



SCHOOL OF GEOGRAPHY, ARCHAEOLOGY AND ENVIRONMENTAL STUDIES

Exploring the impacts of climate variability on urban food security in female headed households
in KwaZulu-Natal, A study of Durban South Africa

By

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DECLARATION

I hereby declare that, this dissertation is my own unaided work. It is submitted in fulfilment of the requirement for an MSc degree in the department of Geography, Archaeology and Environmental Studies at the University of the Witwatersrand and has not been submitted to any other University, for any degree.

Penelope Mkhondo

March 2017

DEDICATION

To my grandmother Sarona Leshaba, your strength and indomitable spirit to live for all of us has kept me going through this process. To my late aunt '*Elinah Matawana Leshaba*', for the last 10 years not a single day has gone by without me thinking about you and feeling your presence, I miss you so much and I deeply wish you were still alive to celebrate this accomplishment with me. To my parents Ezekiel and Millicent Mkhondo, the best parents in the whole world for holding my hand and believing in me!

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‘For I know the plans I have for you,’ declares the LORD, “plans to prosper you and not to harm you, plans to give you hope and a future: Jeremiah 29:11. I thank the Lord for his perfect Plan with this MSc degree.

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“I am, because we are. ”

ABSTRACT

There is substantial evidence to show that the climate has been changing on various scales across the world. The change in climate conditions has had negative impacts for developing countries, particularly poorer communities who use climate-sensitive resources such as urban agriculture which is prone to extreme weather. It is evident that urban agriculture has become a major source of income for a lot of people and its contribution to household food security is significant and in many instances it is increasing. The MSc study investigated the implications of climate variability and change on food production focusing on urban agriculture. It was also of key interest to explore the different adaptive approaches that FHH employ in reducing the impacts thereof. The approach informing the study combined two approaches; firstly, the 'bottom-up' participatory research undertaken in three communities namely Inanda, Ntuzuma and Kwamashu; secondly, a rapid appraisal of policies, programs and institutions. The results were then triangulated using a micro-action planning workshop and a consultation process. A total of 84 small scale farmers who are actively involved in subsistence farming participated in the research study. From the empirical findings it is evident that climate change has manifested itself in floods and droughts and has been ranked extremely prevalent and frequent by 75% and 86% of the overall responses from the three study sites. The combination of these two extreme events has had negative impacts on food production and food accessibility. However, it has been found that FHH use asset based adaptation to modify and adjust their livelihoods as a way of coping with established threats. The eThekweni municipality has developed the Municipal Climate Change Protection Programme (eTMCCPP) with the purpose to mainstream climate change adaptation in the general city planning and development framework as well as to harmonize local urban responses to climate variability. However, only 48% of the participants have received any form of assistance and support from the Municipality. More needs to be done to help build capacity at household level and improve livelihoods of the local community particularly of Female headed households.

Keywords: *Climate change and climate variability, Food Security, Female Headed Households, Climate Change Adaptation.*

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ABBREVIATIONS AND ACRONYMS

ABM	Area Based Management
AFSUN	African Food Security Urban Network
AU	African Union
CBD	Commercial Business District
CBO	Community Based Organization
CC	Climate Change
DAC	Durban Adaptation Charter
DAFF	Department of Agriculture, Forestry and Fisheries
DAC	Durban Adaptation Charter
ETMCCPP	EThekwin Municipality Climate Change Protection Programme
ETMCCP	EThekwin Municipality Climate Protection Programme
FAO	Food and Agricultural Organization
FS	Food Security
FHH	Female Headed Households
HCCAS	Headline Climate Change Adaptation Strategy
INK	Inanda, KwaMashu and Ntuzuma
IPCC	Inter- Governmental Panel on Climate Change
MCCPP	Municipal Climate Change Protection Programme
NGO	Non-Governmental Organization
NPO	Non-Profit Organization
NRF	National Research Foundation
PCCAA	Participatory Climate Change Adaptation Appraisal

RRIA	Rapid Risk Institutional Appraisal
SAWS	South African Weather Services
UNFCCC	United Nations Framework Convention on Climate Change
URN	Urban Renewal Node
URP	Urban Renewal Programme
WEC	Wits Ethics Committee
WEN:	World Environmental Network
WFO	World Food Organization
WMO	World Meteorological Organization

CHAPTER ONE

FRAMES OF REFERENCES

1.1 Background to study

Poverty, in its multi-dimensionality, has proved to be one of the most difficult challenges that many communities in Sub-Saharan Africa are facing and need to address. The challenge to address urban poverty has been compounded by climate variability and change which is increasingly making the poor, particularly women, more vulnerable by eroding the various asset portfolios that they own and utilize to obtain sustainable livelihoods, food security and procure other services such as education and healthcare (Eriksen et al., 2007). Women and female-headed households bear the brunt of climate change impacts and these are projected to intensify, while their resilience and adaptive capacity are expected to reduce. FHH are more affected because of their widespread entrenched gender inequalities which encompass and are not limited to different social rights, limited access to resources such as land, limited knowledge and because it takes them much longer time to adapt to the impacts of climate change (Nelson, 2011).

This is demonstrated by evidence based on data over the last 40 years, showing a drastic growth in the numbers within cities and towns who have fallen victim to extreme and more frequent weather events where the poorest communities have been unable to cope with shocks associated with climate change (Eriksen et al., 2007; Nelson. 2011; Ziervogel et al., 2014).

Among many social economic and environmental shocks, it has been long recognized that climate change has and will continue to have an impact on household food security. The impacts of climate change in the manifestation of droughts, floods and intense tropical cyclones among many other impacts will place immense pressure on agricultural production consequently on food security influencing a shift in preferred diet, placing immense pressure on prices of food, placing stress on water resources, and potentially slowing down or even depriving the worlds' success towards a hunger-free space (Moser and Satterthwarte, 2008; Simatele and Simatele, 2015; Di Falco et al, 2011; Wheeler and Von Braun, 2013). Climate change will have severe

effects on the global food system placing immense pressure on both the demand and supply end of the stick and it will be mostly felt by the locals who dominantly depend on their own production (Wheeler and Von Braun, 2013).

Despite available studies, the extent and the nature of these impacts are uncertain because the relative significance of climate change on food security is comparatively wide across regions; however, the key unanimity is that developing countries will be affected more (IPCC, 2007; Gregory et al, 2005; EP 2007). Developing countries are mostly affected because they have a greater deficit in adaptive capacity in a sense that a lot of the population is poor, they lack adequate resources, they lack technology, they have greater limitations in urban government and because their economies are closely linked to climate sensible sectors such as agriculture which is a dominant practice used to boost and improve the conditions of the livelihoods of the urban poor. (Badolo and Kinda Somlanare, 2014; Moser and Satterthwaite, 2008).

It is often difficult to understand the implications of climate change on urban agriculture in developing countries particularly in Africa, because it is a continent with an enormous landmass stretching over 37° North to nearly 35° South, so while other areas may be drier, other regions will be wetter (Collier et al, 2008). Projected climate conditions of Africa show that drier subtropical regions will be much warmer than the moist tropics, and therefore Northern and Southern Africa will be much hotter with an estimated increase of 4°C consequently resulting in the area being much drier with reduced precipitation while parts of Eastern and Central Africa will have an increase in rainfall.

Considering that the flourishing of agriculture is dependent on climate, extensive literature which focuses on exploring the impacts of climate change on agriculture puts great emphasis on analyzing direct implications of climate change on the sensibility of physical attributes of the crop system which include however are not limited to; land suitability, crop yields, pest regimes etc: placing prominent focus on assessing the biophysical aspects of production without giving other dimensions of food security the much needed attention (Gregory et al, 2005). Gregory et al (2005) argue that in order to address food security in a holistic manner, it is important to develop a broader research framework which will include both the biophysical and socio-economic aspects of the food network and which will address the following questions:

- i) Which aspects of the food systems are more vulnerable to climate change?
- ii) What can be done to reduce the vulnerability of these food systems and thereby improve food security in FHH? (Gregory et al, 2005).

Accordingly, improving household food security requires increasing resilience and strengthening capacity to be able to address external environmental shocks and stresses that can compromise the ability of households to achieve food security. The global scientific research is prominently focused on carbon and methane emissions and ways of reducing or mitigating its effects rather than exploring ways of adaptation (Collier et al, 2008). Although, considering the vast impacts of climate change on food and nutrition security of vulnerable households, it is no longer a question whether to adapt or mitigate climate change, for both principles are significant and required in reducing the risk of climate change.

Despite the consideration that projections of climate change are clouded by a lot of uncertainties and the meteorological statistics used in hazards and risk management are becoming less reliable, FHH are active respondents in adapting to climate change by employing different livelihood strategies to decrease vulnerabilities shaped by geographical location, cultural norms, gender and economic status among other factors. There are initiatives, policies, and frameworks which have been put in place to improve gender inequality and promote women's empowerment. However, Nelson (2011) argues that there is limited and a significant lack of representation of women and of gender issues in climate changes policies and in the platform of decision making on both local and international level. He further argues that it is important that the discourse framing women as 'vulnerable' risks reinforcing the exclusion of women as 'active agents' in responding to climate change and ignores their capabilities, knowledge and relevant skills which should be built upon in climate responses. The right support can allow women to be successful protagonists in action to climate change at all levels (Nelson, 2011).

1.2 Thematic consideration

South Africa is not immune to the implications of climate change and all other challenges experienced by other African countries. South Africa has experienced a warming trend consistent with global temperature increase and has been accompanied by a frequency in below normal rainfall and cases of drought which have had huge ramifications for agriculture and the livelihood of farmers. A case of drought was reported between the year 2002-2003 which attributed to severe food shortages, with an estimated 3.3 million tonnes regional food deficit and over 14 million people needed emergency assistance (Ziervogel and Frayne, 2011). The threat of climate change has never been more urgent than today, and the African food system is more vulnerable than previously thought.

Southern Africa remains the most urbanized region with the largest urban population of 61.5%, which is expected to increase in the future, (Joshua et al, 2014). The increased influx of people in the cities puts an alarm on how the rising population will be provided for with adequate quantities of nutritious and affordable food in the face of climate change. Current studies on household food insecurity show that approximately one million households are food insecure which means that more than 12 million people struggle to get access to adequate food (Nkosi et al, 2014). Sen (1981) in his engagement on discourses contextualizing poverty and famines argues that hunger and poverty are not necessarily an issue of shortage of food but are rather constituted to the fact that a lot of communities and households are unable to access food. This is further heightened by climate variability and change.

In an attempt to address and minimize the potential impacts of climate change on poor communities within the city of Durban, eThekweni Municipality in KwaZulu-Natal developed the eThekweni Municipal Climate Change Protection Programme (eTMCCPP) in 2004 (Lewis, 2010; O'Donoghue and Roberts, 2013). The purpose of this programme was to mainstream climate change adaptation in the general city planning and development framework as well as to harmonize local urban responses to climate variability and change (Mokwena, 2009; and Roberts, 2013). In addition to the eTMCCPP, other local government climate change initiatives such as the Headline Climate Change Adaptation Strategy (HCCAS) and the sectoral Municipal Adaptation Plans (MAPS) for health, water and disaster management were prepared and developed in 2006 and 2009 respectively (O'Donoghue and Roberts, 2013). Despite the

development of these initiatives, the greater questions remain: which these local climate change initiatives contribute towards building the resilience and adaptive capacity of the poor, particularly women in urban areas of KwaZulu-Natal, who are often marginalized, remote and receive limited services or support from their government.

In view of the above observations, the study investigated the implications of climate variability and change on food production focusing on urban agriculture and the different adaptive approaches that FHH employ in reducing the impacts thereof.

1.3.1 Research Questions

In view of the thematic considerations the research study was guided by the following questions:

- In what ways has climate variability manifested itself in the past 10 years to date in KwaZulu-Natal?
- In what ways has climate change affected the ability of the urban poor particularly women to be able to secure food and sustainable livelihoods?
- How do current climate change strategies build the resilience and adaptive capacity of the urban poor?
- What are the implications of this study in the wider context of developing countries especially in Sub-Saharan Africa?

1.3.2 Research aims and objectives

The aim of the study was twofold:

- Firstly, to explore the implications of climate change on the livelihoods of the urban poor in KwaZulu-Natal, particularly in Durban.
- Secondly, to assess climate change adaptation action plans in KwaZulu-Natal, particularly the eThekweni Municipal Climate Protection Programme and the Durban Adaptation Charter in relation to how effectively they are in building resilience and adaptive capacity of the poor, especially women, against climate change.

The aims of this study were addressed through the following objectives:

- To determine the climate change risks that the urban poor in KwaZulu-Natal are currently facing within their social, economic, environmental and political spheres of life.
- To create an inventory on the implications of climate change on food security, particularly in female-headed households.
- Identify the key challenges in implementing the adopted climate change strategies and policies in Durban.
- Identify the institutional opportunities and barriers to integrating climate change concerns in poverty reduction strategies and urban planning and development policies.
- To contribute to research that will feed into the development of new climate change policies and local adaptive strategies.

1.4 Methodological Considerations

Social science is a multifaceted discipline with systematic processes which needs to be critically examined. Unlike exploring natural objects which are still and can therefore be controlled, social 'objects' are in motion and consist of intermingled structures and mechanisms (Sayer, 2000). Sayer also observes that social interrelation structures and mechanisms are not to be merely measured and counted however they need to be understood. Understanding people with different backgrounds, cultures, social status is not an easy task thus a combination of various methods needs to be employed in order to effectively understand any social phenomenon (Cacciattolo, 2015).

This research was qualitative in nature and adopted methods which are inspired by qualitative research. Among many other definitions Denzin and Lincoln (2000) holistically defines qualitative research as 'a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that makes the world visible. These practices turn the world into a series of representations including field notes, interviews, conversations, photographs,

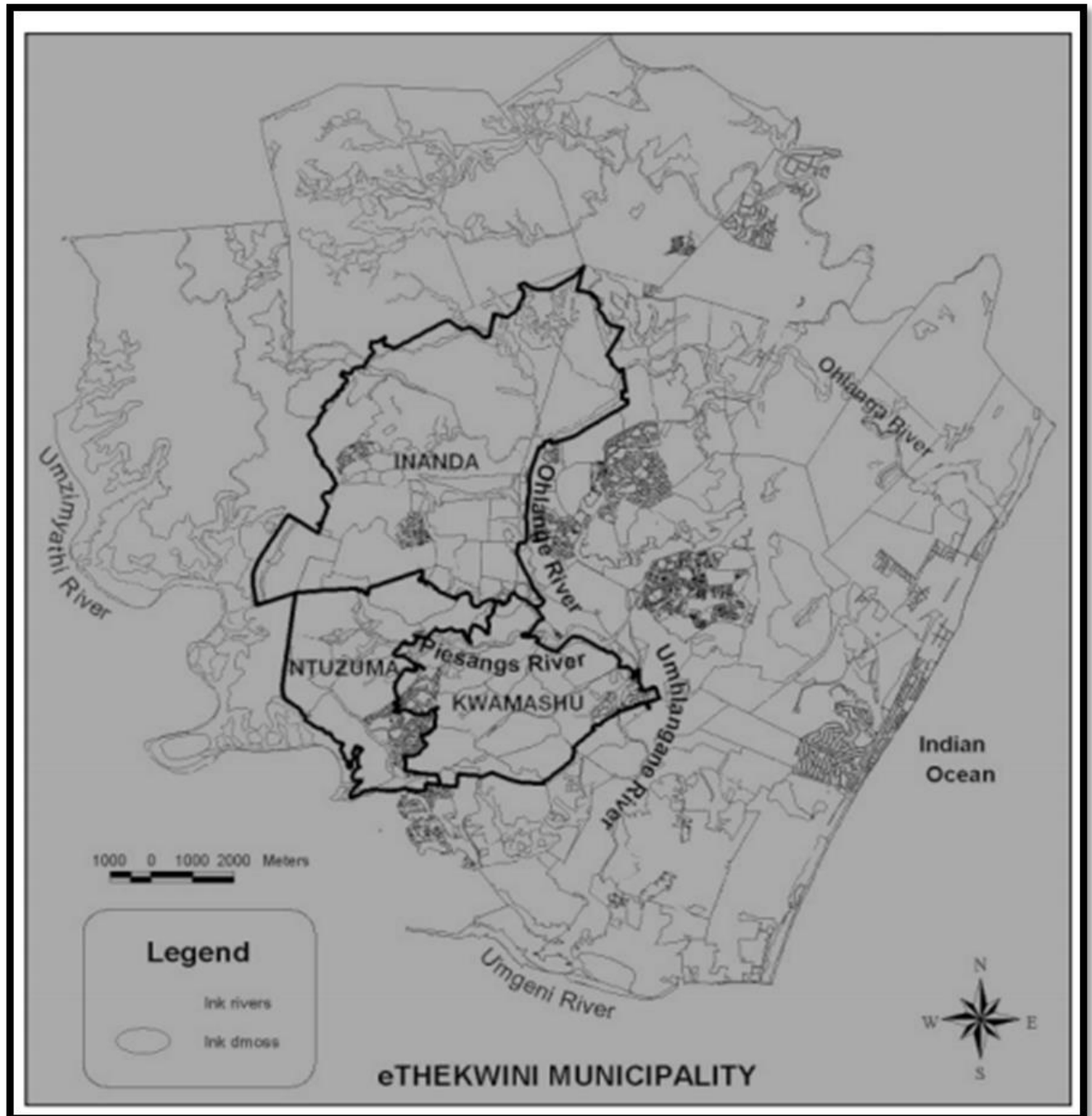
recordings and memos to the self. At this level, qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them’.

The key strength of using qualitative methodology is drawn from the fact that it is an approach which seeks to understand research findings from the perspectives of the local population it involves. The adoption of qualitative methods for this study was crucial in acquiring knowledge, reflections and real perceptions from the community of Inanda, KwaMashu and Ntuzuma, jointly known as ‘INK’, at a micro level which was not pre-determined by any other research (Chesebro and Borisoff, 2007). The study further adopted quantitative research approaches to quantify the descriptive findings into aggregated statistics for the purpose of correlation analysis and interpretation.

The study explored the implication of climate variability and change on household food security of female-headed households and understanding how they utilize household assets to influence the process of decision making in adaptation. In investigating household food security, the study engaged with a total of 84 small scale farmers who are actively involved in subsistence farming to contribute to household food supply and for commercial purposes to contribute to household income in the three poor communities.

INK is situated 20 kilometers inland from the Durban Commercial Business District (CBD), and the population of INK is estimated at 4,871,406 on a land area of 70.13 square kilometers as outlined in figure 1 (eThekweni Municipality IDP).

Figure 1.1: Map of INK in eThekweni Municipality



Source: eThekweni Municipality (2016)

The approach informing the study combined two approaches; firstly, the 'bottom-up' participatory research undertaken in INK; secondly, a rapid appraisal of policies, programmes and institutions. The results were then triangulated using a micro-action planning workshop and a consultation process. These approaches are briefly described below and expanded on in chapter three of the thesis:

I. Participatory Climate Change Adaptation Appraisal (PCCAA)

The 'bottom-up' participatory approach encompassed a participatory appraisal of the different mechanisms through which climate change directly or indirectly leads to the erosion of assets undertaken with different social groups of the urban poor in Durban City. This captured perceptions of female-headed households regarding current policies, programmes and institutions that directly or indirectly constrain their adaptive capacity, as well as their recommendations concerning pro-poor adaptation policies (Moser and Stein, 2010).

Two tools were used to execute the PCCAA framework, mainly the asset vulnerability analytical framework which identified the links between vulnerabilities and assets and the asset adaptation operational framework which identified concrete measures to increase resilience and reduce vulnerability in the face of long-term changes as well as immediate shocks that result from global climate. Semi-structured interviews, focus group discussions and site observations were used to collect information from FHH.

II. Appraisal of current policies, programmes and institutions

In light of the key findings from the interviews and focus group discussions with the women, the research identified a range of top-down interventions of external actors at local and city level working in poor communities, vulnerable to disasters or other climate-related shocks – such as municipal authorities, central government institutions, civil society organizations, and the private sector. The asset adaptation operational framework was used to identify institutions, policies and programmes that directly or indirectly constrain the adaptive capacity of the urban poor; and further identified informative officials who are instrumental in designing, implementing and monitoring pro-poor adaptation policies, or have the potential to do so. This process enlightened

the review by recognizing and establishing the manner in which different institutions influence the access of resources and assets and how the interaction between households and governance assist household to adapt to climate variability while strengthening household food security.

III. Triangulation and validation

After all the field data was collected the last phase included combining all the data and identifying key themes and findings that transpire from the results to formulate ground theories that will be specific to the community of INK. The triangulation and validation process included the following:

- Action planning and consultation process: This is a participatory exercise which collaborated the meeting of both FHH and officials and public authorities who participated in the study. This provided a platform for all participants to engage in dialogue to articulate and identify common problems, define and structure strategies and solutions, reach consensus, and negotiate collaboration.

1.5 Data Analysis

All the data was captured in Microsoft word and organized into different categories and themes to identify patterns and correlate relationships. Some of the data was then converted into visual graphs using Microsoft Excel.

1.6 Delimitation

The study specifically and purposefully decided to focus on perceptions of female-headed households regarding the impacts of climate variability and change in their lives and most importantly to understand the different ways in which they invent or assume to adapt to weather related events experienced through changing space and time. The study did not broaden its analysis beyond this scope by including the male perspective in the exploration and or a gendered comparison of household vulnerabilities, and adaptation strategies utilized by male headed households. It is important to understand that the study sample size is only a small selection considering the vast population of the community of INK, and therefore the results of the study cannot be used to generalize the impact of climate variability and change on urban household food security of FHH in the wider South Africa because each space and each

environment is unique. However the findings are significant in showing how the community of INK within the eThekweni Municipality specifically adapts to climate change and accordingly the findings can be used and adopted as lessons for other communities.

