroom. During the same cyclone a road was destroyed. New landforms were created. This was as a result of river bank and stream bank cultivation up the river and its tributary streams in Ngaoni down to Samhutsa. Even some maize fields that were far away from the river were affected. Some residents who knew the story said it also happened along Rusitu and Changazi rivers. Some homesteads along the rivers were affected too.

The above find support in Fontein's (2008) assertion that Cyclone Eline had devastating of effects of in Mozambique, Zimbabwe and South Africa in 2000. Fontein (2008) posits that in the recent years the floods stretched across West, Central and East Africa between July and October 2007. It is argued that the Southern African region was vulnerable to climatic variability and change. Climate change is at the core of the current water insecurity debates. In cases of this nature, the International Federation of Red Cross and Red Crescent Societies IFRC (2009) recommended for prioritizing adaptation efforts in communities where vulnerabilities are highest and where the need for safety and resilience is greatest. Urgent action in Chimanimani on wetlands was needed according to the respondents.

The citizens' jury proposed that as community members they wish to stop stream bank cultivation and instead we should plant trees along the rivers and streams. They also proposed going back to the tradition in which *zvitenguro* were sacred whereby people would not defecate or having sex in these places. They argued that "Once we do not disturb them *zvitenguro* which are the homes of *nzuzu* (mermaids) will return and rivers will start flowing again and we can start irrigation schemes for all our farming needs".

On harmonizing nature and people elders believed that *magwasha enharaunda* (local rainmaking spirits) and *njuzu* both lived in thick forests and under big trees such as *mionde, michakata, misasa* and *mihute*. Rain making rituals as well as taking first crops from the fields to do thanks giving under these trees was a custom. They proposed putting an end to destroying the trees and

wetlands forthwith and start planting some indigenous trees. Trees mentioned above are known for retaining water and raising the water table. Some trees were also know for treating some ailments. Morris (2010) in a study in Malawi argues that medicinal plants medicines play an important role in the social life of most rural Malawians, throughout Africa and indeed across the globe. Morris (2010) posits that a very close relationship exist between plants and medicines and many African cultures. Above all mammals, humans and animals have happily co-existed in Africa since time immemorial (Morris, 2006). For example insects play a positive role in Malawian culture and are a source of food. In this regard there is need for harmonizing the nature and people.

People had settled almost everywhere including some sacred places. Wild fruits were scarce to find for example *mazhanje, tsumbu, chakata* and *maembe* among others. The respondents said that the land reform was a noble idea but the problem was that it was not organized to the extent that people had settled everywhere. With the coming of the land reform new traditional leadership came into play and in most cases some of the leaders were fairly young with little knowledge about the local culture. Some community members were said to have gone into firewood business and some wild fruit trees were said to produce the best fire wood. The remaining fruit trees were overharvested.

The respondents put a theme agriculture enhancement. In this theme the community jury argued that people were now selfish to the extent that they had become too egocentric. They argued that this was manifested in the disregard of the *humwe* concept. In this people came together and work in one member of the community's field. This practice not only promoted social capital but it motivated even the lazy people to work together with others. In return even the lazy person's field was attended to by the whole community.

The *zunde ramambo* (chief's granary) concept in which people pooled some resources to help the need members of the community also promoted the spirit of familihood and food security. The chief's granary (*zunde ramambo*) and (*humwe/nhimbe*) were said to be traditional strategies used in coping with the negative effects of climate change in Chimanimani District. Brazier (2015) in a comparative study gives practical examples of coping strategies that were being practiced in Muzarabani. These include social safety nets such as *zunde ramambo* "the chief's granary" in which the community contributes grain and store to help the needy families during times of hardship. Community members also practiced *nhimbe/humwe* (collective work is done by community members) in addition to wild fruit harvesting, dry planting, stream bank or riverbank cultivation, conservation agriculture, planting drought resistant small grains, traditional food storage and food processing techniques. Brazier (2015) affirms that traditional flood-proof building

designs, temporary migration and dual-season cropping were being practiced. The citizens' jury proposed the revival of these practices though they had their own weaknesses but these were overweighed by the advantages.

The respondents said that some community members were planting drought resistant crops and short season varieties of food crops. Drought resistant crops like sorghum, millet, rapoko and some short season maize varieties. This was said to not very effective. *Mhunga, mapfunde ne mungoza/rukweza hazvicharimwi maningi* (sorghum, millet and rapoko no longer grown much). The respondents said that growing of maize regardless of the unsuitability of the area appeared fashionable. Community members are resorting to planting maize even in very dry areas such as Wengezi and Changazi. On the other hand while the government programmes of handing out farming inputs was plausible, they would just give any kind of seeds in any part of the District. This caused food insecurity.