1.7 Ethical Consideration

The research study dealt with vulnerable groups which included women and the elderly and because of the nature of the study it was important to understand and consider the ethical responsibilities of engaging with such participants. The process of ethical clearance involved an application with a detailed plan of data collection explaining when, where, how and with whom the research was going to be engaged. Ethical clearance was granted by the Wits Ethics Committee entrusting the research to abide by the ethical standards of the University of the Witwatersrand.

All the participants were given a copy of participant information which explained to them the nature of the research study and all that was expected of them. Each participant also signed an anonymous consent form as a way of agreeing to be part of the study. Anonymity was kept by providing each participant with a unique code which represented their responses.

1.8 Thesis outline

The thesis is divided into six chapters which are combined together to enlighten and inform the topic of the research study. The remaining five chapters are organized as follows: Chapter two presents the literature review and theoretical consideration of the study. This chapter presents the conceptual and theoretical frame of references which this study revolves around, engaging available literature discussing the implication of climate change on urban food security on female-headed households. Chapter three is dedicated to methodological consideration, which outlines the field work material and the step by step procedure of collecting data. In Chapter four, the empirical findings are presented as collected in the field. This section presents perceptions of FHH as communicated during dialogue. Chapter five is dedicated to a critical analysis of the empirical findings, to explore the impacts of climate change on urban food security in eThekweni Municipality, and how institutional support contributes to household adaptation. Chapter six's key discussions are synthesized and recommendations are given for future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is dedicated to literature review, giving note to all theoretical considerations. Considering that there are different definitions, theories, paradigms and dialogues in academia used to engage with the topic of the study, the objective of this chapter is to give both conceptual and theoretical clarity in a way that is relevant to this particular study. In that regard, the chapter engages with extensive literature which discusses the implications of climate variability on urban food security of female-headed households within developing countries. However, it is particularly interested in exploring the contemporary discourse in South Africa.

The chapter is divided into four sections: Firstly, it presents definitions of key terms crucial to the study and clarifying the manner in which concepts will be understood throughout the thesis. Secondly, it contextualizes the implication of climate variability on urban food security of female-headed households in developing countries filtering down to the province of KwaZulu-Natal in South Africa. With the aim of mapping distinct similarities and differences portrayed in the lives of urban farmers which either enhance or compromise their ability to lead sustainable livelihood. In view of that, thirdly, the chapter discusses the different means adopted by female-headed households which they use to respond to the changes in climate conditions in the absence of engendered climate-related policies. Lastly the chapter aims to recapitulate on the key findings and explore the crucial gaps in knowledge.

2.2 Definitions of Key Terms

Before theoretical issues are discussed, it is imperative to define the key terms of the study and contextualize them in a way that is relevant to the discussion of this chapter and the whole thesis. The key concepts for the study include climate variability and change; female-headed households (FHH); food security and climate change adaptation.

Among many definitions, the World Meteorological Organization (WMO) defines climate variability as “variations in the mean state and other statistics of the climate on all temporal and

spatial scales, beyond individual weather events”. Subsequently the IPCC defines climate change as “a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended periods of time”. The two dissimilar terms and definitions are used respectively to denote deviations in climate statistics that firstly occur within a small time frame, such as a month, a season or a year and secondly that occurs over a longer period of time, typically over decades or longer.

It has been established that climate variability and climate change will bear adverse implications for vulnerable communities such as female-headed households who can be regarded as “households where either no adult males are present, owing to divorce, separation, migration, non-marriage or widowed, or where men although present do not contribute to the household income” (ILO Thesaurus, 2005 cited in Zarhani, 2011), and those who particularly depend on climate sensitive resources such as urban agriculture or urban crop production, which is prone to extreme weather. The direct implication of climate change on urban agriculture will further bear severe impacts and compromise household food security, which can be defined and understood as “a phenomenon which exists when people, at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”; The international Food Policy Research institution further elaborates and acknowledges that “a space which has achieved food security is a world in where every person has access to sufficient food to sustain a healthy and productive life, where malnutrition is absent, and where food originates from efficient, effective and low-cost food systems that are compatible with sustainable use of natural resources”.

In light of the definitions of food security, it is established that ‘food security’ is broad and is achieved through a holistic system which incorporates aspects of the environment, socio-economic and a political agenda which needs to be food enabling at all times. From that denotation, four key dimensions of food security are identified namely food availability (production, distribution, and exchange), food accessibility (affordability, allocation and preference), food utilization (nutritional and societal values and safety) and food stability, (Simatele and Simatele, 2014; Gregory et al, 2005). Although food availability is the most crucial dimension to food security, it is important to understand that all other dimensions are

equally significant to measuring food security and are more so equally affected by climate variability and change.

In attempt to secure household food security, small scale farmers, particularly FHH understand the need to uphold and strengthen each dimension because if one dimension is affected, food security at large is affected. That acknowledgement and observation can be referred to as ‘adaptation’. In the context of climate variability and climate, urban farmers have been active respondents in adapting to the impacts of climate variability on household food security, which is defined as “ a process by which strategies to moderate, cope with and take advantage of the consequences of climatic events are enhanced, developed, and implemented” (UNDP, 2005). From the definition it is important to understand that adaptation is a way of responding directly to the implication of climate change through reactive ways, and does not constitute preventing emissions of greenhouse gases and the impacts of climate change (Shipper 2007).

2.3 The impact of climate variability on female headed households in developing countries

There is overwhelming evidence that the climate has been changing over space and time. Long-term changes in climate have been observed at continental, regional and ocean basin scales; observed directly through increasing average air and ocean temperature, changes in precipitation patterns, changes in frequency and severity of storms and other extreme weather events projected to intensify with greater intensity than experienced in the past (IPCC, 2007). Climate variability and change is multi-dimensional in nature and it is arguably the greatest developmental challenge that the global community has ever faced and will be for many decades to come.

In light of that, the IPCC argues that in as much as climate change affects the whole planet, its impacts will have disproportional negative impacts on developing countries, particularly poorer communities near rivers and the coast, communities which use climate-sensitive resources and which are prone to extreme weather (IPCC, 2007; EP 2007). Despite their low contribution to the global GHG emissions, developing countries are more affected because they have a greater deficit in adaptive capacity in a sense that a lot of the population is poor, they lack adequate resources, they lack technology, they have greater limitations in urban government and because their economies are closely linked to climate sensible sectors such as agriculture (FAO, 2007;

Tibesigwa et al, 2015; Badolo and Kinda Somlanare, 2014; Buvinic and Gupta, 1997; Moser and Satterthwaite, 2008; Collier et al, 2008; Rout et al., 2013 Goh, 2012; Nelson, 2011).

Within developing countries, it has been further observed that climate-related risks are experienced differently by different regions, communities, socio-economic groups, generations, and genders (IPCC,2001; Satterthwaite, 2007; Lambrou & Piana, 2006; Ribot, 2009; Rout et al., 2013;Roehr, 2007). In that regard, it has been observed that, women and female-headed households in developing countries tend to bear the brunt of climate variability related impacts due to the fact that women have limited access to resources and are limited in their capacity to prepare for, or respond to, observed and anticipated risks (Lambrou & Piana, 2006; Bradshaw & Linneker, 2014; Roehr, 2007; Kakota, Nyariki, Mkwambisi, & Kogi-Makau, 2011; IPCC, 2014; Ribot, 2009; UN-HABITAT, 2011; Goh, 2012). This can predominantly be linked to their historic disadvantage, and socio-economic characteristics and traits specific to them, namely ‘unpaid’ social roles within their households and communities, lack of rights, muted voice, and the fact that they represent a large percentage of the poor, making them more vulnerable to the impacts of climate variability (Pelsaer, 2016; Demetriades & Esplen, 2010; Edvardsson Björnberg & Hansson, 2013; Kakota et al., 2011; Lambrou & Piana, 2006; Tacoli, 2012; Nelson et al., 2002; Nelson, 2011; UNDP, 2010; World Bank, 2011).

The IPCC defines ‘vulnerability’ as ‘the degree to which a system (household) is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes’ (Third Assessment Report), which can be translated into the formula below:

$$V=E \times S \times (I - AC) \quad [V\text{-Vulnerability; } E\text{-Exposure; } S\text{-Sensibility; } I\text{-Impact; } \\ AC\text{-Adaptive Capacity}]$$

Vulnerability is directly proportional to exposure, sensibility and impact of climate variability and change. This means that the higher the level or extent of exposure, sensibility and impact, the higher the vulnerability. The measure of vulnerability is however inversely proportional to adaptive capacity. The higher the adaptive capacity of a household, the less vulnerable the household will be able to cope with adverse effects.

Exploring vulnerability in the context of urban spaces, Frayne, Moser and Ziervogel observe that concentration of population, the type of economic activity and built environment in urban areas can change exposure to floods, heat waves and other climate related events. For instance the impact associated with an increase in temperature can be more severe in urban areas, which can be constituted to the urban heat island effect and similarly impermeable surfaces within the urban landscape could lead to increased run-off during heavy rains causing flooding that may not be experienced in other areas (Wilbanks et al, 2007; Huq et al, 2007; Romeo-Lankao, 2008; Wilby, 2007; Hotlis, 1988 cited in Frayne, Moser and Ziervogel). Considering the dynamics of space, it won't be exaggerating to say that women and female-headed households in urban areas are exposed to more vulnerability.

While some scholars have argued that there is no definitive evidence to suggest that women are disproportionately affected by climate change, Alber (2011) and Rout et al. (2013), contend that even though gender bias in the impact of climate variability is underreported, there is substantial evidence that gender differences exist during climate change-induced disasters or weather events particularly in the urban context. UNFCCC (2005), have reported that during natural disasters, more females are likely to be victims than men and if they survive they are more likely to suffer more in the after effects. For instance, the cyclone that occurred in Bangladesh 1991 claimed the lives of many female victims because they were not warned of the weather related event, and were further restricted by their mobility and their inability to swim. Similarly the European heat wave in 2003 claimed the lives of more women by up to 75% higher than those of men.

The world Environmental Network (2010) observes that other impacts on women and FHH within developing countries include, increased likelihood to be displaced, experience an increased burden of water and fuel collection resulting in health problems, lower life expectancy of females, increased workload, encountering loss of income and feeling the effect of rising food prices most acutely and being the first to suffer during food shortages (Nelson et al., 2002; Bradshaw & Linneker, 2014; UNDP, 2010; UNDP, 2015; Rout et al., 2013). Among many other scenarios, it is evident that engendered impacts of climate variability aggregates and amplifies vulnerabilities of women and female-headed households and more so compromises their roles as food producers as access to basic needs and natural resources becomes hampered (Edvardsson Björnberg & Hansson, 2013; Kakota et al., 2011).

2.4 The impact of climate variability on urban food security of female-headed households in developing countries

It has been discovered that the increasing engendered impacts of climate variability on FHH causing socio-economic vulnerabilities and environmental degradation will bear adverse implications for household food security within the urban space (Frayne, Moser and Ziervogel 2011). Since women and FHH are at the hem of urban agriculture and uphold the responsibility for household food security, the major concern is how will they be able to feed and provide adequate quantities of nutritious and affordable food with less water, land and labour? (Jacobi et al, 2000; UN-HABITAT, 2008; FAO, 2008; UNESA, 2010; SACN, 2011).

Urban agriculture in Africa is the largest economic activity accounting for an estimated 60% of employment and it also contributes a large percentage to the GDP (Collier et al, 2008). Existing literature on urban agriculture suggests that it has become a major source of income for an estimated 100 million people in Africa and its contribution to household food security is significant and in many instances it is increasing (Simatele et al, 2012; Simatele and Binns, 2008).

A lot of studies have explored climate change and food security nexus on a global and regional scale, however, the link needs to be downscaled and explored more profoundly on a temporal and spatial scale, to be able to comprehend the relationship at household level particularly within the urban context (Battersby ,2012; Ziervogel and Frayne, 2011). A recent study done by The Food and Agriculture Organization (2008) has established that climate variability and change will affect all four dimensions of food security: availability, access, stability and utilization (Schmidhumer and Tubiello, 2007; Simatele and Simatele, 2014; Gregory et al, 2005; IUCN, 2007). The same study has further concluded that in as much as the overall effect and damage will be different for different households, communities, and environments; climate variability will accentuate levels of food insecurity on urban households which are already poor, vulnerable and food insecure (Schmidhumer and Tubiello, 2007; Frayne, Moser and Ziervogel, 2012).

The dimension of food availability encompasses the production, distribution and exchange of food networks that household food security depends on. Small scale farmers who depend on urban crop production or urban agriculture are severely affected by the change in temperature

and shift in rainfall patterns which agricultural production depends on (Nelson et al., 2002; Tawodzera, 2012; Haigh and Vallely, 2010). Although some crops in some regions of the world may experience gains, research predicts that the overall impacts of climate change on agriculture will be negative, impeding on the progress and success of its continuance thus threatening global food security (Keane et al. 2009; Nelson et al. 2009; Nelson et al. 2010; Collier et al, 2008, Hoffman, 2011).

Schmidhuber and Tubiello (2007) observe that areas situated on temperate latitudes experiencing high temperatures will favor their agricultural sector. Areas which are potentially suitable for agriculture will expand and will be able to produce more yields of crops. In contrast extreme temperature in the Mediterranean region may result in heat waves and drought or heavy precipitation and floods which may pose a threat to agricultural yields. Semi-arid and arid regions may experience increased evapotranspiration and lower soil moisture which will result in reduced productivity and increased livestock mortality (Schmidhumer and Tubiello, 2007). Places such as Russia and Central Asia will be favored by climate variability in the form of increased temperature, however, that may not be the same for the agricultural sector of Africa which flourishes well under rain fed conditions (Schmidhumer and Tubiello, 2007; Tawodzera, 2012; Chikozho,2010; Nyambara,2005; Chetsanga,2000; Ndaruzaniye,2013; Nelson et al., 2002).

The impact of climate variability on food production will have direct impacts on food accessibility which encompass affordability, allocation and household preferences that enable FHH to translate their hunger into demand (Schmidhumer and Tubiello, 2007; Nelson et al, 2002). In the case where an area experiences low production of crops as a result of water scarcity, lack of fertile land to plant, environmental degradation and other factors which are linked to the management of agriculture, the price of food will increase to substantiate for the loss. The UNDP (2011) estimates an increase in food prices by 30-50% in the coming decades and AFSUN (2008) content and observe that the price of food is a direct detriment of affordability and hence access.

In 2008, the Food and Agricultural Organisation (FAO) established an increase in people experiencing chronic food insecurity in developing countries as a result of low production of

staple foods and an increase in food prices. This forces households to spend more of their household income on purchasing food, water and acquiring other resources necessary for food and nutrition security (Satterthwaite, 2007). The increased burden on household finances influences men to migrate to other areas in search of better work opportunities while the women are left behind to work hard to take care and feed the family reinforcing the gender roles that have previously kept women vulnerable (Rout et al., 2013). In extreme circumstances, women are forced to seek employment in labour intensive low income jobs within the informal economy due to lack of skills and proper education, inadvertently holding them back within the cycle of poverty (Tacoli, 2012, Nelson et al, 2002)

Food availability and food accessibility greatly affects the stability of household food supply. It is estimated that there will be a 50% increased demand of agricultural products by the year 2030 which will require a shift towards sustainable intensification of food systems (Wheeler and Von Braun, 2013; FAO, 2006; Alexandratos and Bruinsma, 2012). In view of that, Schmidhumer and Tubiello (2007) observed that when cases of extreme weather patterns prevail to be more severe and frequent, poorest regions with the highest level of chronic undernourishment will be exposed to the highest degree of instability, forcing households to change their food basket and explore other alternatives. It is in this regard that malnourishment and starvation will become more prevalent as nutrition tends to be sacrificed in favour of survival (Nelson, et al, 2002, Haigh and Vallely, 2010; Kakota et al, 2011). The UNDP (2011) estimates that the number of malnourished vulnerable communities, which includes children and women will increase by up to 25 million by the year 2050 as climate variability and change continue to exacerbate household food security.

The impact of climate variability on the first three dimensions of household food security will impact the use of food and the manner in which people are able to secure the nutrients and the quality of foods needed which can be referred to as food utilization (Frayne and Ziervogel, 2011). Little research has been done on this aspect of food security (Wheeler and Braun, 2013). Schmidhumer and Tubiello (2007) argue that climate change will affect the ability of households to use food effectively by altering conditions for food safety and changing the disease pressure from the vector, water, and food borne diseases. The main concern is that changing climate conditions can initiate a condition where infectious diseases cause or compound hunger, which in

turn makes the affected household more vulnerable to infectious diseases , heat stress and food poisoning (Hope Sr, 2009; Schmidhumer and Tubiello, 2007; IPCC, 2014; Satterthwaite, 2007). Cases of extreme rainfall can increase the risk of an outbreak of water-borne diseases which will increase the number of women exposed to waterborne diseases such as cholera and diarrhea and thus their capacity to effectively use food.

2.4.1 South African case study

South Africa is not immune to the severe implications of climate change on the urban food system: food security and all facets of South African agriculture are interlinked just as encountered by other African countries (Haysom, 2012; Falling, 2012). South Africa is a semi-arid country which has experienced a warming trend consistent with global temperature increase and has been accompanied by a frequency in below normal rainfall, episodic floods and cases of drought which has had huge ramifications for agriculture and food security. A case of drought was reported during the year 2002-2003 which attributed to severe food shortages, where an estimated 3.3 million tonnes regional food deficit and over 14 million people needed emergency assistance (Ziervogel and Frayne, 2011). The country has also experienced intense occasional floods, however prolonged drought remains severe.

South Africa in comparison to other African countries is regarded as a relatively wealthier country with the second largest economy (Shisana et al, 2014). In accordance with the definition of food security, it is also viewed as a country which is food secure at a national level (du Toit, 2011). However, the country has had high socio-economic inequalities such as high rates of unemployment, high rates of urbanization, high rates of informalization of the urban space and high rates of poverty more particularly among women and female-headed households. These are some of the inequalities which have been responsible for influencing and shaping household food security and have been exacerbated by climate change. Studies done in South Africa reveal that there are currently high levels of food insecurity in South African cities with approximately one million households which are food insecure translating to over 12 million people struggling to get access to adequate food (Nkosi et al, 2014).

The new international food security agenda prioritizes the idea and the concept of small-scale farming at the centre of its efforts to resolve the growing problem of food insecurity in Africa.

and that has become a viable way for households to be able to provide an increased and more consistent access to fresh, nutritional food at lower costs than market produce. (Bruce and Frayne, 2010; Frayne et al 2010; Jacobi et al, 2000; Simatele et al, 2012; Morgan, 2012; Simatele and Binns, 2008; Crush et al, 2011; Crush and Frayne, 2010). Reported cases of drought and floods in South Africa have compromised the ability of urban farmers to flourish in that regard and it has also made it difficult for the majority to cope with the adverse environmental stress and shocks.

Droughts have placed immense pressure on water resources. In response to declining availability of fresh water, many governments have opted to reduce supplies available to marginalized groups, forcing these groups to purchase water, or, alternatively, the price of water may be increased (Satterthwaite, 2007). In this regard women and girl children are either forced to walk long distances to get water or are forced to stay a few days without access to water to drink or cook. Shift in rainfall patterns has led to season variability affecting and influencing the availability of certain kinds of foods at certain times of the year. As a result it has been observed that there is an increased dependence on market purchases among low communities, resulting in households spending more of their income on food (Hendricks, 2005; Falling, 2012; Baiphethi and Jacobs, 2009).

Cases of intense floods have had direct implications on food production and more so, have had indirect implications for the network of distribution and exchange. The impacts have been greater for households that lack access to basic services and reliable infrastructure (IPCC, 2014). There is overwhelming evidence to show that a lot of vulnerable households have lost their houses to floods and have had their assets eroded during the process. For instance, when FHH lose their place of production, particularly those who engage in urban agriculture for the purpose of selling, they lose their space of distribution and exchange which in turn will have an impact on the income of households.

Economic insecurity of FHH in South Africa where most depend on welfare services (grants and pension) and informal employment to survive affects the ability of households to recover from the climate-induced disasters or weather events where most are unable to rebuild their homes, replace damaged property or even pay for alternative temporary accommodation while they wait

for their homes to be reconstructed (Hope Sr, 2009; Lambrou & Piana, 2006; Edvardsson Björnberg & Hansson, 2013). This status quo will be difficult to improve as the changes in climate are projected to intensify while the adaptive capacity and resilience of the most vulnerable groups of people in society are likely to reduce due to the high prevalence of poverty and deprivation (Eriksen, et al 2007; Nelson, 2011; Haigh and Vallely, 2010).

2.5 Climate change adaptation in female-headed households

It is unquestionable that the adverse implication of climate variability and change are already evident in Africa. For a continent where food insecurity is widespread and where the impacts of climate variability and change are arguable prominent than other regions; Frayne, Moser and Ziervoger (2012) assert that the conceptualization of the development nexus which encapsulates climate change, food security and adaptation is essential in setting out a collaborative framework that will support steps towards improving the resilience of urban communities to the convergence of climate variability on food security. This development nexus is more imperative for women and female-headed households.

In light of the growing evidence of the impacts of climate variability and change to food security, Simatele and Simatele (2012) observe that Africans have always been aware of the threatening impacts. While other countries around the world are concerned with reducing carbon emissions and mitigating, the main concern for developing countries particularly African communities is adapting to the effects of climatic change and deteriorating opportunities. Adaptation can be anticipatory, or reactive, private or public (Frayne, Moser and Ziervoger, 2012). Although our understanding of future potential risks of climate variability and change are limited, evidence of past events is paramount in helping households integrate adaptation in their daily planning.

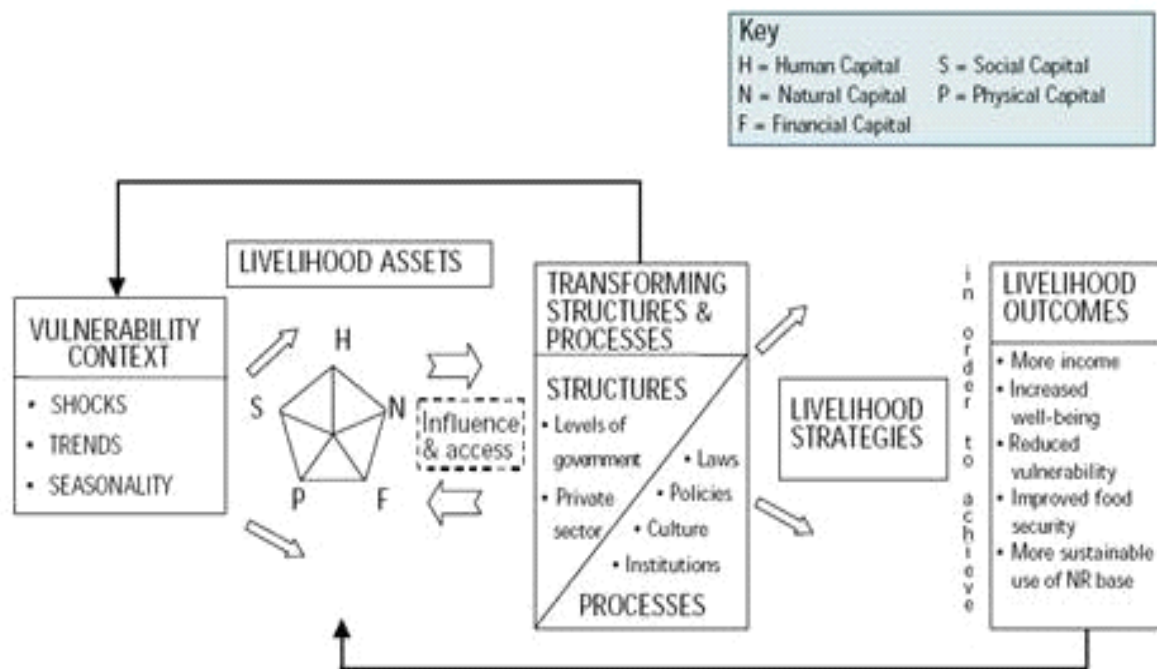
In the quest to adapt to climate variability, there is overwhelming evidence to show that FHH have gendered barriers to building capacity and implementing adaptation. Adaptation barriers can be defined as ‘factors that which make it harder to plan and implement adaptation’ (IPCC, 2014b). A wide range of studies conducted by scholars such as Mersha and van Laerhoven(2016); Deressa et al (2009); Brayn et al (2013); Tazeze et al, (2012); Hassan and Nhemachena (2008); Nabikolo et al (2012); Adger et al (2009); Demetriades & Esplen (2010),

Biesbroek et al, 2013. Across the African continent has revealed that some of the barriers experienced by FHH include: lack of rights to property and land, lack of means to invest in measures that go beyond marginal changes in planting decisions, lack of access to credit to purchase newer technologies, lack of farming assets (land, labour and capital), insecure wealth, low levels of education, to name a few, which may vary for different households across different spaces and boundaries.

Notwithstanding this, there is also substantial evidence to show that although women and FHH may be disadvantaged in the face of climate-induced impacts, they are not helpless victims. Lambrou and Piana (2006) argue that despite their vulnerability, women “exhibit surprising resilience”. It has been observed that in cases when there is a greater need to implement adaptation decisions, they are willing to take on more male roles to ensure the well-being of their families and communities (Nelson et al., 2002). Moreover, they possess valuable knowledge, experience and skills that have placed them in a unique position where they can make a contribution towards sustainable and cost-effective climate change responses, decreasing vulnerabilities and increasing resilience (Habtezion, 2011; Nkoana-Mashabane, 2012)

Adaptation to climate variability is influenced by broader livelihood processes such as household characteristics, institutional arrangements, and information and technology which in collaboration can influence the type of adaptation a household can adopt (Mersha and van Laerhoven, 2016). In light of that, the Sustainable Livelihood Approach (SLA) is used and referenced on to explore the approach to adaptation. Drawing from the SLA; it is most suited to build the adaptation framework because it i) captures the effect of climate variability and change on livelihoods and ii) explores the interaction between different factors which influence adaptation and livelihood outcome in a wider context: moving away from the linear cause-effect way of thinking (Parkinson and Rairez, 2006; Rakodi, 2002; Mersha and van Laerhoven, 2016; Below et al, 2014) as illustrated in figure 2.

Figure 2.1: Sustainable Livelihood Approach



Source: Parkinson and Rairez (2006)

The approach connects different livelihood elements, which include assets (human, social, financial, physical and natural), the activities and the access to institutions and processes and strategies that together determine the livelihood gained by the households (Rakodi, 2002; Parkinson Ellis, 2000; and Ramirez, 2006; Sparr and Moser, 2007; Ford, 2004).

At the centre of adaptation are assets: households have access to a portfolio of assets both tangible (e.g. money, food, infrastructure and resources) and intangible (e.g. social networks and access to services), used to create livelihood opportunities and to increase their capacity to cope with stress and environmental shocks such as climate variability and change (Chambers, 1989, 2006; Rakodi, 2002). The urban poor use complex and diverse strategies to achieve household food security, although there are cases where households use a single source of support. The majority of households prefer to increase their adaptive capacity through wider options (assets) in different combinations and sequences to minimize risk (Corbett 1988 cited in Chambers 2006;

Rakodi, 2002; Parkinson and Rairez, 2006). Substantially, Bebbington (1999) observes that this gives households the capability to engage more fruitfully and meaningfully with the world and most importantly, it allows households the capability to change their world.

In the context of the impact of climate variability and change on household food security; having access to assets is what determines the ability of households to be able to project, anticipate and or deal with actual changes in weather conditions (Moser and Satterthwaite, 2008; Ziervogel et al., 2008), and will determine the extent to which a household will be food secure or insecure (Prowse and Scott, 2008). Having identified the different distinct engendered vulnerabilities of FHH to climate variability and change, women come up with different livelihood strategies to strengthen household food security. Livelihood strategies are a combination of activities which include productive activities, investment strategies and reproductive activities (income, labour, asset pooling). However, the choice of strategies for small scale farmers is not always confined to urban agriculture but they also incorporate non-farm activities in order to diversify income opportunities and to meet the changing needs (household characteristics/demographics, economic status, living conditions etc.) of households (Simatele, 2012, Moser, 2009, Rakodi, 2002, Maxwell, 1998; Moser and Satterthwaite, 2008).

In view of the asset-adaptation approach; human capital encompasses women and female-headed households investing in their skills and expanding their knowledge on how they can minimize the impacts of climate variability in their lives (Battersby, 2012; Moser, 2007 & 2009; Tawodzera, 2012; Hulme et al, 1999). Female-headed households often use indigenous knowledge and compliment it with modern scientific knowledge to adapt to climate change (Haysom, 2012; Simatele, 2012). In extreme cases such as during loss of infrastructure, households can also resort to migrating to other areas as a way to expand their horizons through increasing earnings and or reduce expenditure (Battersby, 2012; Moser, 2009; Dodson, 2012; IOM, 2009). To expand on human capital, FHH often create new networks or draw on existing relationships in the community to get access to food through sharing food or borrowing food from neighbours (Battersby, 2012). Moser (2008) observes that households with higher levels of social capital are unlikely to experience hunger. Simatele (2012), echoes that reciprocity and exchange of food among neighbors, relatives and friends contributes to household food security.

Battersby (2012) argues that while the flow of food is significant to ensuring household food security, it is also important to recognize that access to cash to purchase food is equally important. In order to sustain money inflow, FHH diversify their sources of income through engaging in formal employment, casual labour, applying for social grants and receiving remittances from families (Battersby, 2012; Beall, 2002). Strengthening financial capital through savings and investing money allows households to be prepared for weather related events such as droughts and floods and to be able to invest in recovery costs. While supplementing to 'save' costs, households also reduce their expenditure and consumption patterns. FHH often have to manipulate their diet, reduce the variety of foods, reduce meal sizes to meet their needs and buy in small quantities (Battersby, 2012; Beall, 2002, Moser, 2007 & 2008). It is in this regard, that small scale farmers have to explore different ways of strengthening crop production to maximize crop yield for household consumption.

Some adaptation strategies which are already adopted by farmers include, improved farming management, planting crops that are drought resistant, crops with shorter growing periods and delaying the planting according to availability of rainfall among other strategies (Simatele and Simatele, 2015; IPCC, 2004; Munzhedzi, Adaptation scenarios factsheet series).

Although assets are empirical to adaptation, and allow households the choice to decide what to do, when and how; the ability to adapt is mediated by the environment in which adaptation is taking place (Moser, 2009; Tawodzera, 2012). Access to livelihood assets and their use is dominantly influenced by external factors such as policies, political institutions, regulatory and legal frameworks as well as formal and informal context within which actors operate (Moser, 2009; Rakodi, 2002). Transforming structures and processes embody power and gender relations influencing access to assets and the manner in which household are able to use these assets to achieve a positive livelihood outcomes. Frayne, Moser and Ziervogel (2012) assert that response from external factors supports households through creating an enabling environment to build long term, multi-generational resilience, limiting damage and rebuilding and transforming the asset base of urban poor communities.

Implementation of adaptation policies have been given attention at both local and city scale, which is largely driven by the international scientific community encouraging adaptation as an

integral way to compliment mitigation efforts while increasing the resilience of communities (Frayne, Moser and Ziervogel, 2012; Romeo-Lankao, 2008). There are policies within South Africa which prioritizes adaptation; such as the eThekweni Municipal Climate Change Protection Programme implemented at the local level with the aim to mainstream climate change adaptation into socio-economic development. However there are a few challenges with realizing the potential of such interventions within the local community beyond internal administration, such as low institutional capacity, lack of knowledge, low skill and capacity inventory, limited data regarding future uncertainties etc. Some of the outstanding issues include the concern that:

- i) There is limited integration of household food security and household adaptation in climate change policies;
- ii) There is limited representation of tailored needs for women and female-headed households in climate change adaptation.

While there are a few studies which have explored the role of policy responses in helping communities adapt to climate change; more needs to be considered in terms of how these responses strengthen household food security and how the capacity of women and FHH, who are characterized by historically determined levels of economic and political inequality, is being strengthened and improved to adapt to climate variability and change.

This chapter has extensively shown that climate variability and change is multi-dimensional in nature and it is arguably the greatest developmental challenge that the global community has ever faced and will continue to bear for many decades to come. However, with that said, it is established that its impacts will be disproportionately felt by developing countries and women, particularly from communities which are poorer, situated near rivers and the coast, prone to extreme weather and communities which use climate-sensitive resources such as agriculture (IPCC, 2007; EP 2007). It is evident that urban agriculture has become a major source of income for a lot of people and its contribution to household food security is significant and in many instances it is increasing. The impact of climate change on urban food security bears challenges for livelihoods particularly of small scale farmers. Fortunately it has been established that vulnerable communities and women are passive, however, they are active respondents in

adapting to climate change by using different strategies to decrease vulnerability and increase their adaptive capacity.

It is without a doubt that there are extensive research studies and literature which explores climate change, food security and adaptation nexus however there are gaps in knowledge which are a key interest to the study:

- Firstly the relationship between climate change and food security is complex because climate change is a long and yet unpredictable process while the latter is an immediate and daily concern. A lot of studies look at the relationship broadly, however the studies envision that in order to have a solid understanding of the relationship between climate change and food security it is important to explore the relationship on a temporal and spatial scale.
- Secondly most of the research linking climate change and food security puts great emphasis on analyzing the direct implication of climate change on the sensibility of physical attributes of the crop system which includes however is not limited to; land suitability, crop yields, pest regimes etc. It particularly places prominent focus on assessing the biophysical aspects of production without giving aspects of accessibility, stability and utilization the much needed attention, which are significant in measuring food security. (Gregory et al, 2005).
- Thirdly, global attention is concentrated more on carbon and methane emissions and ways of reducing or mitigating its effects and there is less analysis on indigenous climate change adaptation and the potential of these approaches to be strengthened and improved. (Collier et al, 2008). However with that said, it is acknowledged that there are currently new policies and strategies developed to help communities adapt to climate change. Despite the development of these policies, there is still less known on the impact they have towards building the resilience and adaptive capacity of the poor, particularly women in urban areas who are often marginalized, remote and receive limited services or support from their government.

CHAPTER THREE

METHODOLOGICAL ISSUES AND CONSIDERATION

3.1 Introduction

This chapter is devoted to the methodological discussion and issues within the context of this study. The study falls within the discipline of social science which involves exploring, engaging and understanding the interaction between human society and their social and physical environment. It is worth pointing out that just like any other research; social research has its own limitations. Halloran (2010) observes that social science has created expectations by suggesting that clear answers and successful formulae may be produced at short notice; leading to a huge failure to recognize what reality amounts to the intrinsic unpredictability of our field more especially within the transitional phase.

Many researchers in social science will give testimony that conducting social research is a multiplex process which requires planning and patience... ‘The process of collecting data depends on meticulous timekeeping and constant planning and re-planning, always looking ahead in order to be ready for diversions. It is my experience that diversions do emerge and no matter how well prepared; events do not necessarily develop according to plan’ (Honarbin-Holliday 2005: 47-48). On the basis thereof, research methodology should not be comprehended as a resolution, however, it should be considered as a guide to the entire research process. It is important to note that methodologies used in INK to formulate new knowledge are not pragmatic to every community and social study.

The chapter is outlined and well-ordered in a manner that firstly, describes and clarifies the social research philosophy that influenced the study. Secondly, it outlines all the field work material used and the step by step procedures of collecting data. Thirdly, it presents the methodological reflections of the researcher exploring the different opportunities and challenges that surfaced during field work.

3.2 Philosophical Positionality

The philosophical position of this research was influenced by ‘interpretivism’. The interpretivism school of thought is interested in exploring culturally derived and historically situated ‘interpretations’ of the social life or of the world (Gray, 2014). It is particularly interested in interpretations which profoundly reflect on experiences and perspectives of the studied community and not on theoretical frameworks. Under the interpretivism umbrella the study was further supported by theoretical approaches of Symbolic interactionism, Phenomenology and Realism.

Symbolic interactionism forms a basis on conceptualizing human behaviour through people’s practices and lived realities as a way of establishing meaning (Gray, 2014). Gray argues that people interpret the meaning of objects and actions around them through the process of social interaction which will in turn influence how they act upon those interpretations. The phenomenology paradigm accords with that and argues that social reality is grounded in people’s experiences of their social reality. The realism approach is constructed by the view that entities exist independently of being perceived or independently of our theories about them (Phillips, 1987). Every person has a different way of understanding and viewing their surroundings. The qualitative and objective approach to the study helped the researcher engage with different world views participants to have a deeper understanding of their realities and to further grasp how that has shaped their construction of space.

3.3 Recapitulating on key terms

Before engaging the fieldwork tools and the step by step journey of collecting data, it is of significance to have a brief recap of the key terms and concepts used to conceptualize the study across the thesis. The key terms under inquiry are urban agriculture, livelihoods and climate change adaptation. The broad terms are all magnified under the same lens to understand them not as separate entities but to integrate their existence to develop a nexus and to tell a story of INK. As discussed in the literature review, chapter two of this thesis, urban agriculture, in the context of this study refers to micro-scaled food crop production limited to vegetables and cereals within the urban area. ‘Small scale farmers’ refers to individuals who are actively involved in urban

agriculture on a small scale or in small vegetable gardens to sustain the food basket of their households. The term small scale farmers will be used interchangeably with terms such as urban cultivators and UA farmers which are understood to mean the same thing in the context of this study. Livelihoods are understood as a means of acquiring and securing necessities of life which in this regard prioritizes food security within female-headed households. Climate variability should be understood as variations in weather patterns over space and time which have manifested itself in floods and drought. Climate adaptation refers to different techniques and methods used to adapt to the impacts of climate change.

3.4 Recapitulating on the research questions

The questions and objectives guiding this study were delineated in chapter one of the thesis. However, for the purpose of linking the methodology of the study to the broad objectives of the study, it is imperative to recapitulate on the research questions to understand how they guided the methodology and the choice of fieldwork tools.

The aim of the study was enlightened by the fact that women, particularly female-headed households in KwaZulu-Natal are burdened by a lot of challenges in the face of climate change, while there are solid policies in place which are designed to strengthen, empower and decrease vulnerabilities of the urban poor against climate change. In light of that, three main questions were developed forming the basis of enquiry.

- The first question investigated the manner in which climate variability has manifested itself previously in the province of KwaZulu-Natal. The impacts of climate variability and climate change are already visible in eThekweni Municipality affecting households and communities differently, projected to intensify with time and space. The purpose of the question is to paint a picture of how weather patterns have shifted and changed over time. For the scope and magnitude of the study, it was purposely decided to travel back and create a timeline of only ten years.
- The second question explored the different ways in which climate change has affected the ability of the urban poor, particularly women, to be able to secure food and sustainable

livelihoods. The focus of the question was to create an inventory of the different livelihood factors affected by climate variability and climate change.

- In view of the first two questions, the third question aimed to look at how current climate change policies and strategies build the resilience and adaptive capacity of the urban poor. For instance, eThekweni Municipality has drafted a number of climate change policies which prioritizes community development, food security and social empowerment among many other things and it is in view of that vision to investigate if, where and how they have initiated change.

3.5 Research design

3.5.1 Description of research site

This study was conducted in three communities within eThekweni Municipality in Durban, KwaZulu-Natal, namely Inanda, Ntuzuma and KwaMashu. The communities are adjacent to each other; however the physical boundaries between the areas are blurred. The study area is situated 20 kilometres inland from the Durban Commercial Business District (CBD) as shown in figure 3 below.

Source: VMMN Consulting (2016)



In line with the Apartheid planning, INK was placed at the periphery of the city. Inanda is the oldest of the three communities; it was established in the 1880s. KwaMashu emerged in the late 1950s as part of the Group Areas Act, established as a place to accommodate Africans from other local areas within the city during the Apartheid era. Ntuzuma was built in the 1970s as a planned African township to accommodate the growth of the population. The townships are characterized by both formal and informal settlement on hilly terrain and they share commonalities such as high levels of unemployment, high levels of poverty, social frustration, alienation, decaying infrastructure, and an urgent need to basic services such as electricity, water pipes to name a few.

INK was identified and chosen as an Urban Renewal Node (URN) of the Urban Renewal Programme (URP) in the year 2001 by our former President Thabo Mbeki. INK was selected for the pilot project because of its prevailing status as one of the agglomerations of low-income households in South Africa (South African Cities Network, 2009). The renewal programme aimed to integrate, coordinate and align service delivery to improve the quality of life of residents in the urban space and to further enhance their ability to take charge of their own lives.

In light of that, four areas of impact were prioritized; integrated governance, improvement of living environment, enhancement of income opportunities and investment in infrastructure; as a way to alleviate poverty and strengthen community development within INK (SACN, 2009). Frameworks guided by the programme have presented vast improvements to the social, economic and physical spheres of INK within the democratic space by transforming structures and processes resulting in a different outcome for households through space and time.

3.5.2 Population and sampling methods

The KwaZulu-Natal province of South Africa has the second largest provincial population in South Africa, with a population of 11.1 million (Statistics SA, 2016b). The population of INK is estimated at 4,871, 406 which represents 18% of the population of Durban (eThekweni Municipality IDP). The area has an estimated 115,136 households characterized by a mix of residential townships and informal settlements, with a population density of 6,325 people per hectare (eThekweni Municipality IDP). Due to the large population of INK, the study purposefully proposed to have a study sample of 95 participants, consisting of 90 households

across the communities and five officials from the local municipality and private sector. However, as mentioned before: ‘events do not necessarily develop according to plan’. As a result only 84 females from the three communities (27 from Inanda, 16 from Ntuzuma and 41 from KwaMashu) participated in the study and an additional seven officials from the municipality, NGOs and representatives/leaders of small garden projects contributed to the research findings. The study sample was summed up to 91 participants.

The study employed non-probability sampling methods to collect data. Non-probability can be defined as ‘a sampling technique where the odds of any member being chosen or selected for a sample cannot be calculated’. In line with principles of non-probability, the study purposefully ‘choosing subjects based on the potential to provide certain information that no other subject can provide’ (Maxwell, 1997) decided to collect primary data from local female-headed households who are involved in urban crop farming utilizing both home and public spaces. The approach allows the researcher to select a sample with a purpose in mind which ultimately fulfils the aims and the objective of the study.

Under the purposive sampling, a snowball technique was adopted to identify participants from all three communities. The snowball technique can also be referred to as the ‘network’ sampling (Frey et al, 2000). The starting point for snowball technique is to identify a participant who meets the criteria, then the participant is asked to refer or recommend someone they may know who also meets the same criteria. The snowball technique and approach is useful in reaching out to people who are hard to find, such as small scale farmers using public spaces which is time and cost effective. The same approach was also beneficial to identify officials and professionals.