For example short season maize seeds would be distributed in Rusitu where the rain season was relatively long resulting in depleted yields due to rotting of the maize due to prolonged rain. And vice versa long season seeds in drought prone areas. Plants would dry up before maturity. Hunter (2009) posits that all efforts to address climate change should seek to maximize opportunities and involvement arising from climate change that are driven and developed by Indigenous communities. This was also the recommendation forwarded by Aboriginal and Torres Strait Islander delegates on climate change to the 7th Session of the United Nations Permanent Forum on Indigenous Issues in New York in April 2008 (Hunter, 2009).

The respondents said that the other coping strategy was controlling access of water. This was meant for agricultural and domestic use as a result of widespread droughts which led to crop failures and caused serious threats to human and livestock growth (African Technology Policy Studies Network: ATPS, 2013). However the problem was that community members were putting pipes at sources of water and one takes monopoly over it. Cement was being used at the sources of water. The respondents said that cement was not good for water sources since it sealed water veins (*nyato dzemvura*) from the water table and the sources dry up. Community people proposed none use of cement on sources of water.

The other theme was weather forecasting. The respondents said that they used to forecast weather using the natural. They gave example of animals and plants that they used in forecasting changes of seasons. The group said that "We forecasted early or late rains based on how early or late *misasa* tree shed and shoot new leaves. Secondly forest *gutukutu* bird only made its sound

towards the beginning of the rain season. The frogs also crocked during certain seasons of the year. The respondents said that “Many ants also meant a good year”. They proposed that there was need to stop cutting down trees indiscriminately because tree behaviour helped them to predict the rains. Secondly they proposed guarding the forests, wetland, streams and rivers. The *gutukutu* and other bird species were now rare in Chimanimani. The community predicted weather using wind directions. However, today wind were associated with destruction because of deforestation.

Kaya (2016) goes on to cite the Batswana people of Southern Africa who could predict floods from the height of birds’ nests near rivers or using the behaviour of moth numbers to predict impending drought conditions. Brown (2004) affirms that the indigenous Batswana people predicted the onset of the rainy season by observing the position of the sun; and the cry of specific birds on trees near river. In a study in Tanzania, Kaya (2016) noted that in the flood prone Rufiji river valley area in Tanzania people build houses on stilts, so that the floodwater passes underneath the floor of the house.

The jury proposed not disturb the natural ecosystem since it helped them forecast how good or bad the rain season was going to be like. Kaya (2016) contends that holders and practitioners of indigenous knowledge know that the croak of a frog, movement of termites, or the leafing of certain trees all carry information about weather. Kaya (2016) argues that people in Southern Africa used indigenous knowledge in forecasting weather. This knowledge for centuries enabled people to cope with changes in the weather patterns and to design their disaster management strategies.

Folke (1998) explained that whether indigenous knowledge is or not complemented with science-based knowledge, local communities interpretations and explanations depended on the status and accessibility of science within a culture and on the influence of media. This implies that local people’s observations remain relevant. Kaya (2016) posits that the Wasambaa people in Tanzania, used their local knowledge of cloud colours to determine which the clouds carried hailstones in order for them to run for cover. Another example was that of the Wagogo people of central Tanzania who predict prolonged drought, storm and thunder during the first few rains. These predictions or warning system enabled people to prepare or expect a disaster.

The above theme was related to the theme balancing wild animal and human food needs. It was revealed in this study that in the yesteryears the elders did not believe in over-harvesting of wild fruits, game animals and fish. It was not also allowed to harvest wild fruits for commercial

purposes. Velempini & Perkins (2008) argued that over-harvesting of wild fruits and animals was also widespread in Namibia due to commercialization of these products and buyers were increasingly looking to Botswana's supply. The participants said that it was believed if people over-harvested fruits, the spirits of the forests would be angry and stop the rains. The jury proposed that communities should stop over-harvesting wild fruits and animals because they supplemented food requirements.

From the field studies the researcher noted that community people were destroying natural plants at an alarming rate, whilst no planting was being done. The respondents were asked therefore to suggest solutions to this anomaly. The respondents proposed planting more wild fruit trees. For example trees like *miroro, mizhanje, mionde, mikute* and others were now scarce. It was also noted that some wild animals rely on the natural environment for their food requirements. Thus the citizens' jury proposed co-existence of people, animals and plants. Plants are instrumental in the water cycle and production of oxygen. Some community members were said to resorting to making some crafts. For example like *magudza* (mats made from baobab fibre) were mentioned. However the respondents said that the baobab tree was under threatened of extinction in the western part of the District.

The group of participants postulated that veld fires had a negative impact on the environment, animals and the climate. The respondents said that the belief that veld fires scared away *magwasha enharaunda* (water spirits) and *njuzu* (mermaids) lived in the forests and were an important component of indigenous rain making. It was believed that these were responsible for bring rain as well as taking care of community people's health and general welfare. The jury proposed revival of heavy fines by local traditional leaders on perpetrators of veld fires. They also proposed bee keeping projects so that communities develop collective ownership of forests because as they guard their bee hives they ensure any fire is stop stopped. This would enhance indigenous rain making. On the other hand honey has nutritional and medicinal properties. Velempini & Perkins (2008) noted that game was now so scarce due to some veld fires such that almost no-one can earn a livelihood by hunting today. This reduced the economic status of one-time self-sufficient subsistence hunters to virtual beggary.

During field visits the researcher noted sale of chicken, rabbits and other domestic animals. It was worrisome that the prices were too low taking into consideration the economic situation in Zimbabwe. A full grown indigenous chicken sold for between $3 and $4 whilst broiler farmers sold broilers for $7. A goat could cost as low as $10. The sale of domestic animals was a result of climate change, community members were now resorting to selling of domestic animals.

However, they said that climate change also came with a lot of diseases. As a result the stock was depleted. Some animals would die due to lack of drinking water during the years of drought in the dry parts of the District. The unfavorable economic situation in the country was said to be forcing community members to sell cattle, goats and chicken at unreasonably low prices.

Mashanyare (2012) argues that livestock diseases have increased as a result of climate change making ethno-veterinary medicine relevant and useful adaptation strategy for livestock production. In order to boost improve livestock production, community representatives proposed proper management of natural pastures, through planting pasture grasses and some natural trees. This would enhance indigenous rain making because well maintained environments are a component of indigenous rain making.

8.8 Conclusion

In this chapter it was noted that sustainable adaptation coping strategies in the SADC region were almost the same with those proposed by the citizens' jury. The community people made proposals on issues that directly affected them. It was important community members made an introspection on their own negative practices and charted the way forward. It was important that the community members felt empowered by the process that was involved in a citizens' jury. In the next and last chapter the components and strategies utilized in indigenous rain making practices are synthesised.

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CHAPTER 9: SYNTHESIS OF FINDINGS OF THE STUDY

9.1 Introduction

Modernist thinkers believed that making the globe a village in which everything would be universal would make the world a better place to live. This way of thinking ignored the diversity and uniqueness of different communities. These differences are natural as dictated by not only geographical location but also aspects like socio-cultural, terrain and more so climatic conditions. On the other hand researchers, scholars and development agencies have tended to follow and be influenced by the same perceptions. This has influenced methodology and implementation of research and development programs. Taking into account of the unique identities of communities, development research should be influenced by anthropological and phenomenological approaches. This is so because one needs to get a deeper understanding and meaning of words and actions.

This study on indigenous rainmaking embraced these aspects. This made it possible for the researcher to get a better understanding and to come up with a framework with building blocks for integrated IRM-western science system for countering negative effects of climate change. It also made the researcher to come up with a proposed Strategy for Creating Awareness and Popularising IRM. Indigenous rainmaking is one approach that not only bring diversity in climate change debate but is one of the sustainable development approaches. Indigenous rainmaking is a sustainable solution to climate change.

Currently climate change is the biggest challenge which require harnessing the potential in various approaches in combating its negative effects. United Nations (2008) notes that climate change is capturing the attention of the international community in an unprecedented manner. Marango (2011, 2016) notes that failure to embrace Afrocentric and Eurocentric approaches together militated against rural development. In this chapter a synthesis of all the researches carried out in this thesis is given. The chapter starts with a detailed summary of the whole thesis in tabula form. The research problem of each objective, methodological features, major findings, their implications, conclusions and recommendations are given (see Table 9.1).