3.5.2.1 Study sample and sampling procedure

Before the actual study sample and sampling procedure is discussed it is important to note that the process was neither random nor arbitrary however it builds on a well-established set of principles and practices of Participatory Climate Change Asset Adaptation (PCCAA) framework, which have been used before in earlier studies (Moser and Stein, 2010). The study combined two approaches; first, ‘bottom-up’ participatory research undertaken in three poor communities; second approach, a rapid appraisal of policies, programmes and institutions. The results were then triangulated using a micro-action planning workshop.

The first step was to get a contact person from the community to introduce and familiarize the researcher with the area. Through effective communication with the INK Area Based Management (ABM) offices situated at KwaMashu section E, a contact person was allocated to the research study to provide more information about the community. The next crucial step was to identify key people or research assistants who would help with the process of gathering data. Three local youths were identified through the help of the contact person, who are firstly familiar with the areas, secondly who are actively involved in community development projects around INK and thirdly who have experience in interviews and public participation.

On the 4th of July, the researcher and the assistants had a briefing meeting where the aims, objectives, questions and ethical considerations guiding the research study were discussed. Day two was dedicated to learning about the principles of the PCCAA framework and exploring its measure. Day three dealt with familiarizing the team with the field work materials which included the sampling procedure and the field work material. Day four and five were dedicated to taking a transect walk around the area which unfolded as follows:

Due to the fact that the researcher did not have a formal list of small scale farmers around the community of INK, the first task was to walk around the area to identify small scale farmers who either work in the vicinity of their yards or who utilize vacant land, wetland, backyard of a school, etc. The criteria of the research were twofold. Firstly, the female participant needed to be from a female-headed household or preferably they needed to be the head of the family themselves; however they needed to be above the age of 18. Secondly, they needed to have a vegetable garden in their home or be part of an urban crop production project elsewhere.

The starting point of data collection was at Inanda township, from the 11th to the 14th of July 2016. Three local people assisted the researcher in reaching out to the community and building networks of trust between the student researcher and the participants. The procedure at every community was to explain the aim and purpose of the research study to the participants and go through the participant information sheet with them and let them sign the consent form upon approval to take part in the study. On the 11th of July 2016, a lady from Inanda who will be represented as I1 was identified during the transect walk busy in her garden and agreed to be interviewed and showed us around her small garden. While talking to her, it was identified that

she also worked with other women and men from the community at their local garden situated on vacant land approximately two kilometres away from her house. Through the snowball technique five female-headed households with house-based gardens and 24 females utilizing open spaces were identified.

Four public gardens were visited at Inanda community. The setting of the vegetable gardens on vacant land or public space is that either the women work as a group on one big garden or they divide the piece of land into small sections for each person. The four gardens will be identified as IP1, IP2, IP3 and IP4. On vacant land, there is always a pair or a group of people working together at once. It is rare to find one person working alone at any given time. Farmers feel it is safer to work together. At each site, focus group discussions were held with female participants. One session of focus group would have an average of three to five people participating in an open discussion on the research questions. A total of six focus groups were held at the township of Inanda.

The second segment of data collection took place at KwaMashu township from the 15th to the 19th of July 2016. The same procedure was followed in this township. Through non-probability sampling, eight participants with home-based gardens and 34 participants utilizing vacant land were identified. The first garden was identified through referral from a local source which is situated at the community centre. The community based organization and non-profit organization which will be identified as KP1 provides home based care services to the sick, disabled and vulnerable. They run a gardening project to generate income and to sustain their feeding scheme. A few participants who met the criteria were identified and approached to participate in the study. Some of the ladies working in the project are from neighbouring communities including Ntuzuma. The majority of them volunteer their time to the project to get extra food for their families. Through the snowball method an additional six gardens were identified which will be identified as KP2, KP3, KP4, KP5, KP6 and KP7.

There was more variety of urban food production in KwaMashu Township with a lot of women Imbokodo at the forefront. Among the identified public gardens, we found a close corporation, a group of women united in common gathering to make a living for their families. They found an open land, cleaned the area themselves to create space and they connected water supply from the

river into their garden. They started small and now their garden is growing in members, hectares and in income. A total of 12 focus groups were held at KwaMashu with one session taking between 30 to 45 minutes.

The third segment of data collection took place at Ntuzuma township between the 20th and the 23rd of July 2016. Data collection at Ntuzuma was a little bit challenging due to weather conditions. It was raining, which made it difficult to find farmers working in their gardens. However, through the snowball technique we managed to identify a few participants who could be interviewed from their homes. The first two ladies were already identified at community centre KP1 based at KwaMashu. An additional three females who have home-based gardens and 12 who use vacant land for urban crop production were identified. Most of the interviews were one on one at their homes, however we managed to gather one focus group comprising of four participants. In total, over 10 focus group discussions were held and 84 women participated in the research study.

From the 25th to the 28th July 2016, semi-structured interviews were performed with officials and representatives from local forums, schools, community centres, NPOs and NGOs. A total of seven officials who are actively involved in community development and small scale farming and/or climate change adaptation contributed to the discourse and enlightened the researcher on how climate variability and climate change has impacted on food security at both community and household level.

On the 29th of July 2016, a brief workshop was held at KwaMashu Community Centre, where some of the women and officials from all the communities of interest were invited to attend. In the interest of having a small and organized workshop, an equation was used to determine the interval ratio, at which participants were to be selected from the total 84 to attend the workshop, in order to make sure that a small sample of each community is well represented. The following equation was used to select the respondents;

$$K [\text{interval ration}] = \frac{N}{n} \left[\frac{\text{Size of population}}{\text{Size of sample}} \right].$$

The interval ration for Inanda, Ntuzuma and KwaMashu respectively is as follows:

$$K = \frac{84}{27} : \frac{84}{16} : \frac{84}{41}$$

$$K = 3, 5, 2$$

Using the interval ratio it was decided to invite every third household/individual interviewed from Inanda, fifth female from Ntuzuma and every second respondent from KwaMashu township, which brought the total of respondents who attended the workshop to 32 as calculated below;

$$R [\text{respondents}] = \frac{n}{K} \left[\frac{\text{Size of sample}}{\text{Interval ratio}} \right].$$

$$R = \frac{27}{3} : \frac{16}{5} : \frac{41}{2}$$

$$R = 9 + 3 + 20 = 32. \text{ [Three Officials and community representatives were also invited to the workshop, increasing the number to 35 participants]}$$

The aim and purpose of the workshop was to triangulate and conclude on all discussions that were held prior. It was important to understand how much knowledge the local community have on policies that are meant to advocate for climate change adaptation in their municipality and how much they have been involved in the process of designing some of these documents and/or initiatives. The workshop provided a platform for dialogue where the participants talked about their knowledge and asked questions of clarity on issues that they have. The workshop was then disseminated into small working groups where they further engaged in discussion to formulate documented concerns and solutions about some of the challenges they encountered as female headed households of INK. With climate change adaptation as the key topic of concern, a SWOT

analysis approach was adopted as a way to identify some of the key strengths, weaknesses, opportunities and threats to the different climate adaptation strategies they use.

On the 30th of July 2016 all the researchers who were involved in data collection had a meeting to discuss, reflect, assimilate the data collected and to analyze the findings. The findings revealed interesting information presented in chapter four of the thesis.

3.6 Data collection tools

3.6.1 Approaching the interviewees

The PCCAA framework comprises of two components namely;

- 1) The Asset analytical framework which identified vulnerabilities of households in the context of this study.
- 2) The Asset adaptation operational framework identified the different bottom-up approaches adopted by female headed households to increase their adaptive capacity and to reduce vulnerabilities in the mist of climate change.

The purpose of this framework was to use data collection methods which allowed participants the opportunity to voice out their opinions, perceptions and tell a story of their lived experiences. The actor-oriented approach was important for the researcher to learn about the experiences of urban farmers without imposing his/her perceptions about the community on them (Author). In view of the PCCAA, the collection of data was done through the following methods:

- **Interviews**

Using methods inspired by qualitative research, interviews were the main method of collecting data, in an attempt to understand issues under inquiry from the subject's point of view and to unfold the meaning of their lived experiences in their own words.

Among many other definitions an interview can be defined as a meeting where a reporter obtains information from a person, as a meeting with another person to achieve a specific goal, and more

generally, as a conversation with a purpose (Kvale, 2006). For any successful interview, every social researcher would agree that careful management, sensitivity and trust are some of the traits one needs to present to the interviewee for a satisfying outcome or great understanding (Kvale, 2006; Mauthmer et al, 2002). There are three types of interviews which one can employ to collect data namely, structured interviews, semi-structured interviews and unstructured interviews.

Interviews can be administered on a one on one basis and during focus group discussions. Individual interviews offer a great degree of flexibility. Mathers et al, 1998 observe... the researcher can explain the purpose of the interview, encourage potential respondents to co-operate, clarify questions, correct misunderstandings, offer prompt, probe responses and follow up on new ideas in a way that is not possible with other methods. Individual interviews are easy to conduct and to analyze. However, they also have disadvantages, such as a possibility of respondents feeling intimidated to ask for clarity and feeling uncomfortable to answer certain questions with the fear of being judged by the interviewer. In view of that possibility, the study also collected information through focus group interviews. Focus group interviews are great in identifying and engaging with a group who share a common factor using fewer resources. It allows for a more relaxed setting where people are freer to engage on topic of enquiry with people they know. This method can provide a broader range of information which can reveal consensus or divergent opinions within a group. The disadvantage of focus groups is the challenge of managing groups and keeping order. Because of this possibility the researcher kept it to small groups not exceeding five people per focus group discussion.

For the purpose of this study, semi-structured interviews were used; adopting the use of open ended questions to gain meaning and understanding. Semi-structured interviews allowed the respondents to express themselves freely and to clarify and further elaborate on key issues involving urban agriculture, food security and climate change adaptation. Semi-structured interviews were used for both one on one sessions and focus group discussions. Two interview guides, guided by the three main questions of the research were drafted in advance before going into the field. The first interview guideline was administered to urban farmers and the second one was administered to professionals and community representatives from the municipality, NGOs

and local community initiatives. The interview guidelines were reshaped during the research process, demonstrating an increase in the level of knowledge acquired during data collection.

The interview guide which was administered to urban farmers was subdivided into five categories to get a fragmented but yet a holistic picture of what the questions aimed to capture from the local community. The interview guide captured the following:

- 1) Demographics and socio-economic status of households. Moser; and Simatele (2010) argue that factors such as socio-economic status and household assets can reveal how vulnerable a household is, because not only do assets help households build sustainable livelihoods but they also give them the capacity to respond and recover;
- 2) Baseline study on urban farming/agriculture aiming to get an idea on where, how and when farming takes place, the timeline or rather their experience in farming, the types of crops they harvest, and their perceptions on how urban agriculture has made a difference in their lives;
- 3) The perceptions and understanding of climate change, to understand how the local community perceive climate change and how they think the phenomenon has impacted on their livelihoods in the past 10 years;
- 4) Climate change adaptation;
- 5) Government and private interventions to help the urban poor, particularly female-headed households to adapt to climate change on both short and long term basis.

The second interview guide administered to professionals and community representatives was divided into four sections. The first section required the respondents to give a general overview of INK highlighting how the urban renewal programme has shaped the community and problems facing the community. The second section investigated the stretch and significance of urban farming to food security of INK and the impact of climate variability to its existence. Section three centered on eThekweni Municipal Climate Protection Programme and the Durban Adaptation Charter in relation to how effective they are in building resilience and adaptive capacity of the poor households of INK. The forth section addressed the future of climate change

adaptation to food security of female-headed households of INK and eThekweni Municipality at large.

- **Rapid Risk Institutional Appraisal**

Complementing the PCCAA, the study also adopted the Rapid Risk Institutional Appraisal (RRIA) which involved a top-down desktop review of policies and interventions used by relevant institutions which are instrumental in designing, implementing and monitoring policies related to climate change and food security on a local level (Moser and Stein, 2011). Meteorological data from the South African Weather Services were used to prove long term trends of weather events and to verify information from the respondents without scientifically investigating incidents of climate variability. Reports and published research studies from the Food Agricultural Organization (FAO), Intergovernmental Panel on Climate Change (IPCC), World Food Organization, African Food Security Urban Network (AFSUN), Department of Agriculture, Forestry and Fisheries (DAFF) among others were also used to substantiate findings of the research study.

- **Participant Observation**

This method of collecting data comprises of two factors namely observation and participation. Among many definitions it is defined as a method which involves observing behaviour and systematically recording the results and these observations. It is often rooted in ethnographic research with the objective to investigate perspective held by the study population. This method allows the researcher to describe existing situations using the five senses, providing a ‘written photograph’ of the situation under study (Erlandson et al, 1993 cited in Kawulich, 2005). Bernard (1994) indicates that while ‘observing’ it is important to establish rapport within a community and learn to act or ‘participate’ in such a way as to blend into the community so that the members will act naturally; the researcher tries to learn what life is like for an “insider” while remaining, inevitably, an “outsider.”

This method was employed in addition to interviews because it allows researchers to check definitions of terms that participants use in interviews, observe events that informants may be unable or unwilling to share when doing so would be impolitic, impolite, or insensitive, and

observe situations informants have described in interviews, thereby making them aware of distortions or inaccuracies in description provided by those informants (Marshall and Rossman, 1995 cited in Kawulich, 2005).

Participant observation was conducted throughout the whole process of collecting data in various phases; from the initial transact walk to the final workshop. The method was conducted in natural character and not in disguise. The researcher observed the outstanding factors framing the socio-economic and cultural dynamics of INK, taking note of how people live and how they interact with one another within their social space. The researcher also formed part of their activities by helping them in their gardens to create a bond of trust and making them feel that the researcher was a part of them and not a person who intended judging them or imposing views on them. During the interviews the researcher would also take a break and observe them as they worked in their gardens. After a few observations they would draw out some time to reflect and interrogate the observations. All the scattered key points, (unorganized) data, pictures and each point of knowledge from the field notes needed to be analyzed through coding, pairing and categorizing the findings to formulate ground theories that are relevant to the study area of INK.

3.7 Data Analysis techniques

Qualitative analysis is a process of reviewing, synthesizing, and interpreting data to describe and explain the phenomenon or social worlds being studied (Fossey et al, 2002). Data analysis can be carried out in three major steps which involve; 1) cleaning and organizing, 2) describing the data and 3) testing the hypothesis and models of the research study. The first step involves arranging and documenting the data in a database or in a structured manner. Step two and three involves making summaries of findings using both descriptive and inferential statistics.

Tesch (1990) discusses two approaches which can be used to analyze data namely meaning focused approach and discovery approach (cited in Fossey et al, 2002). The meaning focused approach emphasizes the comprehension of meaning, which can be translated into; understanding subjective meaning of experiences and situations for the participants themselves, as opposed to how these meanings might fit with researchers' conceptions. This approach involves identifying key themes that come out of the data. The themes are then grouped together to correlate meaningful relations (Fossey et al, 2002). The discovery approach aims to establish

patterns and connections among elements of data, to formulate ground theories. This approach involves a progressive process of classifying, comparing and refining grouping of text segments to create and clarify definitions of categories, or themes, within the data, (Tesch, 1990 cited in Fossey et al, 2002).

Both approaches were used to analyze data of this research study and more so, Fossey et al (2002) observe that both approaches involve more than just grouping and coding data; however, it is a process which requires conceptual inquiry to explore meanings, patterns or connections among data which involves the researchers' own thoughts, reflections and intuition.

Data was collected in three phases and was further analyzed according to the different phases. For the transact walk, participation observation notes were collected and were coded into different themes and patterns of discovery. Appraisals of policies were analyzed through a literature review. The responses from the interviews were recorded and analyzed according to the same structural layout of the interview guidelines. This made it easy to group the findings into small workable categories; making it easy to follow up, detect errors and analyze each category separately. Perceptions and views of participants were recorded on Microsoft word and key words were highlighted where frequent or common terms and perceptions were coded. The livelihood framework was used to analyze household assets and the manner in which they utilize them to make a living. Data which was converted into numerical value was added on Microsoft Excel computer package used to create visual models such as tables and graphs.

Below is a table which shows all the tools and approaches used to analyze data of this study (Table 3.1)

Table 3.1: Data analysis methods and tools used

Phase	Data Collected	Method of analysis/ Tools
Transact Walk and appraisal of policies	-Community profile; -Historic profiles of weather related events; -Appraisal of current policies, programmes and institutions assigned to deal with climate change; -Field observations	-Participatory community maps; -Seasonality calendars which identify climate variability patterns over space and time; -Literature review of policies; -Graphs.
Field Work/ Data collection phase	-Perceptions and views of the local community on the impact of climate change in their lives and how they adapt to the weather related events during different phases. -Field Observations	-Community problem timelines; -Causal flow diagrams; -Timelines; -Inventory tables; -Graphs.
Triangulation and Conclusion phase	-Brainstorming session by the local participants and their key solutions to the challenges that they have. -Focus group discussion and key findings by researchers	-Narrate stories as told by the local communities; -Create statistical data from the stories; -SWOT analysis; -Model linking all subject matter of the study.

Source: Field based data (2016)

3.8 Methodological Reflections

Data collection is a journey that requires patience and an open mind to anything that can happen in the field. There are always certain challenges that need spontaneity and good problem solving skills for a successful outcome. As researchers we all have expectations before we go into the field, which are mainly influenced by the desktop research that we do beforehand. That

immediately paints a picture in our minds of how the area looks like and what we can expect. That further influences the proposed methodology particularly the research design of the study which can either work or fail.

Methodological challenges might arise in the field which include but are not limited to language and communication barrier, social-cultural dynamics, religion, politics governing the area, to name a few. However, because of the nature of social research, the greatest challenge is developing that bridge of trust between the researcher and the researched. The researched are important subjects to the research for they inform the study, therefore without their participation no data will be collected and there will be no results. In this section I will give personal expectations, methodological reflections, actual field experiences and teachings of all happenings in the field.

The first step the researcher took was to have a transact walk around the area, which immediately gave the researcher a realistic picture of the area and what to expect. The researcher could identify areas of interest and observe the social dynamics of the communities. The researcher had personally expected to find a small community where people had small gardens in their yards. The transact walk triggered and inspired a lot of questions and made the researcher rearrange some of the proposed methodological approaches. The first discovery was that the communities are very big and vast and the geomorphology of area is also very steep, which required the researcher to change the systematic approach to collect data as initially proposed because the majority of the gardens are in public spaces and not in their yards.

The research methodology changed and the research team ended up using the snowball technique more. As mentioned in the sampling procedure, the first household was chosen systematically and then the other participants were referred through the snowball technique. Some people were not really comfortable being approached in that manner, which required a bit more time to explain and make them understand the purpose and the objective of the study. Most people took a while to warm up and to understand. The major concern was that we are government officials and they wanted to know how they are going to benefit from the study in terms of getting resources, because they get a lot of people who come and ask questions, show interest, however they do not return to fulfill their promises. The researcher thinks it would have been best to have

a contact person from the municipality who would have engaged with the participants a few weeks before the interviews.

The majority of the participants were old people and that posed a few challenges which included language, high level of intimidation, deviation of topic, short memory etc. Language was not too much of a challenge, however not too much because all researchers could understand the language, however, it was challenging and time consuming to translate certain words from Zulu to English and vice versa. Some of them have short memory so they would only remember the response to an earlier question later which would require going back to previous questions. Qualitative methodology is subjective in nature and allows people to express themselves in a way that is comfortable to them; however that posed a few challenges to time. For an example some would deviate from a question and let you in on personal historical events, past experiences which are not necessarily relative to the study. However, that helped the researcher get a deeper understanding of the background and history of some of the households.

The process of data collection and engaging with the participants through interviews and focus group discussions came with a lot of learning and a platform for exchanging knowledge. Participants learned a lot about key terms of the study and what they mean for them. It was enlightening to understand how issues of inquiry such as climate change and food security was perceived and understood by the community, and how that in turn influenced the manner in which they dealt with those issues as a community. It was observed that within the democratic space there are still a lot of people who lack a sense of independence. The local communities still believe that the government needs to ‘provide for them’; which in the context of this study includes climate change adaptation strategies and more means for their sustainable livelihoods owing to democracy and their right to have.

The greatest reflection and observation is that exploring a society and thoroughly learning about its history and the experiences of its people takes time; one has to live with the community for months or even for years to be able to say they ‘know’ and that they understand the community. That observation is more important for this particular study of exploring the impacts of climate variability on food security; which is a long process and cannot be fully comprehended in a space

of a few weeks. In view of that consideration, there is no short or long time to collect data, for each research has its own expectations and prerequisite for the results they aim to get.

However despite all the challenges, the journey of acquiring data was a great experience and it was also very informative. The community members had a very deep sense of Ubuntu and they were cooperative; which made it very easy to deal with certain challenges such as language barrier and explaining certain things to them because they assisted each other.

The methodology is merely a guide to develop a method or plan of action. Research reveals that it is important to have a plan of action to approach field work, because without it, it will be difficult to know where to start or what to do. The methodological approach provides direction and a structure. It is observed that there is no wrong or right way to do things; however it is all dependent on the type of the research and the prerequisites of what the research aims to capture, achieve or prove. Nothing could have prepared the researcher for the field work except to experience it firsthand. The proposed methodology provided a pathway to follow and helped the researcher capture data in a way that would help the researcher answer research questions. Due to the nature of the research study; the study sample, the sampling methods and all the fieldwork material complimented or worked well together to the desired results in chapter four.

CHAPTER FOUR

THE EMPIRICAL EVIDENCE

4.1 Introduction

This chapter is dedicated to presentation of the empirical data and evidence collected in the field. The data was collected between the months of June and August 2016, over a period of five weeks. The findings were obtained in line with the research objectives of the study as outlined in chapter one of the thesis.