9.2 Justification of Research Methodology Used

Two designs were employed. These were the exploratory and survey designs. These were underpinned by anthropological and phenomenological approaches. Anthropologists believe in a

holistic approach to studying humans. Biological, cultural and all the social aspects are to be embraced in research involving people. According to Boston University (2017), argue that anthropologists insist that they see the lives of others through lenses of their own grinding and that the others look back on theirs through ones of their own. On the other hand researchers need to understand how people construct their social reality out of many phenomena comprising their experience (Foster & Harman, 1992). These social realities can be observed both objectively or subjectively in social interactions. Thus while the interactionist approach looks at the interactions objectively, phenomenology takes on the subjective aspect of the social interactions. It is these actual experiences and the meanings that people place on them in the course of their daily lives. And these are the raw data that researchers should record and analyse.

The reason for using more than one design and approach was to triangulate data collection, data processing and data analysis. This is supported by literature. In using these designs data was collected by more than one person. Three data collection tools were used namely the Likert scale, semi-structured questionnaire and a closed ended questionnaire. Three data collection tools were used and two data analysis methods were applied. The two designs allowed both qualitative and quantitative research to be applied in one study. In all this there was triangulation of methodology, data, research tools, techniques, sampling and researchers. Yeasmin & Rahman (2012) argue that triangulation is used to combine the advantages of both the qualitative and the quantitative approach.

Creswell (2013) affirms that mixing research methodology enable the researchers to collect, analyze, and integrate both quantitative and qualitative data in a single study or in a sustained long-term program of inquiry to address their research questions. Dawson (2002) further argues that triangulation enables counteraction of the weaknesses in both qualitative and quantitative research. Yeasmin & Rahman (2012) further assert that combining designs is a process of verification, thereby increasing validity as several viewpoints are incorporated in one study. Triangulation therefore, combines multiple observers, empirical materials, theories and methods. Intrinsic biases, problems associated with single methodology, single observer and single-theory studies are overcome by triangulation.

9.3 Major Issues Emerging from the Study

Basing on the available literature, there is little appreciation of indigenous or cultural practices for example indigenous rain making practices. This is regardless of the fact that these indigenous practices form an integral part of the rich African heritage defining the unique identities of these

communities (FAO, 2009). From the field study the researcher noted that community people were very serious about indigenous rain making. This was clear during the execution of this research. In fact the components of indigenous rain making are part and parcel of their everyday lives. These components for example ensuring good care of the environment ere not an event but a continuous process that ran in their blood.

It was revealed and became very clear that whilst the locals were trying to embrace the western approaches of indigenous rain making, their counterparts were not. For example, as alluded in the previous chapters some respondents were very candid to tell the researcher that studying anything along cultural lines was waste of time. The researcher had to do an extra mile in trying to see the veracity of the former white farmers' support of indigenous rain making in the form of material support which they provided. The white respondents were open enough to say that for them these ceremonies meant nothing to them but a form of entertainment as well as a way of ensuring that their farms were not sabotaged by the local people. Thus the outward actions did not speak their minds. This is why phenomenology require the deeper meaning of actions rather than what we just see. There are deeper meanings to every action.

It also emerged that the indigenous people had a misconception that the white farmers were appreciating the traditional cultural practices. With the revelation by former white farmers, it may confirm that scholars such as Plockey (2015) were right to attribute lack of appreciation of indigenous knowledge to missionaries and colonial masters. Machoko (2013) also affirms there is a disjuncture between those who believe in the effectiveness of traditional practices and those with conventional science based beliefs.

After a critical analysis of the components of indigenous rain making practices, it became clear that indigenous practices and beliefs do not really differ much from conventional science. The missing link was in the mindset of people. It is mere use of different language and actions for the same purpose. For example, one component of indigenous rain making is the belief that natural forests and sources of water need not to be disturbed. The belief was that this would disturb *nzuzu* and that the water spirits including *nzuzu* would disappear.

In conventional rain making they study the clouds that already have potential to bring rain. These clouds are produced through the general rainfall cycle. The rainfall cycle is only complete when the natural environment and water bodies are not disturbed through evaporation and transpiration processes. The missing link is an appreciation that without following the traditional beliefs of keeping water sources and forests sacred make the water cycle complete. A closer look then implies that the two world views complement each other.