The aim of this chapter is four-fold. Firstly, it aims to capture the demographics of female-headed households in the communities of INK. Secondly, the chapter aims to highlight the significance and contribution of urban farming to urban food security. Thirdly, the chapter investigates the manner in which climatic conditions of KwaZulu-Natal have significantly shifted and changed over the past 10 years; and to further explore how the change has had an impact on household food security. Subsequently, the fourth aim explores the different adaptation techniques and methods used by female-headed households to adjust their livelihoods to the impacts of climate variability.

4.2 Recapitulating the scope of the study

Before presenting the empirical findings, it is important to recap on the scope of the study and briefly discuss the key subjects which this study revolves around. The research findings presented in this chapter are based on grassroots responses and perceptions from three communities namely Inanda, Ntuzuma and KwaMashu in eThekweni Municipality, Durban. As outlined in chapter three of this thesis; a total number of 84 local females participated in the research study represented by 27; 16 and 41 female-headed households in each community respectively. In addition to these responses; seven officials from the government, non-governmental institutions and local authority of INK who are instrumental in designing and implementing CC and FS interventions and programmes were also interviewed. This summed up the total respondents of this study to 91 participants.

The study was limited to female-headed households who are involved in urban food production through the activity of small-scale farming. The terms urban farming and urban agriculture are used interchangeably in the study but must be understood as referring to urban food crop production. Urban food crop production in the context of this study refers to vegetable farming only. It is established in chapter two of the thesis that urban agriculture contributes significantly to household food and nutrition security. In an attempt to explore that statement, the study adopts a more systematic approach in measuring household food security which includes aspects of food availability, access, stability and utilization.

It has been established in chapter two that climate variability and change has and will continue to have an impact on the sustainability of urban agriculture. It was therefore important for the study to explore the ‘type’ and extent of the impact particularly on FHH in the community of INK, and to subsequently comprehend on how they adapt. In view of that, it was imperative to understand the different factors and processes that either constrain or enhance female-headed households to adapt to climate change in an economically, ecologically and socially sustainable manner. eThekweni Municipality has invested in climate change policies with a pro-adaptation framework. A more magnified lens is placed on the Municipal Climate Change Protection Programme (MCCPP), to explore how the policy contributes to building capacity of FHH in the context of climate change adaptation while acquiring food security.

4.3 Demographics and Socio-economic Status of female-headed households of INK

“While urban women share a common identity based on the prevailing social norms that assign them the major responsibility for reproductive activities (which include not only biological reproduction but also social reproduction or care work), they are also a highly diverse group”
(Tacoli and Satterhwaite, 2013).

The South African Department of Provincial and Local Development (2009) has identified that the female to male ratio in INK is almost equal with 51% of the population made of females and 49% of males; however, male-headed households are in the majority at 57%. FHH are represented by 43%, and most of them bear a lot of challenges and responsibilities in regards to upholding family stability and support. The majority of FHH are breadwinners for their families

or are conversely from households where either no adult males are present, owing to divorce, separation, migration, non-marriage or widowed, or where men although present do not contribute to factors such as the household income.

Below are demographics and household characteristics distinct to FHH in INK. The following section is important in drawing or giving a picture of the different households. The findings for this section will be significant in enlightening the measure of household food security and beneficial in determining the different factors which influence adaptation to climate variability and change.

4.3.1 Age

The study was interested in finding out the ages of the female participants to determine the trend in headship. The ages of the participants are useful and helpful in determining factors such as their marriage status, the number of dependents they take care of, the amount of responsibility they uphold, their ability to work and the general state or wellbeing of the participant to be able to take care of themselves.

Table 4.1: Age of female headship

Age	Inanda	Ntuzuma	KwaMashu	%
20-30	IIII	II	IIII I	14%
31-40	IIII I	IIII	IIII IIII II	26%
41-50	IIII II	IIII I	IIII IIII IIII I	
51-60	IIII	I	III	10%
61-70	II	III	I	7%
Above 70	IIII	-	III	10%
Total n (84)	(n)=28	(n)=16	(n)=41	100%

Source: Field-based data (2016)

In view of the ages in Table 4.1, it is evident that the majority of the participants are old, revealing that an estimated 35% of FHH are between the ages of 41 and 50. The age trend is followed by an estimated 26% of females between the ages of 31 and 40. The elderly are also fairly represented in the study with an estimated 7% FHH who are between the ages of 61 and above. Based on the findings it is evident that the majority are old participants. In addition to that, it is established that the participants take care of between one and eight dependents who include children, grandchildren and extended family.

4.3.2 Nationality

The community of INK is dominated by Zulu speaking people; however, the community is made up of rich and diverse cultures. Within the community there are females from neighboring countries who have come to South Africa to seek working opportunities and to make a living for themselves and their families. In the context of FHH and the discourse framing females to be vulnerable particularly in attaining sustainable livelihoods and adapting to social, economic and environmental stresses and shocks; it was of a small interest to the study to determine if females with different origins experience life differently and have different challenges in that regard. Participants were asked to reveal their nationality as captured in Table 4.2 below.

Table 4.2: Nationality of households

Nationality	Inanda	Ntuzuma	KwaMashu	%
South African	25	15	37	92%
Other	2	1	4	8%
Total	27	16	41	100%

Source: Field-based data (2016)

It was discovered that there are females from neighboring countries such as Mozambique, Zimbabwe, Swaziland, and Lesotho. However, the findings from Table 4.2 reveal that there is

only a small percentage (8%) residing in the community or who are particularly involved in urban crop production.

4.3.3 Duration of settlement in INK

In addition to that, the study was highly interested in establishing the number of years that the participants have been residing within the community of INK. The duration of settlement was significant in gauging how knowledgeable the households are regarding issues that involve the background history of the community, and the social, economic and environmental dynamics abounding the area.

Table 4.3: Number of years of settlement in the area

Number of years	Inanda	Ntuzuma	KwaMashu	%
Less than a year	-	2	2	5%
1-5 years	3	1	7	13%
6-10 years	6	3	11	24%
11-15 years	18	10	21	58%
Total	27	16	41	100%

Source: Field-based data (2016)

In view of Table 4.3, the majority of households, 49 of them (58.3%) have been staying in INK for more than 11 years. This gave their responses a depth of confidence because they were able to provide or share their encountered reflections of how life has changed or transformed over space and time as experienced firsthand.

4.3.4 Employment Status/ Source of Income

The South African Department of Provincial and Local Development (2009) stated that the economy of INK is conceptualized into three categories namely;

- 1) Welfare provision,
- 2) Employment on an external economy and
- 3) Limited economic activity.

This can be translated into the following;

- 1) a lot of households depend on welfare for survival,
- 2) Those that are employed work out of the node of INK in the Durban CBD because,
- 3) There are less economic activities happening around INK in the form of small businesses and enterprises.

In view of these findings, it was of great interest for the study to explore the economy of INK particularly of FHH. In order to establish the economy of INK and to get a picture of the financial stability of the households, the participants were asked various questions which captured factors which include their employment status and the different sources of revenue that contribute to their monthly income. The key findings are summarized in Table 4.4 below.

Table 4.4: The different revenues or sources of income for households

Employment status/source of income	Inanda	Ntuzuma	KwaMashu	Total	%
Grant (Child support/foster/disability)	19	8	32	59	33%
Unemployed	8	9	23	40	22%
Informal employment/ Part time jobs/ Self-employed	15	4	16	35	19%
Other	4	5	9	18	10%
Formal Employment	4	3	7	14	8%
Pension	7	3	5	15	8%
Total Frequency of response	57	32	92	181	100%

Source: Field-based data (2016)

In view of findings presented in Table 4.4 it is evident that a lot of households depend and survive on welfare which includes child support grant, foster care and disability grant. Welfare is the most dominating supporting income for households. There is currently an astonishing high rate of unemployment (22%) and only 8% of the female-headed participants are represented in the formal economy. A female respondent aged 28 from Inanda stated, ‘It is very difficult to get a job without any qualification, now even if you want to work in retail to do anything they still want standard 10 or what is referred to as grade 12 certificate’ (Pers. Com 2016a). The few who have managed to secure formal employment work in elementary occupation and low wage jobs such as housekeeping, security, cleaning, textile manufacturing, retail, sales etc.

However, there is an estimated 19% participants who have managed to infiltrate the informal economy through part time jobs or what they refer to as ‘piece jobs’ such as housekeeping work for other people once or twice a week and through self-employment such as selling and providing small services (sewing, hair salon, baking etc.) to other people which has proved to be a viable and practical source of income for the households in absence of conventional work opportunities.

In view of the ‘total frequency of responses’; the responses are not averaged from the total 84 because there are certain households if not the majority who survive on more than one source of income i.e. a pensioner who is self-employed and still receives child support grant for the grandchildren or extended family. The category “other” includes extra support or other income generating opportunities such as financial support from family (children and relatives), rental of outside rooms, remittances, and social gatherings such as ‘stokvel’ etc.

4.3.5 Average Income

In light of the divergent sources of income, it was important for the study to get an average income which the households receive on a monthly basis. As mentioned above, there are certain households who have more than one source of income and based on that, households were asked to average their monthly income inclusive of all the money they receive from the different sources of revenues (table 4.5). From the aggregated income, it is established that some households have a guaranteed or fixed source of income such as grants which is used to sustain the households on a monthly basis; however the income fluctuates more especially for households who rely on informal economy or part-time occupations for survival.

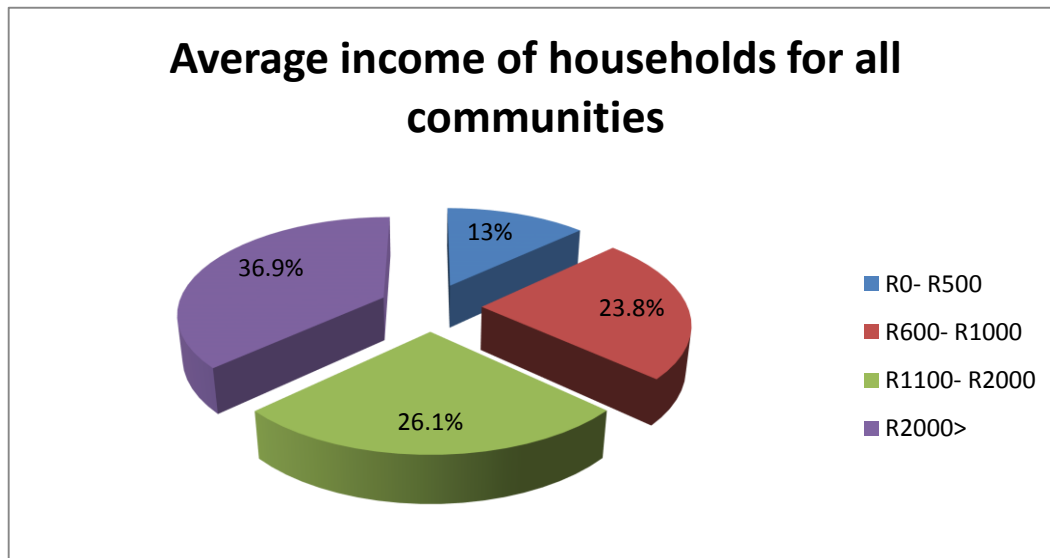
Table 4.5: The average income for households on a monthly basis

Income	Inanda	Ntuzuma	KwaMashu	Total	Percent %
R0- R500	1	2	8	11	13%
R600- R1000	4	3	8	15	18%
R1100- R2000	10	7	11	28	33%
R2000 >	12	4	15	31	36%
Totals	27	16	42	85	100%

Source: Field-Based data (2016)

In view of the findings in Table 4.5, it is evident that the majority of the households (36.47 %) get an average income of +R2000 in total per month and the least (13.09%) manage to secure a minimum income of < R500. However, magnifying to the visual illustration (Graph 4.1) the aggregated income for all households in the three communities show that when combined there are actually more (62.9%) households who survive on less than R2000 a month.

Graph 4.1: The average income of all households in the three communities



Source: Field-Based Data (2016)

Factors such as the average income can be used to measure affordability and in turn be used to determine vulnerability of households particularly in regards to their ability to secure sustainable livelihoods.

Households have mentioned that finances are stretched on food, health care, rent, house maintenance, insurance, transport, church fees, education to name a few. From that, it is established that the average income is not always enough to cover all expenses each month. For instance a female respondent aged 45 from Ntuzuma stated that '*Cost of living is too high and things are expensive. I cannot afford to provide for my family everything that we need in the house such as food, electricity, water, fees etc. with the money that I get and I cannot help but stress about tomorrow*' (Pers. Com 2016b). It is more of a need for household to have more than one source of income or find other alternative income generating opportunities.

4.4 The significance of urban farming to food and nutrition security of female-headed households

It is established in chapter two of the thesis that urban agriculture is adopted by communities and households as a survival strategy, responding to several combined living conditions, shocks and stresses shaped by the environment. The South African government and other food institutions recommend and endorse small-scale farming as a solution to food insecurity in Africa (Frayne et al 2010). In South Africa the government, NGOs, CBOs, the community and other relevant stakeholders have been taking initiative to start community gardens to increase the network of production, distribution and access, to lower the cost of food within the urban landscape and to contribute to sustainable livelihoods, more especially of female-headed households who often survive on less income.

In view of the findings that the average income for households is not always enough to cover all households needs, one of the key interests of the study was to understand the significance of urban agriculture to sustainable livelihoods particularly of FHH. Households were asked to mention the different motivations for farming to get an idea of how the activity contributes to households achieving sustainable livelihoods. The different motivations for farming or engaging in urban food production overlap between the three communities. The key findings are summarized below (Table 4.6).

Table 4.6: Household motivations for urban farming

Reasons and motivation for farming	I	N	K	Rank
Extra food	22	14	32	1
Lack of employment	16	12	36	2
Avoid buying vegetables/ Save on costs	20	10	24	3
Source of extra income	6	4	18	4
I am part of a co-operative;	2	4	12	5+
I am part of the feeding scheme garden for my kids at school;	3	2	5	
My neighbour used to give me vegetables so I got inspired to do it for myself while I'm still looking for a job;	2			
Got seeds from the government/Project and so I decided to continue;				
I attended training by the department of agriculture and I loved it;	2	1	6	
My families (father, mother, grandparents etc) have been doing it for some time and I got used to it	1	4	13	
I come to socialize with other ladies;	3		4	
Physical Labour;				
Recommended by the Doctor/Nurse to be healthy;	1	2	12	

Source: Field Based Data (2016)

Given the choice to select multiple motivations for farming, the four key motivations of engaging in small scale farming include:

- 1) Source of extra food (80.95%);
- 2) An activity to keep busy while looking for employment (76.19%);
- 3) A way of saving financial costs on fresh vegetables (64.28%); and
- 4) Source of extra income (33.33%).

The majority of households (55%) have been farming for more than two years even though the duration is not fixed or stable for certain households. There are certain periods and phases where households stop farming due to reasons which can be attributed to a new job opportunity, illness, floods etc. However, farming has turned into a lifestyle for most. While certain participants have mentioned that they prefer to work alone some of the female participants have decided to unite in common gathering to work together through small projects and co-operatives to flourish economically and to increase the amount of yield for households to share.

Some of the crops that they harvest include spinach, beetroot, potatoes, maize, amadumbe (*Colocasia esculenta*) carrots, tomatoes, cabbage, spring onions, pumpkin, cabbage, peppers, mushrooms, herbs, fruits only to name a few. Households have mentioned that urban crop production has increased household food diversity and nutrition security. Households have access to a variety of different kinds of foods and they are able to eat healthier while saving financial costs as well.

Figure 4.1: Maize field in Kwamashu Section



Figure 4.2: Spinach produce in a garden at Inanda Section



Source: Field Based (2016), Photo Researcher and Author

There are a few challenges that can hinder the success of urban agriculture. One prevalent challenge within the community of INK is availability of land. During the transact walk, it was discovered that many households do not have access to sufficient space to have backyard gardens. They use minimum spaces such as, tires, and buckets to plant their produce. However,

despite the challenge, many female participants have gone an extra mile to find open spaces which allow them access to a wider space to erect their gardens.

Table 4.7: Space utilized for farming

Place of garden	Inanda	Ntuzuna	KwaMashu	%
Backyard gardens	5	3	8	19%
Public Space*	24	16	36	90%
Totals	29	19	44	#

Source: Field Based Data (2016)

Note: *Public space refers to open field, school backyard, community centre etc.

In view of the findings in table 4.7 it is evident that some female participants still prefer to be involved in community gardens even though they have access to backyard gardens. Female participants who have access to backyard gardens (19%) have mentioned that having a garden at home or at close proximity allows for easy access to the garden meaning they do not have to walk long distances to the community gardens more especially elders, it allows for full control over resources, and they are able to protect harvest from thieves because there is high security.

However, despite such benefits, participants (90%) have also mentioned that being involved in community gardens provides more convenience in terms of having access to bigger land, access to resources such as enough water, they are able to produce more and get a better income, there is shared responsibility, and it also provides a space to get to network with other members of society as well, to share knowledge on how to flourish and deal with any challenges they might have such as climate variability.

4.5 Change in climate conditions in the province of KwaZulu-Natal (eThekweni Municipality) over the past 10 years

It is established that the climate of eThekweni Municipality has been changing over the years. For instance, temperature has been increasing and it is projected to increase further by up to 1.5° C and 2.5° C between the year 2045 and 2065. In addition to that, the annual rainfall is also projected to increase by up to 500mm by the year 2100. The change in rainfall patterns over short spaces of time is expected to result in higher and faster stream flows with potential to cause frequent floods, high levels of erosion and a number of tropical storms.

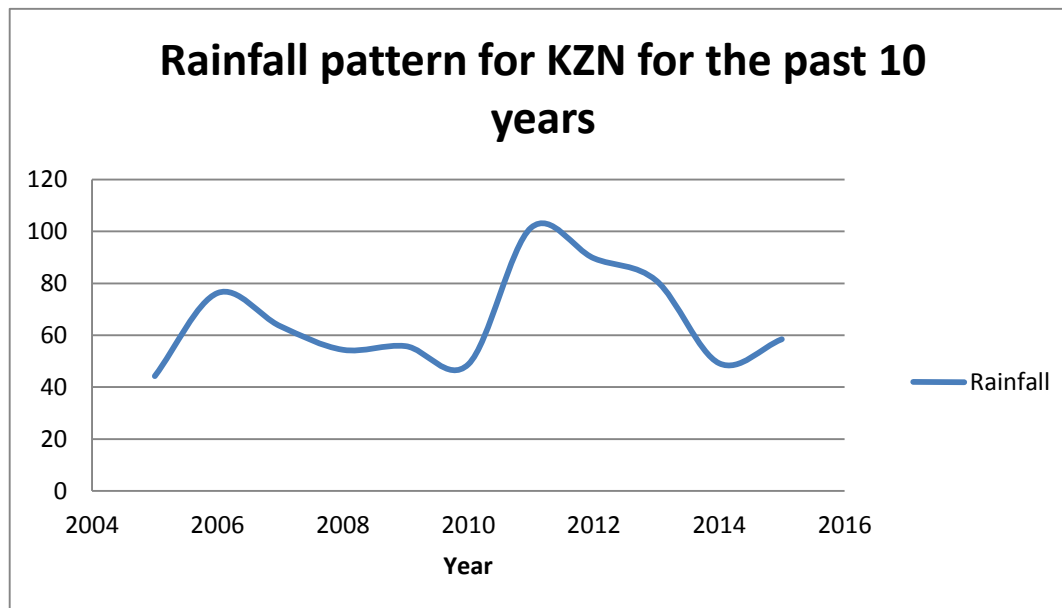
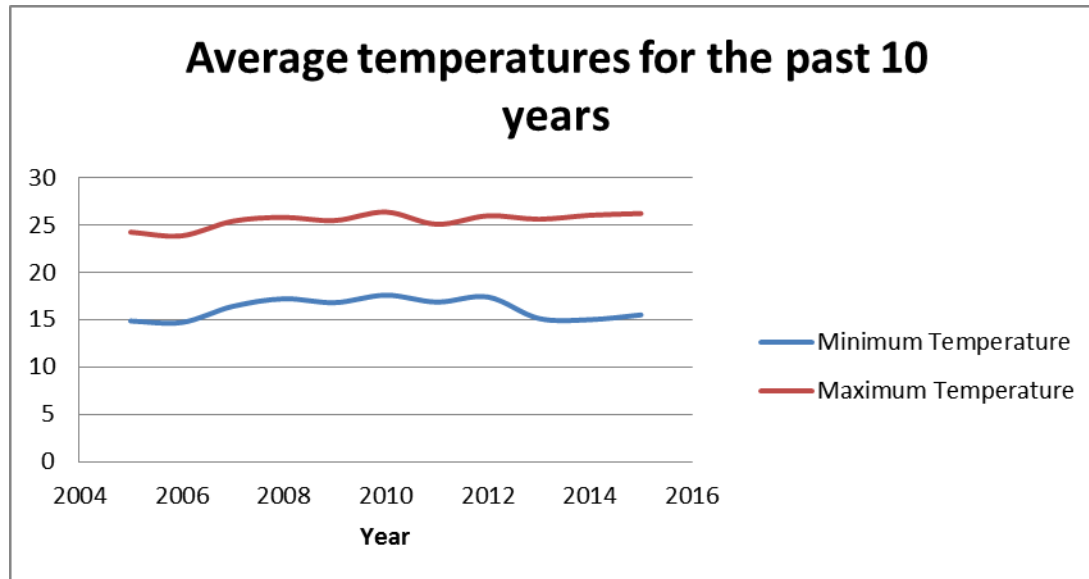
Considering that urban agriculture is dependent on climate conditions, one of the key interests of the study was to analyze how climate conditions have changed over the last 10 years from the year 2005 to the year 2016. The study was particularly interested in merging both scientific data and human perceptions to explore how the change in meteorological data has had an impact on human society particularly on small scale farmers. For the analysis, temperature and rainfall data for eThekweni Municipality was retrieved from the South African Weather service archives (table 4.8), recorded at Mount Edgecombe weather station which is approximately 19 Kilometers away from the community of INK.

Table 4.8: Meteorological data trends

Year	Minimum Temperature (°C)	Maximum Temperature(°C)	Rainfall (mm)
2005	14.86	24.24	44.25
2006	14.7	23.85	76.25
2007	16.4	25.39	63.5
2008	17.2	25.8	54.4
2009	16.8	25.46	55.8
2010	17.58	26.36	48.8
2011	16.86	25.07	101.4
2012	17.39	25.96	89.68
2013	15.12	25.6	80.98
2014	15	26.02	49.2
2015	15.5	26.2	58.46

Source: South Africa Weather Service (2016)

Graph 4.2: Yearly average temperature and rainfall patterns



Source: South African Weather Service (2016)

Drawing from the data in table 4.8 and graph 4.2, the minimum temperature over the 10 year time frame demonstrates a shallow ‘parabolic’ shape. Between the year 2005 and 2006 the temperature was low, however it slightly increased from the year 2007 following that trend for

four consecutive years. From the year 2013 the trend reverted and decreased. The maximum temperature demonstrates a non-linear pattern which illustrates an increase in temperature.

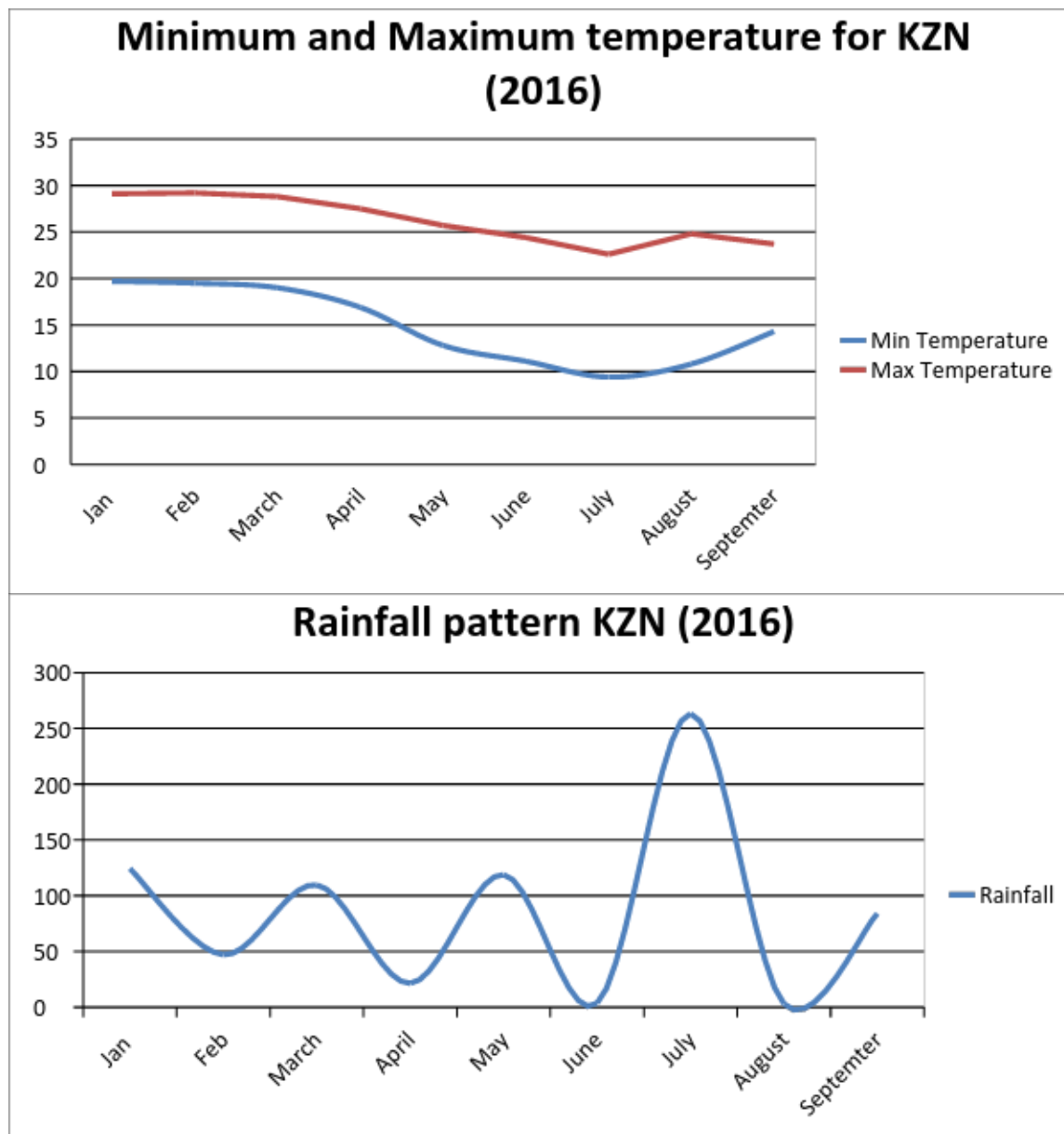
Projecting to the year 2016, the data for the current year (2016) cannot be averaged because the data was retrieved during the month of September. Below (table 4.9) are averaged temperature and rainfall patterns for each month from January to September 2016.

Table 4.9: Average monthly weather for 2016

Month (2016)	Jan	Feb	March	April	May	June	July	August	September
Min temp °C	19.7	19.5	19	16.9	12.8	11.1	9.4	10.8	14.3
Max temp °C	29.1	29.2	28.8	27.5	25.7	24.4	22.6	24.8	23.7
Average rainfall mm	124.2	47	109.6	21.4	118.8	3.6	263.2	3	84

Source: South Africa Weather Service (2016)

Graph 4.3: Monthly average temperature and rainfall pattern



Source: South African Weather Service (2016)

Drawing from the data in table 4.9 and graph 4.3 the average minimum temperature for the nine months is recorded at 14.8 C°, the average maximum temperature at 26.2 C°, and the average rainfall was recorded at 107.48 mm.

4.6 Climate variability: Human Perceptions

The data retrieved from the South African Weather Service demonstrates a significant change in both temperature and rainfall patterns over the 10 year time frame. More so, there have been reported cases of prolonged drought (isomiso) and frequent floods (Izikhukhula) within the boundaries of eThekweni Municipality as well, affecting all study areas. In view of that, the study was interested in exploring the views and perceptions of female participants to understand their understanding of climate change and how the change in climate conditions has had an impact on farming and livelihoods.

The participants were asked to define climate change and explain their understanding of the phenomenon. The majority of them (58%) are not familiar with the scientific discourse framing the dynamics triggering the occurrence; however, they are observant of the changes in climatic conditions that have been occurring over the years and they refer to it as ‘Ukuguquka kwesimo sezulu’. In light of the manifestation of climate variability and change, households have observed an increase in temperature accompanied by heat waves, cold winters accompanied by frequent cold fronts and heavier rainfalls as well. One female participant aged 58 from KwaMashu stated that *‘the weather has been very unstable, when it’s hot it gets extremely hot and when it’s cold it gets extremely cold. And that is not how we are used to the weather here in eThekweni. For example this year in winter it was freezing and raining heavily and usually our winters are warm and sunny* (Pers. Com 2016c). The key perception is ‘it has been almost impossible to predict the weather’.

Climate variability has been perceived differently by households, and while some perceive it as a natural occurrence, the majority believes that climate change is a result of God punishing the world for sinning. A female participant aged 44 from Inanda stated, *‘the weather is controlled by God, there is nothing much that we can do to control the floods or even stop the heat, we can only pray for rain and hope that we survive’* (Pers. Com 2016d).

To delineate the general observations, participants were asked to compare and rank the prevalence of the different weather related events. The perceived findings are summarized in table 4.10 below:

Table 4.10: Prevalence of weather related events in the study sites

Change in weather	Inanda	Ntuzuma	KwaMas hu	Frequen cy	%	Rank
Decrease in temperature	8	3	16	27	32%	Code 0
Increased precipitation	11	7	22	40	48%	Code 1
Increase in temperature	12	8	27	47	56%	Code 1
Drought/shortage of water	19	10	34	63	75%	Code 2
Floods	23	10	39	72	86%	Code 2
Total	73	38	138	249		

Source: Field-based data (2016)

Note* Code 0- Not prevalent, Code 1- Prevalent, Code 2- Extremely prevalent

In view of the findings (Table 4.10), participants (32%) have mentioned that cold spells are not prevalent and do not have a prominent impact on livelihoods. Contrary to that, participants (56%) have observed that there has been an increase in temperature and due to that heat waves have been ranked as a prevalent weather related event. A substantial 48% believe that due to the increase in temperature and prevalence of heat waves there has been an increase in the frequency and intensity of rainfalls. However, despite the reported prevalence of rainfall, droughts are also perceived and regarded extremely prevalent by a substantial 75%. Households have mentioned that they have been experiencing shortages of water and restricted water supply which is an issue that prolongs from a few days to a few weeks at a time. In view of that one can assume that INK

is a community which is water scarce, however a substantial 86% have rated floods as being prevalent and an extremely severe weather related event. The significantly high ranking for floods can be attributed to the fact that the interviews were conducted just after the community experienced flooding and strongly based their perceptions on the recent occurrence.

4.7 Impacts of climate variability and climate change on food security

“Climate change will bring with it increased frequency of natural disasters that affect agriculture and households. It will alter temperatures and rainfall patterns, thereby changing farming practices and household behaviour” (Yamauchi and Quisumbing, 2009)

Drawing from the participants understanding of climate change and their perceptions of the weather related events strongly associated with the occurrence, female participants were asked to elaborate on how that has had an impact on household food security more particularly as small scale farmers. The study was interested in exploring the climate change and food security nexus capturing the broader dynamics that drive food security at a micro level.

Referencing to the key motivations of urban farming (Table 4.6); it is evident that food production is paramount to food security. However, considering the different definitions of food security; it is noted that the measure of the food system is broad, just like a web, and encompasses other dynamics which includes food accessibility, stability and utilization as elaborated on in chapter two. This implies that the relationship between food security and climate change is intricate and needs to be explored using a systematic approach.

Considering the extensive amount of literature that prioritizes and magnifies more on the biophysical aspects of farming the study intended to take a different approach and explore the socio-economic dynamics that influence the food system. In view of how female participants perceive climate change (Table 4.10), households were asked to explain how frequent floods and drought, as the two most rated weather related events, have had an impact on household food security. The findings are summarized below (Table 4.11):

Table 4.11: The impact of climate change and variability on food security

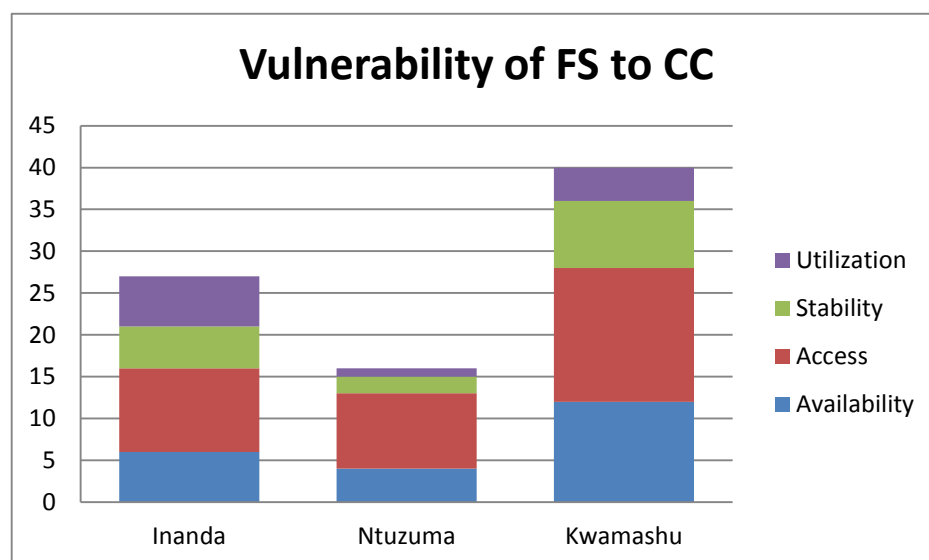
	Availability	Access	Stability	Utilization
Inanda	6	12	3	6
Ntuzuma	4	9	2	1
KwaMashu	12	16	8	5
Total %	27%	46%	16%	11%

Source: Field based data (2016)

Households are not familiar with the term and definition of food security (ukulondela kokudla) as used in academia but the general understanding or perception of food security is ‘not to be poor’ or ‘not to go to bed hungry’.

In view of the findings in Table 4.11, it is evident that climate change has the most impact on food accessibility (46%) and availability (27%). Households have mentioned that climate change puts more pressure on the process of production and ultimately on affordability. However, even though food stability and food utilization are ranked vulnerable at a low rank of one by 16% and 11% households respectively, they are also viable dimensions to the measure of household food security as shown in Graph 4.4.

Graph 4.4: Vulnerability of Household Food security to Climate change



Source: Field based data (2016), data from table 4.11

In view of the findings (Table 4.11 and Graph 4.4) the study wanted to explore the dimensions broadly. Households were asked to point out the key factors that are most impacted on under each dimension (Table 4.12). Using this approach to explore the impacts of climate change on food security will be significant in coming up with approaches that can be used to reduce vulnerability and thereby improve food security.

Table 4.12: Impact of climate variability on food security

Dimension of food security	Drought			Floods			vulnerability		
	0	1	2	3	0	1	2	3	
Availability									
Production increase/decrease yield, Shortage of water				•				•	
Soil erosion/ soil fertility				•	•				
Exchange(Destroy garden or infrastructure)		•	•					•	2
Access									
Affordability									
Price hike and savings				•				•	
Food preference and consumption				•				•	2
Stability									
continuity in the urban food supply			•				•		1
Utilization									
Food quality and safety			•				•		1
Health		•					•		

Source: Field Based Data (2016)

Note * 0 = no impact/not vulnerable, 2 = severe impact/extremely vulnerable

Drawing from the responses, all of the households have mentioned that they are not food insecure; no households have gone a day without food. Even though it does not always entail having nutritious food, households manage to make ends meet by accessing other alternatives or by adjusting their livelihoods to adapt to climate variability.

4.8 Different adaptation strategies used by female-headed households to adapt to climate change and climate variability

In light of the climate change and food security nexus in INK, the study was further interested in exploring the different approaches used by FHH to build and strengthen their capacity to adapt to climate change. It has been established in chapter two of this thesis that women across the globe have always been active respondents in adaptation to climate change; and based on that it was therefore important to find out how women and FHH in KwaZulu-Natal adapt to the convergence of climate variability on food security.

Literature in chapter two has identified that a magnified focus is pinpointed on post adaptation and this research was interested in highlighting the broad spectrum of climate adaption looking at pre, during and post adaption methods. Before the actual adaption mechanisms were explored, the participants were asked to mention when they were likely to adapt to the different weather related events focusing on both floods and drought as the two most severe and prevalent weather related events as stated by the participants (Table 4.10). The findings are summarized below (Table 4.13)

Table 4.13: Number of households who invest in adaptation

	Inanda	Ntuzuma	KwaMashu	Total Frequency	%
Pre-event	18	9	30	57	34
During	9	4	24	37	22
Post-event (floods)	22	12	38	72	44
Total frequency	49	25	92	166	100

Source: Field based Data (2016)

In view of the findings, it is evident that most household (44%) adapt to the implications post the event more especially during cases of floods. Households have mentioned that ‘post’ event is the most significant phase of recovery because they are forced to invest in ways to survive which often includes restructuring, rebuilding and even healing. However, there are households (34%) who manage to invest in pre-adaption methods to build and strengthen household capacity before they experience anything, which is not always viable because they either have no warning signs or receive the warning late. A female respondent aged 58 from Inanda stated ‘usually we do not know if there is going to be a flood or when we going to experience water restriction in the area, so most of the time it becomes very difficult to stay alert or prepare yourself for it. In cases of floods it is understandable because that is a natural occurrence, however with water restriction it becomes very difficult because you find that the household cannot function properly during that time’ (Pers. Com 2016e). It is also evident that only a few female participants (22%) are able to come up with different strategies to help their households cope during the weather related event.

In order to explore the different methods used by households to adapt to the adverse implications of climate change, the Sustainable Livelihood Framework (SLF) was found to be more suited to use to find broader findings. It is evident from section 4.1 that FHH in INK have diverse characteristics and demographics even though they share the same societal space. Based on that fact, it was immediately assumed and established that households will employ different approaches and methods specific to household capacity and needs. The livelihood framework was useful in that regard because it is deeply rooted in exploring livelihoods using an approach that incorporates environmental factors, socio-economic dynamics and the political agenda as well which are all significant in either enhancing or hindering the ability of households to adapt.

Using the SLF, households were asked to describe the different climate change adaption techniques they employed using their different household assets before, during and after floods or droughts particularly as small scale farmers (Table 4.14)

4.14: Adaptation strategies used by households

	Human	Social	Physical	financial	Natural
Pre-event					
Availability	Increase human labour, work extra hard, attend training to acquire more skills and use indigenous knowledge	Work with other females/ Join co-operative	Secure shelter and garden maintenance.	Use regular financial flow such as grants to invest in agricultural inputs and resources.	Increase production; Find bigger land, Invest in flood control measures such as drains
Access		Share agricultural and financial benefits with co-op members		Save money	
Stability					Increased production

Utilization	Invest in health				
During					
Availability	Discontinue and focus on other things	Remittances	Recover resources such as agricultural inputs		Harvest rain water/ draw water from the river
Access	Decrease consumption	External support and aid from community		Spend less and borrow or get a loan	
Stability	Decrease consumption	External support and aid from neighbours			
Utilization	Invest in health				
Post-event					
Availability	Invest in training	Strengthen social	Recover and		Increase

	and new skills, resume farming.	networks and forums by working with others	rebuild infrastructure; Maintenance of resources such as water capture and drains;		production, Change farming practices, save water, resettle to new land
Access	Decrease consumption	Share recovered produce		Sell household assets to make money, Find more income opportunities, borrow from neighbors, purchase on credit	
Stability	Change or adjust food preferences (depend on processed food)	Seed aid from municipality		Buy cheap food;	Switch crops
Utilization	Invest in health				Harvest rain water

Source: Field based data (2016)

In view of the inventory, it was important to explore the significance and efficiency of the adaptation strategies towards the wider development of the households. In this regard, respondents were asked to outline a brief SWOT analysis evaluating the different adaptation mechanism they use. In summary, the key issues drawn from the discussion are illustrated below:

Figure 4.3: Summary of a SWOT analysis of adaptation strategies



Source: Field-based data (2016)

4.9 EThekweni Municipality's response to climate change adaptation (MCCPP)

“...climate change runs the risk of undoing all of the development gains of the last one and a half decades, and for a city such as Durban climate change adaptation in all sectors will have to become one of the Municipality's top development priorities” (EThekweni Municipality, 2014:76).

Climate change is identified as a key issue in the Municipality's long term plan with the vision “To transform Durban's governance, social, development and economic systems in order to effectively respond to climate change”. As per mandate of the local government to implement policies and programmes as mandated by the national and provincial spheres, eThekweni Metropolitan Municipality has embarked on a series of interventions with regards to prioritizing climate adaptation which is defined as ‘ensuring that Durban's citizens are able to cope with climate change impacts, such as rising temperatures, changes in rainfall intensity and distribution and sea level rise by transforming the way we plan and manage the city’.

In 2004 the municipality initiated the Municipal Climate Change Protection Programme (MCCPP), in an attempt to address and minimize the potential impacts of climate change on poor communities and the city of Durban in general (Lewis, 2010; O'Donoghue and Roberts, 2013). The purpose of this programme is to mainstream climate change adaptation in the general city planning and development framework as well as to harmonize local urban responses to climate variability and change (Mokwena, 2009; and Roberts, 2013). The programme is informed by three key components: municipal adaptation to ensure the integration of key activities into relevant line functions; community-based adaptation focused on building capacity; and a series of interventions focused on urban management challenges such as urban heat island effect and sea-level rise. The programme has been evolved and developed through the following phases;

Phase 1, - impact assessment;

Phase 2,-adaptation planning;

Phase 3, -developing an integrated assessment tool to enable evaluation;

Phase 4, - mainstreaming

In view of the different strategies used by households to adapt to climate variability and change (Table 4.14) and in light of the SWOT analysis (Figure 4.3) it was important for the study to explore how the Municipal Climate Change Protection Programme (MCCPP) has made a difference in strengthening the capacity of FHH to adapt to climate change. Focusing on the key components of community based adaptation of the policy, it was of interest to the study to firstly understand how familiar the community is with the programme and secondly to establish how the transforming programme and strategy has either enhanced, hindered or had no impact at all on household adaptation. The households were asked questions about their comprehension of the different initiatives steered by the municipality. Their responses revealed the following (Table 4.14):

Table 4.15: The impact of MCCPP on household adaptation

		Inanda	Ntuzuma	KwaMashu	%
Are you familiar with the MCCPP?			×	×	0
	No	27	16	41	100
Have you received any adaptation assistance from the municipality?	Yes	12	7	22	48
	No	15	9	17	52
If yes, what kind of intervention have you received?	vulnerability assessment	5	3	11	39
	Public awareness	0	1	7	17
(Averages based on the households that only said yes =48 households)	Yes	×	3	9	33
	Early warning system	2	3	8	27
	Food aid/ social welfare	6	1	10	35
	Water	10	5	17	67
	Agricultural input i.e. seeds	5	2	11	37
	Relocation	1	0		0
	Healthcare				0

Source: Field Based (2016)

A study sample of 84 female-headed households from INK participated in the research study contributing new information to social studies of INK. The majority of female-headed households in INK are middle-aged South Africans, who have been staying in the community for more than 11 years. Findings reveal that the socio-economic status of households is precarious characterized by a high rate of unemployment with only 8% of the study sample absorbed into the formal economy. The majority of the households depend on social welfare and part-time occupation.