Table 9.1: Summary of synthesis of PhD Thesis Research

Objective	Research problem	Research Methodology	Major Findings	Implications	Contribution to Knowledge
1. To analyze the general community perception of the potential of indigenous rainmaking (IRM) practices in combating the negative effects of climate change	Indigenous rainmaking looked down upon, with western science-based practitioners viewed in more positive light	**Design:** Exploratory **Population:** Adults, mainly ≥ 70 years old **Sampling method & size:** Judgmental, 18 key informants **Data collection:** Semi-structured interview guide administered face to face **Data analysis:** Thematic Content Analysis	Ndau community members: (a) know what climate change is; (b) believe IRM can counter the negative effects of climate change and can articulate the science behind it in simple terms	Can IRM practices be used more to combat negative effects of climate change on people's livelihoods?	**1. Framework with building blocks for integrated IRM-western science system for countering negative effects of climate change** **2. Proposed Strategy for Creating Awareness and Popularising IRM** a) Interface workshops and seminars linking IRM practitioners and western science trained experts (underpinned by anthropological approaches) b) Streamlined communication to get deeper meanings of people's attitudes and actions (phenomenological approach) c) Curriculum Review, incorporating 'Community Professors' (indigenous rain makers) as guest lecturers, workshop facilitaors or anchors in education system starting from ECD to PhD d) Revamping and reconfiguring *matare* taking into account modern communication technologies and practices e) Strategic placement of scholars or students with 'Community Professors' when conducting IRM studies f) Collaborative research
2. To examine components of IRM practices	Components of IRM practices not well understood. Thus, IRM never considered in search for solutions to negative effects of climate change	**Design:** Survey **Population:** Adults **Sampling method & size:** 34 adults conveniently selected to confirm results of study 1 **Data collection:** Questionnaire with closed-ended questions requiring responses on Likert-type scale administered face to face **Data analysis:** Chi-Square test for Goodness of Fit	Components of IRM unpacked a) Forests as habitats for *njuzu* and local rain spirits b) Water bodies e.g. rivers and wetlands c) Rain makers d) Traditional authority	Better understanding of IRM	
3. To analyse the means of disseminating knowledge on IRM	How knowledge on IRM is disseminated is not clear, which necessitates documenting, sharing and archiving it	**Design:** Exploratory **Population:** Elders in community and members of royal families **Sampling & size:** Snowball, 16 respondents, data saturation as guide **Data collection:** Semi-structured interview guide applied face to face **Data analysis** Thematic Content Analysis	Limited literature available on IRM is mainly anthropological and old. Traditional information and knowledge sharing platforms e.g. *matare* almost non-existing now yet modern communication platforms e.g. internet and social media - Facebook and WhatsApp never incorporate this	IRM classified as merely part of history yet it is needed now to help combat negative effects of climate change	
4. To identify the negative effects of climate change on livelihoods	Non-existent literature on what indigenous rain makers perceive to be negative effects of climate change and what their role is in combating them	Refer to objective 2.	Reduced yields, especially of staple food crops; Increase in pest and disease incidences; Water bodies drying up; Wetlands disappearing	Climate change threatens water, food and nutrition security	

The other issue emerging from the study is that there is more talking in academic and development related conferences and platforms, but in reality there is less on the implementation side. This is noted in (Marango *et al*., 2016) presentation at the 2nd UNIVEN-WSU International Research Conference. It is also affirmed by Owiny *et al*. (2014) who argues that preserving, managing and sharing IK is crucial for social and economic development. In this research it came out that little literature on indigenous rain making is available. Much of the literature is only on indigenous knowledge systems in general but not on practical issues.

Many indigenous technologies for example were available, for example on making lighting but this is not recorded. Worse still those with this knowledge are dying. For example two elderly key informants who were both over 80 years old died before the conclusion of the study. Another example is that given by Ajani *et al.* (2013) who note that local farmers in this region had developed and implemented extensive adaptation strategies which were enabling them reduce vulnerability to climate variability and change over the years using indigenous knowledge systems.

Last but not least, based on available literature the existing strategies being utilized to combat the negative effects of climate change are almost common across the SADC region (Brazier, 2015; Chanza, 2015; Shadrack, 2011). These strategies are have short term effectiveness and the same are implicated in making the situation worse. For example deforestation with the aim of solving the land issue, stream and river bank cultivation. These make the situation more devastating in the event of natural disasters such as cyclones. It is important to critically look and build on the existing indigenous knowledge of indigenous rain making. The International Fund for Agricultural Development: IFAD (2016) posits that:

> Indigenous peoples are also the world's "advance guard" of climate change. While they are generally depicted as victims of poverty and vulnerability to climate change, it would also be appropriate to emphasize their sensitivity to the environment, adaptive capacity and resilience, as manifested by their ability to modify their behaviour in response to changing climatic conditions. Indigenous peoples' knowledge can provide important insights into the processes of observation, adaptation and mitigation of climate change consequences (IFAD, 2016:5).

9.3 Contribution of the Study to Body of Knowledge on Rural Development

This study came up with a framework with building blocks for integrated IRM-western science system for countering negative effects of climate change, as well as a proposed Strategy for Creating Awareness and Popularising IRM. These strategies will be implemented through:

a) Interface workshops and seminars linking IRM practitioners and western science trained experts (underpinned by anthropological approaches)
b) Streamlined communication to get deeper meanings of people's attitudes and actions (phenomenological approach)
c) Curriculum Review, incorporating 'Community Professors' (indigenous rain makers) as guest lecturers, workshop facilitators or anchors in education system starting from ECD to PhD
d) Revamping and reconfiguring *matare* taking into account modern communication technologies and practices
e) Strategic placement of scholars or students with 'Community Professors' when conducting IRM studies
f) Collaborative research of scholars, development practitioners and community Professors.

9.4 Recommendations

It is recommended that researchers embrace various approaches in doing human or community research. This includes a re-look at the traditional *matare* approach to break the monotony and weaknesses of the top-down approaches.

9.4.1 Recommendations for policy

a) Policy makers are recommended to embrace the framework that came out of this study in dealing with climate change.
b) It is recommended that policy planners put in place a clear legislature to protect those who practice traditional practices for example rain makers.
c) Indigenous knowledge and practices such as indigenous rain making should be incorporated into conventional weather forecasting and the school curricular. Indigenous knowledge should not be treated as mere history but as active and useful knowledge.

9.4.2 Recommendation for development practice

a) Rural development planning should involve the affected people, because this has potential to yield sustainable results due to its people-centredness. Communities are concerned and they understand the development challenges they face, but they feel disempowered to make decisions on how to address them.

b) Development planners and funders should consider the long-term consequences of the climate change mitigation policies they decide and allocation of their research and development funding.

9.4.3 Recommendation for further research

Further research on indigenous knowledge specifically indigenous rain making on a larger geographical area in a rural setting would enable policy planners and scholars to make a more generalized conclusion on this subject in rural Zimbabwe. From this study in one district, it is clear that there is need for macroscopic rather than the microscopic approach to social capital. This is so because this study has focused on real problem that most researchers and most external community development practitioners mostly overlooked. Further research is required on:

a) What steps African governments are taking in making indigenous rainmaking coexist with conventional weather forecasting?

b) How effective are indigenous technological knowledge systems?

c) How much indigenous wild foods in the Chimanimani district documented and characterised for the benefit of our posterity?

d) Which policies have been designed that focus on promoting the indigenous strategies for combating the vagaries of climate variability and change?

9.5 Conclusions

It is clear that local people are concerned about climate change. They have very useful adaption strategies for combating the negative effects of climate change. However, the platform for the indigenous people to contribute to this world debate is limited. Generally the term “indigenous” is still associated with serious connotations. It needs to be demystified. One white respondent told

the researcher that, “Timothy you are wasting time on studying about these pagan indigenous rain making practices”. However, after a discussion the respondent then said, “Oh! Timothy but you are right. I didn’t see any link of your study with science”. Indigenous people are greatly concerned and affected by climate variability and change. Therefore their contributions in this global debate may play a big role in charting the way forward in mitigation and adaptation strategies. There is truly potential for combating the negative effects of climate change in harnessing indigenous rainmaking practices as a sustainable adaptation strategy.

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APPENDIX 1: LETTER OF CONSENT

Introduction

My name is Timothy Marango. I am a student at the University of Venda in South Africa where I am studying towards a PhD in Rural Development degree. A central requirement of the degree is that I must carry out a study focusing on a rural development issue. I chose to focus on finding answers to how best to connect western science and indigenous practices of rainmaking as way of combating the negative effects of climate change, especially on food and water insecurity. I am concerned because I believe for far too long it seems not much attention has been focused on how the two knowledge systems can complement each other for the good of humanity. By signing this form, you will be agreeing to participate in this study.

Consent Form

I……Identity number……acknowledge that I am fully informed of the purpose of a study on the topic: **Potential Strategies for Harnessing Indigenous Rainmaking Practices to Combat Negative Effects of Climate Change in a Rural District of Zimbabwe.** I acknowledge that everything pertaining research ethical issues has been fully explained to me. I acknowledge that I am participating freely without any form of incentive or being coerced to after this has been explained to me. I further agree that the information can published using pseudonyms.