Households engage in urban crop production through small scale farming as a way to cope with socio-economic shocks and to contribute to sustainable livelihoods. Many households utilize their backyards and public spaces to set up their gardens which are greatly steered by the:

- 1) Need to acquire extra food,
- 2) Save on household expenditure patterns and
- 3) As a source of extra income.

There is overwhelming evidence to prove that the climate has been changing and has had extreme challenges on food production and ultimately on food security of small scale farmers. Climate related events such as floods and drought have had major impacts on livelihoods and household food security. In the broader context of FS, food production and food accessibility are the two most vulnerable dimensions of FS to prevalent drought and floods. However, in that regard, households have adopted various mechanisms to adapt to climate change as a way to increase household capacity and to reduce their vulnerability to weather related events particularly on household food security.

In view of the impacts of climate change, eThekweni Municipality has developed policies and prioritized interventions to help communities to adapt to climate change. However, all female participants have mentioned that they are not familiar with the MCCPP policy and its objectives towards climate change adaptation. There is evidence that 48% have benefited from initiatives steered by the municipality towards adaptation to climate change while an astonishing 52% have mentioned that they have received no help or any support from the government or the municipality. More still needs to be accomplished at household level to strengthen capacity

through the municipals' visions of *“transforming Durban’s governance, social, development and economic systems in order to effectively respond to climate change”*

CHAPTER FIVE

ANALYSIS AND DISCUSSION

5.1 Introduction

In light of the empirical evidence presented in chapter four of this thesis; this chapter presents an analysis and discussion of the findings of the study. The discussion is presented in a way that firstly answers the research questions, and secondly engages the objectives of the study as outlined in chapter one. Thus, the chapter is structured in the following way: the discussion of the observed changes in climate patterns is presented in the first section of this chapter. Section two is dedicated to a discussion on how climate change has affected the ability of female headed households to secure sustainable livelihoods. The third section discusses climate change adaptation by firstly, exploring the different ways in which female headed households adapt to climate change and secondly, the role of policies, to either enhances or constrains household adaptation to climate change. Lastly the chapter looks at the wider implications of the study within South Africa and Sub-Saharan Africa in general.

5.2 Manifestation of climate change and climate variability and the risk faced by households in eThekweni Municipality

There is outstanding evidence to show that the climate has been changing on various scales visible through changes in statistical distribution in weather patterns such as annual rainfall and temperature and through extreme weather events such as droughts and floods (IPCC, 2007). Emerging research has made substantial contribution to our knowledge of the occurrence, and has further been significant in making projections for different areas to help communities prepare for mitigation and adaptation measures. Such studies include meteorology research done in KwaZulu-Natal which have suggested and projected that temperature will increase by 1.5 °C and 2.5 °C between the year 2045 and 2065. While the annual rainfall will increase by up to 500mm by the year 2100, over short periods resulting in higher and faster stream flows causing floods, high level of erosion and a number of tropical storms.

Drawing from the scientific data sourced from the South African Weather Service (2016), the annual temperature and rainfall pattern across a 10 year timeline from 2005 to 2015 has not been stable or linear. Referring to Table 4.8 and Graph 4.2, it has been very difficult to predict climatic trends with the years. Both temperature and precipitation have been shifting following an unconventional pattern; showing no consistent pattern of elevation or reduction for at least five consecutive years. This can be substantiated by studies (Hulme et al, 2001; Collier et al,) suggesting that Africa is a country with an enormous land mass and its climate is varying, exhibiting differing degrees of temporal variability, particularly with regards to rainfall, which poses a great challenge to climate scientists to be able to fully comprehend and predict accurate inter-annual, inter decadal and multi-decadal variations in climate. This is further supported by the findings that there is relatively little work published on future climate change scenarios for Africa (Hulme et al, 2001).

A number of research participants as observed in chapter four were not familiar with the scientific discourse framing climate change; however, they have been observant of the changes in climate conditions over the years. For example, households have noticed a significant change in weather patterns; and while others perceive it as a natural occurrence there are a few who believe that climate change is a result of God punishing the world for having sin. This perception is similar to the findings reported in South African and Zambia through studies done by Hlahla, Simatele and Hill (2015) and Simatele (2010) respectively, where the local community attributed the change in climate conditions as ‘punishment’ from God for living sinful lives. Although households were not able to reference the accurate dates and years of when they experienced extreme weather events in the past; the general observation is that in the recent years, temperatures have been extremely high during summer, precipitation has become heavy and the winters are colder as compared to previous years. The underlying perception is that the weather has been very unstable and as a result it has been almost impossible to predict the weather. In view of that, households were asked to rank the prevalence of weather related events from severe to extremely severe (see Table 4.10).

From the empirical evidence in chapter four, it is clear that droughts/and or shortages of water and restricted water supply and use as well as increased floods are frequent and have been ranked extremely prevalent by 75% and 86% of the overall responses from the three study sites. From

these findings it is evident that climate change in INK has manifested itself through increased floods and drought episodes. The combination of these two extreme weather events can be argued to have combined to affect female headed households negatively. This is because female headed households as observed in chapter four have a lack of both productive and adaptive capital from which they can potentially build their resilience against climate variability and change.

Projecting to the year 2016, eThekweni Municipality experienced high averages in rainfall as compared to other years. Findings (see Table 4.9 and Graph 4.3) illustrate that during the months of January, March, May and July, eThekweni experienced high rainfall which resulted in a reoccurrence of floods. The average rainfall for January to September for the year 2016 has been averaged at 107mm, which is at close proximity to the average rainfall for the year 2011 at 101.4 mm. This means that it has been approximately four years since the municipality has experienced such high rainfall. In view of the climate trends over a longitudinal study (see Graph 4.2), the pattern suggests that it was not easy to project and predict that the province could experience such high rainfall and severe episodes of floods during the year 2016. However, despite the prevalence of heavy rainfall, eThekweni Municipality has communicated that, the province is still experiencing a magnified shortage of water, the dam levels remain low and the prolonged droughts remain severe.

The key argument drawn from the conversations discussing the wider implications of climate change deduce that climate change is not only an environmental concern; it is a phenomenon which shapes livelihoods and influences the social and economic construction of space (households). Through participant observations, it was observed that the prevalence of drought or shortage of water has an impact on the ability of households to access water for consumption and or for watering their vegetable gardens. Households have been forced to buy water or alternatively have had to walk long distances to get water which has had strenuous implications for household finances and human health. It is evident that many of the households are financially struggling to stretch their finances to meet households needs (see Table 4.5) and that often means it is difficult or even impossible for them to reserve extra money to buy water. However, even if they are able to buy water, it is found that many households can only afford small quantities for household consumption and not for watering their gardens. Due to such

reasons households have reported that vegetables often wither during such occasions resulting in reduction of crop yields and ultimately that results in less income for households who farm with the purpose of selling.

Reported cases of floods have also had bad or negative implications for the community. Cases of floods in Durban have been documented from as early as 1856, however, there is little evidence documented on how the prevalence of floods has affected livelihoods, particularly of female-headed household in the urban space of eThekwinini. Floods have resulted in loss of infrastructure, loss of life and displacement of many households more especially those staying in informal houses such as backyard shacks. During floods, it has been observed that people affected often have to move and find alternative shelter or 'skwat' with friends or relatives. Migration and resettlement influenced by climate change has implications for livelihoods; households have stated that, firstly, the space where food is produced is lost or destructed, secondly, households are forced to share limited space, and thirdly, households have to share insufficient and or limited resources such as food and finances as they await the reconstruction of their homes.

More so, households have also mentioned that weather related events such as floods have crucial impacts for local outlets as well as threatening working opportunities. For an example, workers have potentially lost their jobs or got retrenched as they await reconstruction of their businesses. That often bears unforeseen appal on household income and financial stability. Female headed households often have to find other working opportunities to generate income which has demonstrated to be a challenge to them attributed to referenced issues such as lack of relevant education and skills which would allow them to be absorbed in the formal economy. In light of these observations, it won't be exaggerating to say that the prevalence of economic insecurity exacerbated by climate change affects the ability of women to recover from the climate induced disasters. The status quo will be even more difficult to improve as the changes in climate are projected to intensify.

The severe impacts of climate variability impacts on households differently and livelihoods are carved differently. However, the implications are not particularly unique or exclusive to one household; they overlap between household boundaries. This can strongly be attributed to the

influence of shared society upholding similar geographical characteristics and institutional coherence among other things. In view of the demographics, socio-economic status and the risk faced thereof by households in INK it can be argued that the communities of INK to a greater degree are vulnerable to the impacts of climate change. Although scholars such as Zheng (2015) have argued that the overall higher vulnerability cannot be generalized, on the basis that households have a broad range of demographics and economic composition (United Nations, 2010), shaped by space (society) and time: the findings from the three studies reflect a society that is greatly disadvantaged with lack of sufficient capacity. Reflecting on the first part of the convention formula ($V = E \times S \times (I - AC)$) used to delineate vulnerability in chapter two, it can be argued that the community and households are highly exposed and more sensitive to the impacts of climate variability particularly as small scale farmers.

Small scale farmers are more depended on urban agriculture for a living, and the impact of climate variability on their assets and conditions essential and required for the adoption and sustainability of urban agriculture which ultimately puts a strain on household food security which is projected to be aggregated with space and time.

5.3 The impact of climate change on urban food security

The climate change and food security nexus, particularly of female headed households is intricate and requires a systematic approach to explore the relationship. In the context of small scale farming, food production is primarily regarded as a signifier of food security, however, drawing from the different definitions of food security; it is evident that food security is broad.

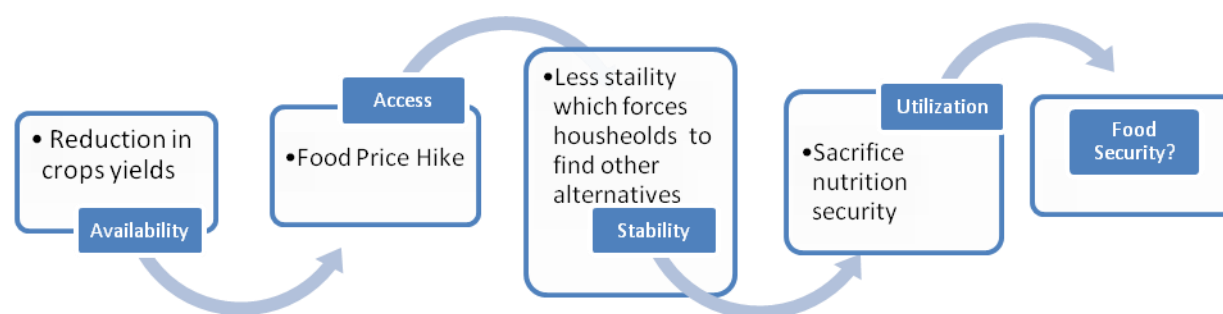
Increasing food production is the main research review and policy prescription for addressing food security; and that broadly neglects the importance of other dynamics shaping food security (Tacoli et al, 2013). Gregory et al (2005) argues that in order to address food security in a holistic manner, it is important to develop a much broader research framework which will include both the biophysical and socio-economic aspects of the food network. In view of that, it was important for this research to enlarge the focus lens of food security on a household level to explore the most vulnerable dimensions of food security to climate change. It was also important to integrate the human dimensions because the food systems is ultimately driven by people and

their behavioral responses to real and perceived changes in their local climate influential in addressing underlying issues and planning for adaptation (Wheeler and Braun, 2013).

The broader understanding of *ukulondela kokudla* or being ‘food secure’ in INK is NOT to go to bed hungry or not to be poor. However, in trying to get a more profound understanding of the measure of household food security, the FS index was dissembled into its four dimensions namely availability, access, stability and utilization. The female participants were asked to rate how each dimension is affected by climate change through the manifestation of floods and droughts. After explaining thoroughly to the participants what each dimension measures, food stability and utilization were regarded vulnerable to climate change by 16% and 11% participants respectively, while food availability and food access were rated extremely vulnerable to climate change by 27% and 46% households respectively.

The dimensions of food security are broad and are influenced and shaped by different elements of livelihoods. The key factors and elements which are more vulnerable to climate change particularly in INK are illustrated in Figure 5.1 below:

Figure 5.1: Impacts of climate change on all dimensions of food security in INK



Source: Author (2016)

Although all of the households have indicated that they have not had a day where they had no food in the house, it is evident that food accessibility is the most vulnerable dimension of food security. It has been noted that women make sure that daily meals are always provided even though it does not always entail having a nutritious meal. This suggests that FHH in INK do not

suffer from shortage of food, however, the dominant challenge is the ability of households to access the food. This can be strengthened by the theory of the scholar Martya Sen (1980) who argued that hunger and poverty is not necessarily an issue of shortage of food but it is rather constituted to the fact that households are unable to access food. ‘Access’ according to Sen’s theory signifies endowments and entitlements. Endowments refers to control of assets and resources including labour power and entitlement refers to the act of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that they face. Food accessibility is strongly vulnerable to climate change because the phenomenon strongly impacts on livelihood assets which influence affordability and the ability of households to grow and sell their food.

In the context of the community of INK, food accessibility is constituted and influenced by the increase in prices of food and the inability of households to afford (see Table 4.12). During periods of floods and droughts the price of food often goes up due to substantial decrease in the amount of crop yields. Households have mentioned that, a lot of strain is felt on their financial stability because they either have to spend most of their income on food or find other alternatives. Research conducted by Women Environmental Network (2015) has found that women particularly in developing countries are more likely to stretch their income on food and other household commodities because they have the role and responsibility to take care of their dependents. The financial stability of households is already precarious and weak (see Table 4.5 and Graph 4.1) and households have mentioned that it is often difficult to stretch the money on food and other household commodities equally considering the amount of dependents they have to feed. Similar findings have been found in Asian studies conducted in Bangladesh where a lot of women were found to be living below the poverty line because they could not afford to buy food. The UNDP (2011) has estimated an increase in food prices by 30% to 50% in the coming decades and the worst affected will be the poor in developing countries. Food price hikes and the precarious economy of households in the community of INK makes it difficult for families to be able to afford what was meant to be cheap, accessible and nutritious foods.

The second most affected dimension of food security is found to be food production, which is strongly linked to food availability. Crop production is noteworthy to farmers more particularly subsistence farmers because it signifies availability or easy access to food and an income for

households. It has been mentioned that both floods and droughts have an impact on food availability which has direct implications on food accessibility. EThekweni Municipality is known to have a humid subtropical climate characterized by hot and humid summers and pleasantly warm and dry winters which are snow and frost free (South African Weather Services). These conditions are not entirely favourable for the agricultural sector which flourishes well under rain fed conditions. These conditions are further made worse by the constant change in weather patterns.

Change in climate conditions have resulted in a shift of the growing cycle of crops. Impacts associated with floods such as soil erosion and over watering of crops and impacts associated with droughts such as evapotranspiration and low soil moisture, all destroy crops and that often leaves urban farmers with less or no produce at all. It is evident that households are already struggling with having access to sufficient and fertile land for agriculture. An outstanding 90% of the female participants are utilizing public spaces for their gardens which makes them more vulnerable and at risk to the impacts of climate change. Households have mentioned that it is already difficult to monitor crop production and safety from a distance; therefore it is even more challenging with monitoring in a space where there is constant changes in weather. Although they manage to eat from the garden once or twice a week, it is not always enough to share the amount of crops amongst themselves. As a response to low crop yields, households often need to shift to a less balanced diet with minimal diversification.

The acute and frequent impacts on crop production further influence the stability of food and the manner in which people are able to secure the nutrients and quality of foods needed. Although food stability and utilization has been regarded vulnerable to CC by only 16% and 11% households respectively, households mentioned that when the chain of supply cannot meet the end of demand then they have to find other alternatives sources of food which is often dominated by processed foods. In the absence of crops from the gardens, households depend a lot on processed foods because they are easily and readily accessible and sold at a reasonable or cheap price. This means that many small scale farmers particularly women sacrifice their nutrition and health to be food secure in the face of climate change.

Similar findings have been found by Battersby et al (2015), who substantiate that food insecurity is changing in South Africa. Battersby et al (2015) have found that in South Africa food insecurity is no longer characterized by households being malnourished because of lack of access to sufficient food; however it is now also characterized by increasing obesity, diabetes and hypertension. Battersby et al (2015) argue that while malnutrition persists in households, aspects of overweight, obesity and diet related non-communicable disease such as diabetes are also prevalent. This is due to the change in urban diet which is characterized by food utilization and consumption dominated by highly processed foods which are rich in sugars, fat and a low intake of fibre and micro-nutrients. This can also be supported by the number of elderly participants (see table 4.1) represented in the farming community. The dimension of food utilization is most affected in households headed by elderly women who are often burdened by poor health which greatly impacts on the way they utilize food.

Whilst the connection between climate change and food security has been extensively explored at national and regional level, the local scale within the urban context has been largely neglected (Battersby, 2012). In view of that, this section broadly engaged the relationship between climate change and household food security in the community of INK. There is outstanding evidence to show that CC impacts on household food security in both direct and indirect ways. From these findings presented in chapter four, we can comfortably argue that the impact of climate change on household food security in all the study sites is twofold: firstly, extreme weather events have damaged and or put a strain on the capital assets that promote household food security, and secondly, extreme weather events have also had a negative impact on crop yields which has influenced the price of food and shifted the market volatility. Whilst crop production is the signifier of food security for small scale farmers, households have mentioned that the most sensitive dimension of food security is the ability of households to access the food which in turn impacts on the stability of food and the manner in which households are able to utilize the food.

Exploring the interrelationship between climate changes, the social dynamics constructing livelihoods and food security has raised interest in analysing the added value of addressing the nexus between the three related issues, thereby understanding the different approaches used by households to address the nexus using both short and long term responses and solutions to the impacts of climate change.

5.4 Climate change adaptation

IPCC (2001) has stated *‘the projected trends in temperature, precipitation, and extreme weather events will push future climate variations and extremes beyond the bounds of what people and places have been exposed to and had to cope with in the past and present, and that will require modified adaptation strategies’*.

Recognising the direct and immediate impacts of climate change on the poor and their livelihoods, the United Nations Framework Convention on Climate Change (UNFCCC) is increasingly highlighting adaptation as a key response to climate change alongside mitigation measures. In light of the impacts of climate change on livelihoods of FHH particularly in INK, it was important for the study to explore the different ways and approaches used by households to adapt to the phenomenon. Adaptation plays a significant role in helping households take a step to improving their resilience and increasing their adaptive capacity to the convergence of climate variability on household food security. Referencing back to the formula used to delineate vulnerability ($V = E \times S \times (I - AC)$). Climate change adaptation is influential in decreasing vulnerability of households to the impacts of climate change. It has been found that when households have desired methods in place to adapt to climate change, the exposure and sensibility of livelihoods particularly on food security decreases.

Female participants in INK are not familiar with the term climate change adaptation, however, it is immediately realised that ‘adaptation’ comes naturally and spontaneous to households as a way of living and surviving. The key constituent to adaptation is to ‘live’. It has been found that women can either be disempowered or empowered to invest in adaption measures, depending on a number of socio-economic factors in their local communities. World Environmental Network has highlighted that across the globe, when women are positively empowered, extraordinary solutions are possible with evidence of women formulating grassroots strategies designed to solve multiple problems. Using the asset adaptation operational framework, households were asked to identify the different bottom-up approaches they adopted to increase their adaptive capacity and to reduce their vulnerabilities in the mist of climate change. It is evident from the findings that households from all three communities have come up with ways to modify and adjust their livelihoods as a way of coping with established threats (see Table 4.14).

While climate change impacts on livelihood assets (human, socio-economic, natural and physical) it is found that households use the very same livelihood assets to modify, change and habituate livelihoods to cope, limit danger and to recover. Research done by scholars such as Bebbington (1999) has found that assets are not only resources that people use to build livelihoods; they are also resources that give households the capacity to be and act. Asset adaptation is an approach that has been used in different communities across space and time where households and societies have been found to be actively involved in exploiting opportunities to develop resilience, cope and resist, or to recover from the negative impacts of climate change. Comparable scenarios have been documented in countries such as Zimbabwe, Harare (Tawodzera, 2012), in Zambia (Simatele, 2012), Mombasa (Omenya et al, 2012), India (WEN, 2010) and, in South Africa (Hayson, 2012; Faling, 2012) among many other countries. There is overwhelming evidence to show that urban farmers have long understood the significance of adaptation to extreme weather related events. Although women may be disadvantaged in the face of climate-induced impacts, they are not helpless victims.

Magnifying to adaptation at household level in INK; it is found that most households (44%) invest in adaptation post the event particularly after floods, because they usually have limited choices to help them rebuild and reconstruct. Thirty four percent of the participants have tried to increase their adaptive capacity before they experience extreme weather related events by increasing human labour, working hard to produce more crops, save money, save water, invest in health, build strong social networks to name a few. However 66% of the female participants have mentioned that it is not always easy and practical for their households considering the status and stability of their livelihoods assets. From the evidence in chapter four we can argue that FHH in INK are accustomed to spontaneous adaptation and reactive adaptation rather than planned adaptation.