Signed……..... Date…….....

APPENDIX 2: ETHICAL CLEARANCE CERTIFICATE

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Mr T Marango

Student No:
11582404

PROJECT TITLE: **Potential strategies for harnessing indigenous rainmaking practices to combat negative effects of climate change in a rural district of Zimbabwe.**

PROJECT NO: SARDF/17/IRD/03/2802

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Prof J Francis	University of Venda	Supervisor
Dr P Matshidze	University of Venda	Co-Supervisor
Mr T Marango	University of Venda	Investigator – Student

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE

Date Considered: February 2017
Decision by Ethical Clearance Committee Granted
Signature of Chairperson of the Committee: .....
Name of the Chairperson of the Committee: Prof. G.E. Ekosse

University of Venda
PRIVATE BAG X5050, THOHOYANDOU, 0950, LIMPOPO PROVINCE, SOUTH AFRICA
TELEPHONE (015) 962 8504/8313 FAX (015) 962 9080
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APPENDIX 2: DATA COLLECTION TOOL FOR OBJECTIVE 1

Insights into the potential of indigenous rain making practices in combating the negative effects of climate change in Chimanimani District of Zimbabwe

SECTION A: DEMOGRAPHIC INFORMATION

Designation (e.g. rainmaker or elderly person)…….

Gender…….Age……Marital……status……Employment……..

Number of members in family……..Highest level of education……

SECTION B: INSIGHTS INTO THE POTENTIAL OF INDIGENOUS RAIN MAKING PRACTICES

1. Based on your own experience and knowledge of this area (where you live),
    a. What is climate change? B) Is it true that climate change is really taking place?
    b. Why do you say so?
2. What are the negative effects of climate change (especially with respect to water and food)?
3. Do you believe that indigenous rainmaking can effectively counter the negative effects of climate change?
4. Let us talk more deeply about indigenous rainmaking.
    a. In the past, what did you use to do when too much rainfall was received?
    b. In the past, what did you use to do when you received too little rainfall?
    c. If the practices you cited in (a) and (b) worked, why were they abandoned?
    d. What do you suggest should be done now for indigenous and western knowledge of rainmaking to complement each other more effectively in order to counter the negative effects of climate change?

e. Do you believe indigenous and western knowledge of rainmaking can complement each other? If yes or no explain the reasons.

APPENDIX 2: DATA COLLECTION TOOL FOR OBJECTIVE 2

Components of indigenous rain making practices in Chimanimani District

This information is confidential. The names and contact information of respondents shall not be divulged for any other purpose other than academic.

SECTION A PERSONAL DETAILS (Put X where applicable)

1. Sex

M		F	

2. Age Group

Below 20		20 – 35		36 – 50		51 – 65		Above 65	

3. Highest Qualification

None Formal		Primary		Secondary		High School		College		University	

4. Marital Status

Single		Married		Divorced		Widowed		Not married, but living together	

5. Duration of stay

Less than 5yrs		6 – 10 years		More than 10yrs	

SECTION B: NEGATIVE EFFECTS OF CLIMATE CHANGE

What is your response to the statements below?

Statement	SA	A	U	D	SD
1. I believe christian prayers are part of indigenous way of rainmaking					
2. Besides makoto and christian prayers there are other common rainmaking practices practiced in Chimanimani District					
3. I believe in the effectiveness of indigenous rain making (*makoto*)					
4. I have witnessed an indigenous rain making					
5. I agree that only homemade beer (*mabota*) is used in indigenous rain making					
6. Any beer can be used in indigenous rain making					
7. I believe *zvitenguro* places for local rain making rituals should be kept scared in order to have enough rain					
8. Some trees like the fig tree (*muonde*), *mukute* and other very big trees should not be destroyed in order for indigenous rain making to be effective					
9. I believe that there are no scared forests for rain making purposes					
10. Brewing of beer and other rain making preparations can be done by any woman regardless of age					
11. Snuff is one component of indigenous rain making					
12. A sacrificial animals such as a cow/bull or a cock is a component of indigenous rain making practice					
13. I believe indigenous and western knowledge of rainmaking can complement each other					

Thank you very much for sparing your time to participate in this study.

APPENDIX 3: DATA COLLECTION TOOL FOR OBJECTIVE 3

NEGATIVE EFFECTS OF CLIMATE CHANGE ON THE LIVELIHOODS OF RURAL HOUSEHOLDS

This information is confidential. The names and contact information of respondents shall not be divulged for any other purpose other than academic.

SECTION A PERSONAL DETAILS

(Put X where applicable)

1. Sex

M		F	

2. Age Group

Below 20		20 – 35		36 – 50		51 – 65		Above 65	

3. Highest Qualification

None Formal		Primary		Secondary		High School		College		University	

4. Marital Status

Single		Married		Divorced		Widowed		Not married, but living together	

5. Duration of stay

Less than 5yrs		6 – 10 yrs		More than 10yrs	

SECTION B: NEGATIVE EFFECTS OF CLIMATE CHANGE

What is your response to the statements below?

Key: SD = Strongly Agree; A = Agree; U = Undecided; D = Disagree; SD = Strongly Disagree

Statement	SA	A	U	D	SD
14. There is general increase of temperature in my area compared to the previous years					
15. There is a general shift in the rain or planting season and others					
16. There is now high risk in planting winter wheat due to changes in climate					
17. Rivers are drying up in our area					
18. Wetlands are disappearing in our area					
19. Fish have shifted locations in local rivers					
20. Animals have shifted location to other places					
21. Certain species of animals, fish and plants are getting extinct					
22. There is reduction in population of birds, animals and reptiles					
23. There is general reduction in agricultural yield due to climate change					
24. There is increased malnutrition due to reduction in food production					
25. We have experienced extreme events such as heat waves and cyclones					
26. We have experienced severe droughts in recent years					
27. We have experienced storms in the recent past in our area that destroyed crops, vegetation and some human settlements					
28. There has been shift in the behaviour of migratory birds e.g. the (shuramurove) the stork					
29. We now have fewer wild fruits compared to the past					
30. We are experiencing scarcity of water for domestic animals and for household use					
31. There is increase in pests and plant diseases than before					

Thank you very much for sparing your time to participate in this study.

APPENDIX 3: DATA COLLECTION TOOL FOR OBJECTIVE 4

Section A: Demographic Information

Designation (e.g. rainmaker, community member)……

Gender Age Marital status Employment

Number of members in family Highest level of education

Section B Dissemination of Knowledge on Indigenous Rainmaking Practices to Combat Negative Effects of Climate Change

1. What are the major indigenous rain making practices you are aware of?
2. Taking into account each of the following categories (local community members, indigenous rain makers and western science researchers).
   a) What evidence exists to suggest that indigenous rain making practices are known?
   b) How is the knowledge being disseminated?
   c) Who is disseminating the knowledge?
   d) Do you believe that the means of disseminating the knowledge are effective? Why?
   e) What available technologies can be used to improve dissemination of indigenous rain making?
   f) What else needs to be done to make the dissemination even more effective?
   g) What might make it difficult to disseminate this information to the different groups e.g. children, adults, and the elderly
   h) What is making it difficult to more effectively disseminate the knowledge?
3. Briefly, what does “climate change” mean to you?

4. What are some of the observed negative effects of climate change taking place over the years in the area on the people's, health, food and nutrition, physical infrastructure, wild plants, wild animals & birds, and rivers among others that you have observed taking place over the years in this area?
5. In what way can indigenous rain making be used to counter/fight/eliminate the negative effects of climate change that you identified in question 4?
6. How can indigenous and western science rain making be harnessed together to counter/fight/eliminate the negative effects of climate change identified in question 4?

Thank you very much for sparing your time to participate in this study.

APPENDIX 5: DATA COLLECTION TOOL FOR OBJECTIVE 5 and 6

Objective 5: Effectiveness of existing strategies used by households to cope with the negative effects of climate change

This information is confidential. The names and contact information of respondents shall not be divulged for any other purpose other than academic.

Put X in the appropriate box

Chief or Rainmaker	Group of **Headmen,** **Community Elders,** **Adults, Youth**

1. What strategies are households using to cope with the negative effects of climate change?
2. Do you think they are effective?
   a) Please explain
3. Kindly suggest strategies that households can use in order to cope with the negative effects of climate change.

Objective 5: Proposal of strategies for utilized in relationship to indigenous rainmaking practices to counter the negative effects of climate change

Chief or Rainmaker	**Headmen,** **Community Elders,** **Adults, Youth**

1. May you propose strategies that can be utilized in relationship to indigenous rainmaking practices to counter the negative effects of climate change on the livelihoods of rural households

APPENDIX 6: The Published Paper on Indigenous Rain Making Practices: Effects on Climate Change in Chimanimani District of Zimbabwe