Households utilise the resources they have at their disposal and the knowledge that they have gained from previous encounters with climate-induced risks as a response to climate stress. Nkoana-Mashabane (2012) has observed that vulnerable communities across the world continue to develop diverse coping mechanism however; he suggests that as the nature of climate risk continues to evolve, it will become necessary to create awareness and provide access to more resources and improved technologies to enable vulnerable groups to adapt in the long-term.

The different mechanisms adopted by households have their strengths, weaknesses, threats and potential opportunities to increase resilience and build capacity. It has been established in chapter two that the kind of assets that households own or have an access to can greatly influence the type of adaptation that the households adopt; and the ability of households to cope and recover is critically dependent upon their access to assets. For an example households who are already poorly endowed with assets may well be becoming gradually, but notably, more vulnerable and marginalised. Households in good financial standing, with solid social networks, adequate housing and access to land will be moderately affected by climate variability as compared to household with livelihoods that are counterpart.

Adapting to climate change has been challenging for FHH in INK due to their precarious assets, constituted to referenced issues to vulnerability such as low wage jobs, financial problems, gender inequality, inadequate agricultural inputs and shortage of resources among many others. This deeply signifies that the gender roles that have previously kept women vulnerable are further and deeply reinforced in the community. However, it is found that urban agriculture has brought women together in common gathering to empower themselves and to build on climate related solutions as a collective. The social asset which is prevalent through increased social cohesion has been found to help FHH in the community of INK to flourish economically, enhance their health and improve on further action and awareness on climate change.

It is established in chapter two that adaptation does not happen in a vacuum; however, it is strongly influenced and shaped by political institutions, government policies and non-government actors. Many countries and governments have invested in policies and regulatory frameworks strongly advocating for community development which will enhance asset adaptation of communities and households. South Africa is one such country which has put in place national policies and regulatory frameworks guiding climate change. The transforming structures and processes have decisively become integrated into climate change and related environmental regimes ensuring compliance with regional, continental and international obligation and commitments (Mokwena, 2009). Some of these include the 2004 Climate Change Response Strategy for South Africa and the National Climate Change Response White Paper from 2011. Downscaling to the provincial scale of Durban, the eThekweni Municipality has developed the eThekweni Municipal Climate Change Protection Programme (eTMCCPP) with

the purpose to mainstream climate change adaptation in the general city planning and development framework as well as to harmonize local urban responses to climate variability and change (Mokwena, 2009; and Roberts, 2013).

The department of Environmental Planning and Climate protection has further advanced the adaptation agenda with the development of the Durban Adaptation Charter (2011) which was strongly supported during the United Nations Framework Convention on Climate Change COP 17. Among other objectives, the charter has prioritized *mainstreaming adaptation as a key informant of all local government development planning*. Through this the municipality has initiated an all-inclusive, participatory process to develop a climate change strategy for the municipality, engaging with vulnerable communities and allowing all stakeholders to bring their ideas together to be incorporated into the strategy to ensure that the municipality's vision to empower Durban's residents to adapt to climate change is met.

In endorsement of the MCCPP and by recognizing that climate change impacts more on vulnerable and poor communities, former MEC of Agriculture, Environmental Affairs, and Rural development Ms. Lydia Johnson took to the streets of INK to educate the locals about climate change and environmental management. The campaign's objective to raise awareness and teach the local people on how to avoid hazardous climate disasters and how to build concerted and structured efforts at local or community level and to show the community that planning can improve their lives in tangible ways. More so, in fulfillment of mainstreaming climate change adaptation in the general development of the community, the campaign placed a magnified focus on alleviating and enhancing food security within the Municipality in the face of climate change.

There is substantial evidence to show that more women are more likely to be involved in community projects to tackle climate change and are constantly in need of initiatives that will help decrease vulnerabilities and increase their adaptive capacity to the impacts of climate change. However in view of that, it has been established that all of the FHH participants of the study are not familiar with the objectives of the MCCPP. However, in light of the community adaptation plans, there are less than half households from the study sample (48%) who have received some form of assistance from the municipality.

In view of Table 4.14, households have mentioned that they have received some form of assistance and aid from the municipality to help them with sustaining urban farming in the face of climatic change. Interventions such as early warning signs, training, agricultural inputs, social welfare and water among other support devices have been provided to the community over space and time. There is however, an apprehension of the extent of assistance provided by the municipality. The scope of the adaptation plans prioritizes and oversees implementation at community level capturing the wider vulnerabilities and does not down size impact assessments to household levels to understand small scale evaluations which can be substantial to inform the big picture. Consequently, that does not build or strengthen household capacity. For an example, skills training based on the large-scaled vulnerability assessment will consolidate measures such as designing flooding plans and focusing on adjusting storm water pipes which is not an immediate resolution for households.

Households show appreciation for the assistance and support provided by the municipality, however, they have mentioned a few challenges that are prevalent in implementing the initiatives. Some of the key issues mentioned include; poor mobilization and awareness; social exclusion where the council will only invite closely related community members and friends to receive benefits (workshops) which are also scarcely held as well; it is usually a once off event of implementation and the authorities never come back and as a result some projects and community initiatives never get to grow; the municipal authorities engage us about our needs through public participation, make promises and after consultation they do not come back probably because we are so overpopulated; females are usually not given a platform at community meetings, the men want to lead and as a result, issues concerning females are not fully comprehended; and the needs of the poor are not 'taken serious', among other shortcomings.

There is immense evidence documented in annual financial plans showing that eThekweni Municipality reserves financial capital each year towards climate change adaptation and broadly targets local development. However, in view of the community perceptions regarding the shortcomings to implementing adaptation measures the study can argue that there is a gap in the extent of these initiatives reaching out to marginalized communities. However, in that regard, the municipality has also identified a few inadequacies in integrating the framework with the needs

of the different communities. Some of the challenges they believe limit and restrict the municipality in executing the vision include but are not limited to; not being able to reach out to all stakeholders especially the local community or lack of social cohesion, poor financial management practices, shortage of skills and human capacity, lack of monitoring and evaluation tools to name a few. However, the greater gap is finding the common ground between the municipality and the community of INK to unearth and understand the vulnerabilities of communities using bottom-up approaches to be able to design community adaptation measures that are more community and area specific. In light of the views of the community regarding the support they receive from the municipality, it is evident and arguable that more still needs to be done to help build capacity at household level and improve livelihoods of the local community particularly of FHH

5.5 Conclusion: The wider implications of the findings in South Africa and Sub-Saharan Africa

This section has broadly engaged the relationship between climate change, food security and adaptation. The study of the community of INK has enlightened the nexus, providing literature with a new analysis of the implications of climate change on household food security of FHH within the context of the urban space. It is evident that climate change has been changing on various scales and has been bearing negative implications for different communities and spaces. South Africa is one country which is already experiencing adverse implications of climate change and the burden of the occurrence is felt by the poor who are unable to adapt to the frequent pace of climate change. Cases of droughts and floods have been reported frequently and intensely during the year 2016 across the country, more prevalent in Durban, and that has strongly shaped the construction of space, influencing how people live, where people work and what they eat among other factors.

Urban agriculture is one sector which is most vulnerable to the impacts of climate change. Many studies have documented the significant contribution of urban farming to food security, employment and income as well. The severe impacts of CC on urban agriculture bear threats to livelihoods and not only on food security and income respectively. Battersby (2012), states that food security is not just about food but about the broader ability of households to be able to mobilise their assets base from which they can draw sustainable development. The study has

made a significant contribution to the abstract that substantiates that food insecurity is not constituted to the fact that people do not have food, however it is largely influenced by the fact that people and households are unable to access the food which is enlightened by the inability of households to afford.

In view of the empirical evidence and findings of the study, it is arguable to say that climate change is not gender neutral. Women and FHH across the world more particular in developing countries experience similar encounters in terms of the implications of climate change on livelihood and their responses to the weather related events thereof. It is found that women are more likely to be at the forefront in adapting and engaging in initiatives and development that tackles climate change. Contradictory and ironically, they contribute less to climate change and they often have fewer resources to adapt. Asset adaptation is found to be the most influential approach to dealing with the phenomena. Women and FHH utilize their assets both tangible and intangible to build resilience and to strengthen their adaptive capacity to dealing with the impacts of climate change. It has been found that all the women participants from the three study sites of INK engage in adaption either before, during or after the weather related event. However, more resources are invested in spontaneous and reactive adaptation. Similar studies have been found in various countries and the key and underlying factor is that women are not passive victims.

The Government and other political institutions have the power to influence adaptation by designing and implementing transforming processes, policies and regulatory frameworks that will help communities deal with the implications of climate change better. It is found that women and FHH are the key decision makers at household level and they are often at the forefront of initiatives that advocate for climate change adaptation; however it is also observed that they are under-represented at both national and international platforms where panels engage on issues of climate change. This is a significant observation which is prevalent across many boundaries globally.

The findings of this particular research study, contribute significantly to the dialogue of how women in eThekweni Municipality, Durban, South Africa can be assisted in achieving food security in the mist of climate change, through learning from other countries across the developing world. Having explored the specific vulnerabilities of FHH in INK to CC, the study

can argue that women need to be provided firstly with the opportunity to engage on issues specific to them at a higher platform and secondly to be given the access to existing mitigation and adaptation funds to help strengthen their financial stability. These findings are significant and applicable to the wider communities within South Africa and Sub-Saharan African countries. Having policies that are designed to mainstream climate change into the wider development of the community is a privilege and a signifier of progress, however it is ineffectual if the vision of the transforming processes are not fully realised and when people are not benefiting. More needs to be done in terms of identifying specific vulnerabilities of communities and working towards strengthening our policies to communicate directly to the needs of societies.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter aims to bind together the key findings and lessons learnt from engaging with the community of INK through conversing and observing the implications of climate change and variability on urban food security of female headed households. The chapter is divided into six sections. Firstly it presents a summary on the impact of climate change on food security. Secondly, it gives a brief overview of the different approaches used by female headed households to adapt to climate change and the role of the MCCPP to building capacity of FHH, Lastly the third chapter explores the recommendations for further research within eThekweni municipality.

6.2 The implications of climate change on food security

There is outstanding evidence to show that climate change has been changing on various scales across the globe. However in as much as climate change affects the whole planet, it is evident that its impacts have disproportional negative impacts on developing countries, particularly poorer communities who use climate-sensitive resources such as urban agriculture which is prone to extreme weather (IPCC, 2007; EP 2007). Urban agriculture particularly in Africa is the largest economic activity accounting for an estimated 60% of employment and it also contributes a large percentage to the GDP (Collier et al, 2008). Existing literature on urban agriculture suggests that it has become a major source of income for an estimated 100 million people in Africa and its contribution to household food security is significant and in many instances it is increasing (Simatele et al, 2012; Simatele and Binns, 2008).

It is found that households in INK engage in urban crop production through small scale farming as a way to cope with socio-economic shocks and to contribute to sustainable livelihoods. Many households utilize their backyards and public spaces to set up their gardens which are greatly steered by the:

- 1) The need to acquire extra food,
- 2) Save on household expenditure patterns and
- 3) As a source of extra income.

It is evident that the impacts of climate change in the manifestation of droughts and floods in the community of INK has placed immense pressure on agricultural production consequently on food security, influencing a shift in preferred diet, placing immense pressure on prices of food, and placing stress on water resources. Although there are certain scholars who have argued that there is no definitive evidence to suggest that women are disproportionately affected by climate change, there is evidence to show that gender differences exist during climate change-induced disasters or weather events particularly in the urban context across the world. Such evidence is also found in the community of INK. Women have been disproportionally displaced by climate change, impacting on household food security, household income and the wider well-being of households. Women and FHH are found to be struggling to deal with the impacts of climate change due to referenced issues such as lack of education, financial instability, lack of agricultural inputs and to name a few, exacerbated by climate change. The prevalent and frequent impacts of climate change disempowers women by affecting their incomes and livelihoods and, inadvertently, locking them within the poverty cycle.

6.3 Climate change adaptation

It has been found that female headed households in INK are active respondents in adapting to climate change. Households utilize different livelihood assets to cope with the adverse implications of weather related events on livelihoods and household food security. While only 34% invest in pre adaptation, 22% invest in adaptation during the events and 44% adapt after the extreme weather related event; the underlying factor is all of them take an active part in building

household capacity and resilience to the impacts of climate change.

Although assets are empirical to adaptation, and allow households the choice to decide what to do, when and how; the ability to adapt is mediated by the environment in which adaptation is taking place (Moser, 2009; Tawodzera, 2012). Access to livelihood assets and their use is dominantly influenced by external factors such as policies, political institutions, regulatory and legal frameworks as well as formal and informal context within which actors operate (Moser, 2009; Rakodi, 2002). Transforming structures and processes embody power and gender relations influencing access to assets and the manner in which household are able to use these assets to achieve a positive livelihood outcomes. Frayne, Moser and Ziervogel (2012) assert that response from external factors supports households through creating an enabling environment to build long term, multi-generational resilience, limiting damage and rebuilding and transforming the asset base of urban poor communities.

The community of INK is part of the eThekweni municipality, Durban; the city well known internationally for its early and pioneering work in the field of climate change adaptation, having developed adaptation policies with a pro-poor focus. eThekweni municipality has attempted to address and minimize the potential impacts of climate change on poor communities within the city of Durban, by developing the Municipal Climate Change Protection Programme (eTMCCPP) in 2004 with the purpose to mainstream climate change adaptation in the general city planning and development framework as well as to harmonize local urban responses to climate variability and change. All female participants from the three communities have mentioned that they are not familiar with the MCCPP policy and its objectives towards climate change adaptation. There is evidence that 48% have benefited from initiatives steered by the municipality towards adaptation to climate change while an astonishing 52% have mentioned that they have received no help or any support from the government or the municipality. More still needs to be accomplished at household level to strengthen capacity through the municipals' visions of "transforming Durban's governance, social, development and economic systems in order to effectively respond to climate change".

6.4 Recommendations for future research

For a continent where food insecurity is widespread and where the impacts of climate variability and change are arguable prominent than other regions; Frayne, Moser and Ziervogel (2012) assert that the conceptualization of the development nexus which encapsulates climate change, food security and adaptation is essential in setting out a collaborative framework that will support steps towards improving the resilience of urban communities to the convergence of climate variability on food security. This development nexus is more imperative for women and female-headed households.

Based on the findings of the study, female headed households in INK can be recommended the following:

- Urban agriculture in INK contributes significantly to both food and nutrition security and towards strengthening the socio-economic status of households. Small scale farmers should be granted funding as part of social development towards the establishment of community gardens. More so, continuous support structures and networks are needed and should be developed towards building capacity and providing resources and assets such as water, tools and human skills.
- More is needed in regards to building capacity towards climate change adaptation. Majority of households invest in post-adaptation because of lack of awareness and much needed knowledge. The municipality can expand on that by engaging more with the community through social media (Radio, newspapers, whatsapp etc) and as well as through community workshops where they teach the community about climate variability and change and how to adapt to the phenomenon particularly when manifested through droughts and flood.

Magnifying on the contribution of the government; the eMCCPP is an effective tool towards climate change adaptation nexus, however there are a few challenges which limit and restrict the municipality in executing the vision. In view of that, there are knowledge gaps that need to be explored and researched further, placing prominent focus on phase 3 and phase 4 of the implementation of the MCCPP:

- The municipality needs to explore and analyze the different processes used in informing the policy to understand how the current approach has influenced the implementation of the program.
- It has been almost 13 year since the program has been implemented. There is a need for a longitudinal study to extensively monitor and evaluate the wider implications of the program so to see how it can be reshaped with recommendations to i) firstly explore the specific vulnerabilities of each community at household level and ii) secondly to consider engaging gender issues in the policy.

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Pers. Com 2016a, Interview with female respondent in Inanda on the 11th of July (2016), Kwa-Zulu Natal, Durban.

Pers. Com 2016b, Interview with female respondent from Ntuzuma on the , Kwa-Zulu Natal, Durban.

Pers. Com 2016c, Interview with female respondent from Kwa-mashu on the 16th of July (2016), Kwa-Zulu Natal, Durban.

Pers. Com 2016d, Interview with female respondent in Inanda on the 11th of July (2016), Kwa-Zulu Natal, Durban.

Pers. Com 2016e, Interview with female respondent from Inanda on the 13th of July (2016), Kwa-Zulu Natal, Durban.

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PARTICIPANT INFORMATION SHEET

DATE: JUNE 2016

Sir/Madam

My name is Penelope Mkhondo; I am a Masters Student in the school of Geography Archaeology and Environmental Studies at the University of the Witwatersrand. As part of my school assessment I am required to conduct a research study, to explore the implications of extreme weather conditions on food production within Inanda, Ntuzuma and Kwamashu (INK). I am particularly interested in how extreme weather conditions affect the ability of female headed households to secure food. The study further seeks to explore the different ways in which the households respond to the change and how they survive.

I kindly invite you to be part of the research study by participating in a brief interview. I would like to inform you that your participation in this research is completely voluntary and you will not be paid any money for it. If you do not wish to participate, you will not be affected in anyway, however I would appreciate it if you do share your views as a member of the community. If you would like to continue to be part of the study, please be informed that you are allowed to stop me or withdraw at any point of discomfort and I pledge that you will not be penalised, charged or be discriminated against in any way.

The interview will take between 30 and 45 minutes of your time. Your identity will be kept anonymous, and all data will be reported as a collective total in a form of a dissertation and therefore no one other than the researcher will know your individual responses. There are no known risks to participate in this research beyond those encountered in everyday life. Please feel free to answer all questions and do remember that there is no right or wrong answer for every response is equally valued. You will also be observed on how you and your household live, how you secure food and how you adapt to the implications of climate change.

Thank you for your time, you are welcome to contact me or my supervisor if and when you have any further questions about the research on the contact details provided below:

Researcher: Penelope Mkhondo

Supervisor: Prof Danny Simatele

Phone: 078 873 7606

Phone: 011 717 6515

Email: penelopemkhondo@gmail.com

Email: Danny.simatele@wits.ac.za



CONSENT FORM

I hereby acknowledge that I have read and understood all information as provided on the participation sheet and that in addition to that the researcher Ms Penelope Mkhondo has thoroughly explained to me all details of the research study and what is expected of me. I have been given the opportunity to ask questions about the nature and conduct of the study and my participation. I have been informed that my participation is completely voluntary and that I will not be paid any money.

I agree to be interviewed. I pledge to answer each question to the best of my ability and with great honesty. The researcher has explained to me that there are no known risks in participating in the study however I understand that I can withdraw from the study at any given point of the process and that I will not be penalized and charged for my actions. I also understand that I am allowed not to answer more than one question if it makes me feel uncomfortable and that no responses will be linked to my name for everything will be kept confidential and anonymous.

I have been given contact details of the researcher to contact at any time if and when I do need further information and clarity about the study.

.....

.....

Signature of Participant

Date



Questionnaire

Unique Code:	Language of Interview:
Interviewer :	Date:

Introduction

This questionnaire seeks to get information on the implications of climate variability on food security of female headed households and the different adaptation strategies adopted by the households to respond to the change.

Please feel free to answer all questions, remember there is no wrong or right answer for all responses are valued equally.

Thank you for your time and your cooperation.

1. Demographics and Socio-economic status

1.1 What is your age?

20-30	
31-40	
41-50	
51-60	
61-70	
Above 70	

1.2 Nationality

1.3 Section/ Area of residence

1.4 How long have you lived in this area?

1.5 Employment Status

Employed	
Unemployed	
Pensioner	
Survives on grant	
Other	

1.6 Extra Support/ Income generating opportunities

1.7 Do you own your house or are you renting the place?

1.8 How many people do you have in household/ number of dependents?

2 **Baseline study on urban farming**

2.1 When did you start farming and why?

2.1 Where is your garden situated? Home/ public space?

2.2 How many people are involved in your garden?

2.3 How do you share the different tasks among yourself?

2.4 Which crops do you produce?

2.5 Please explain what do you do with the produce? (eat/ sell)

2.6 How do you think your life and that of your family has changed since you have started farming?

2.7 Which of the following resources do you have access to?

Land	
Tools	
Fertilizers	
Technology	
Credit	
Access to markets	
Other	

3 Impacts of climate change on agriculture and households livelihoods

3.1 In your understanding, what is climate change?

3.2 Please explain, how has the climate changed over the past 15 years?

Temperature: _____

Rainfall: _____

3.3 Have you experienced drought or any floods in the area?

	Yes	No
Drought		
Floods		

3.3.1 If yes, how severe and how often? Please further explain how has that affected you?

_____ 3.4

How has the change in climate affected agricultural activity and produce in the past 15 years?

Temperature: _____

Rainfall: _____

3.5 How has change in climate affected your life in general?

3.6 Looking back to the last five years, in which months did you manage to harvest and produce more? _____

3.7 How do you think climate change will affect you in the future?

3.8 How do you think we can overcome the effects of climate change as a community?

4 The impact of climate change on food security and the adaptation techniques adopted by women to respond to climate change

4.1 Can you briefly explain your understanding of food security

4.2

Can you explain how food secure your household is in terms of the following aspects?

	Not secure	Secure	Extremely Secure
Availability			
Accessibility			
Utilization			
Stability			

4.3 Which aspect of food security do you think is more vulnerable to climate change and why?

4.4 Which measures have you adopted to adapt to climate change before, during and after the event?

4.5 Where have you learned about the adaptation measures? Is it indigenous knowledge or taught skills?

4.6 Has adaptation techniques changed over the years?

4.7 How has adopted measures helped built capacity and improve your life?

5 Government intervention to respond to climate change and to build capacity of the urban poor in EThekweni Municipality

5.1 How has the government assisted you in responding to climate change and to adapt to its effects?

5.2 What do you think are the challenges in implementing climate change initiatives?

5.3 What more do you think can be done to help female small scale farmers adapt to climate change?